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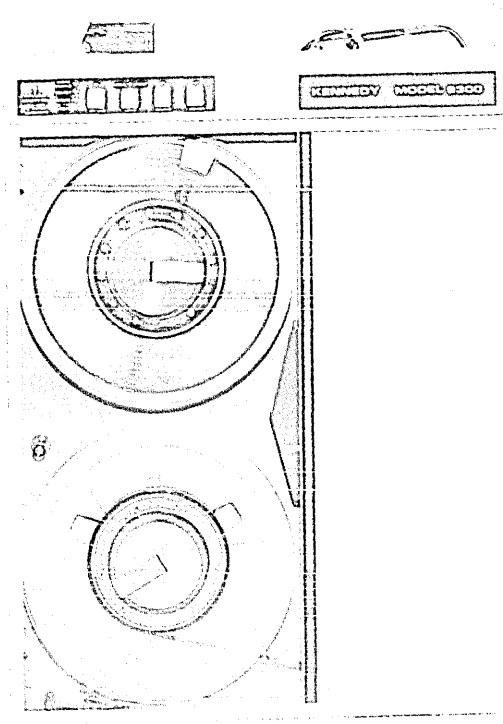

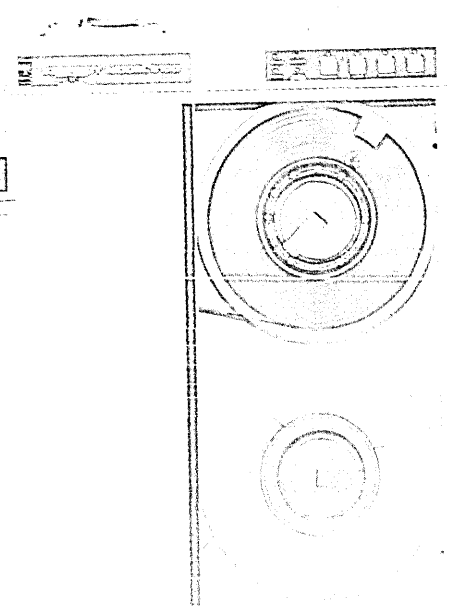

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And it does a whole lot more. It interfaces to AM Varityper phototypesetters, can easily communicate with mainframes, and can handle electronic mail and a multitude of tasks that other systems can't. And all for about $13,500 per screen.

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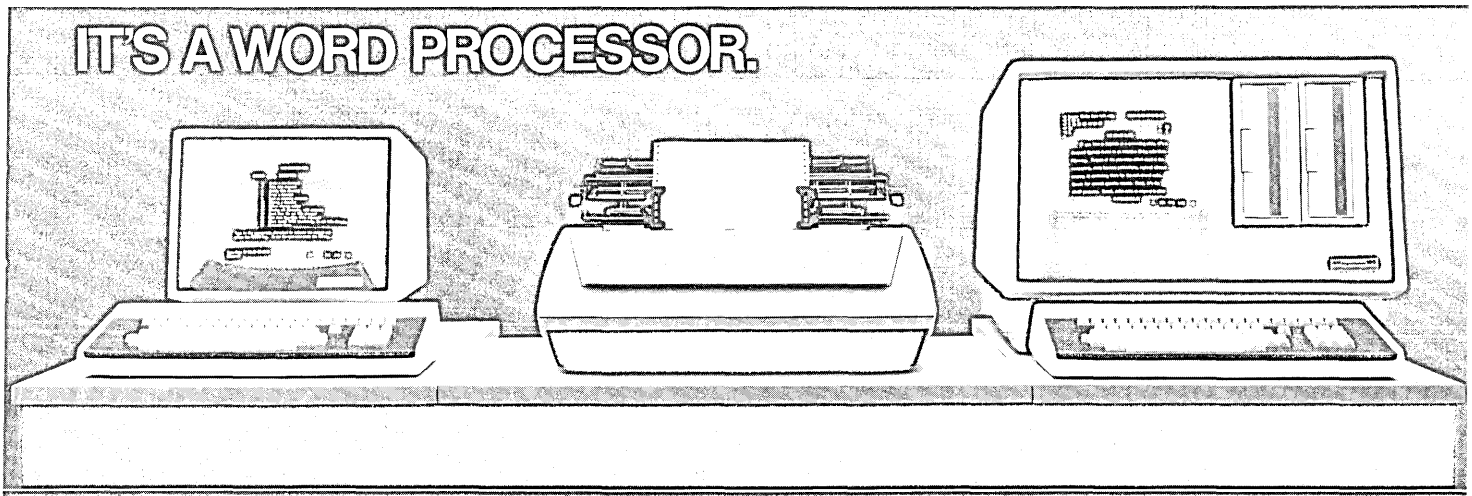
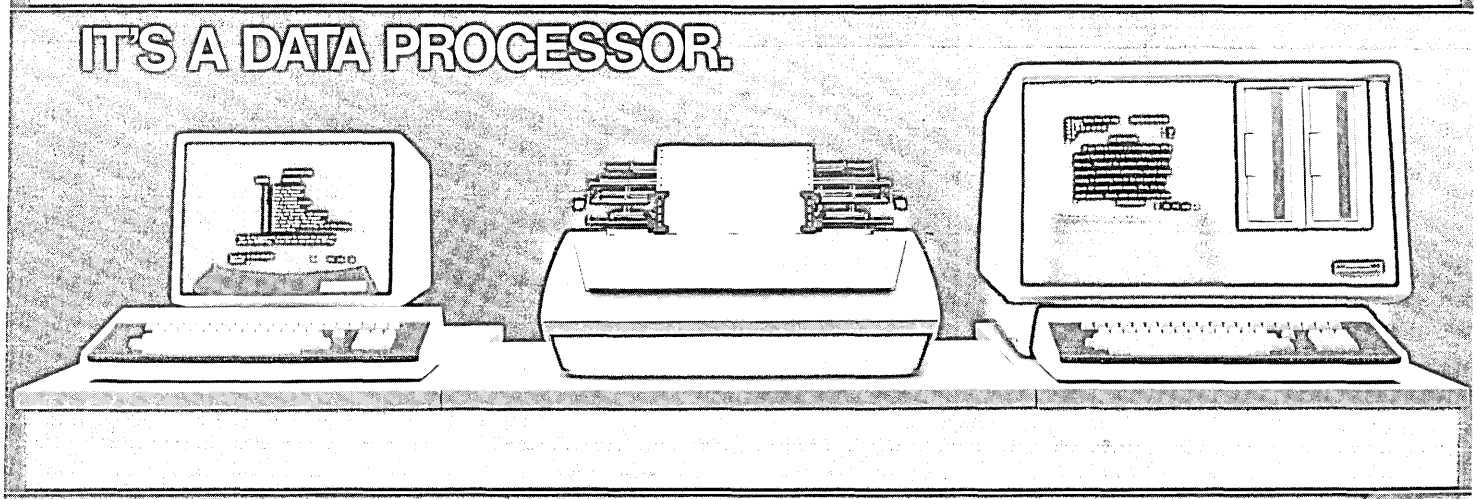
The AM Jacquard J121 is designed to boost your office's productivity and profitability. No one, but no one, offers so much versatility and flexibility for the money. And we know what we're talking about. Our parent company, AM International, Inc., has been designing products to modernize offices for more than 90 years.

If you want to know more—and you should—about our Datapro award-winning J121, contact AM Jacquard Systems, the Informationists, a division of AM International, Inc., Dept. 777, 3340 Ocean Park Blvd., Santa Monica, CA 90405. (213) 450-1242, Ext. 777.





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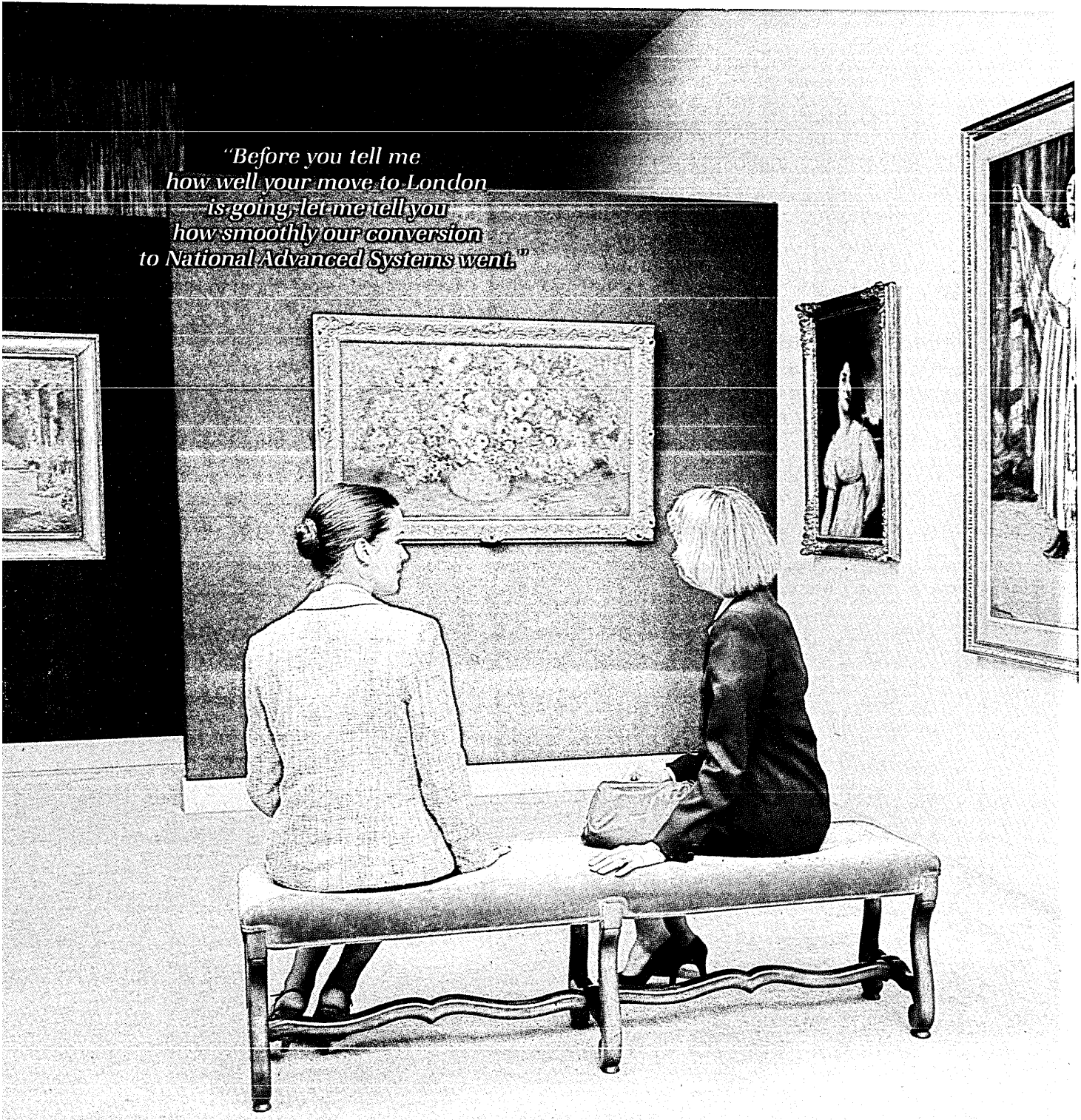

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National Advanced Systems

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CIRCLE 5 ON READER CARD

DATAMATION®

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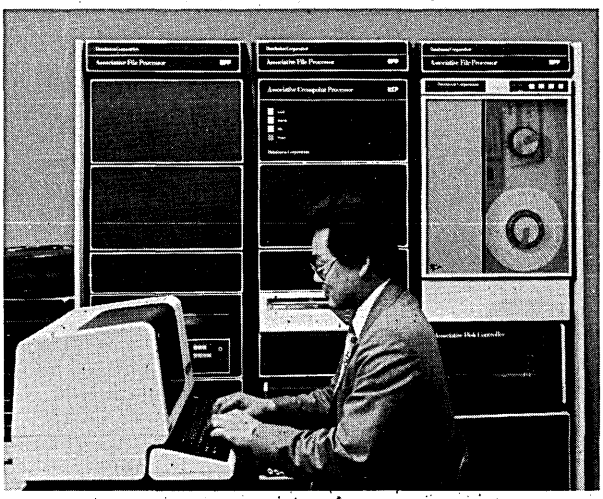
COVER PHOTOGRAPH BY STEVE PHILLIPS.

The Associative File Processor. AFP.



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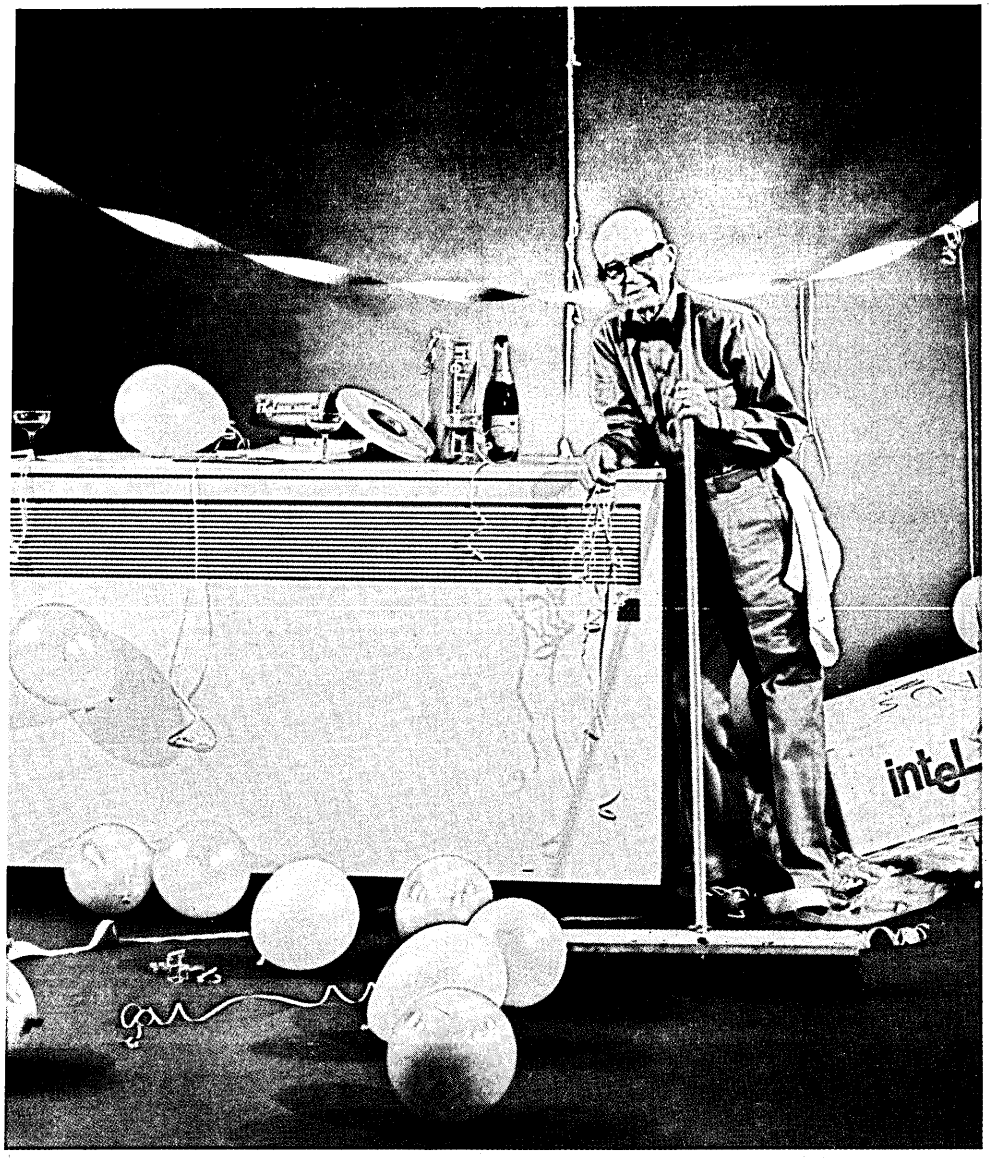

Cause for Celebration... your new 4300 with Intel's DBMS

Your DP staff is out celebrating a long-sought solution: hardware and software which work for them.

It feels good to be right. You've chosen Intel's SYSTEM 2000®/VSE data base management system to go with your 4300. It's a match that certainly calls for celebration.

SYSTEM 2000®/VSE DBMS: Made for the 4300.
Intel's DBMS is specially tailored to the IBM 4300 line and you, the user. Intel knows you have a diversity of application requirements and an urgent need to develop and maintain application software. You face a two-pronged challenge: to clear out backlogs and respond to increasing growth demands, while keeping budget and DP staffing on an even keel. Towards this end, you expect your software to relieve you of two fundamental concerns: *people productivity* and *low maintenance.*

Intel answers these people-intensive needs by providing:

- powerful productivity tools for programmers;
- simplified interfaces for end users;
- extensive prototyping facilities for application development; and
- flexibility to respond to modifications and change.

It's software that brings life to the party.
SYSTEM 2000/VSE DBMS, teamed with the 4300, allows you to maximize your valuable human resources by providing them with tools that make their jobs easier.

Programmers applaud Intel's versatile programming language extensions, which greatly facilitate their design efforts and free them to develop new applications as well as to update old. *End users* appreciate the free-form, English-like language that allows them to create, update and retrieve data bases without programmer assistance. Both enjoy Report Writer's comprehensive facilities which make reporting a routine and worry-free task. No programming is required.

And because SYSTEM 2000/VSE is dictionary-driven, you need never be apprehensive about changing your data base. The Integrated Data Dictionary (IDD) ensures that adjustments will not throw off the rest of the system in a "ripple effect."

Haven't had a good celebration for a long while? Call Intel's Market Information Office at 512/258-5171, or clip the coupon below. For you, the celebration has just begun. 4300 plug-compatible guests are also invited.

Please tell me more about SYSTEM 2000/VSE DBMS in 4300 (compatible) environments.

Name _____

Company _____

Mailing address _____

City _____ State _____ Zip _____

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Return to: Intel Market Information Office
P.O. Box 9968
Austin, Texas 78766

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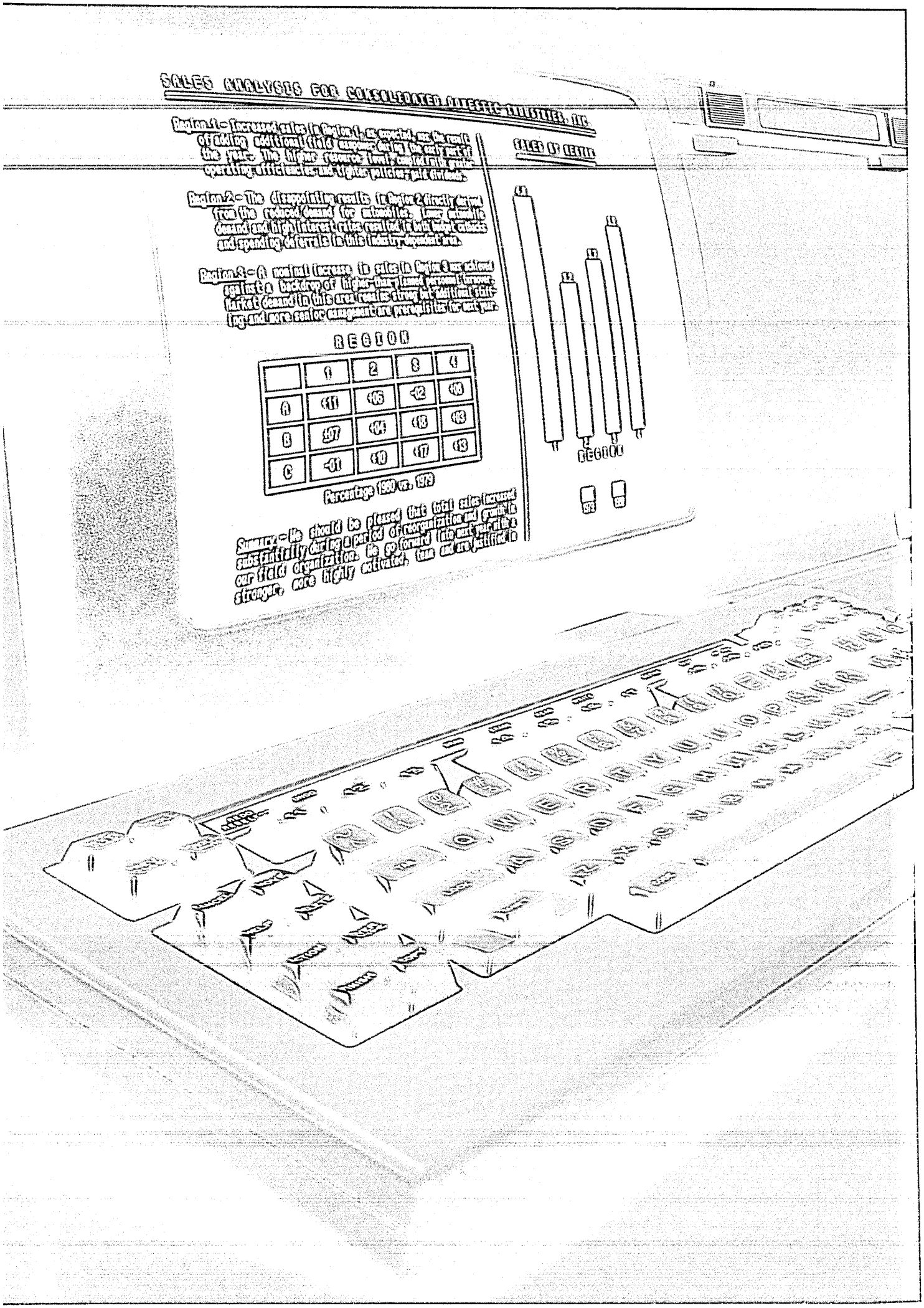
SALES ANALYSIS FOR CONSOLIDATED MAGNETIC INDUSTRIES, INC.
Region 1 - Increased sales in Region 1, as expected, was the result of adding additional field manpower during the early part of the year. The higher resource level, coupled with greater operating efficiencies and tighter policies, gave dividends.
Region 2 - The disappointing results in Region 2 directly derived from the reduced demand for automobiles. Lower automobile demand and high interest rates resulted in both budget cutbacks and spending deferrals in this industry dependent area.
Region 3 - A nominal increase in sales in Region 3 was achieved against a backdrop of higher-than-planned personnel turnover. Market demand in this area remains strong but additional staffing and more senior management are prerequisites for next year.
REGION
1 2 3 4
A +11 +06 -12 +08
B ±07 +04 +18 +03
C -01 +10 +17 +13
Percentage 1980 vs. 1979
Summary - We should be pleased that total sales increased substantially during a period of reorganization and growth in our field organization. We go forward into next year with a stronger, more highly motivated, team and are justified in
SALES BY REGION
REGION
1979
1980

THE FIRST MAJOR EVOLUTION IN COMPUTER DESIGN

"Major evolution" is the only way to describe the remarkable series of innovations in Convergent™ systems.

And it has some important implications for the computer OEM.

A megabyte mini on a desktop.

Convergent's "distributed intelligence" architecture replaces the conventional central processor with a powerful 16-bit processor at each workstation.

So workstations share peripherals and data, but not processing power. The result is unprecedented responsiveness, with the ability to support complex and diverse applications operating on the same data base, simultaneously.

The ultimate OEM building blocks.

Convergent hardware and software are totally modular, with multiple upgrade paths. A stand-alone system can be converted to local networking — without software modifications. Multibus™ card slots (standard equipment) let you simply plug in custom interfaces.

The multitasking operating system is specifically designed to be built upon, and supports five powerful languages (COBOL, FORTRAN, Pascal, BASIC, and Assembler), ISAM software, and much more. Industry standard communications protocols include 3270, 2780, and 3780.

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The Convergent workstation is designed with total sensitivity to the physiological and psychological needs of the operator. The simple, elegant package establishes the ideal spatial relationship between eye, screen, keyboard, and the built-in document holder. Heat and noise output are negligible, and every aspect of the operator interface is entirely "friendly."

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Distributed intelligence has long been discussed as desirable.

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Twenty Years Ago/Ten Years Ago

LOOKING BACK

APRIL FOOLISHNESS IN '71

A few paragraphs from funsters of the past:

From "Just So Programs," by Tom Woods: "In the High and Far-off Times, oh Best Beloved, the Very-First-Manager-of-Programming made loud unhappy noises about the lack of documentation, and he realized not that he had established a Tradition. Indeed, scarcely a month goes by, even now, that some minor pooh-bah does not hold forth, in one of the software trade journals, on his own documentation system. Such profusion proves confusion. If the bald truth be known, oh Nibbler of Small Bytes, any documentation is rare, and good documentation is unknown.

"Programmers prefer writing for machines rather than for humans; otherwise they would author magazine articles, rather than programs. The well-known scarcity of programmers has bred an independence that is largely superfluous since most Programming Managers are programmers who have made bad and are busy trying to start their own software houses on the side. What care they for the dictum 'Thou shalt not code until the flow-charting is complete.' Only two programmers in the country flow-chart before they code, and I've lost track of the other one."

Mr. Woods' Kipling look-alike ends with sets of instructions for managers, programmers, and customers:

"Managers! Continue setting up software houses. Being busy at that, you will not bother the Customer or the programmers.

"Programmers! You who so hate to document programs, because you know it to be a sham and a waste, you shall not document a line until the Customer returns with that successful test run and tells you what he really wanted in the first place. Then, with the expertise you have gained from the first iteration, you shall plan your program, flow-chart it, specify formats, and, let us not forget, write the code.

"Customers! You shall not demand any documentation until after the first good test run. You shall include the second iteration in your initial budget and schedule, and you shall realize that programmers, crazy though they are, are not the less human for it, and you shall live together with them in mutual peace and respect."

In "Naked Came The Time-Sharer," D. Neil Loshem describes his experiences as a timesharing-user-to-be, seeking the right firm for his needs: "Symbiotic Sharing Systems looked attractive, but when I called them the telephone operator said the phone had been disconnected for nonpayment. Hmmm. I had heard things were tough in timesharing. Shared Silver Cord looked like a likely candidate. They had a range of languages, no minimum, and since the salesman's commission was to be paid over a three-month period I figured they would be in business at least three more months. I put a check mark by that one. Amniotic Fluidics worried me. I couldn't shake the impression that they might be trying to do too much for me. I let that one go.

"Togetherness Terminals didn't seem bad, but when I called I was told the number had been changed. Warily I dialed the new number, and spent a pleasant few minutes with the operator at Cosmic Conglomerates. She was pretty sure she had heard about the acquisition of Togetherness, but couldn't put her finger on the number. I had decided to look for other opportunities." Loshem's luck never did improve.

STRETCH LOVE LETTER

DATAMATION interviewed Mr. Bengt Carlson, University of California, Los Alamos Scientific Laboratory, on Jan. 17, 1961, and then ran the interview on STRETCH in the February issue. By April, Mr. Carlson sent a letter saying the piece was unfair to both IBM and STRETCH because it reflected the situation as it existed in January, but not what existed by February. "For the past month, STRETCH has worked reliably and very well, not only on IBM diagnostic routines but also on Los Alamos production codes. I no longer feel that April 1 is an optimistic delivery date, since the performance and reliability of STRETCH has improved steadily over the last month. Formal reliability and performance tests will take place in Poughkeepsie during March on LASL problems for preshipment acceptance." Later in the letter, Mr. Carlson says of STRETCH, "We are eager to get it to Los Alamos, where we have a heavy work load waiting for it."

April Fool, Mr. Carlson.

—Deborah Sojka

Introducing the NEC 7700.

Cost of ownership counts.

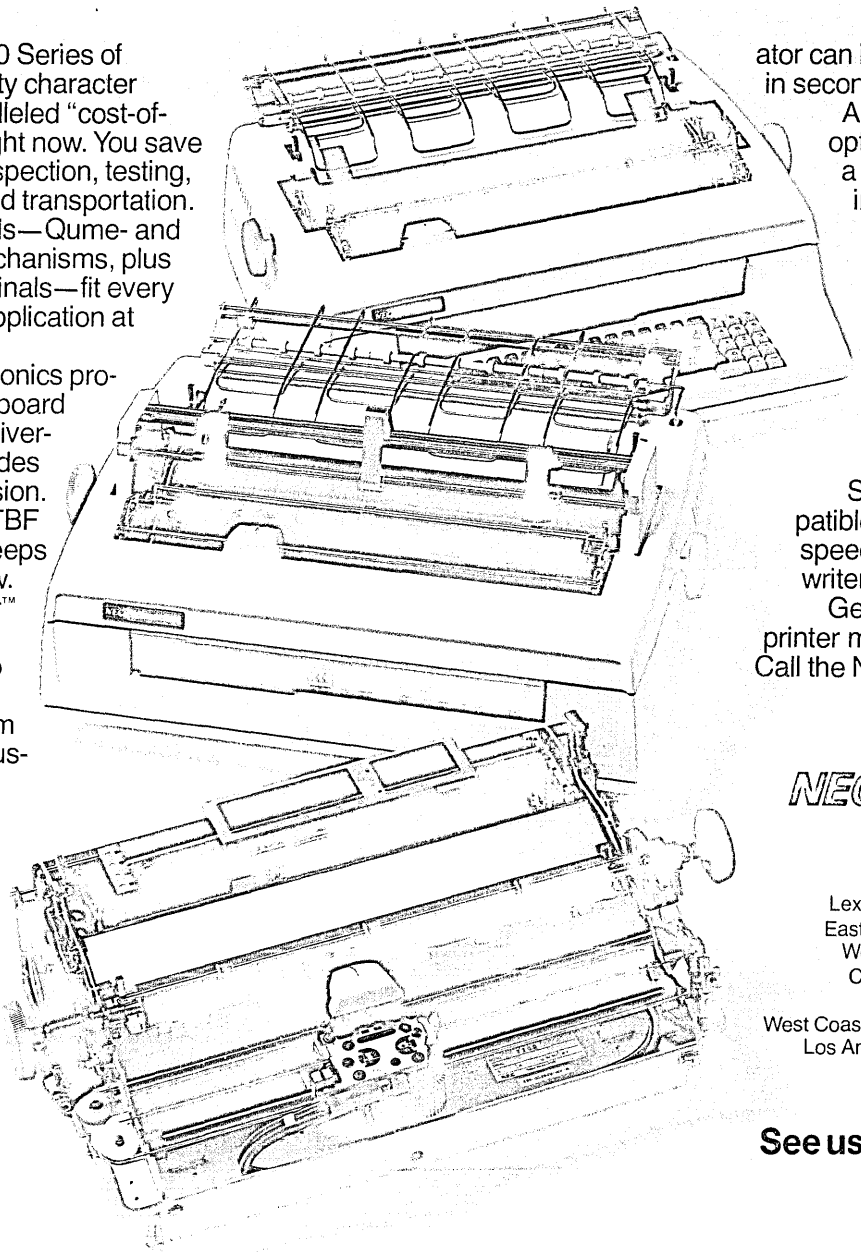
The new NEC 7700 Series of Spinwriter™ letter-quality character printers deliver unparalleled "cost-of-ownership" benefits right now. You save on service, sparing, inspection, testing, software, interfaces and transportation.

Seven basic models—Qume- and Diablo-compatible mechanisms, plus five RO and KSR terminals—fit every letter-quality printing application at speeds up to 55 cps.

Single-board electronics provide a 4-1 reduction in board sparing. A standard universal power supply provides simple voltage conversion.

Our 2,500-hour MTBF sets a new high that keeps your cost of service low. Series 7700 Spinwriter™ printers are so reliable you may never have to open the box. Dock merge with your system or direct ship to your customer with complete confidence.

Interchangeable forms handlers. NEC designs and builds more handlers than any one else. On any Model 7700, an operator can install any forms handler in seconds.



A powerful WP-assist option provides more than a dozen word processing print functions automatically.

That's not all. The 7700 Series offers new operator controls, a 30-minute MTTR, and NEC's huge selection of up to 128 character print thimbles. And the 7700 Series is functionally compatible with NEC's medium-speed 3500 Series of Spinwriter™ printers.

Get the best letter-quality printer money can buy. Right now. Call the NEC office nearest you.

NEC

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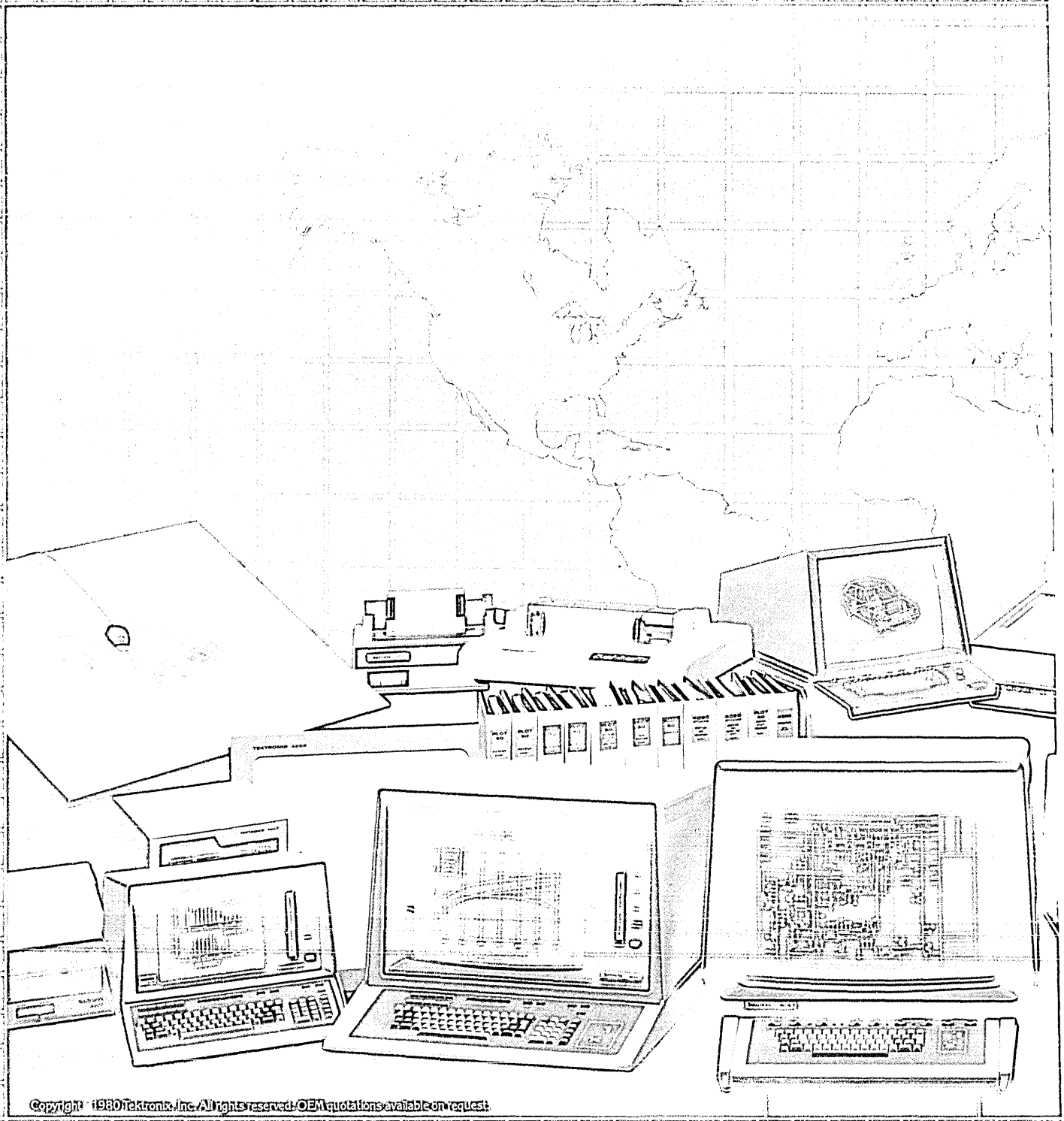
The Graphics



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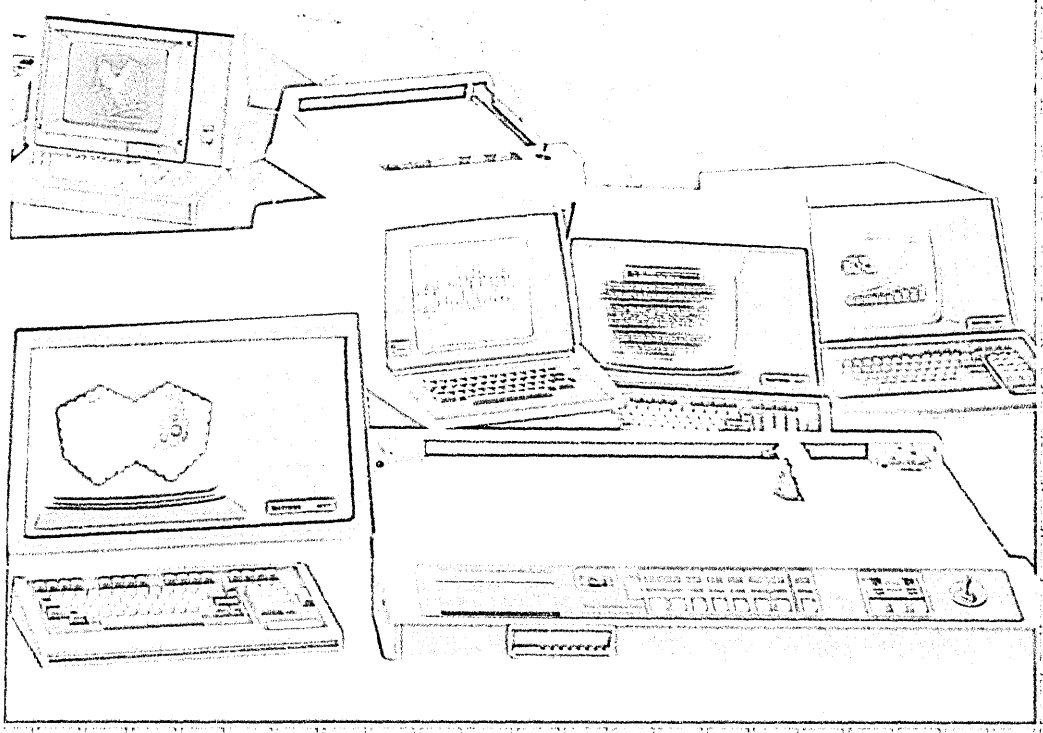

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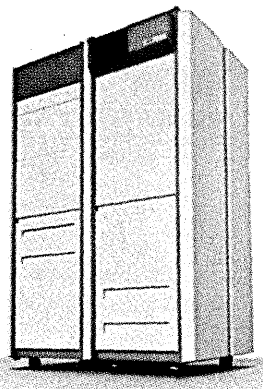
The entire BTI family
of 32-bit multiprocessor systems

See us at NCC Booth 948



Finally, there's a computer system that lets you grow by plugging in resources, instead of by changing models—the BTI 8000.

Our family secret is Variable Resource Architecture (VRA): a flexible mix of hardware resources controlled by a single, self-regulating operating system. The result is mainframe level performance at substantially lower costs, plus unequalled flexibility.

You can tailor the BTI 8000 to serve over 200 on-line, interactive users. Or to handle large batch loads. Or to do some of each. And, you can vary system performance **over a tenfold range** by merely adding or deleting hardware modules.

Additionally, built-in growth potential allows you to respond to changing requirements easily and quickly—without modifying either the operating system or your applications software.

As for reliability and support, they're established family traditions, proven by over 2,500 other BTI computers operating in the U.S., Canada and Europe. For full details about the BTI 8000, contact the BTI office nearest you.

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Corporate Offices: 870 West Maude Avenue, Sunnyvale, CA (408) 733-1122 Regional Offices: Piscataway, NJ (201) 457-0600; Palatine, IL (312) 397-9190; Altanta, GA (404) 396-1630; Sunnyvale, CA (408) 733-1122. Sales Offices in major U.S. cities. In the United Kingdom: Birmingham (021)-477-3846

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CIRCLE 12 ON READER CARD

LOOK AHEAD

IBM GETS PERSONAL

IBM may have emphatically denied a small computer deal with Matsushita, but the mighty mainframer most certainly has a personal computer up its sleeve. Latest reports indicate an early summer date has been set for the introduction of Chess, a desktop machine aimed at polishing off Apple, trashing Tandy, and sinking Commodore. Designed to retail in the under-$5,000 range, the Intel 8088 microprocessor-based machine is under wraps at the General Systems Division's Boca Raton, Fla., facility, home of the Series/1, 5120, and other small cpus. Those in the know claim IBM will distribute the machine widely throughout its own ranks before letting it out the door.

AN ADA IN YOUR FUTURE?

Expect an Ada compiler on the commercial market by summer. It will come from a San Diego company called TeleSoftware, launched by Dr. Kenneth Bowles of the University of California, San Diego (UCSD), a key figure in development of the popular UCSD Pascal. Difficulties in using Pascal for distributed processing led Bowles to Ada, the language on which the Department of Defense has invested some $10 million in hopes of making it a government standard. Bowles took a sabbatical from UCSD and formed TeleSoftware. Late last month TeleSoftware was in negotiations with another San Diego firm, Renaissance Systems, which also has at its core a group of UCSD Pascal developers, for a joint venture to bring TSI-Ada to the market. Bowles said their development efforts will be based on the last 10% of DOD development efforts and will not be complete until early 1982, when government validation for Ada is expected.

NEW DP/WP MICRO IN THE MAKING

Small but well-financed Artelonics of Santa Clara, Calif., an 80-employee affiliate of Shell Canada Ltd., is developing a $15,000 microcomputer that it has designed from the bottom up to perform dp and word processing functions at the same time. Many of today's mini and micro manufacturers add wp packages because customers ask for them, but they don't alter operating systems to accommodate the wp capabilities. Thus, performance is degraded when dp and wp functions are being performed simultaneously. At least that's the way Artelonics president William Odell explains his company's strategy for the Series 1000 office workstation, first shown at last month's Office Automation Conference in Houston. (No sales yet, but 20 workstations are being evaluated by customers.) With an investment from Shell of $10

LOOK AHEAD

million, and more to come, Odell plans to offer the Series 1000 as the heart of an office automation product that performs many other functions such as managing databases and handling electronic mail and facsimile.

AT&T DRIVES A HARD BARGAIN

AT&T's entry into competition is being preceded by rate hike applications on all fronts. The latest Bell application to the FCC is for approval to boost private line rates more than 16%. The phone company claims the increase is necessary to bring these services up to its authorized 10.5% rate of return. Coming hard on the heels of a proposal that would increase WATS rates for large users, the private line rate hike will be challenged by the Tele-Communications Association and other industry groups. Some observers believe the hike in costs to operate private lines is part of a subtle, long-term effort to make such facilities uneconomical for large corporations. This would pave the way for Bell to offer alternative switched services at lower rates. If the increases are approved by the FCC, competing new carriers are expected to fall in line under the AT&T price umbrella, causing users to wonder if they will ever see promised lower rates as a result of competition.

MOST FAVORED COMPANY

It looks like the British government wants to help carry domestic mainframer ICL through its current financial troubles. In addition to its long-standing support of the company's R&D efforts, the U.K. government now says it will act as guarantor of ICL's current $160 million overdraft position with the banks. British industry minister Sir Keith Joseph also says that the government will guarantee an additional $450 million in bank loans that ICL may need over the next two years. Some observers take all this to mean that ICL's second quarter figures won't be much of an improvement over its first quarter debacle.

DYALING INTO THE '80S

Ten years after introducing the computer industry to mail order software, Dylakor of Chatsworth, Calif., will introduce this summer its first new product in nine years. This time, it's a product aimed primarily at the end end user. The new DYL-280 is a report writer/utility programmer aid much like its predecessors DYL-250 and DYL-260, except that it can be used by nonprogrammers. Joshua Kahn of D.S.J. consultants, Northridge, Calif., who has been beta testing DYL-280 at a major southern aerospace company, says a nonprogrammer can learn to use the product in one day, a

(continued on page 39)

Think what your programmers could do if your users did their own reports.

Answer/DB, the latest Implementation System from Informatics, is the new on-line software tool for report generation. It lets non-DP people develop their own report requests at a terminal—in an English like language—with as few as four simple statements.

That means much faster report turnaround, wider smiles from non-DP people in your organization, and greatly increased programmer productivity.

Answer/DB has made old-fashioned batch reporting systems obsolete because it's designed to handle the problems you'll be facing in the data base and data communications world. Answer/DB operates with your standard OS/DOS files and IMS data bases. And it offers completely interactive, on-line query entry with syntax checking and editing capabilities for creating error-free report requests.

For more information on Answer/DB and other information retrieval systems, just complete the coupon. Or, call us at (213) 887-9121.

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Computer_____ Operating System: ☐ DOS/VS ☐ OS/VS

TP Monitor: ☐ IMS/DC ☐ CICS/VS ☐ TSO ADB-DM-481

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CIRCLE 13 ON READER CARD

STC can help you realize greater productivity from your information processing system with products designed for maximum performance.

Products such as the STC 4305 Solid State Disk. This high speed device improves paging rates and enhances total system throughput far beyond any other device available today.

The STC 8000 Series disk family provides the industry's fastest response times. Innovative features such as dual port, multiple recording formats and media interchange switch offer you higher capacity, optimum performance and greater reliability. Our STC/Documation 3000 Series impact printers with speeds beginning at 1550 LPM are upgradable to 3000 LPM as your throughput requirements increase.

STC tape products with their proven reliability make STC the world's largest supplier of high performance tape subsystems.

We have solved throughput problems for some of America's most demanding users—often at significant cost savings. To find out how STC can help you, call the STC sales office in your area. Or call us toll free at 1-800-525-2940, Ext. 4063. Storage Technology Corporation, MD-3M, 2270 S. 88th Street, Louisville, CO 80027.

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P3077S G 2/81

CIRCLE 14 ON READER CARD

CALENDAR

APRIL

Ninth Annual Telecommunications Policy Research Conference, April 26-29 Annapolis, Maryland.

The object of this conference is to provide a forum for the analysis and discussion of telecommunications policy issues. Contact William E. Taylor, Bell Laboratories 2C-258, 600 Mountain Ave., Murray Hill, NJ 07974, (201) 582-2108.

MAY

NCC, May 4-7, McCormick Place, Chicago.

The NCC's theme this year is "Keys to Productivity." Contact Diana Snow, AFIPS, P.O. Box 9658, 1815 North Lynn St., Arlington, VA 22209, (703) 558-3617.

AEDS Annual Convention, May 5-8, Minneapolis.

This convention is sponsored by the Association of Educational Data Systems each year. Contact Dale Schneiderhan, MECC, 2520 Broadway Dr., St. Paul, MN 55113, (612) 376-1600.

Intelcom '81, May 5-8, Paris.

One in a series of Intelcom International Telecommunications and Computer Expos, addressing the developments occurring in Europe, the Mediterranean, the Mid-East, and Asia. Contact Horizon House, 610 Washington St., Dedham, MA 02026, (617) 326-8220.

Association for Systems Management Annual Conference, May 10-13, Las Vegas.

The conference emphasizes systems planning, concepts, and advanced office systems. Contact R. B. McCaffrey, ASM, 24587 Bagley Rd., Cleveland, OH 44138, (216) 243-6900.

Eighth International Symposium on Computer Architecture, May 12-14, Minneapolis.

The symposium is cosponsored by the IEEE and the ACM. Contact Computer Architecture, P.O. Box 639, Silver Spring, MD 20901.

Fifth International Conference on Computers and the Humanities, May 17-20, Ann Arbor, Michigan.

The ACM, the University of Michigan, and the Association for Literary & Linguistic Computing put this one together. Contact R. W. Bailey, Department of English, University of Michigan, Ann Arbor, MI 48104, (313) 764-6354.

Automan '81, May 19-21, England.

This is the first European Automated Manufacturing Exhibition & Conference. It will be devoted to robotics and automated manufacturing. Contact Clapp & Poliak International, 7315 Wisconsin Ave., Washington, DC 20014.

1981 Canadian National Conference and Exhibition, May 25-27, Hamilton, Ontario.

The DPMA's Hamilton conference (also called "Hard Hat Solutions") is geared toward enhancing the education of novices to professionals in dp. Contact W. B. Seifried, 1981 National Conference Committee, P.O. Box 814, Station A, Hamilton, Ontario, Canada L8N 3M8.

Trends and Applications 1981: Advances in Software Technology, May 28, Gaithersburg, Maryland.

The IEEE and the NBS Institute for Computer Sciences and Technology cosponsors this symposium. Contact Stan Lichtenstein, National Bureau of Standards, U.S. Dept. of Commerce, Washington, DC 20234, (301) 921-3181.

JUNE

Europe Software 1981, June 2-4, Utrecht, the Netherlands.

The show is limited strictly to software, and will have a U. S. Exhibition section. Contact S. V. Smith, Consulate General of the U.S., Museumplein 19, 1071 DJ Amsterdam, The Netherlands.

1981 National Computer Graphics Association Conference & Exposition, June 14-18, Baltimore, Maryland.

This second annual event is managed by the Society of Manufacturing Engineers. Contact Robert Kian, SME, One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

COMDEX/Spring '81, June 23-25, New York.

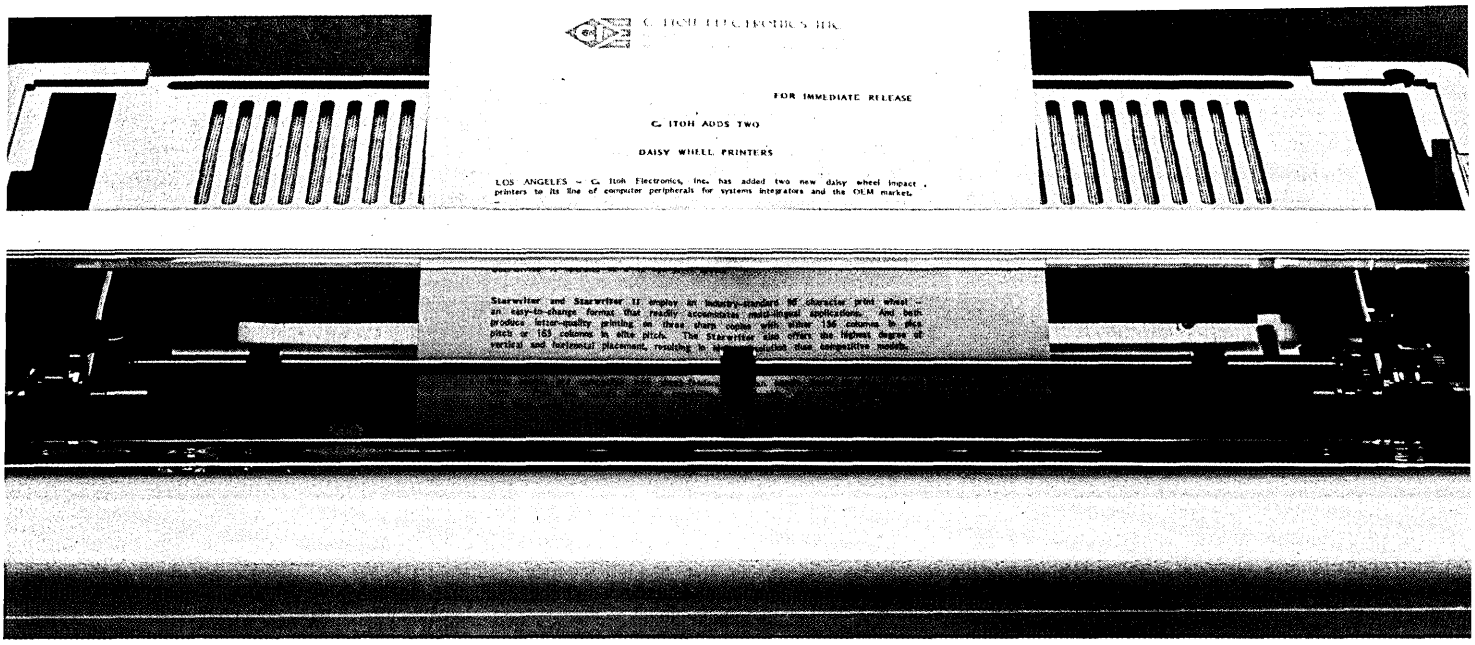
"Where vendors and ISOs (independent sales organizations) get together." Contact The Interface Group, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Eighteenth Design Automation Conference, June 29-July 1, Nashville.

The major topic will be computer-aided design of digital systems. Contact Dave Hightower, Texas Instruments, Box 225621 MS3907, Dallas, TX 75265.

Syntopican IX, June 29-July 2, Atlanta.

Presented by the International Word Processing Association, conference will feature panels, sessions, and workshops on information processing topics. Contact Conference Services Dept., IWPA, 1015 North York Rd., Willow Grove, PA 19090, (215) 657-6300.



LETTER PERFECT.

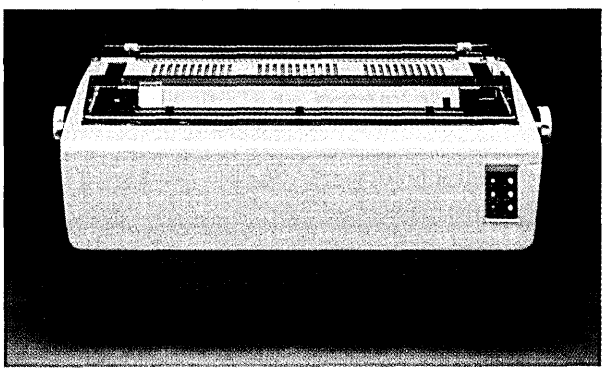
You can actually see the superior print quality when you use C. Itoh's new daisy wheel impact printers. Besides clear and crisp print characters, you also get the throughput performance you're looking for, at prices never before available to quantity buyers of Daisy Wheel printers.

C. Itoh's Starwriter offers you a print speed of 25 cps while the Starwriter II operates at 45 cps. Both machines incorporate the latest LSI technology and utilize an easy-to-change industry standard 96-character wheel. Starwriter printers are the perfect choice for multilingual and multi-discipline applications.

The two Starwriter models also feature self-test capabilities and a programmable VFU. You'll be able to print up to 163 columns on multiple copies and you can process paper widths to 381 mm (15"). Both models are equipped with front panel indicator lamps and switches.

You can put our printers to work the minute they're delivered. They're plug-compatible and meet either the industry standard parallel interface specifications or serial RS 232 C with voltage or current mode capacity.

So if you're looking for perfection in printing, let our Starwriters do the job. All printers are backed by C. Itoh's warranty and nationwide service organization. For more information, contact C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066; Tel. (213) 390-7778. Chicago Office: 240 E. Lake Street, Suite 301-A, Addison, IL 60101; Tel. (312) 941-1310. New York Office: 666 Third Ave., New York, NY 10017; Tel. (212) 682- 0420. Dallas Office: 17060 Dallas Pkwy, No. 108, Dallas, TX 75248; Tel. (214) 931-0177. Represented in Canada by Canadian General Electric.



C. ITOH ELECTRONICS, INC.

One World of Quality

SEE US AT NCC—BOOTH 645

CIRCLE 15 ON READER CARD

Meet the first family of compatible computers.

The Prime 50 Series is the first family of 32-bit computers to feature total compatibility. It's a unique feature. And if you intend to grow, you won't want to be without it.

No growing pains. Compatibility is a word we don't use loosely. It applies across the line to every computer system we make.

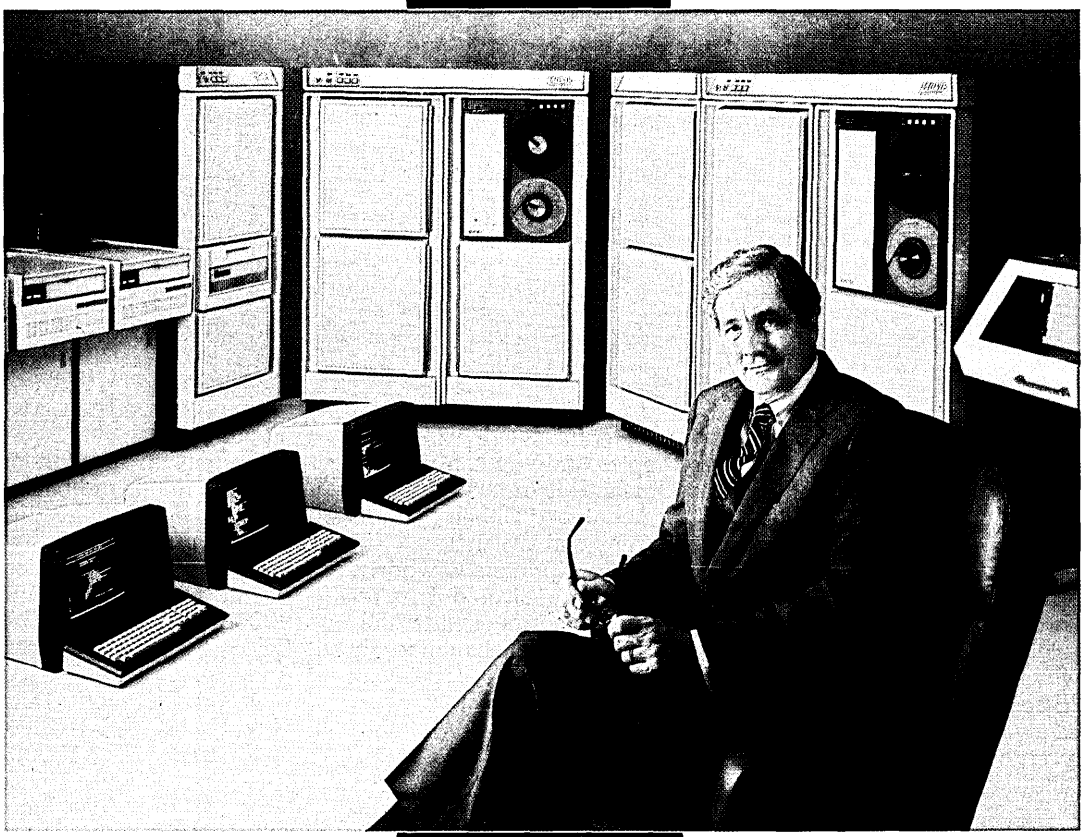
In fact, all Prime computers use the same operating system, the same file structure, and the same communication system. So no matter what level system you start with, you can easily and economically expand capacity by upgrading your current system or adding another member of the family.

First and foremost. Prime means first. And we've had a lot of them. We were first with a family of compatible 32-bit computers. First to put mainframe capabilities – like large on-line disk storage and DBMS – on a mini. First with a single operating system and a common file structure across an entire product line. First with virtual memory on a mini. And first to open an X.25 transatlantic communications link.

At Prime, being first has become a habit.

Meet the family. In a time when the relationship between price and performance has become vitally important, you should make it a point to meet our family. In the U.S., write Prime Park, MS 15-60, Natick, Massachusetts 01760. In Europe, write Prime Europe, 6 Lampton Road, Hounslow, Middlesex, TW3 1JL, England, Tel: 01-570-8555.

PRIME Computer



CIRCLE 16 ON READER CARD

LETTERS

SAY, WHAT?

Re: "Robots to the Rescue" (Jan., p. 84), the vendor list omitted Mobot Corp., a supplier of industrial robots for magnetic disk manufacturing. Although small, we are publicly held and are addressing our entire corporate purpose to the manufacture and sale of practical, laborsaving machines.

LAWRENCE J. KAMM
President
San Diego, California

The article maintained my interest more as an assay of my command of the English language than a review of the robotics industry. Manumission . . . pullulating . . . posit . . . Really! A hasty survey of the dp personnel on my staff revealed pandemic inadequacies in our vocabularies. Summarily, Mr. Froelich's profligate use of his meretricious vocabulary served only to derogate an otherwise elucidative article.

ANTHONY R. FONZE
Regional Support Manager
Computer Communications Inc.
Torrance, California

The weight capacity of the Maker Robot System is 5 pounds and under, not "over 5 lbs." as stated.

SUSAN MONTGOMERY
U.S. Robots
Conshohocken, Pennsylvania

The article quoted several persons on the impact on society of job displacement by industrial robots. I wish he had mentioned a free enterprise outlook, however. The implication was that with free enterprise capitalism, economists and society in general don't know or care what the impact of industrial robots would be. This is not true.

An economist would note that if the cost of an industrial robot was exactly the cost of the labor it replaced, then the task it replaced would be exchanged for the higher level task of designing, installing, and maintaining the industrial robot. If the robot was lower in cost, which it must be to be used extensively, then this will result in a lower-cost product. This lower-cost product, when passed on to consumers (assuming a competitive environment), will give the consumers more money, which they will spend on other goods and services that they were previously unable to afford. This would create new jobs in exactly the same amount as those lost.

The total net effect would be a higher standard of living, and the necessity of retraining those people displaced by the industrial robot . . . The displaced person usually has a convenient target to strike out at in protest; people faced with a stable or decreasing standard of living often do not.

RICK ROOME
Group Engineer, Software Development
McDonnell Douglas
St. Louis, Missouri

BIG-TIME OPERATING

Re: "A History of Operating Systems" (Jan., p. 118), Mr. Weizer has presented an extremely inaccurate and distorted picture of events of the last two decades. In several cases, he has reversed the chronological order of events by giving as effects developments which occurred prior to their purported causes.

As examples of the time reversal in this article, the GE 600 family could not have been developed in response to S/360, since it was out long before; the Honeywell 200 family, marginally compatible with the 1400 line, was out before the 360; the CDC 6000 series was cut before the 360; and the Univac 1100 product lines (both 1103/1105 and 1107/1108/1110) were out before the 360.

The references to OS/360 are completely off base: PCP, MFT, and MVT are not different operating systems, but different SYSGEN options. The bulk of the code in OS/360 proper is included regardless of which option is specified. It is, of course, true that some selectable components, such as RJE, CRGE, TSO, GJP, either require MVT or at least exclude PCP, but these are peripheral to the actual operating system. As for OS/VS1 and OS/VS2, they are so different that some of the code in OS/VS2 MVS Release 3.8 still bears comments identifying the code as pertaining to OS/360 Release 20.1. The most important of the conversion tools alluded to in the article were the various emulators, but these were standalone programs until long after the period in question. Finally, OS/360, in "its most complete version," did include multiprocessing; it was available for the MP65 (aka 65MP), and was supported as a specialized variant of the MVT option.

"TSS is history," but, if so, it is very recent history; it is still being used on large models of IBM S/370s at such companies as GM. As for its place being taken by VM, the *only* piece of software which IBM has available to provide the function of TSS/360 is TSS/370; VMF/370 doesn't even come close, although it does provide unrelated functions to those who use it.

The Operating System Family Tree shows totally spurious relationships, while omitting some which actually existed; in particular, most of the system pairs shown as "user-level" compatible are not, yet OS/VS1 and OS/VS2 have a high degree of user-level compatibility, which is not shown. IOCS is not shown as having any relation to either FMS or IBSYS, even though versions of IOCS ran under both FMS and IBJOB in IBSYS. BPS is shown as having a direct relationship with OS/360, which is totally unrelated, yet is not shown as having any connection with TSS/360, which actually used BPS for certain system components, such as TSSS; the highly influential CTSS is not shown as having any effect on the IBM operating systems, including TSS; GECOS, the primary operating system of the GE 600 family, later evolving into the main product line of Honeywell in the large system area, is not shown. The Burroughs B5000 family is shown as continuing on into 1981, yet the 6500 family (6500/6700/6800, 7500/7770/7800), which effectively knocked it out of the marketplace a decade and a half ago, is not shown.

The final section of the article describes recent developments as "fourth generation operating systems." The description of what the user now sees coming in from IBM is diametrically opposed to real-

LETTERS

ity: rather than an increasingly simple operating system, there has been an increasingly complex operating system, consisting of a free base and a number of chargeable packages which replace, rather than supplement, various components of the base. Not only does the resulting Rube Goldberg system cause problems in the complexity and support of the system, but a simple task like obtaining a manual requires assembling a base publication and supplements with baling wire and chewing gum. This is a step backwards, not a step forward, and represents a change in the packaging of the software, not in the structure. IBM has clear legal and economic motives for taking this approach, but the reliability and ease of use of the software has clearly suffered as a result.

SEYMOUR J. METZ
Comnet
Washington, D.C.

The story should have been titled "A History of IBM Operating Systems." Mr. Weizer did mention that General Electric, among others, was developing operating systems in the '60s. However, not to point out that GE's GECOS ("GE's New Monitor," DATAMATION, November 1967) was years ahead of the industry is disappointing. When announced, GECOS (now Honeywell's GCOS) was a multiprogramming, multiprocessing, batch/remote batch/time-sharing operating system with a sophisticated centralized file system. The GCOS was built on a hardware architecture, channel to system/memory controller that is recognized ("Trends in Software Structure Seen Affecting System Functions," *Computerworld* p.S/37, Feb. 23, 1976) as the most desirable even today. Many of Weizer's fourth generation operating system attributes have been a part of GCOS before the year 1977 given in Table I.

It is a disservice to the non-IBM readership out here to distort the past history of computers to match IBM's present share of the marketplace.

RONALD J. ROMANCZUK
Phoenix, Arizona

I was disturbed to see no mention of Honeywell's General Comprehensive Operating System (GCOS). This OS has survived an orderly 15-year transition from the GE-635 to the H6000, Level 66, and DPS8.

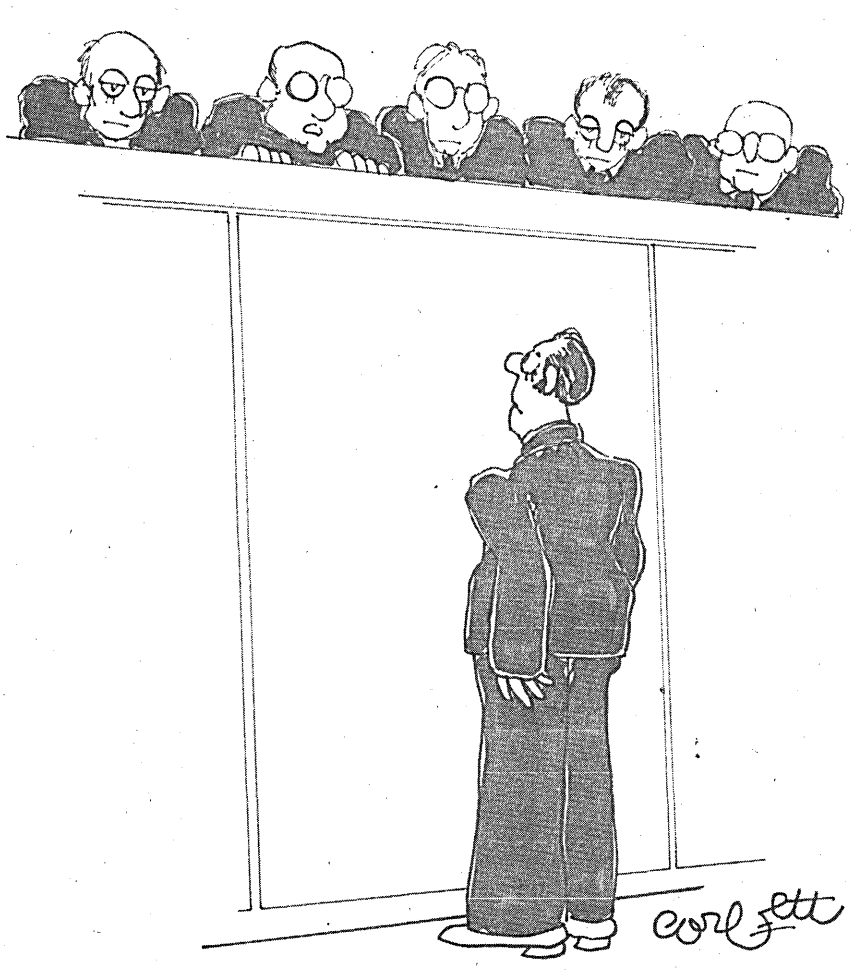
A single version of the GCOS supports all the models in the product line. Perhaps of more significance is that GCOS automatically adapts itself to the hardware configuration at hand. For example, it can change from a uniprocessor environment to a multiprocessor environment with a mere reboot of the system (about two minutes) with *no SYSGEN*.

GCOS not only enjoys the satisfaction of its customer base but regularly achieves lengthy MTFB rates for even very-large-scale configurations.

GERALD M. BULL
Manager
Corporate Data Processing
PHH Group
Hunt Valley, Maryland

Mr. Weizer stated "However, OS/360, even in its most complete version, OS/MVT, was missing some of the more advanced features of the Burroughs MCP, such as multiprocessing, virtual storage, and source level debugging support." All three of these features were available in OS/MVT, albeit in crude or limited implementations. MVT supported multiprocessing for the S/360/65, ROLLOUT/ROLLIN was a form of demand swapping for batch jobs, and TESTRAN allowed source level debugging. But these were not very popular features of OS—I have never heard of any installation that used them, but they were there nevertheless.

WILLIAM R. FAIRCHILD
Senior Systems Programmer
American Management Systems, Inc.
Arlington, Virginia



"We've gone over your case, and we have an opinion, a minority opinion, and a gut reaction."

©DATAMATION

CARTOON BY JACK CORBETT

NO LOW

Re: "People" (Special Edition, p. 67), Bunker Ramo was described as being in a "low" period and the article speculated about a "sellout." We fail to understand how your reporters reached such a conclusion.

Over the past five years we have had a steady increase in revenues, net income, return on equity and book value, while making large increases in capital expenditures and research and development.

Our year-end results and the most recent dividend increase certainly do not support your description of a "low period" for Bunker Ramo.

W.E. VAN DYKE
Vice President
Bunker Ramo Corp.
Oak Brook, Illinois

Ed. Note: B.R. directors voted a 17% increase on the annual dividend— to $1.40/share— in January. FY'80 earnings were $4.23 per share, up from $3.65 in FY'79.

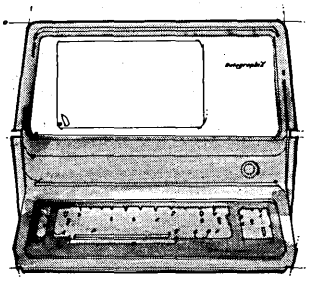
EXPERIMENTAL INDICES

Re: "Making Friends With User Friendly," (Jan., p. 108), index registers were available on the Ferranti Mark I computer as early as 1951, five years before the "first

DATAGRAPHIX LETS YOU HAVE YOUR 132-COLUMN DISPLAY AND READ IT, TOO.

It's the Charactron that makes the difference.

Why suffer with display terminals that show only part of your output? Or if you do get a 132-column display, why suffer eye strain trying to read it?



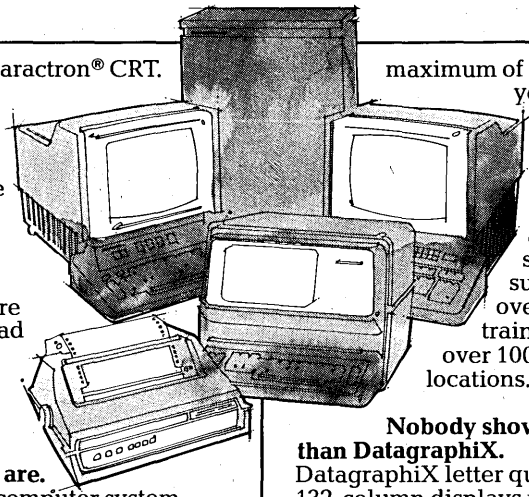
DatagraphiX display terminals show all 132 columns, and the CHARACTRON® makes them easy on the eyes. Now you don't have to waste time and money on programming to reformat the computer output to 80 columns. You don't have to waste your time and the computer's time and lots of paper running hard-copy printouts when you need to see the complete 132-column picture.

DatagraphiX puts an end to the big data squeeze. DatagraphiX will free your data crunch. DatagraphiX® display terminals give you the full 132 columns on a display that's as easy on the eyes as a good book.

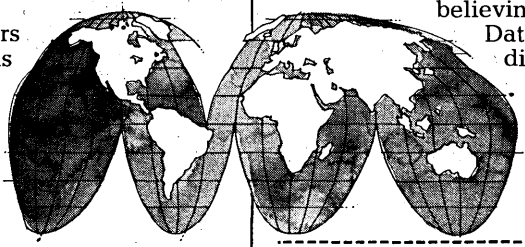
Not only that, but what you save on format programming, computer time, paper and improved operator and programmer efficiency makes DatagraphiX the most economical display terminal you can buy.

A new page in display terminal advancement. The innovation that makes all other 80- and 132-column display terminals and their dot matrix characters seem primitive is the DatagraphiX Charactron® CRT. A DatagraphiX exclusive that literally stencils letter-perfect characters on the screen with an electron beam.

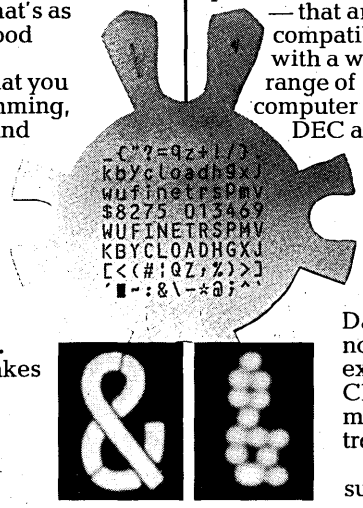
Sharp, clear, fully-formed characters that are even easier to read than most hard-copy computer printout pages.



DatagraphiX is ready when you are. No matter what computer system you're using, there's a good possibility that one of our DatagraphiX terminals can give you all the advantages of the 132-column format in a perfect match-up with your system. DatagraphiX offers six display models plus two cluster controllers, printers, and printer interfaces — that are compatible with a wide range of computer systems including IBM, DEC and Univac.



No waiting either. Delivery is from stock on many models.



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CIRCLE 17 ON READER CARD

LETTERS

appearance" Gruenberger cites as occurring on the IBM 704. Admittedly this was a British computer, but it was available in North America—the first machine was installed at the University of Toronto Computing Center in 1952. This feature was an intrinsic element of the experimental computer, predecessor of the Mark I, developed jointly by Ferranti and the University of Manchester team led by F.C. Williams and A.M. Turing. While this had only a single index register ("B-tube"), to the best of my recollection the Mark I had eight.

AUDREY CLAYTON
Forecasting International, Ltd.
Arlington, Virginia

Mr. Gruenberger replies: Usually, DATAMATION's editors operate on my prose and greatly improve it. This time, their deletion of three words, "in this country," triggered another one of those "who did it first" debates. Ms. Clayton is of course correct, and the history people should be grateful for her footnote.

ONE MORE DBMS

Re: Letters (Jan., p. 25), RTFILE, our relational data base management system, should have been included in Mr. Blodeau's list of commercially available relational systems. RTFILE runs on DEC PDP-11 and LSI-11 computers under the RT-11 operating system. The single-copy end-user license costs $2,500.

ROBERT C. NATALE
Brentwood, Maryland

HELPFUL HEAD

Re: "Help from a Headhunter" (Feb., p. 183), Howard Weeks deserves the "Tell It As It Is Award." His six paragraphs should become the written code of our industry; he describes what most of the ethical recruiting and search firms do to earn their keep.

JOSEPH N. GANIM
Recruiting Services, Inc.
Cincinnati, Ohio

AGE OF THE 4GL

Re: "Assuring MIS Success" (Feb., p. 109), the age of the fourth generation languages has arrived. Yale University's Administrative Data Systems has been using them for the past 3½ years. Our experience has convinced the programming staff and management that these languages are the most revolutionary application programming tools to be developed in the last 10 years.

For example, since mid-1979 we have implemented several administrative production systems using FOCUS in a fraction of the time it would take to do using COBOL.

The reference to Interactive Requirements Analysis, or what we refer to as "prototyping," should be emphasized. At Yale, we use a fourth generation language extensively to do prototyping, not only to show our users a sample of the system, but to let them actually use it for a while and evaluate it. After all, this is the decade when the users will become more involved in a project from its very inception and with these tools, prototyping eliminates any postproduction surprises.

GORDON J. MATHIESON
Manager, Application Systems
Administrative Data Systems
Yale University
New Haven, Connecticut

CREDIT IS DUE

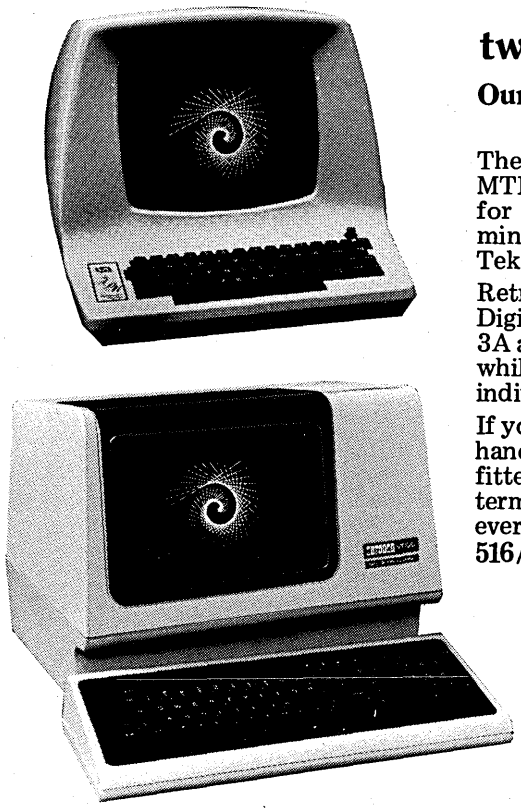
The piece "Nonavailability of Straightforward Formulation," which appeared unsigned in the February issue (p. 82), was written by Vicki Porter Adams.

CORRECTIONS

Re: Letters (Jan., p. 25), please note the correct spelling of the company's name, Krall.

CARL A. SINGER
Senior Associate
Krall Management Incorporated
Radnor, Pennsylvania

P.S. "The sort of limitations" in paragraph No. 6 should read "The sort limitations."



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Retro-Graphics are retro-fitted graphics boards manufactured by Digital Engineering, Inc. that fit neatly into Lear Siegler's ADM-3A and 3A+ and DEC's VT100. They give full graphics capability while maintaining the original high performance features of each individual terminal.

If you already have an ADM-3A, 3A+ or VT100, and want to enhance it with Retro-Graphics, MTI can supply you with a retro-fitted board at a low, low price. MTI is the one source for all the terminals, peripherals, applications expertise and service you'll ever need at truly great purchase and lease prices. Call us today: 516/482-3500, 212/895-7177, 518/449-5959, outside N.Y.S. at 800/645-8016, and in Ohio: 216/464-6688.

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Retro-Graphics is a trademark of Digital Engineering, Inc. Tektronix and Plot 10, of Tektronix, Inc.

CIRCLE 36 ON READER CARD

When you plug a microprocessor or minicomputer straight into the wall, you frequently get a lot of unwanted power which can cause equipment memories to go blank. But when you plug into an Elgar Power Line Conditioner first, you automatically regulate the voltage to that equipment—and isolate it from unwanted noise. The net effect is a dedicated line.

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CIRCLE 18 ON READER CARD

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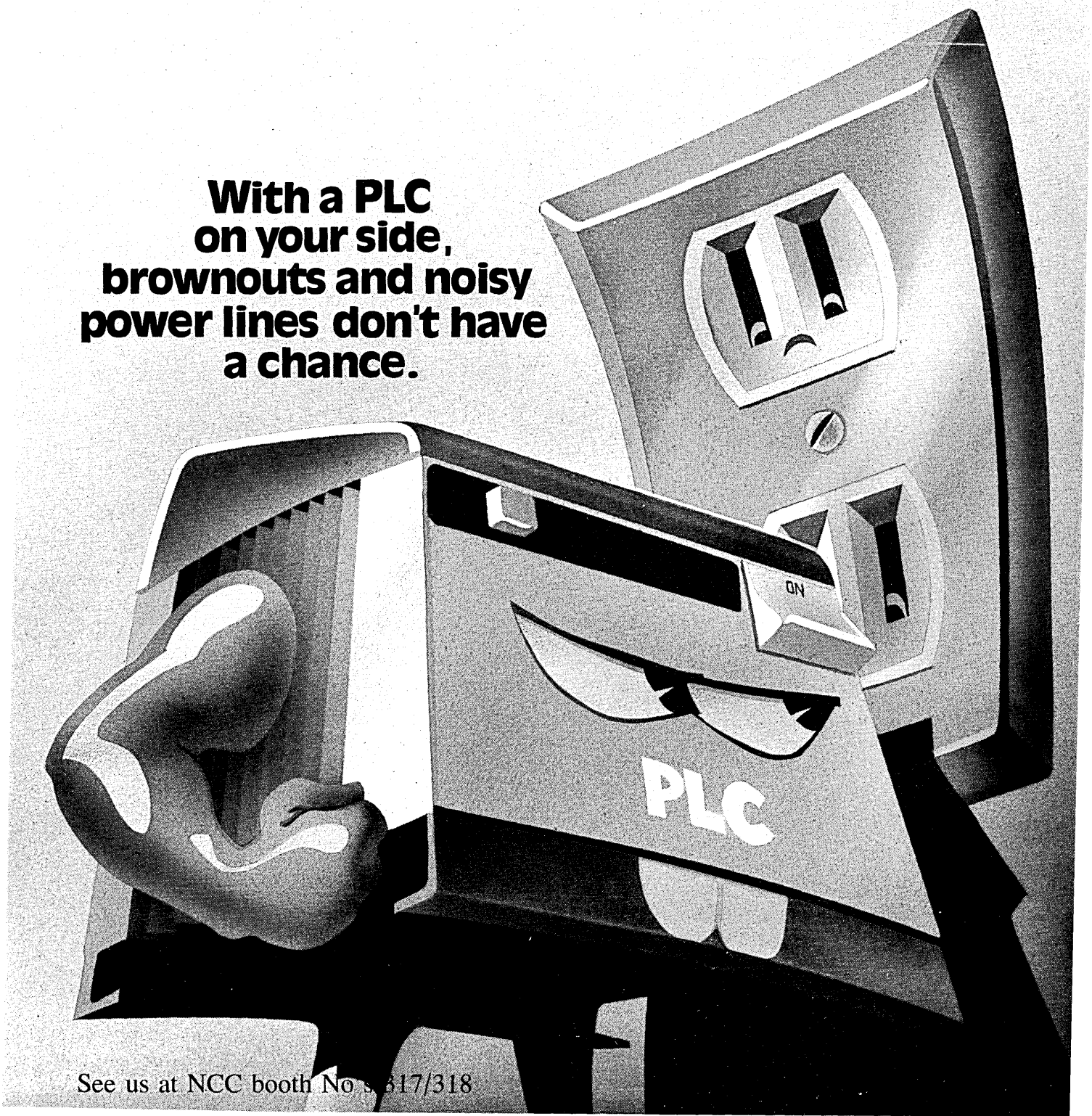
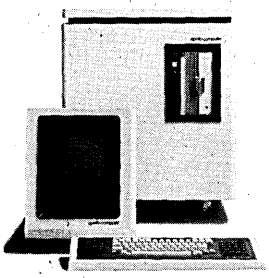


See us at NCC booth No. 317/318

DOMAIN PROCESSING



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A network level modularity, providing a system with a very high performance level, a wide range of growth capability, and a vast improvement in system reliability and availability.

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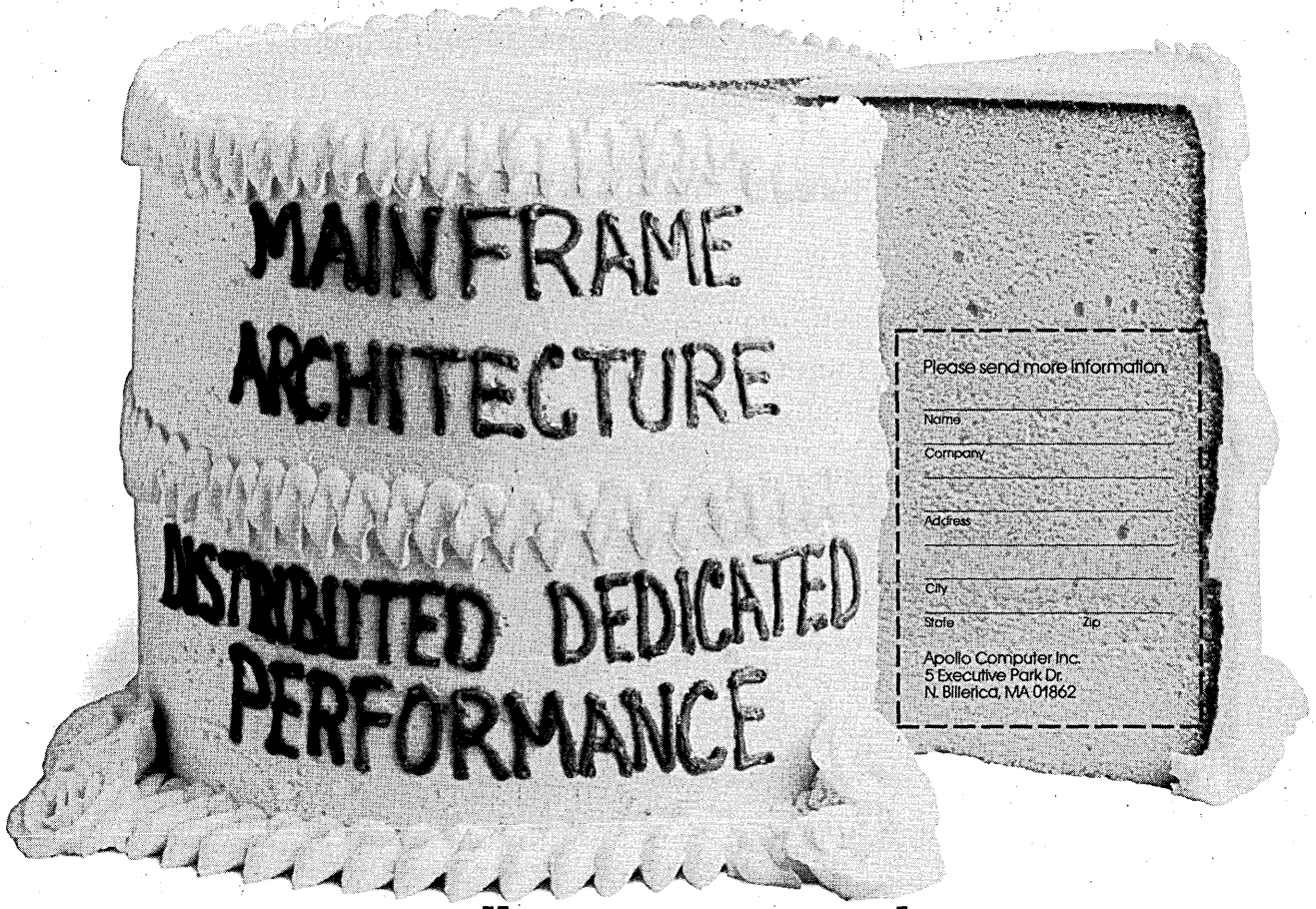

Please send more information.

Name

Company

Address

City

State Zip

Apollo Computer Inc.
5 Executive Park Dr.
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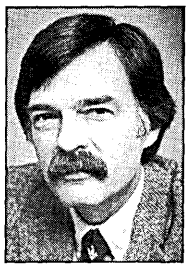
CIRCLE 19 ON READER CARD

John L. Kirkley, Editor

EDITOR'S READOUT



DP MANAGER'S CHANGING ROLE

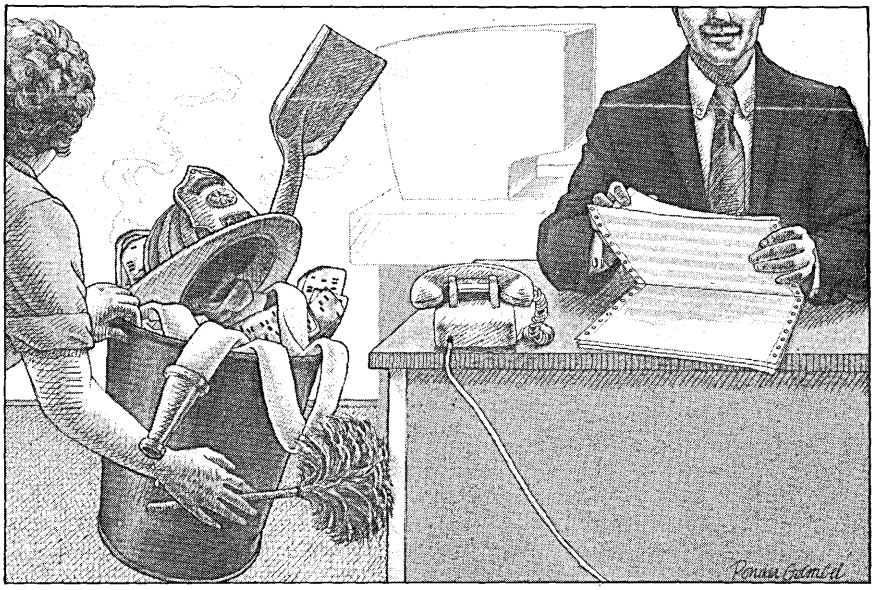


ILLUSTRATION BY PONDER GOEMBEL

For some time now, in articles and editorials, DATAMATION has been examining the changing role of the dp and MIS professional. These opinions and observations have been buttressed by regular surveys and interviews which take snapshots of the dp pro's information needs.

Earlier surveys had consistently indicated a prime interest in hardware and software product trends, with the emphasis on hardware. Interest in the latest on programmer productivity and program development tools also ran high. Dp managers were reacting to a nuts and bolts environment that pushed "bang for the buck," fire fighting, and, in general, shoveling the work out the door.

This shortsightedness inevitably led to the oft-told tale of user dissatisfaction and corporate disaffection with the dp department. But inertia is often overcome, and when minis and micros came charging onto the scene, things began changing. As Joe Ferreira and Jim Collins noted in a Nov. 25, 1979 DATAMATION article, "Minicomputers and microcomputers are moving heavily into business applications without the control or even the advice of MIS, as more and more line managers demand greater control over the MIS activities which directly support their areas of the business."

In the article, Ferreira and Collins not only accurately described the perturbations to the dp manager's traditional role, but also indicated how he might survive and prosper. Two and a half years later, as the answers to our latest survey and interviews come rolling in, it appears that quite a few dp managers are on the track outlined by the authors.

The survey respondents are beginning to see information as a resource that must be managed for the benefit of the entire corporation. They understand that information resource management can mean life or death for a company and that the MIS function's lack of accountability in the past is no longer acceptable.

Add this trend to the user's bid for local dp autonomy and a new pattern of dp shop concerns becomes evident.

For example, today's dp manager needs to know more about bridging the gap between the MIS department and general management. As one respondent wrote, "Since company objectives are not clear to data processing, we tend to align our objectives based on user department requirements. This approach works fairly well for short term needs. However, our long term planning is generally the result of an intuitive guess and frequently must be changed at the last minute. Projects are initiated much too late to be totally effective. Maintenance of systems is increased because of lack of knowledge of changes at the time the systems were installed."

There is also a much greater emphasis on how to manage people, especially the training, motivation, and retention of top performers. Money matters, in the form of salary data and budgeting, are of key interest, and for the first time on our surveys, long and short range planning techniques and tips have made a strong showing.

Quite a few of the respondents mentioned standards—or rather the lack of them. They were not referring to hardware and software standards but rather to those needed to evaluate personnel and the dp department itself.

As one reader so succinctly put it, "As I review my list of important information needs, I see a large number of them are measures of data processing activities. Once a measurement of activity is possible, it is necessary to have standards with which to compare it. However, data processing industry-wide standards are virtually nonexistent. Every dp shop struggles on its own to solve its 'unique' problems. Until standards are achieved by industry-wide consensus or through rigorous research, each shop will continue its own struggle, and the dp community will fail to reach the professional status now enjoyed by engineering, architecture, etc."

But Collins and Ferreira are quite definite about a rigorous standard that is already in place. "The MIS power base no longer rests on an unchallengeable mystique. Its own technology has transformed its most viable structure into that of a mature staff function. Like other staff functions, its role is to help—either directly or indirectly—the line operations of the corporation to achieve the results they have set out to achieve. Its success will be measured by the contribution it makes to those goals." ✲

IN FOCUS

ARIZONA DREAM HOUSE

A glimpse of what life in a computerized home could be like.

It glints in the relentless Arizona sunshine like a copper wigwam: "The House of the Future at Ahwatukee."

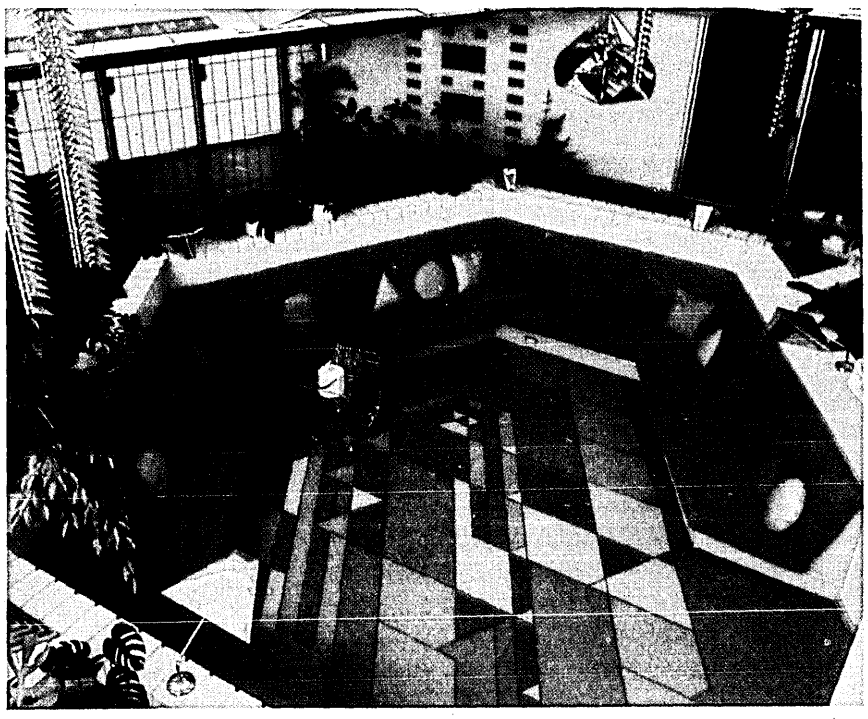
It is appropriately situated: *Ahwatukee* is Crow Indian for "house of dreams." The name was originally given to a large ranch house built in the 1920s by a dentist from Iowa; it now identifies a new community being promoted by the Presley Development Co. of Arizona as a means of coping with the ceaseless sprawl of Phoenix.

But the House of the Future is unlike any other house in Ahwatukee—or anywhere else for that matter—which is why it attracts nearly 1,400 tourists a week who gladly pay $2 (donated to charity) for a tour that in something under half an hour offers a glimpse of what life in a computer-controlled home could be like. All it takes is five microcomputers and a little elegant distributed data processing to make a home a House.

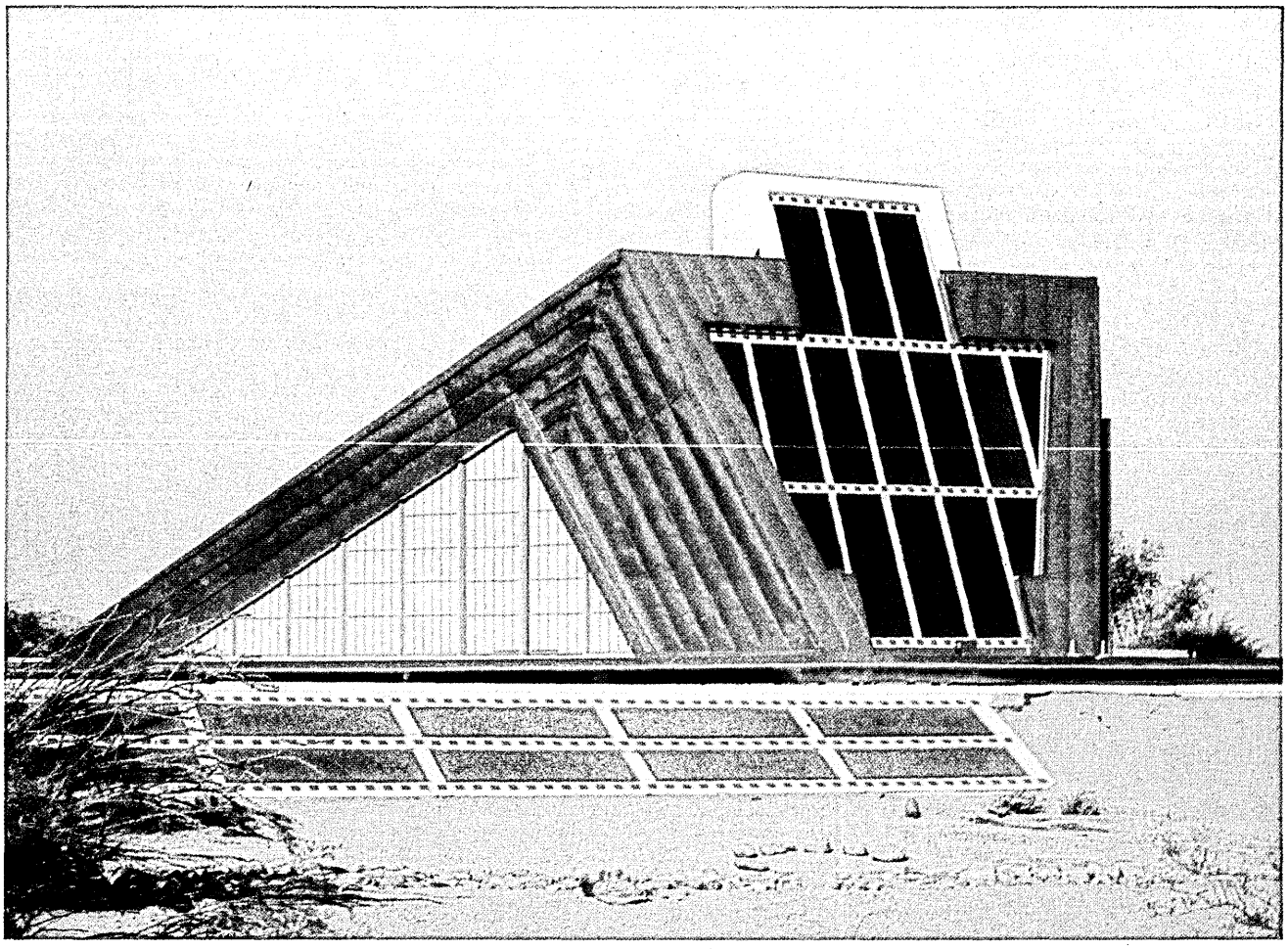
The House is designed for a family of four. Around a large central atrium—at the heart of which is a conversation pit—are arranged three bedrooms, a sitting room, a kitchen-and-dining area, and two bathrooms. The upper level consists of what interested parties insist on referring to as a children's loft, but which could probably serve better as a retreat for someone who feels the occasional need for a little isolation. Such a need is not otherwise easily fulfilled in the House of the Future.

Although translucent sliding panels serve as doors to rooms, the layout of the House discourages solitude. There are, for example, no corridors or halls—only a kind of walkway around the periphery of the atrium. Sensors in every room relay your moves to the computer system. An environmental control system is programmed to close and open doors and windows as temperature and humidity dictate. The House talks to you: when you enter, it says, "Welcome to Ahwatukee," and on the hour it tells you the time. It gives you the willies. The need for solitude could develop into a craving, and one that is not readily satisfied.

As might be expected, the efficient utilization of energy is a prime consideration. Most of the main floor is three feet below ground level, and the exterior is surrounded by berms (a kind of ridgelike construction of earth) to keep out the formidable summer heat. There are no external glass areas. Solar collectors, supplied by Grumman Energy Systems, Inc., provide more than 75% of the heating requirements and nearly all of the hot water needs. There are energy-efficient cooling and heating systems, and even the fireplace, focal point of the conversation pit, "has been completely redesigned to keep you



Conversation pit at the center of the atrium features Indian jewelry colors and diamond-grid design. View is from the "children's loft."



The House of the Future of Ahwatukee presents a low profile in the desert on the outer fringe of Phoenix.

PHOTOS BY MARVIN GROSSWORTH

warm . . .,'' according to the voice-over of an introductory film.

The House, designed by Charles Robert Schiffner of the Frank Lloyd Wright Foundation, provides 3100-square-feet of living space, not including the pool area and a three-car garage. It sits on an acre of harsh desert, the colors of which Schiffner decided to bring indoors, along with the reds, turquoises, and oranges of Indian jewelry.

''The design,'' explains Patricia Myhrberg, who runs the tour office, ''was inspired by the Salt Mountains [which dominate the surrounding landscape]. The whole House is a diamond grid.'' It certainly is: there is almost nothing round in its design, only angles, all ingeniously lined up throughout the entire construction. One needs an affinity for Indian jewelry and angular decor to appreciate fully the architect's efforts. Otherwise, there is a sense of harshness and rigidity, unrelieved by an occasional soft line. Even the furniture conforms. ''Most of the furnishings,'' says the film, ''. . . are built in. Manufactured furniture has practically been eliminated throughout your home. You won't have to wrestle with couches or beds anymore''—even, presumably, if you should want to.

But, the film's narrator hastens to point out: ''The House of the Future is not meant to be a cure for any present housing problems. Rather, it's an evolving showcase of ideas—the state of the art in technology, ecology, and sociology''—especially technology. The computer system is, after all, what makes the House futuristic. It is an experimental site and a customer showroom for Motorola, Inc., and Don Sheppard, of the company's Semiconductor Group, is unquestionably Motorola's man about the House.

It's not a cure for present housing, but a showcase for state-of-the-art technology.

''We're trying to demonstrate some of the concepts that we're showing here,'' Sheppard explains. ''We're not indicating that this house, or ones exactly like it or even modeled after it, are going to be the houses of the future. This is a very large and magnificent home, more than what I think we could individually afford, perhaps. But scaled differently, the concepts could be used . . . A showcase of concepts, that's what we have.''

Those concepts are embodied in five systems that run the House: environmental control, security, electrical load switching, energy management, and information storage and retrieval.

The environmental system opens and closes doors and windows for what is described as ''passive'' heating or cooling. It also controls solar heating, a heat pump, and resistive electrical heating. Cooling is accomplished by an evaporative cooler of the type that has recently gained popularity in the Southwest, by redirecting the function of the heat pump, and by a technique being tested at the House by the Salt River Project (SRP), the local water and power utility. SRP has installed a device which makes ice at night during off-peak energy usage hours (when electricity is cheaper), and then uses the ice during the day to cool water that is circulated throughout the House. The system is capable of regulating the environment in three different zones, adjusting for temperatures in accordance with the needs and uses of the occupants. It is also designed to utilize whatever method can accomplish the required task at the lowest possible cost.

The security system consists of the predictable tv cameras at the front door and the swimming pool. But it also includes sensors set into ceilings all over the house

that detect smoke, light, and human presence. It is these sensors that enable the system to turn lights on for you when you enter a room and extinguish them when you leave. If there is smoke, the system sets off an alarm, turns on all the lights, opens all the windows and doors, and telephones the fire department. If there is an intruder, the system again turns on all the lights and calls the police. An integral part of the security system is the front door: instead of a keyhole, there is a keypad. Enter the correct code word, and your sesame opens. (Have the code word changed by a family member who neglected to tell you, or forget the code because you've come home too sick or too drunk or in too much of a hurry to use the bathroom, and then what? On the other hand, people have been known to lose a conventional key, or to be in no state to negotiate the little devil into its keyhole.)

Under the electrical switching system, all the lights and about half the wall outlets are under the computer's control. The system's real-time clock can trigger on-and-off functions. It can also save you the trouble of operating your own switches; remember the sensors in the ceiling? Even if you elect to operate a switch yourself, you are not actually turning anything on or off, because the switches are not really switches. "They're simply a notification," explains Sheppard, "that you want action taken. The computer's going around and surveying the switches." The system

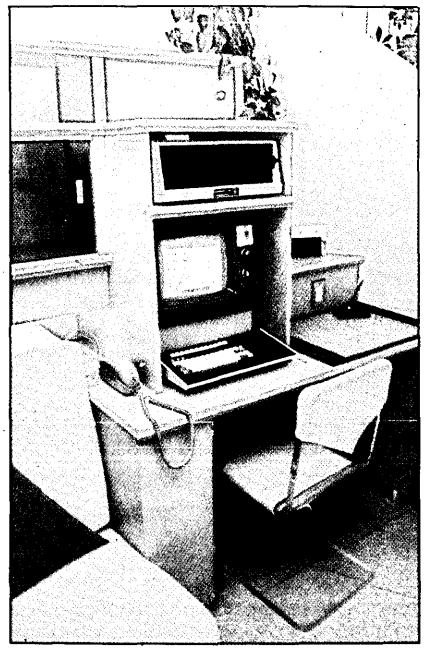
It's a large, magnificent home, but scaled differently, the concepts could be used.

"knows," therefore, where you are and what, more or less, you are doing all the time. Even solitude can be relative.

The energy management system is a sort of watchdog system that ensures the most cost-efficient use of electricity, given the needs of the occupant at any particular moment and the environmental and security functions in operation. Its chief attraction is the ability to calculate continually the cost of energy on a daily, even hourly, basis and to relay that information, on demand, to whoever is paying the bills.

The information storage and retrieval system is about what it says it is. At present, it contains menus, recipes, a calendar of events, and similar domesticities. It gives the status of the other systems; it congratulates Don Sheppard on his birthday; it draws a picture of Snoopy.

The occupant—or visitor—sits at a standard full ASCII keyboard above which is an equally standard television set, one that can be used to watch shows simply by switching channels. There is no brand name on the keyboard, and its origins are summarily dismissed. "This is the standard available keyboard that Motorola has," says Sheppard. "We've made some adaptations in the cards."



Bedroom includes one of the terminals in the House. Screen, an off-the-shelf tv, can receive regular telecasts.

At the heart of the network of five microcomputers is Motorola's MC6800 microprocessor. Each microcomputer is located in a different part of the House, but all are connected by an RS-422 communications link. Most of the hardware consists of "off-the-shelf" items made by the Motorola's Microsystems Div. and have been installed with little or no modifications. In effect, then, the House of the Future could be a House of the Present. All you would need are the computers, and the price.

That, to a large extent, is the name of Motorola's game. The company has no present plans to produce home computers. "My business is making semiconductors," says Sheppard. "We're taking the board-level parts we have available and putting them together so that they can perform this distributed processing network. . . . We don't have it quite done yet, but we're going to be using fiber optics for one of the links, just to show that it can be done."

While he agrees that in actual use the system would have to be operable by someone who neither knows nor cares about computers per se, that is of minimal concern in this particular House except for allowing the tour guides to demonstrate the use of the terminals. "We're not in the business of interfacing with users that much," Sheppard says. "We're just saying, yes, it needs to be interrogatory, and yes, it needs to speak English. . . . We try to show that a little bit." To itself, however, the system speaks MPL, an MC6800-oriented high level language similar to PL/1 or Pascal. A lot of the speaking is done by the multifunctioning executive in each microcomputer. The executive orchestrates the processes resident in its microcomputer and handles interprocess communications. A 1-byte destination identifier enables the executive to move data to the proper destination.

Gary Kloesz (pronounced "Klase") is an electrical engineer who, along with two others, "built the computer system and put it in. . . . I come down to the House once a week just to make sure it keeps running and to fix the little bugs." He is also responsible for trying out new ideas, such as the fiber-optics communications link. "From what we've learned," says Kloesz, "it's ridiculous to have all this computing power tied up controlling the House. If we were to do it again, you would have little dedicated 'boxes' on your heat pump for security, for load-shedding, for switching. Then your personal computer would talk to these little boxes when it needs to. . . ."

Sheppard carries it a step further. He visualizes a time when department stores or hardware dealers will sell a variety of home controllers loaded with microprocessors, accompanied by a questionnaire which, upon completion, would be turned over to a service facility. Someone would then come to the home, program the module in accordance with the owner's wishes, and leave. "They could do this with their computer in a truck or a van and then pull the plug and run off and leave the other equipment in place to do the jobs that I want done. I might, therefore, get away from a $5,000 expense." And, because he gives the appearance of being supremely well adjusted, he might also get away from the paranoiac realization that somewhere on a truck or a van is a computer that knows all about how his house is run, including its security.

This is not mere conjecture on Sheppard's part. He and of course his company are, above all, responsive to the marketplace. "Our customers will determine what happens in the future," he says, "and the way our customers are going, chances are

Most of the hardware consists of off-the-shelf items from Motorola's Microsystems Div.

we would probably see systems that will be modular in their behavior."

Cost is another factor. Sheppard does not know the cost of the system now in place, but he concedes: "I don't think it's cost-effective; it isn't expected to be. To make a cost-effective system, I would not have a distributed processing network; I'd have modules. And I wouldn't have a house hardwired. I'd use some kind of communication links, either over the mains or with RF [radio frequency]. . . . Those things are under a lot of investigation. We're developing special parts that will accommodate this, and as we get them developed, and as they're available, we'll begin to test them in the House here."

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CIRCLE 20 ON READER CARD

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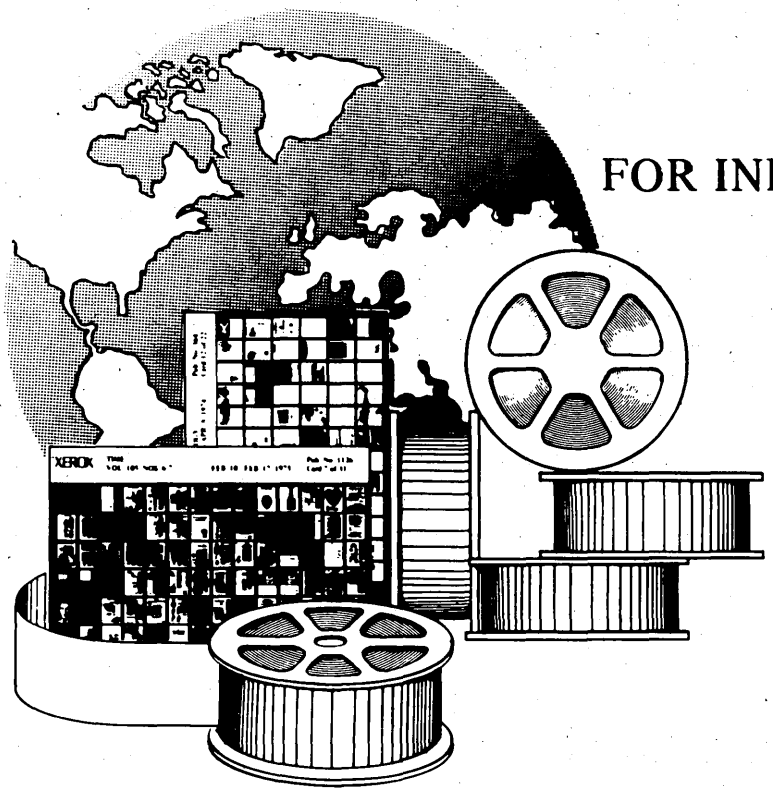

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As for the House itself, he estimates its cost at "something under a million and a half" to build and believes it would cost at least as much—perhaps more, allowing for inflation—to replicate. He does not believe, however, that anyone would want to do so. "This is," he emphasizes, "almost an industrial application. . . ." Indeed it is: the House is also a showcase for Kalwall to demonstrate its translucent, insulating building material, for the Copper Development Assn. to point with pride at the House's gleaming roof, for GE to show off its latest appliances, for W. M. Grace Construction to remind the world that it is the House's general contractor, and for Presley, which is in the house-selling business.

Nevertheless, for all its showcase characteristics, the House is virtually a ready-to-move-into home. If only they would let you. If only you would want to.

The House as it now stands could readily be adapted to accommodate an office at home, from which one would only need to dial-up to available databases. (Modems are already in place to allow Gary Kloesz and others to monitor the House from Motorola's offices in Phoenix.) "It would take a little bit of software," says Sheppard, "and a little bit of hardware, but it could be done." He has, however, more ambitious plans.

The three-car garage, now being used as an exhibit area, has been earmarked as the site of the House's home office. Several Motorola divisions, including the Business Equipment and Consumer groups, are now hard at work on the project. Unfortunately, some of Sheppard's visions for the future are clouded by the realities of the present. His dream centers on a satellite earth station on the property, but local zoning ordinances will not permit him to erect one. "There's a restriction about having an antenna exposed . . . and it's got to be a three-meter 'dish.' If we had that," he postulates, "it would be the beginning of the building of my office. That, plus calling up information about a database and tying into other databases, would enable people to interact with computers more.

The House is virtually a ready-to-move-into home, if only they would let you.

"I believe," he says, "that within the next 10 years, we're going to see the number of privately owned earth stations approaching 200,000." In the meantime, his specific plans about the office he wants to install in the garage—perhaps another possible refuge for solitude—are confined to the inner sanctums of Motorola, well shielded by Sheppard's uncharacteristic reticence.

Every year, around Christmas, the Phoenix Art Museum displays an exhibit of gingerbread houses, many of which are models of actual buildings in the area. Last year, Sandy Anderson, a local housewife, chose to render a pastry version of the House of the Future at Ahwatukee. Standing among the happy, open-mouthed children gazing at the display, I was struck, inevitably, with the notion that a Gretel of the future would be imprisoned in a gingerbread house of the future, to be rescued, finally, when Hansel shoves the wicked witch into a microwave oven. Would the house's gingerbread computer, presumably loyal to its principal occupant, respond in a proper manner, or would the witch be turned into a cookie in a matter of nanoseconds? Would the Forces of Good triumph over the Forces of Management?

Fairytale fantasies, however, quickly give way to earthier ones. It is pleasant to pretend, in a romantic frame of mind, that one need not bother with mundane details because one's House will lower the lights, turn on the music, and start cooling the wine. It is somewhat less pleasant, however, to conceive of the communications system that links the computers inside the House also linking them to central general security and maintenance control. While that could be convenient and efficient, it could also lead to arguments about whose security and maintenance are being controlled, and why. Motorola is already remotely monitoring the House from its headquarters. Why not also a utility company interested in controlling and monitoring the use of resources, like water and electricity? ("There is a lot of experimentation going on," says Sheppard, "as to whether I'm going to control the appliances in my house or whether I'm going to let the power company put something on my water heater and turn it off or on when *they* want to.") And if a utility company can do it, why not a government?

I did not enjoy hearing the House talk. I did not enjoy having it turn lights on and off for me as I wandered through its rooms taking pictures. I felt like the House was watching me. It was.

Toward the end of the day, I found a local oasis and ordered a margarita. The bartender served it from a computerized dispenser. I found myself wondering whether the dispenser could be programmed to communicate with my front door to tell the keypad I would be too drunk to let myself in.

I finished the margarita and returned to my hotel, comforted by the knowledge that the desk clerk had an extra key.

—Marvin Grosswirth

"That's Arthur you hear singing and playing his guitar. His company just let go eight executives and he's got those 'low down mean, over the hill with two still in college, post-firing blues'."

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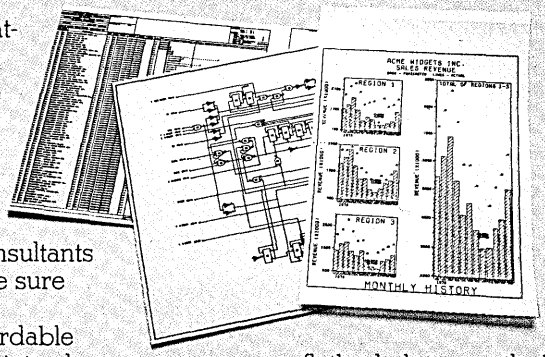

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CIRCLE 22 ON READER CARD

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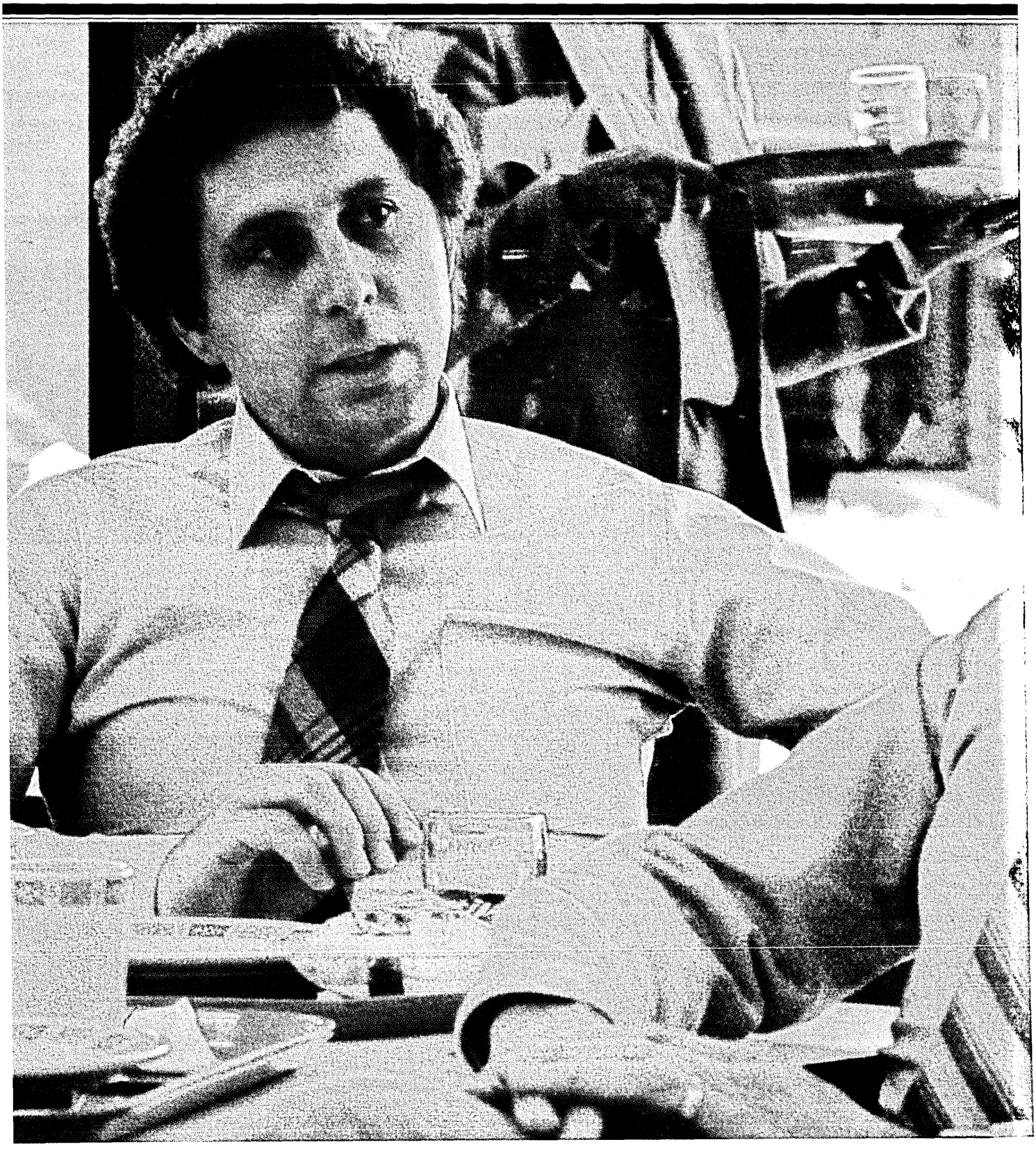

set up our network, to a computer company that's networking down cold."

At Hewlett-Packard, we've been delivering networking software for our computer systems since 1973. By making improvement upon improvement, we've been able to solve problems before *you* encounter them. And with over 1,000 installations around the world to date, we know what it takes to build a successful information network.

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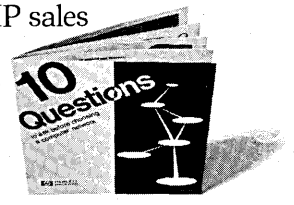

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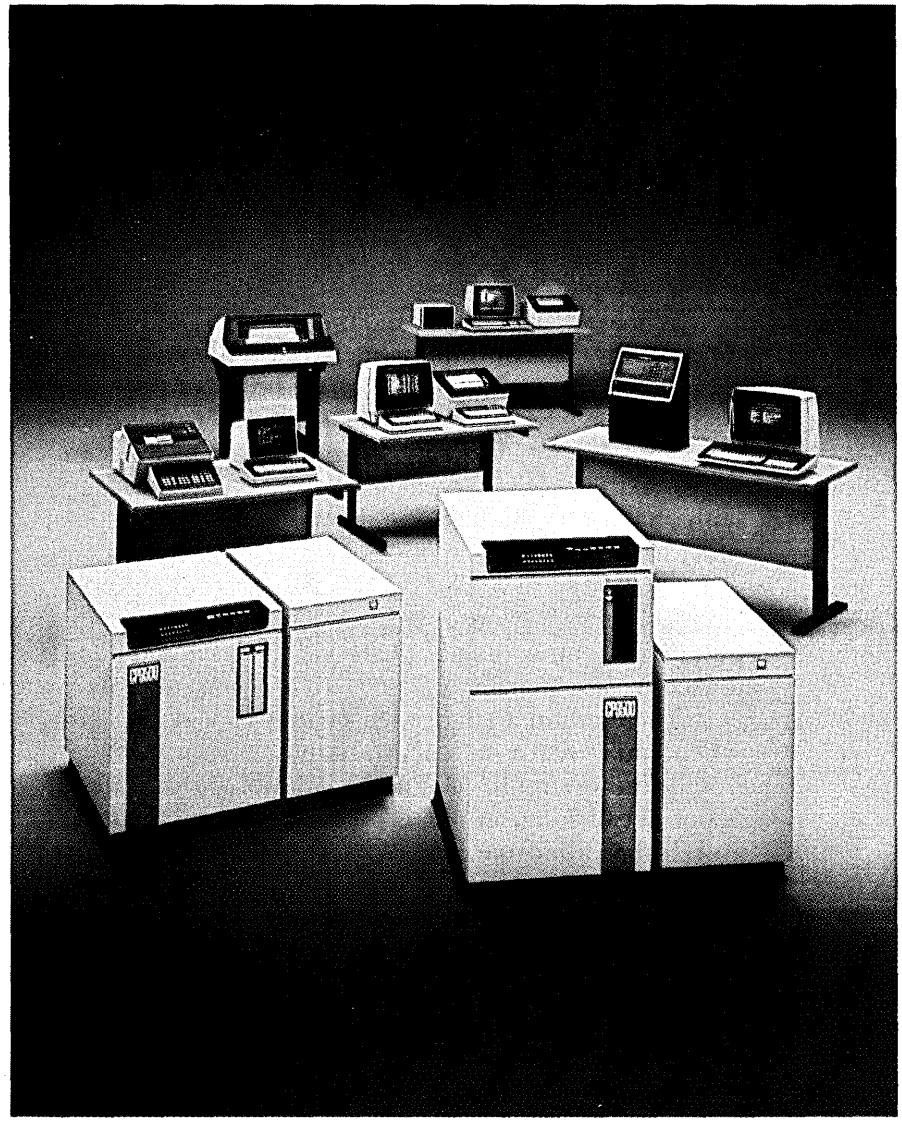

Shown above are Burroughs 4 to 6 processor and 5 to 8 processor CP 9500 models with Burroughs terminals and printers for banking, manufacturing, hospital, and general purpose use. See them at Booth 1156 at the NCC, May 4-7.

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CIRCLE 24 ON READER CARD

Burroughs

LOOK AHEAD

(continued from page 14)

programmer in half an hour. It combines both fixed form and English language free form data entry, and will be priced at about $130 per month on a three year lease. Kahn says DYL-280 produces only single reports now, but he expects a multiple-report version later this summer.

IT'LL BE A SMASH

When Hewlett-Packard announced in late February its HP 7976A 6250/1600 bpi, half-inch tape subsystem for HP 3000 computers, one of the happiest recipients of the news was Dan O'Neill, president of Qualex Technolgy Inc., Reseda, Calif. Qualex has been selling a 6250 bpi tape subsystem to the HP 3000 base since last October and has some 20 installations. O'Neill says the Qualex system is not only cheaper ($44,500 compared to $52,500), but it's 67% faster (125 ips compared to 75 ips) and requires half the rewind time.

And, we're told, Qualex has a new product in the works called SMASH (Shared Mass Archive Storage Host), which will make the expensive 6250 bpi technology even more economical for HP 3000 users. It will be introduced at an HP users meeting in Florida late this month and will make possible the sharing of a single 6250 bpi tape subsystem among up to four cpus.

RUMORS AND RAW RANDOM DATA

Sources inside Sperry Univac were unable to confirm at press time rumors that the company will be one of the first major oem customers for Intel's new 32-bit micro sensation. All we know for sure is that Univac is preparing some kind of announcement in that area for around June....The so-called "silent computer company," none other than Burroughs Corp., is about to open its mouth. But don't be surprised if what comes out has a British accent. Insiders say that an internal "competition" to flush out the best public relations and image-building plan to transform the company's stuffy mainframe profile was won by the firm's English PR man, Peter Carney. He has since been promoted to acting head of PR at the Detroit HQ office. Carney, now in his "trial" period, refrained from comment. Maybe he's too busy helping profile the company's imminent attack on the office automation market....Word has it that MSI Data Corp., Costa Mesa, Calif., is exploring new applications for portable terminals. This month the firm's expected to introduce a terminal for use by computer and business equipment service engineers.

NEWS IN PERSPECTIVE

MANAGEMENT

REELING, WHEELING & DEALING

Reeling financially, Burroughs hopes its internal wheeling and dealing will produce a positive turnaround.

Can a company whose earnings dropped 73% in one year continue as a viable factor in the computer industry?

When the company in question is Burroughs Corp., it's difficult to get a negative opinion from any observers, even those closest to a company that the business press once called "the secret computer company." In fact, these observers view the candidness of the new Burroughs ceo, former Treasury Secretary W. Michael Blumenthal, as a harbinger of a resounding "yes, it will."

Burroughs' earnings for 1980 were $82 million or $1.99 a share, down from $305.5 million or $7.45 a share in 1979. The company had a loss in 1980's fourth quarter of $68.7 million or $1.66 a share. It was its first negative quarter in some two decades. This loss reflected a decision to implement a number of write-offs which reduced the year's earnings by about $125 million and which were, in Blumenthal's words, "designed to help us use our assets as effectively as possible."

And last month Burroughs also lost its vice president of research, Robert S. Barton, best known as the architect of the B5000 and its successor machines. Barton said his resignation "was actually something I've been thinking about for three years. I guess I was waiting for a management change to take place which would make things get more interesting."

Barton is far from displeased with the latest management changes but he feels they're directed "towards improvements in efficiency," and he's more interested in new concepts and innovation. He's going to do some independent consulting for awhile and dust off "some entrepreneurial ideas."

Barton said he thinks the new management "is going to do a lot of good things," but he worries that what he thought were "good things" at Burroughs all along might go away if there's too much change. He said the good things that he wouldn't want to see disappear include the architectural innovations the company has made.

Barton has had an ongoing relationship with Burroughs for 22 years, some of that time as an employee and some as a consultant. "I have a sentimental spot in my heart for Burroughs," he said, "and I still may do some consulting for them."

A newer relationship with Burroughs is that of BWI, a cooperative group of unhappy Burroughs users, founded last December as Burroughs World Inc. "Burroughs was leery of us when we started," said Tom Clark, general manager of the group and a six year Burroughs district salesman, "and they asked us not to use their name. So we do business as BWI, A Cooperative of Burroughs Users." BWI is headquartered in Austin, Texas.

Clark started BWI with James C. Boon, a B-2800 user and a principal partner in Boon-Chapman, insurance managers. Boon is chairman of a five person BWI advisory board (all users) and president of BWI.

Clark said BWI was formed at the behest of Burroughs users who felt "A tremendous isolation in an IBM dominated world and a lack of communications because of the uncommunicative nature of Burroughs. We're a vehicle for communication."

BWI has some 3,500 corporate memberships at $92 per year, and it serves members with a monthly publication, cooperative buying, software exchange, used equipment exchange, personnel exchange, user surveys, consulting, installation write-ups, and analysis of Burroughs and Burroughs-compatible products.

Clark puts out the publication and another former Burroughs man, Curtiss McAdams, handles most of the rest. "We're all [at BWI] either ex-Burroughs [employees] or Burroughs users."

He said Burroughs is less leery of BWI "now that they've seen we're out to deal with them objectively." BWI, he feels, can identify a user's problem such as delivery or hardware as a "one-of-a-kind problem or a common problem. If it's common, we have more leverage with Burroughs than a single user."

Last month Burroughs lost its vice president of research, Robert S. Barton.

While BWI admittedly was formed because Burroughs users were having problems, Clark is firm in his belief that the corporate problems will be solved.

He referred to Blumenthal's appointment as "a very positive move. He seems to have a history of doing what he says he'll do. He's not a false promiser. Even the users are optimistic. As for Burroughs' employees, they're ecstatic. It's the only thing they've had to hold their heads up about for 1980."

Prognosticators of Burroughs' fate in the computer business point, as a plus, to a "big customer base that is not going to go away." Clark agrees. "Burroughs users are pretty loyal. They may not be happy with

ILLUSTRATION BY ANDRZEJ DUDZINSKI

some things but when it comes down to buying another computer, the greatest number will buy Burroughs again. All the surveys we've been able to lay our hands on point to this."

Of his membership, he said, "we're all loyal Burroughs users and it's to our advantage to have Burroughs prosper." He said the greatest degree of loyalty is with large systems user. "With the B800 class of users there is a problem with customer loyalty. They have an attractive alternative in the micro area where Burroughs has no product."

BWI's members include "a couple of companies" that are among many of Burroughs' small business systems users who have filed lawsuits contending that Burroughs oversold its equipment.

"We've gotten involved," said Clark, "but we take no position. The suits are a problem and they've gotten lots of publicity. We've tried to determine where responsibilities lie and to present each side to the other. We've made presentations to Burroughs on behalf of our members and have received insightful response. There are two sides, and we feel there has been a very one-sided presentation in the press."

Estimates of the number of lawsuits against Burroughs range from 15 to 20. Burroughs has won one, a $2.5 million claim brought by a user in Andarko, Okla., and settled out of court for $80,000 with a user in Dallas. The most publicized case, a $1.9 million suit brought by Quality Books of Northbrook, Ill., is still pending. Burroughs has countersued Quality for $1.5 million and has asked for an injunction to prevent Quality from making "false or misleading statements" to the press.

Burroughs has also mounted a marketing campaign to counter criticism of its small computer systems. The company put together a 20 minute videotape involving some dozen satisfied small system users. It also produced a number of case histories of satisfied users for trade journals.

Computer architect Barton has other speculations about Burroughs' position in the small systems marketplace. He wonders about the B5000-type architecture which was introduced in the early '60s and didn't become widely recognized until the late '60s. "It was slow in becoming profitable, but it did. Why not pursue this [architecture] into small machines?"

GEORGE E. MUELLER: "We had to find a partner to sell and service the product once we'd designed and manufactured it. Burroughs is the ideal one."

He says the market is there, as witnessed by installations of the HP 3000 series, Tandem computers, and a line of ICL's, all of which he said are similar to the B5000 architecture. "All that is business which could have been Burroughs'."

Barton believes a part of Burroughs' problems over the years has been the fact that "it was five or six computer companies in one." This, he explained, was partly because of the way it grew. "There was a large systems company, a medium systems company, a small systems company, and a terminal products company and maybe a fifth for machines which grew out of office accounting equipment." And, he said, each company had its separate architectural direction.

Whatever it did or did not do with small systems, Burroughs evidently did good things in big systems. Most of its mammoth machines are considered easy to use and efficient. Ted Withington, vice president and computer analyst for Arthur D. Little Inc., said Burroughs' large equipment is "very good, and so is the software for it. In fact, it's the best in the business right now—easy to operate and program."

A black mark against Burroughs in 1980 was the abandonment of its BSP supercomputer after more than four years of effort and after twice missing initial deliveries. Dropped a year earlier was the scientifically oriented computer called the Attached FORTRAN Processor. It was announced at about the same time as the BSP.

Another computer, the B3950, was put on indefinite hold with no promised delivery date. Burroughs has confirmed that it was unable to get the machine to perform at specified levels when it was introduced in February 1979, just after IBM's introduction of the E series.

Burroughs' problems in late '80 led to layoffs—485 in Detroit, 150 in California, 350 in Scotland, and others scattered throughout the company's worldwide operations.

The company has said it plans no new product manufacturing at its three Detroit area manufacturing plants and has indicated that these plants could be phased out over the next three to four years as present products are replaced. The three plants currently employ 2,570 people. Reasons given by Burroughs were wage rates and manufacturing costs at the facilities.

Loss of market share is another bit of tarnish on Burroughs' image. The company once had a clear number one spot in terminals. That started eroding in 1975 and has continued to the present. Barton said the company had allowed a gap to occur between production of small electro-mechanical terminals with small disk storage which it sold widely and its more modern terminals. "But they've made rapid strides in the last few years."

Probably the worst market share erosion for Burroughs is the loss of its leadership position in banking equipment to IBM, NCR, Digital Equipment Corp., and a number of smaller companies.

In the mid-'70s, burroughs acquired three companies that gave it a nice early position in office automation—Redactron, word processing equipment; Graphic Sciences, facsimile devices; and Context Corp., optical reading equipment.

These firms were allowed to languish to a point where they're no longer considered a factor in office automation markets.

But wheels may be in motion to change this, indicated by Burroughs' most recent acquisition, that of System Development Corp., the Santa Monica, Calif., software and services firm.

BWI was formed at the behest of Burroughs users who felt "a tremendous isolation in an IBM dominated world..."

When this acquisition was agreed to last fall, there was a lot of speculation as to the whys of it. Often mentioned was Burroughs' ability to help SDC market its Records Manager, an electronic file cabinet. It was said this product could help rejuvenate Burroughs' attempts to penetrate the market for office automation equipment.

"We had to find a partner to sell and service the product once we'd designed and manufactured it. Burroughs is the ideal one," said SDC chairman George E. Mueller when acquisition plans were announced.

So it was no big surprise when Burroughs moved Roger Johnson, who had been president of SDC's products group, which had responsibility for the Records Manager, to Danbury, Conn., home of Redactron, to become vice president and group executive of a newly formed Office Systems Group. The new group has responsibility for word processing systems, facsimile, optical character recognition and page reader electronics.

Another former SDCer, Robert V. Dickinson, was named to head a newly formed Text Management Systems division within Johnson's group.

Other executive appointments were made by Burroughs from the outside.

Burroughs has mounted a marketing campaign to counter criticism of its small computer systems.

Thomas E. Winter was brought in from Xerox to become executive vice president of finance and administration. Paul G. Stern moved in from Rockwell International to become executive vice president, engineering and manufacturing.

SDC's Mueller was named senior vice president of Burroughs, and chairman of the board and chief operating office of SDC. James Scaggs, who Mueller had brought with him to SDC from General Dynamics 10 years ago, was named president and chief operating officer of SDC, a move which pleased most SDCers.

BWI's Clark sees the bringing in of outsiders to top Burroughs management spots as a positive move. "Ray McDonald [former Burroughs president] put Burroughs into the mainframe business, but his time was past. He ran the company with an iron fist. He promoted only from within. When everyone on top comes up through the ranks, they only know one way to operate."

Another pleasant fact for some SDCers, those who owned stock for which they had paid $1.50 per share, was the $69 per share price paid by Burroughs for their company.

SDC originated as a think-tank spinoff from the Rand Corp. It made four unsuccessful attempts to go public. It had been owned 67% by System Development Foundation and 33% by employees for many years. System Development Foundation is a nonprofit organization which would have had to divest itself of its interest in SDC by 1989 under the Tax Reform Act of 1969.

SDC experience in working with the government undoubtedly was an attraction to Burroughs. SDC did 66% of its work with the government last year. Burroughs' government business accounted for only 5% of its total. Burroughs insiders claim the com-

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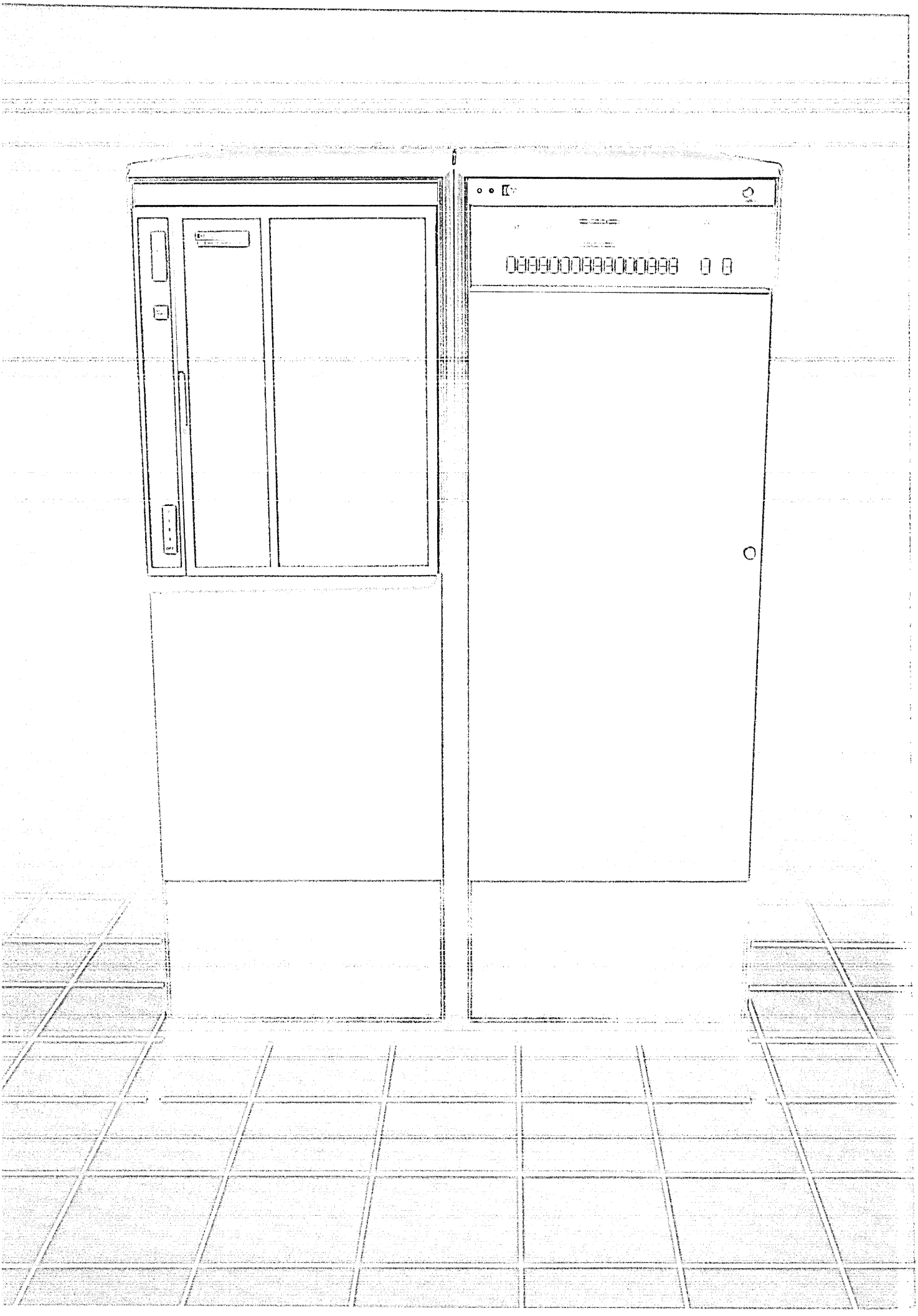

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pany is determined to increase that share.

Some SDCers say the Burroughs-SDC relationship was dictated years ago by the Air Force. SDC has been developing systems for the Air Force since the mid-1960s, using Burroughs equipment.

Others see the merger as a move on Burroughs' part to get into the total systems business. "They've been selling hardware, not systems. We can help them develop a line of systems," said one SDCer.

How do SDC employees feel about being part of the Burroughs organization? The consensus seems to be "we'll wait and see."

Burroughs' big machines are generally considered easy to use and efficient.

Burroughs has said that the $168 million a year, 4,000 employee firm would retain its separate identity and management. Last month it was still business as usual, with paychecks still coming from SDC.

But Burroughs, in its 13D filing with the Securities and Exchange Commission on the acquisition, did note that "subsequent to the merger, Burroughs may cause the dissolution of [SDC] or may cause [SDC] to make changes in its present capitalization and dividend policy."

Burroughs has been taking a number of steps to correct its problems. One has been the establishment of six staging centers in the U.S. and one in England to integrate and test equipment before it is shipped to customers.

The company also has offered some 400 eligible employees an early voluntary retirement plan. In addition, it has launched a campaign to recruit third party software and systems houses to market its B80, B800, B90, and B900 small business systems, something it has never done before.

Burroughs also is considering manufacturing computers in Japan in the early 1980s. Blumenthal visited Japan late last November and met with government and industry officials.

Japan is one of Burroughs' two most important markets outside the U.S. and Blumenthal is reported to have expressed a need to meet special requirements of that market such as Kanji characters. He also is said to have suggested that a Burroughs plant in Japan might manufacture office automation and data communications systems.

Blumenthal is no stranger to the Far East, having spent the duration of World War II in Shanghai. "He didn't hit this country until he was 21," said Clark of BWI, "and he got himself an education and moved up. He's an achiever."

One of his achievements was turning around Bendix Corp. when it was in trouble. Now, ironically, he might be competing with that company if some directorship reshuffling last month indicates what many people think it does.

Burroughs has been taking a number of steps to correct its problems.

Three Bendix directors, all on the board of Burroughs, including Paul Mirabito, former chairman and chief executive of Burroughs, resigned their Bendix positions and a Bendix board member resigned from the Burroughs board. Speculation is that Bendix is preparing to get back into the computer business, which it left when it sold its Computer Div. to Control Data Corp. in 1964.

Reeling financially, Burroughs still retains its charitable nature. It has sold a small operation in Zimbabwe to a group of former employees and has donated $4.7 million from the sale and leftover assets to the Save the Children Federation and Oxfam-America, Inc. Both groups have operations in Zimbabwe.

—Edith Myers

ANTITRUST

MUCH ADO ABOUT NOTHING

Just when everyone thought a settlement was only a sentence or two away, AT&T and Justice resumed their six-year struggle in court.

The breakdown in settlement talks between the Justice Department and AT&T may well have been a conscious, aggressive action by the government rather than a passive act allowing U.S. District Judge Harold Green's clock to run down to the final second.

On Feb. 23, Sanford Litvack, then Assistant Attorney General of the Antitrust Division, informed Judge Greene that "no final settlement agreement has been reached even between the negotiators and, in my view, it is extremely doubtful one will be reached by March 2."

Until that correspondence, speculation was rampant that settlement was just a sentence or two away. Litvack's letter ended such talk and, despite AT&T general counsel Howard Trienens' admission to Greene that "defendants were surprised" by Litvack's position, the two parties re-

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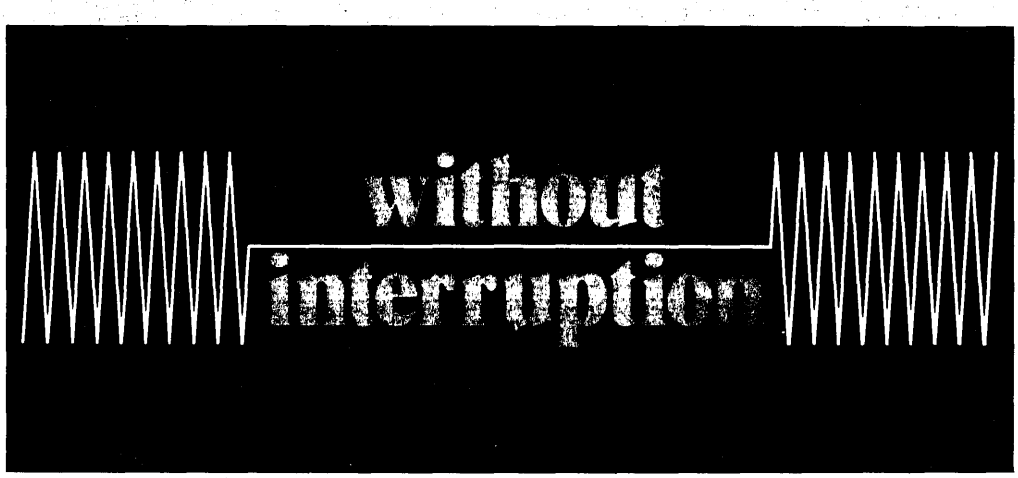

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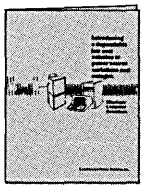

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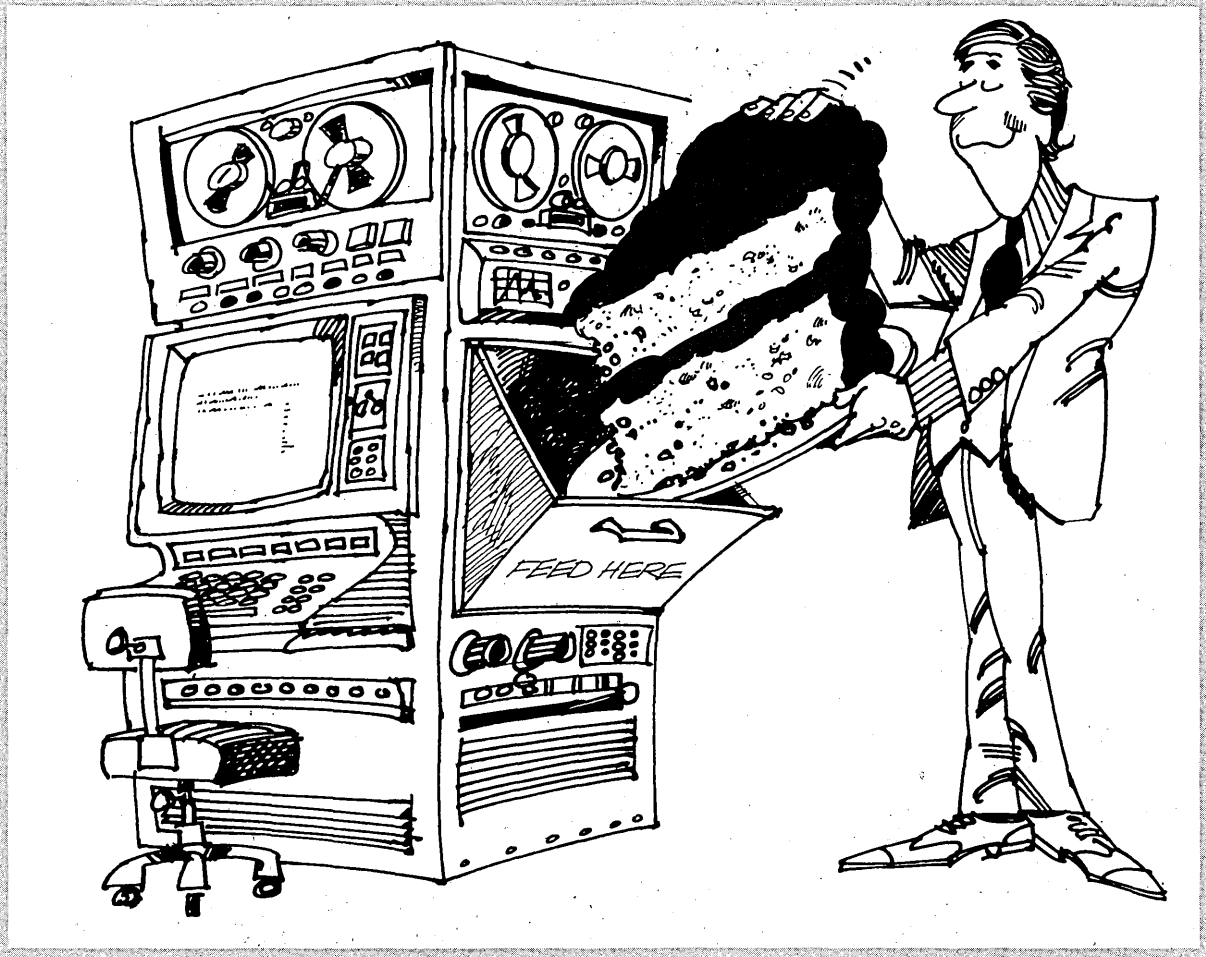

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sumed their six-year struggle in Greene's courtroom, as promised, on March 4.

"I cannot believe Litvack wrote that letter without consulting [his eventual successor, Stanford University law professor William] Baxter," a source close to the case said. "I'm persuaded Litvack was informed that Baxter didn't like the settlement. If Baxter had looked upon it favorably, he could have asked the judge for more time even if Greene had already said they couldn't have any. It suggests that Baxter didn't want to have anything to do with it."

The trial had begun the last week in January, then was recessed by Greene a day later when it became clear that the parties had achieved a detailed agreement. The case was then scheduled to resume Feb. 2 if the parties failed to finalize that agreement. They did not, but Greene—albeit reluctantly—granted the government a month's extension.

Justice had requested the extension to further refine the agreement and to give Litvack's successor a chance to review its proposed terms. But Baxter was not nominated until Feb. 20 and his name not sent to the Senate for confirmation until March 2, clearly too late to put his imprimatur on any settlement.

"The new Administration hasn't focused on this case at all," the source said. "There's been nothing that represents a studied judgment. The evidence we're getting is 'don't talk to us, go see Justice.' I think they're looking to Justice to work it out."

There also seems to be little judgment, studied or otherwise, on telecommunications policy. At press time, neither a director for the National Telecommunications and Information Administration (NTIA) nor a chairman of the FCC had been nominated by the Administration.

"I don't know that we know enough yet to get a handle on what the Administration's going to do," another source said. "Right now they have too many economic concerns to worry about. I think this is something they'll just stick in a corner and come around to later."

"We have no authoritative indication of the plans for us," an NTIA source said. "An assistant secretary for us wasn't the first priority, and understandably so. Their treatment of us will probably be synonymous with their general philosophy —deregulation and minimum government intervention. Right now we've got very thin gruel to go on."

In Congress assembled, it's full speed ahead and damn the trial. Both Senate and House communications subcommittees are planning once again to address the Communications Act of 1934. Each spent much time and energy on telecommunications legislation last summer, with the House proposal succumbing to legal questions raised by the Judiciary Committee and the Senate

SIDESHOWS

Once the settlement talks collapsed, Bell decided to take no chances. The day after the trial resumed, it filed a petition in U.S. District Court in New Jersey requesting a clarification of the 1956 consent decree.

AT&T had been planning to ask for such a clarification in light of changes mandated in its organization by the FCC's ruling in Computer Inquiry II, but had apparently hoped to resolve uncertainties in its role under the decree in the attempted antitrust settlement.

"We held it in abeyance while the negotiations were going on," said AT&T's Pickard Wagner. "We simply can't wait any longer."

The FCC had ruled that Bell could compete in selling phone equipment and dp services only through a separate subsidiary. The subsidiary, which has to be created by March 1982, would be able to charge whatever prices it wished without being subject to tariff regulation by the FCC and state agencies. The FCC and AT&T contend such restructuring does not violate the '56 decree. Justice disagrees.

"If I were Bell I'd be doing the same thing," admitted Walter Hinchman, former chief of the FCC's Common Carrier Bureau and now a leading dp consultant.

"This is also a good time to strike. They've got Justice on record that the '56 decree is ineffective, so Justice will have a hard time arguing against it. They can't think much of it if they were willing to do away with it during the settlement talks."

Then too, there's the matter of Justice's recent request to Greene to find AT&T in contempt of court. Although the request was actually made earlier in the year, it went largely unnoticed until the day after Bell's filing in New Jersey. Justice had asked Greene to find Bell in contempt for delaying as much as a year in producing more than 3.1 million pages of documents. In addition, Justice requested sanctions that could include payment of costs and fees, a figure it said could reach $3.5 million. Justice also asked that it be given access to AT&T computer records indexing the key documents.

AT&T's response, filed Feb. 10 in the midst of settlement negotiations, called the contempt request "a stratagem chosen to attempt to embarrass the defendants and achieve some other technical objective at this stage of the litigation. Defendants will not attempt to match the government's invective, but take strong exception to the government's reckless charges."

—W.S.

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bill never a serious contender to reach the floor once then-chairman Howard Cannon (D.-Nev.) objected to several provisions.

This session, the positions are reversed. The Senate will lead, the House will follow. Shortly after the session began, the Senate Commerce Committee held hearings on radio and television deregulation. It plans to spend two to three weeks, including several hearings, on telecommunications deregulation before tackling the FCC's license renewal authority, which many members want reduced to three years.

"We have the votes to move all of them through the committee," said chief counsel Bill Diefenderfer, "and we expect to pass them all by August. We're in a better position to move than the House, because we have less new members and less people to educate. We bore the brunt of the early going last year, so it's nothing new for us.

"I think there's a real sense that Congress has been derelict in the communications area. The bill hasn't been rewritten in 46 years, and it's time something is done. If it's not, it won't be for our lack of trying.

"Sure, I expect the same issues that caused trouble last summer will do so again. But we feel we can stay out of the judge's way. He has his turf and we have ours."

So believes the House communications subcommittee, where Tim Wirth (D.-Colo.) ascends to the chair following the unexpected defeat of Lionel Van Deerlin, who failed both to shepherd his pet telecommunications bill through the House and to regain his seat. There has also been significant turnover in the subcommittee's membership, so Wirth, a veteran of last summer's battles, is proceeding cautiously. He had been planning to wait until after settlement of the antitrust case to begin action. Now he can't hang his hat on an event which may never take place.

Baxter's name wasn't sent to the Senate for confirmation until March 2, clearly too late to put his imprimatur on any settlement.

"It's clear that some legislation is necessary, and Tim thinks Congress, not the FCC, should set the policies where possible," explained David Aylward, the subcommittee's chief counsel and staff director. "But we're not looking at it intensively. It's going to be dealt with. We're just not sure when or how yet.

"We are sure that it shouldn't interfere with the antitrust laws and their enforcement. There's a difference between antitrust policy and communications policy. We've got expertise in the latter, not the former. But it's obvious they're going to overlap again."

The legislative stakes have changed as well. Last summer, AT&T several times appeared on the verge of convincing Congressional members that what was best for it was also best for both the telecommunications and dp industries.

They didn't buy it, but Justice almost did. According to sources, under terms of the proposed settlement, which neither side will confirm, Bell would have divested itself of its minority ownership in Southern New England Telephone and Cincinnati Bell, as well as of its 91% share of Pacific Telephone. The manufacturing of transmission and switching equipment would have been removed from Western Electric and made a separate subsidiary. AT&T Long Lines reportedly would also be made a separate subsidiary. In return, the 1956 consent decree preventing Bell from entering unregulated markets, such as dp and telecommunications, would be modified to allow it to compete therein.

"It was a bad operation from the beginning," an informed source said. "Those terms were substantially beneath and very wide of the complaint the government brought to the court in 1974."

Justice had originally requested that AT&T be forced to divest itself of all 23 operating companies as well as Western Electric and its main research facility.

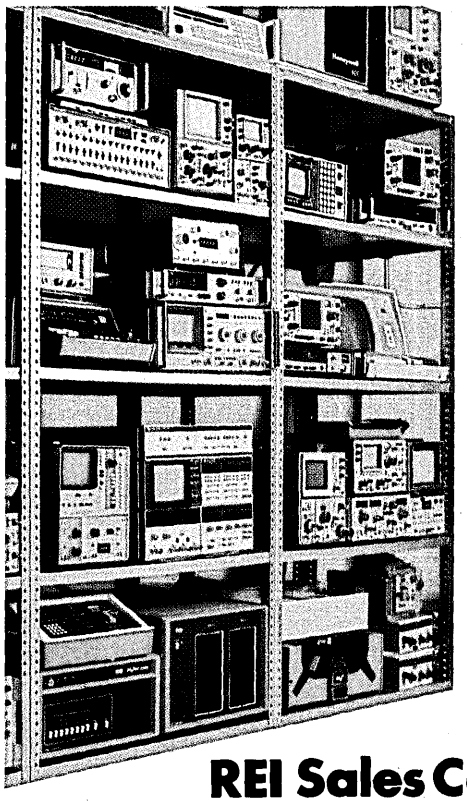
"There was almost nothing said about divestiture," the source continued. "Those terms are not the kinds of remedies which would eliminate AT&T's ability to sell below cost, control markets, and continue its anticompetitive practices."

"A case of this complexity couldn't possibly be solved in such a short time, even without Greene's deadline," another observer said. "To think that two such adversaries could reduce an agreement in principle, if in fact the terms had been reduced to that, to settlement was ludicrous. Members of the Justice trial team had told at least two of AT&T's competitors as long as two weeks before the deadline that they didn't think a settlement was possible. I think Justice wanted more specificity than AT&T was willing to yield."

Now the world's largest corporation may not have such a luxury. It will have less control over its fate at the judge's bench than at the negotiating table. Legislators, possibly having learned some lessons from last summer's wrangling over proposed bills, may well be less responsive to the phone company's entreaties. So AT&T's fate is less certain in that arena as well.

But charging up the Hill is preferable to coping with the court. In addition to insisting that going to trial would severely lessen the chances of settlement, AT&T counsel Trienens and cohorts are fearful of the effect a full trial could have on other pending antitrust suits against AT&T.

The specter haunting the phone company is Section 5 of the Clayton Act,



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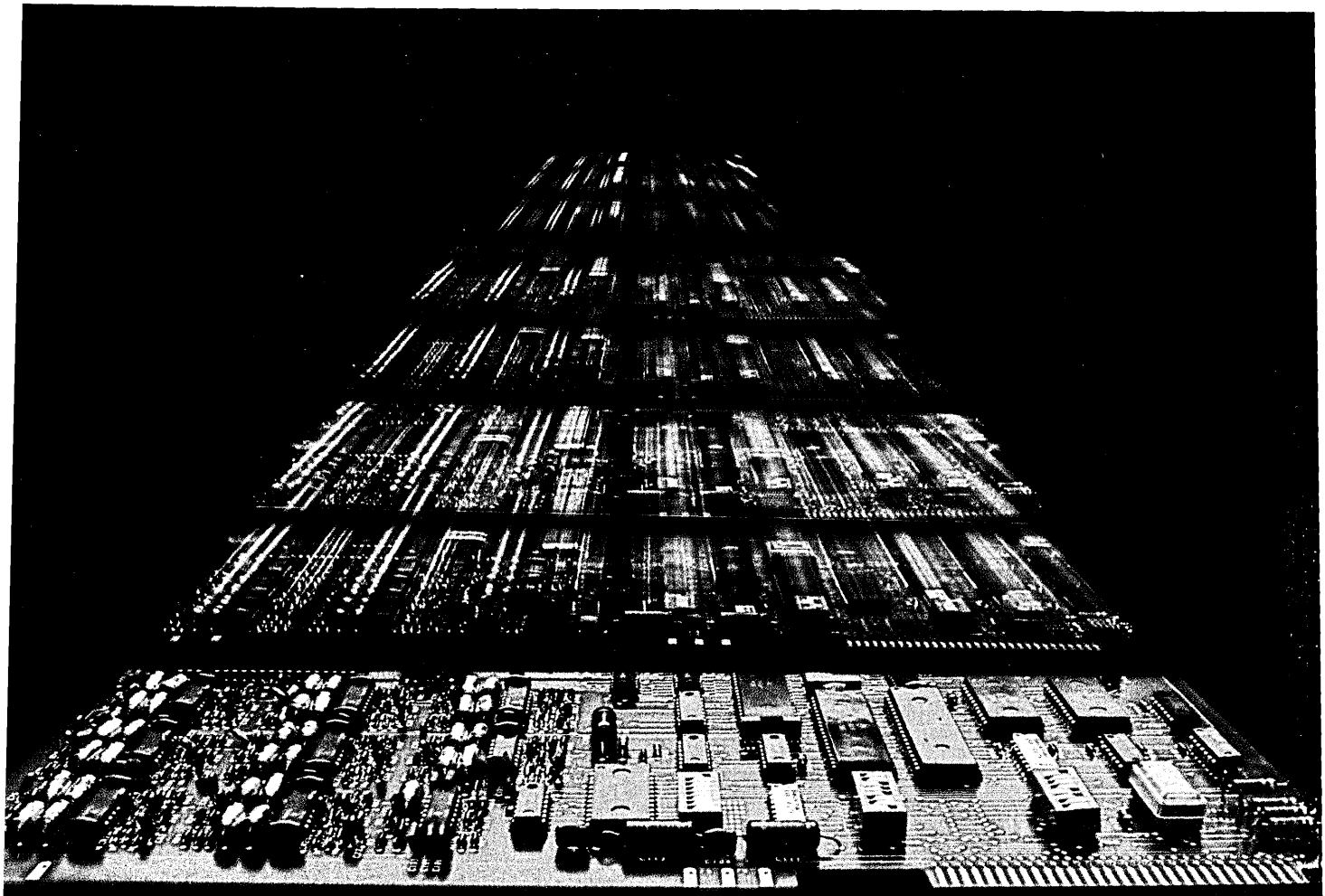

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which permits other parties bringing antitrust suits against the same defendant to use, as prima facie evidence of that defendant's guilt, any final judgment or decree rendered in any suit brought by or on behalf of the United States. The exact application is unclear, although prevailing legal wisdom indicates that such decrees could in fact be used as supporting evidence for plaintiffs even though they have not often been used in the past.

It is clear that Section 5 does not apply to consent judgments or decrees entered before any testimony has been taken in the instant case. Thus, it was surely to AT&T's advantage to press for a settlement prior to opening day in Green's courtroom. Any terms of such consent decree or judgment would not have been permitted as evidence in any of the more than 40 current private antitrust suits pending against Ma Bell. Once the trial began, however, all evidence submitted would appear to be fair game for other litigants. Justice attorneys have said that Section 5's scope is often exaggerated by defendants as a tactical matter. It is certain that AT&T will obtain the most mileage possible on the issue.

"We're almost at the end of our case, so we'd have some serious procedural impediments to using anything [from the government's case]," said plaintiff's attorney involved in a multimillion dollar antitrust complaint against Bell. "If a real bomb came out in the government case, we could probably do something with it.

"But there are lots of smaller companies that don't have the wherewithal of us or MCI—and my hat's off to them [MCI]—that will stand to benefit from Section 5. A lot of people have been hurt by Bell's actions. I think it's absolutely true that a regulated monopoly has no incentive other than to use its position to encroach on unregulated markets, and it couldn't be more clear than that Bell has done exactly that."

A key to the outcome might be in how Baxter views things. Although the Reagan Administration has promised hands and regulations off business, that philosophy may not wash in antitrust cases. While the professor-cum-bureaucrat is a confirmed foe of putting resources into big divestiture cases, he has indicated—albeit several years ago—he would make an exception for AT&T.

"I would applaud continued heavy intervention in regulatory proceedings by the [Antitrust] Division," he wrote in the 1977 American Bar Association *Antitrust Law Review*. "For example, I would exempt from my criticism of the big divestiture case the division's activities against AT&T. A regulated monopolist has incentives very, very different from that of an unregulated monopolist. An unregulated monopolist could, but rarely finds it profitable to, engage in cross-subsidization. He has the option of putting his monopoly profits in the bank.

"As soon as one starts talking about a regulated monopolist, one must recognize that he is limited in his ability to earn the monopoly profits unless they are used for cross-subsidization. So, the incentives for cross-subsidization in contexts of that sort are vastly stronger than they are in unregulated sectors. Historically, AT&T, as a political matter, has cross-subsidized the local loops at the expense of business use of long lines communication. Local loop charges should be higher and, of course, divestiture would necessarily deprive the regulated monopolies of the opportunity to engage in that kind of cross-subsidization. Experience indicates that nothing else will accomplish that.

In '77 Baxter said, "I would exempt from my criticism of the big divestiture case the [Antitrust] Division's activities against AT&T."

"So, whether it's intervention before the regulatory agencies themselves or cases such as the AT&T antitrust case brought parallel with such intervention, heavy antitrust involvement in the regulated sectors seems to me quite desirable."

There is no indication that those earlier words will translate into action when Baxter is confronted with the realities of shredding Bell's corporate structure. Even if he wants to perform such surgery, higher authorities may not allow him to do so. Nevertheless, such a philosophy can hardly help Bell chairman Charles Brown sleep peacefully.

"The pressure on AT&T to resume negotiations and give up more is sharply increased every day the trial continues," an antitrust expert said. AT&T, however, expresses another opinion.

"We feel we have a good case and we'll win," AT&T spokesman Charles Dynes said. "We were almost at the point where we thought we had something, but those talks have been concluded. They can be resumed at any time, but I doubt the incentive will come from us. We'd be starting all over again. We're always prepared to negotiate or litigate, though the latter seems to be the current course. But if there's no one in the government who can approve a settlement, what's the point of starting talks again?"

None, as far as Bell's myriad competitors are concerned.

"A trial on the merits is the best way to get the true facts," an industry group spokesman said. "It would serve everyone's best interest to have the facts on the

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table. We'd all like to ultimately see where the Supreme Court stands on monopoly and its misuse.

"If what eventually emerges from this is a competitive divested entity that is a real world company, raising capital and marketing its own products and services like we do, and every other business aspect is the same, that would be a tremendous plus for the industry and the users. In a fair fight, most of our guys think they'll win. If they don't, at least it'll be their own fault."

Bell doesn't have a marketing force nearly as sophisticated as do many of its competitors," said another interested observer. "They won't achieve it overnight no matter how much money they spend. And they have no credibility in computers. Who in the world is going to listen to a phone company account executive talk about mainframe cpu's?"

AT&T's competitors apparently would rather have their fate rest with Judge Greene than with Justice negotiators.

"As long as the ball is in the air for a trial, we feel better about things," a leading trade group source said. "That proposed settlement was an absolute disaster, and we would have gotten no further relief. The next one, or a judgment, will be better. Baxter's statement of '77 is a hopeful sign, although it's a pretty thin reed."

—Willie Schatz

MICROCOMPUTERS

MICRO MADNESS

The recent outpouring of 32-bit micro chip designs raises the question of whether it's technology in search of applications.

No less than four different companies have disclosed designs of new 32-bit microprocessor chips, this outpouring taking place at the 28th annual International Solid State Circuits Conference. Generating the most discussion was the Intel Corp. iAPX 432, implemented with three chips.

"This is a milestone of historic proportions," asserts consultant Omri Serlin, president of ITOM International Co., Los Altos, Calif. "It is both a beginning and an end," he says. Placing this sophisticated and powerful architecture on only three chips, he explains, will open up new applications that cannot be cost-effectively addressed with existing technology. To this extent, it is a beginning.

It is not a statement that goes unchallenged. "I think we're starting to experience technology compression, where the technology can produce things faster than the marketplace can really assimilate them and put them to practical use," says another consultant, David Gold of Saratoga, Calif. "We haven't even fully exploited the 16-bit micros, and by the time people are halfway through with that, the 32s are around." He thinks there still are plenty of applications for the old and more mature 16-bit processors without resorting to the added horsepower in the 32-bitters.

The oft-cited question arises, therefore, whether the 32-bit microprocessor is an example of technology in search of some applications. "I would say that's very close to the truth," says Will Strauss of Integrated Circuit Engineering (ICE) Corp., Scottsdale, Ariz. He admits there are applications out there that have been crying for the 32-bit processors, just as there have been for a 64-bit processor. He says the new technology will allow some needs to be filled and be responsible for new needs to be thought up.

The initial market for 32-bitters is expected to be small, "simply because people haven't thought of places they can use 32 bits instead of 16."

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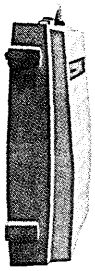

The Model 745 allows representatives to access the full capabilities of the host computer with its interactive communication features for reliable, responsive results. With the Model 765, utility auditors can speed up the audit process using the data terminal's editing feature, built-in bubble memory data storage, and Data Entry Validation Option capabilities.

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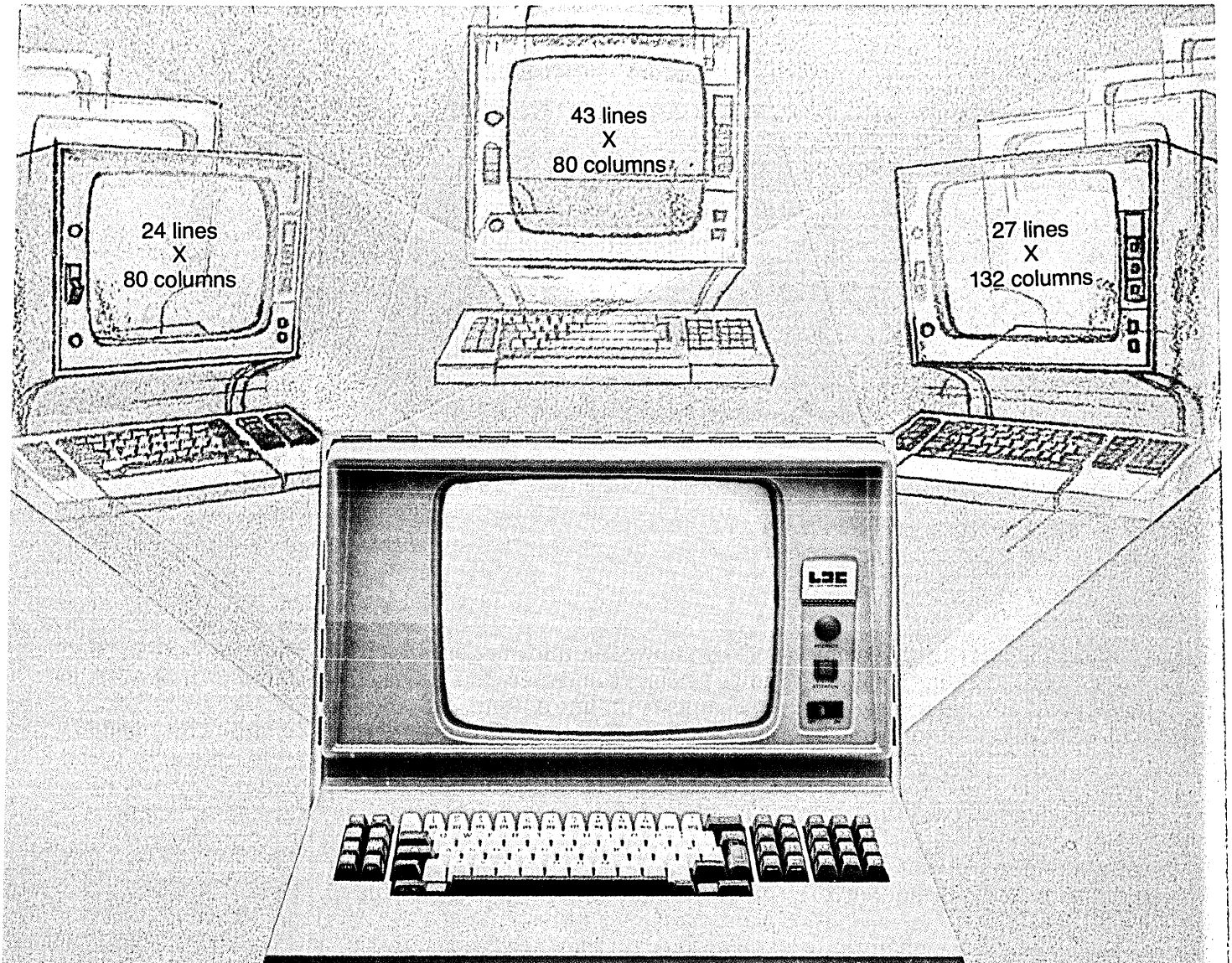

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The analogy he uses is the declining price of memory. "Every time you reduce the price per bit," he says, "people find new applications. I think the 32-bit processor is along those lines."

But ITOM's Serlin believes the "answer looking for a question" charges do not hold water. "I think they said the same thing about the 32-bit minicomputer," he argues.

Serlin thinks the Intel processor is also a beginning in the sense that others will follow with similar products. At the conference, Bell Labs disclosed its one-chip 32-bit design. Hewlett-Packard's 32-bitter is implemented with more than 450,000 transistors on one chip. National Semiconductor's processor chip, separate from the memory management chip, incorporates more than 60,000 transistors.

The 32-bit micros, in another sense, are also an end point, says Serlin. A 4-bit chip was the first micro, followed in order by the 8-, the 16-, and now the 32-bitter. "Beyond this, I don't think we are likely to see 64-bit micros," he says. "Look at the mainframe industry. They also stopped at 32 bits as the architecture most suitable for the widest range of applications." Others agree that, except for limited applications, the 32-bit design will suffice.

Strauss of ICE says 32 bits are useful where a lot of number crunching is required, is beautiful for floating point arithmetic, ideal for random number generating, and would be a boon for anyone who must move lots of data, assuming the microprocessor's I/O organization is designed right. But he notes that the initial market will be fairly small, "simply because people haven't thought of places they can use 32 bits instead of 16." Currently, he thinks, there are more 8-bit chips in use than anything else. A lot of people find they don't need the power of a 16-bit processor, so they stick with the 8-bitter, which is cheaper. Similarly, the market for the 16 is larger than for 32 bits.

Neither does he view the new processor chip as posing an immediate threat to minicomputer makers. "I don't think anybody's going out and making a VAX lookalike from it," he quips.

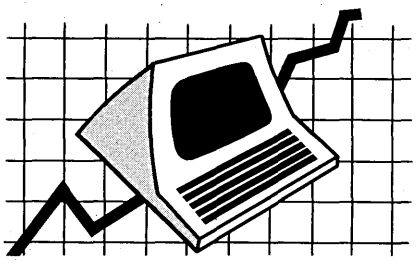
But Serlin observes that the Intel chip set is architected like a large machine. It has a very large addressing space, up to 4 gigabytes, a virtual memory system, built-in floating point microcode, instruction execution speed that in some cases is in the IBM 4331-1 and 2 class, and content addressable memory buffer to support an efficient virtual memory operation, much like the IBM translation look-aside buffer.

"All these features are not new, of course," he says. "What is new is that IC designers are now fully conversant with mainframe concepts and have the technology to put it on a few chips. The separation of cpu and I/O processors and the elimination of all interrupts from the cpu domain is highly reminiscent of the CDC 6000 architecture of the early 1960s. The memory management system looks a lot like the Burroughs 5500 of the same era."

Serlin adds that he gets a strong sense of *déjà vu* here. "Those of us who have followed the mainframe and minicomputer industries can't help feeling that the micro developments in general are following the same pattern of 20 years ago, except that the size and costs are many orders of magnitude smaller."

The consultant also thinks this chip set puts Intel in the computer software business. The maker is talking about supplying a complete operating system and a compiler for the Ada language. Perhaps Intel's strategy is to avoid having to sell systems products, as Texas Instruments and National Semiconductor have been doing, but rather to generate additional revenues and profits from the sale of software. "This is a smart move," says Serlin, "because an IC house cannot afford to sell systems in competition with its own chip customers."

Intel dubs its new chip set a "micro-mainframe," for the maker has shown that a major portion of the architecture of a mainframe of the IBM 4331 class can be reduced to a few VLSI chips. "They could probably



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have developed an IBM-compatible chip set just as easily," says Serlin. "Had they done so, they would have singlehandedly created a very strong and viable PCM threat to IBM at the low end of the 4300 series."

But he reasons that Intel didn't want any such confrontation with Big Blue, if only because IBM is both an actual and potential large customer for Intel products.

—Edward K. Yasaki

SOFTWARE

A PRO THAT'S APROPOS

A new software productivity tool is said to eliminate programming.

Software productivity is a hot topic these days, and tools to achieve it are proliferating. Perhaps one of the most unique is the product of the fertile brain of a young programmer from New Delhi, India, who developed it while working for a service bureau in Hawaii. It eliminates programming.

But what is it? That's a hang-up of both developers and licensees. And what to call it? At Data Technical Analysts (DTA), Honolulu, it was dubbed Pro. "The name has no particular significance," said Sushil Garg, the young developer.

Garg began development of Pro in 1975 when he noted the vast number of common elements in many different applications he was working on for DTA. Simply put, what he did was to store common elements, precoded in a computer, and to develop an algorithm which can link them to generate an application based on specifications input by the user.

These specifications come from a selection of forms or questionnaires filled out by the user. Generally five or six are needed for most applications, but nine were developed for the first iteration of Pro. Others have been added by licensees.

Garg developed Pro on a General Automation computer used by DTA, and General Automation, Anaheim, Calif., was the first computer manufacturer to be made aware of it. GA became one of the first licensees and the first to make the concept commercially available. GA calls the concept NoCode, and has been marketing it on a limited basis in California for about a year.

The first company to actually sign a license for Pro was C. Itoh Electronics, a Los Angeles-based unit of a diverse Japanese trading company, which is implementing it on a system based on the Motorola 68K processor. C. Itoh will introduce a prototype system at the National Computer Conference next month and is presently talking to potential oem customers. The company will sell its systems on an oem basis only for an indeterminate period before deciding whether to sell end users a C. Itoh product.

AL COSENTINO: "If Pro can do what they say it can do, we'll go with it."

C. Itoh was introduced to the Pro concept by Calvin Lee, who is president of still another licensee, Capro Inc., formed last September in Irvine, Calif. Capro will develop a Pro system it will call Unibiz, based on an Intel 8086 processor.

Lee, who learned about Pro while working for General Automation, also is working closely with DTA on licensing arrangements, which he said have been contractually limited to five. DTA, he said, has sold off its service bureau operation and is working solely on enhancing Pro.

A fourth potential licensee is Microdata Corp., Newport Beach, Calif. "We have an option to take a license," said Microdata president Al Cosentino, "and if Pro can do what they say it can do, we'll go with it." Cosentino said Microdata would benchmark Pro, bringing up an application on Microdata's Realty system using its proprietary English language and comparing the time involved with the time it would take to bring up the same application on Reality under Pro.

Garg said early last month that these tests were taking place in Honolulu.

Lee said the fifth and final licensee is a "small, California startup company," but he wasn't able to disclose the name because "the contract is signed but all the money's not in."

So far, only C. Itoh is planning an oem thrust with Pro. Jay L. Kear, a consul-

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tant to the company and its Pro project manager, admits the newest licensee might get into this but "nobody knows now."

All licensees consider themselves in on the beginning of a concept that is going to catch on throughout the industry. "We've got a two year head start as I see it," said Kear. He added that he had information through C. Itoh's service bureau operations in Japan that IBM is working on a similar approach in "a lab" but "they wouldn't want it out now."

Garg said the Pro concept has been pitted against a lot of things, but "you really can't compare it because it's not like anything else." Pro has been compared with IBM's QBE (Query by Example) offered on the System/34, but Garg points out, "that's a different ball game. It [OBE] is a database management query system similar to Microdata's English."

General Automation calls the concept NoCode and has been marketing it on a limited basis in California for about a year.

Pro also has been compared to a number of productivity tools used by manufacturers, such as Point 4 Data Corp.'s Force and Computer Automation's Symple. Garg said these are "program generators. Eighty percent of the things we are compared to are program generators."

So what is Pro? Peter G. Papiro, GA's director of marketing development (referring to GA's version, NoCode), called it "a thing. It doesn't generate anything at all. All it does is link. It doesn't require a language, coding, compiling or anything."

Garg said the biggest difference between Pro and a program generator is that Pro "generates and executes at the same time."

Papiro said Pro has its restrictions now. "In theory it can do any job, but now its applications are of the business and commercial type. It can't handle FORTRAN or scientific computing, although it does have a business arithmetic capability." It can't today communicate interactively in a bisync mode with a high level protocol, though it can batch to a host computer. But within a fully implemented system such as GA's or others that have been proposed, it is fully interactive.

Kears of C. Itoh has come up with what developer Garg calls the best definition so far. He calls Pro an "application level operating system." Garg said he considers that accurate, but he worries that the term operating system "might really scare people."

Peter Tsukahira of General Automation, responsible for, among other things, training new users of NoCode, likes to call it an "applications generator." He allows, as do others, that no programming knowledge is needed to use NoCode, "but a little bit of systems analysis knowledge helps."

GA's Papiro said "a couple of weeks of training will take care of that. You need to know what a field is, what a file is, and things like that. But a small business, first-time user can be trained to become his own systems analyst."

Tsukahira said he has found it easier to train users who have had some background in computing. "The important thing is to know what you want the application to do, but it helps to be able to define it in terms of systems."

Papiro talked of an application that was done in COBOL with 998 lines of code in 40 hours. The same approach with NoCode, he said, took 110 entries and one and one-half hours. And, he added, "NoCode allows remote correction."

A factor that convinced General Automation to go with NoCode was very close to home. The company has a subsidiary in Santa Ana called National Technology, which sells circuit boards to many mainframe computer manufacturers. National Technology last year was halfway through the process of bringing up a whole dp operation including a variety of applications when it suffered a fire. Everything pertinent to the operation was destroyed. The firm decided to try out NoCode rather than start again from scratch. It was back in business with a complete set of applications in a matter of a couple of days "and without a programmer," said a GA spokesman.

Licensing arrangements have been limited to five companies.

Papiro said the current limitations to Pro and NoCode "will go away. We can write elements that can accommodate IBM."

Lee of Capro bemoans the difficulty of explaining the Pro concept: "But once they've seen the light . . .!" He told of one person who came to understand the concept and reacted by saying, "We're still in the horse and buggy days and you've gone beyond the first auto to interplanetary rocket ships. It's a quantum jump. We won't be talking in terms of programming anymore."

To some, that might not be good news. But to companies bucking the programmer shortage, it could be. A recent survey by New Faces & Places, a financial and computer executive search firm, predicted the 1981 demand for programmers would be 35% higher than that of 1980.

But then, suppose the Pro concept catches on . . .?

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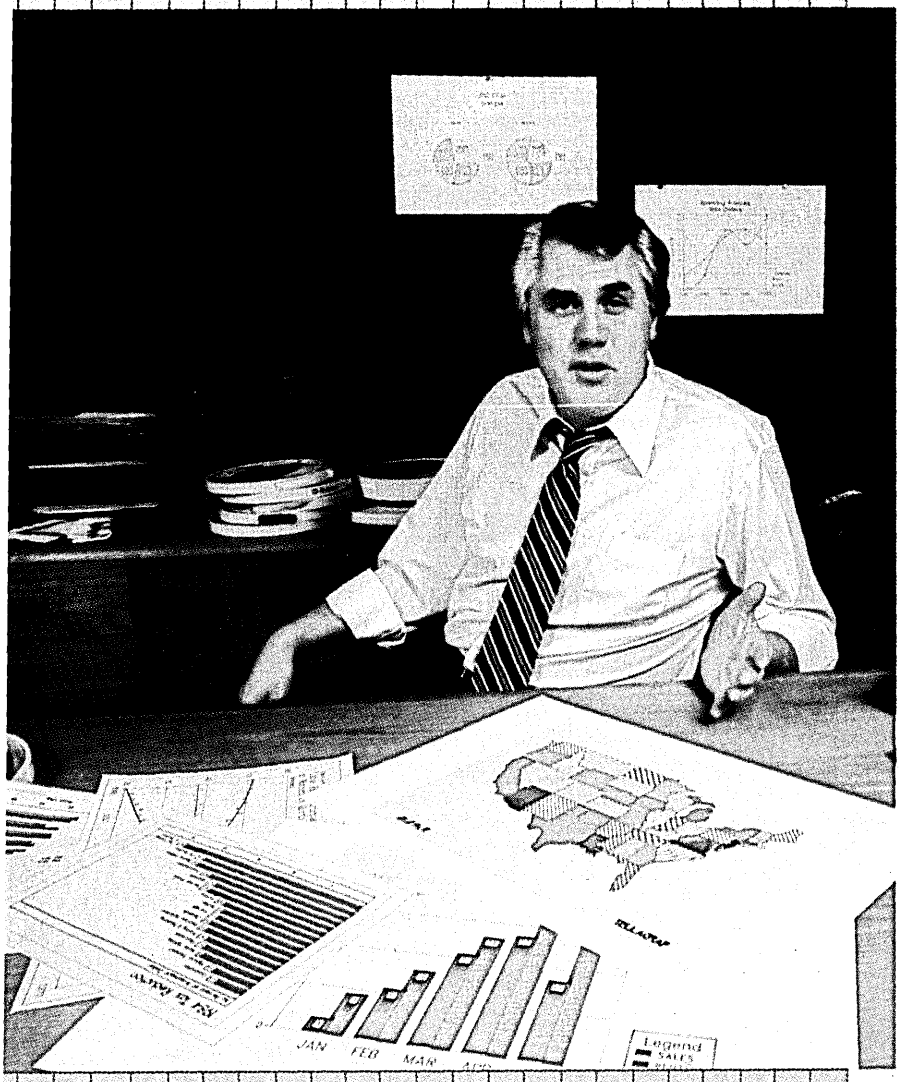

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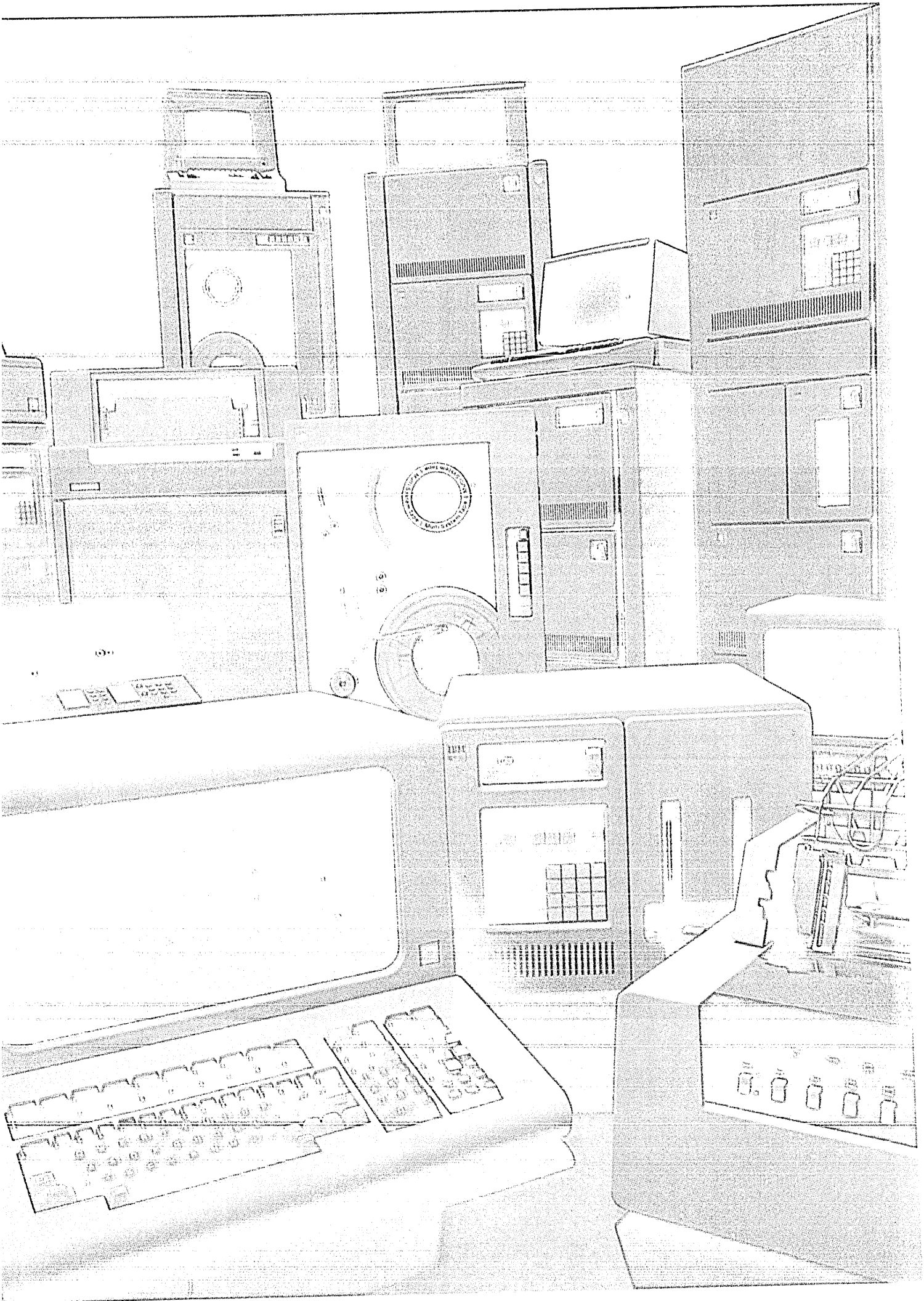

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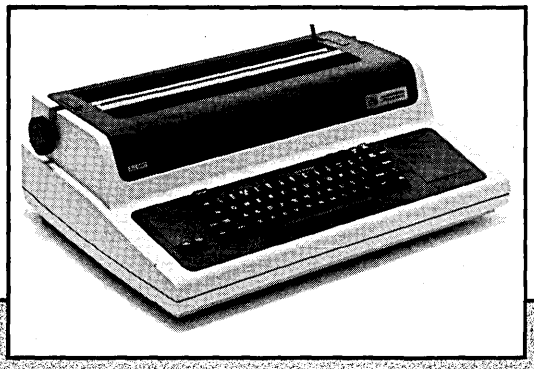

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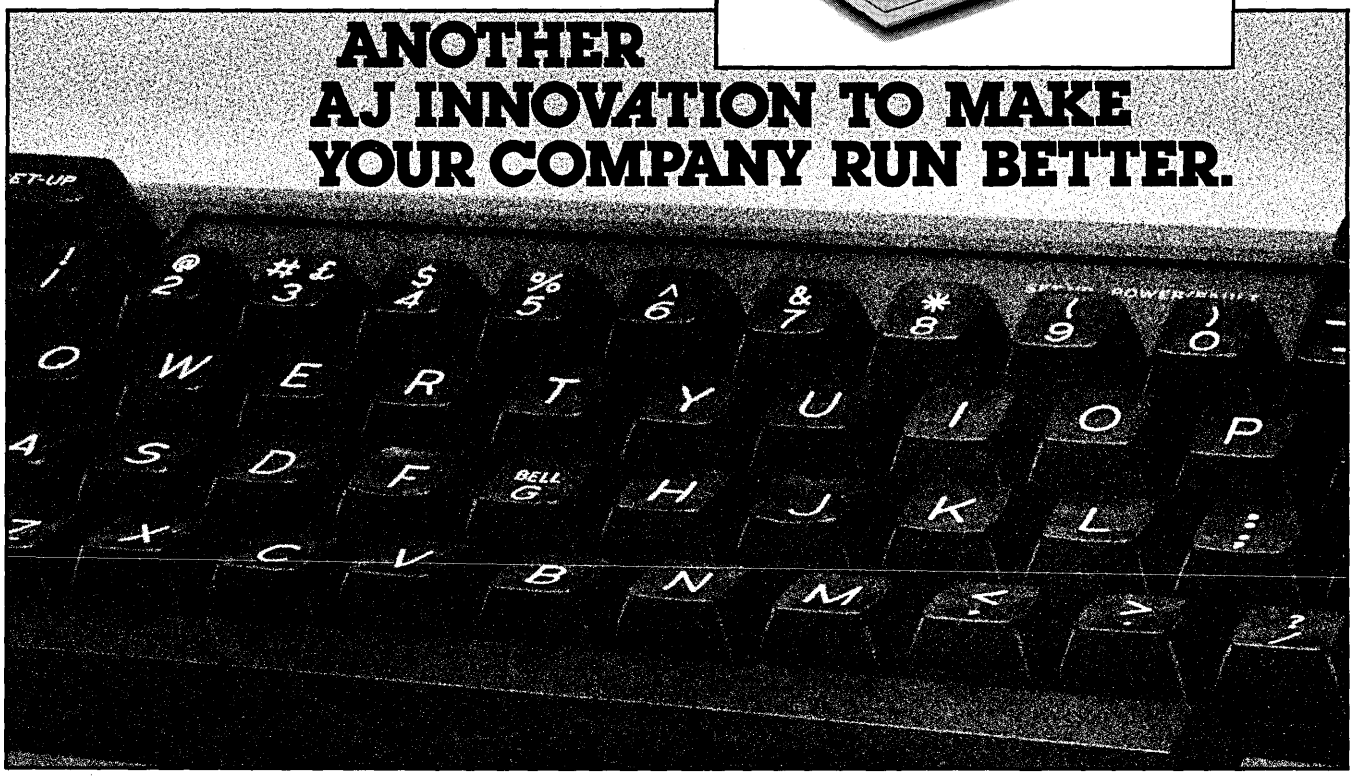


CIRCLE 57 ON READER CARD

HARDWARE

TI TIES INTO IBM TERMINALS

Texas Instruments has expanded its bubble memory terminal line into markets requiring an IBM interface.

Texas Instruments' Terminals and Peripherals Div. in Houston has made its initial foray into the IBM 3780 protocol batch terminal market with the introduction of two new models in its Silent 700 series.

The Models 767 and 769 are based on the firm's four-year-old bubble memory terminals (the Silent 700 Models 763 and 765), and are intended to provide a low cost ($4,000 ballpark) batch terminal for low-volume—80KB and under—sites needing communications with IBM and other machines supporting the widely used synchronous 3780 error checking protocol.

The new terminals also can be used to access systems supporting asynchronous start-stop protocols, but in such applications there can be no access to the bubble memory (in other words, you get the additional functionality of a Silent 700 Model 743 or 745). Unlike the other Silent 700s, perhaps the most popular portable terminals on the market, the 767 and 769 will not be called portables since they require the use of external modems for their major application as 3780 devices. In all other physical respects, the two new terminals look much the same as any other Silent 700.

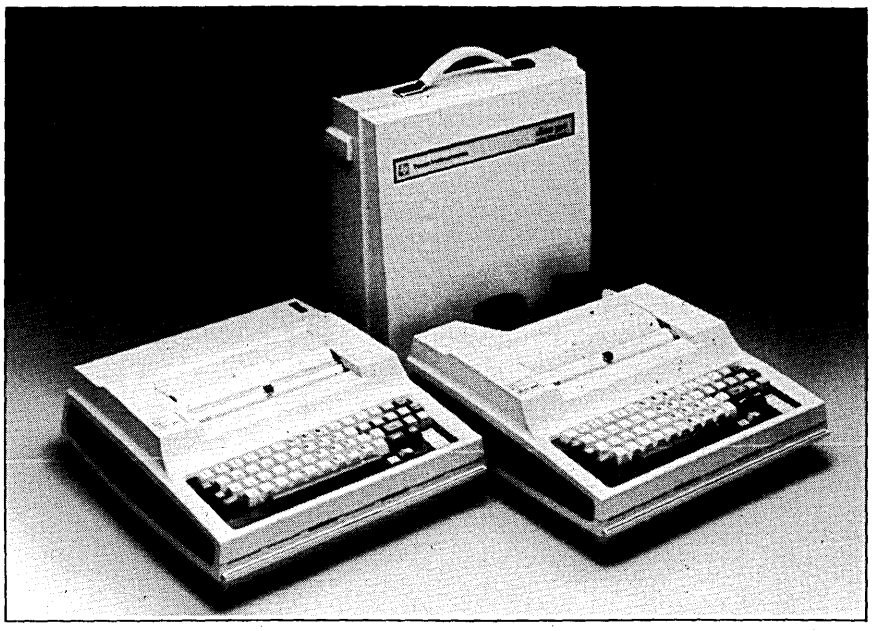
The two terminals—which differ only in that the 769 has an integral Bell 113-type acoustic coupler—represent an evolutionary growth of the original bubble memory terminal line.

The first bubble memory terminals, the Models 763 and 765 (DATAMATION, May 1977), allowed off-line data entry and editing, with subsequent asynchronous transmission. This satisfied the needs of many customers. Customer feedback led to the introduction in 1979 of Data Entry Validation capabilities.

DEV, programmable in TI Bubble Operating Language (TIBOL), provided field and character validation based on type, size, range, and table lookup operations; it also supported conditional branching, integer arithmetic, and operator data input prompting. All this attempted to ensure the integrity of data sent to the host.

Users then began to complain of problems encountered with poor communications lines—all the data validation in the world won't help if the line garbles a message. So TI began investigating ways to increase the reliability of the actual data transmission, finally selecting IBM's 3780 protocol as appropriate to batch communications and perceived market needs. Hence, the 767 and 769, and the optional external Racal-Vadic V3400 Tri-modem (1200 bps synchronous/asynchronous V3400 and Bell 212A compatible communications, plus 103-compatible asynchronous to 300 bps).

If it suits the user's requirements, a



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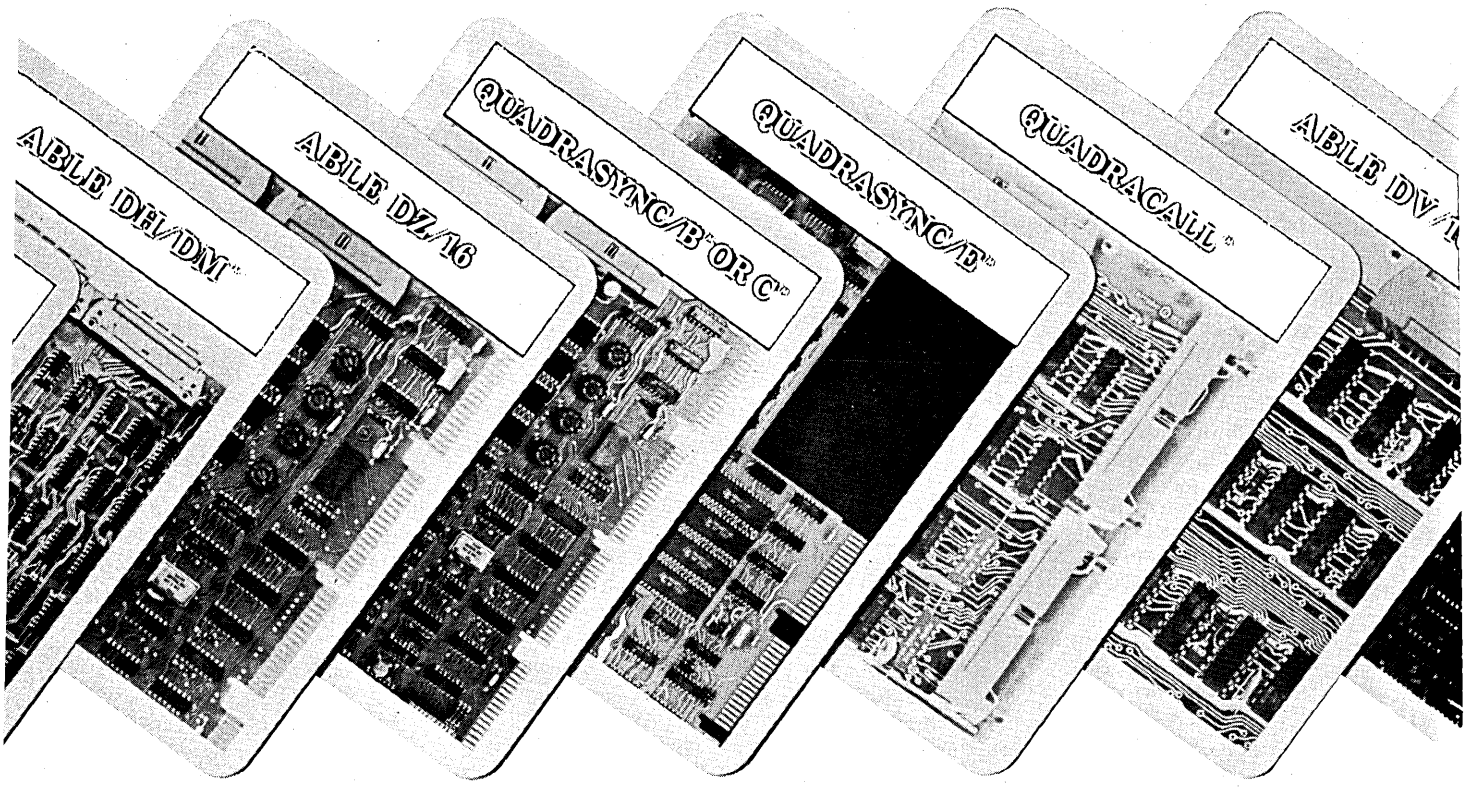

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Poller Applications package can be implemented on TI's minis (DS990 Models 4 through 30), allowing collection and distribution of data to and from 767 and 769 terminals. Either tty or 3780 protocols can be used for polling, downloading and broadcast functions. TIBOL 2.0 cross-support also can be performed on DS990s.

Opting to base its first IBM-compatible terminal entries on the extant bubble memory line seems a good choice. The terminals have already been proven in many respects—the 30cps thermal printer, the bubble mass storage, etc. And, since those terminals are microprocessor-based, much of the 3780 support turns into a software project (e.g. protocol handling, converting from the terminal's internal ASCII representation of data to EBCDIC).

TI will not call the Models 767 and 769 "portables," since they require external modems for their major application as 3780 devices.

While TI says there are some engineering considerations that would have increased the terminals' cost if it allowed ASCII tty communications from the bubble store, it's probably as much a marketing consideration to protect the 763 and 765.

Initial availability of production units is slated for the third quarter (Model 767) and the fourth quarter (Model 769). In basic configurations both come with 40KB of bubble memory, expandable to 80KB in 20KB steps. The 767 lists at $3,995 and the 769 is $4,295; the external modem—which will be serviced by TI—sells for $1,095. All prices are quantity one.

DISTRIBUTED PROCESSING

DDP DECADE IS HERE

Four-Phase is finding that people now want to offload applications from their host mainframe and run them at the remote sites.

It was shortly after IBM had introduced its E-Series computers, the 4331 and 4341, in January 1979. At the annual shareholders' meeting of Four-Phase Systems Inc., the company's chairman and president Lee L. Boysel was asked whether those 4300s could be used as remote processors in the distributed processing marketplace where Four-Phase had staked its claim. Boysel said he couldn't see that happening, figuring IBM's offerings for this environment would instead be its Series/1, the Systems/34 and 38, and the 8100.

"Boy, was I wrong," he now says.

For the last nine months, Boysel claims, there has been a veritable parade of customers though the Four-Phase headquarters in Cupertino, Calif. They've been telling their systems vendor they intend to acquire 4300s for the local processing function, retaining the Four-Phase hardware for the interactive, front-end jobs. The reason, he explains, is that they want to off-load applications from their host mainframe and run them at the remote sites. Those customers are saying the local batch processor must be 370-compatible. After all, there are $200 billion to $300 billion in applications programs at user sites that run on IBM iron.

"What's happening is that 4300s are winding up in ddp networks. I never would have believed it, but that's where we're coming from."

During this period, fortunately, Four-Phase had been discussing the terms under which it would acquire Two Pi Corp., maker of the 370-compatible V/32 computer with the power of a 4331-1. Simultaneous with the consummation of that deal earlier this year, Four-Phase announced a processor with twice the power of the V/32 and renamed the two machines the Four-Phase Systems 311 and 312—which are the last three digits of the 4331-1 and 4331-2. Now the company is prepared to begin supplying its customers with a 370-compatible, back-end batch processor for use at remote sites in conjunction with the old Four-Phase System IV interactive processors now in place. And it is promising a fall '81 announcement of new front-end processors that will run existing Four-Phase software.

While IBM blessed the ddp concept two years ago with its 8100, there's been more jawboning than joining by users.

"The story at Four-Phase is consistent with what seems to be happening in the industry," says Richard Matlack of Dataquest, the research and consulting firm also in Cupertino. "That is, people *are* offloading from the mainframe."

While IBM blessed the distributed processing concept two years ago with its introduction of the 8100, there's been more jawboning than joining by the user community. Some say the transformation will occur in this decade, that the '60s was the period of decentralized processing, the '70s of centralized processing, and the '80s will

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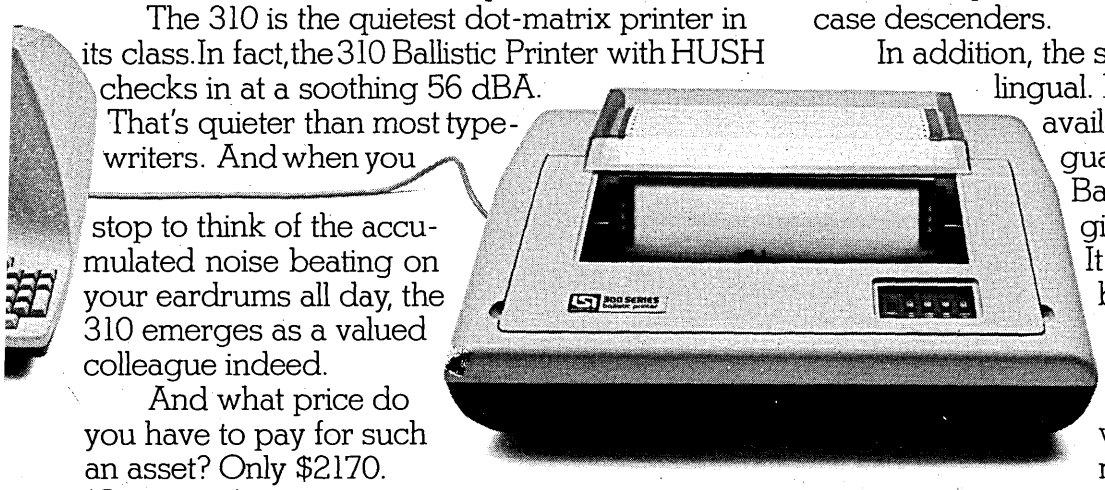

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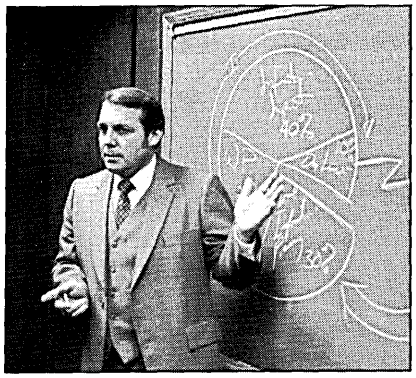

LEE L. BOYSEL: "What's happening is that 4300s are winding up in ddp networks. I never would have believed it, but that's where we're coming from."

be the decade of distributed processing. The marketplace is growing "but not exploding overnight, like a lot of people say," according to George Weiss of Quantum Science Corp., New York. Still, he sees it becoming a $55 billion market by 1985.

It will not come too soon for Four-Phase Systems, founded in 1969, shipper of more than 13,000 systems since that time, known for what some call the shared-processor data entry application on a processor design that's now more than 10 years old. The company has concentrated its direct sales effort on the nation's largest corporations, which may purchase their IBM and Amdahl mainframes but lease their Four-Phase hardware (the software is bundled). At least 90% of its hardware is on long-term lease.

Four-Phase is known among market analysts for its loyal customer base, for possessing an excellent sales force, and for a crack field support network of more than 1,000 people operating out of 130 locations nationwide. One of its oems, confirming these superlatives, is also high on the hardware. "The design is dated but not out-of-date," says B. R. Cabaniss, president of San Francisco-based Maestro Systems Inc. The company has installed about 30 on-line

Ddp could be a $55 billion market by 1985.

programmer workstation systems based on the Four-Phase hardware. Cabaniss tells of visiting a user site, asking what the user liked about the system. "Without any prompting the guy said, 'The best thing about your system is availability.' He said the thing never goes down."

Cabaniss readily admits there are two things he would like. One is a bigger terminal, one with a 132-character line width and graphics capability. The other is a larger disk drive. He's led to understand that both enhancements are being planned. Looking at products on the market, he concludes, he doesn't see anything else that can provide the kind of response time he needs.

Oems are important to Four-Phase's business, accounting for some 20% of sales. The medical industry, for example, accounts for about 24% of its installed base, and most of that was installed by a few oems.

But the thing to understand is that the company concentrates its end-user sales on large customers with, for example, large networks. "Our objective is not to compete [as a PCM] with IBM," says Boysel. "I don't care if we do have better price-performance." The company shies away from the onesy-twosy user who would require too much support for what little hardware it buys. In contrast, a large customer could be given a lot of support at its corporate headquarters, the buyer then taking the responsibility for installing the machines at branches around the country. Following this sales philosophy, Four-Phase has managed to have about 10 systems installed for each customer on its books.

Four-Phase has enjoyed an uninterrupted growth since its inception. Last year for the first time there was a drop over the previous year in net income, but total revenues increased by 10% and were just shy of reaching the $200 million mark.

The company paid some $10 million for Two Pi. ("It was a real steal," Boysel says laughingly.) He estimates it would take them three years and $15 million to develop the same hardware today. He says the $15 million isn't bad. "The three years is the kicker." They need the Two Pi hardware today, and would be a lot better off if they had had it to sell last year.

According to Dataquest's Matlack, the company has had problems with its R&D. He thinks the initial impetus for the acquisition of Two Pi stemmed from the fact the company is late with its new line of ddp products. It needed something to sell in the interim, lest it lose its sales force. He estimates the company is 18 months behind where it should be in its product cycle.

Indeed, consultant David Gold of Saratoga, Calif., describes the Two Pi ma-

Four-Phase's focus for end-user sales is on large customers with large networks.

chine as "somewhat the equivalent of a midlife kicker on their old product line. It gives them the additional horsepower that they need outboard without having to change the current product." And the beauty of it is that it's IBM-compatible.

Four-Phase's product line "is getting old, becoming obsolete," observes Grant (Skip) Bushee of Dataquest. The company has put a lot of money into R&D

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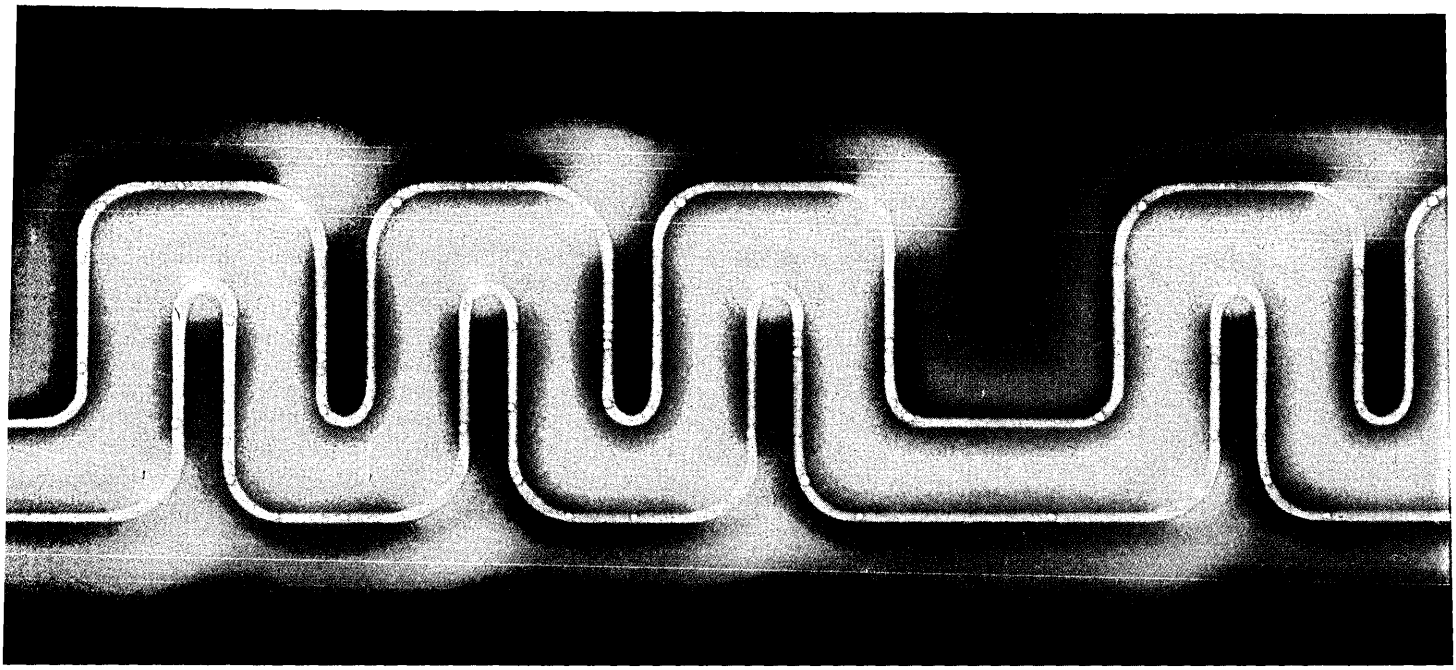

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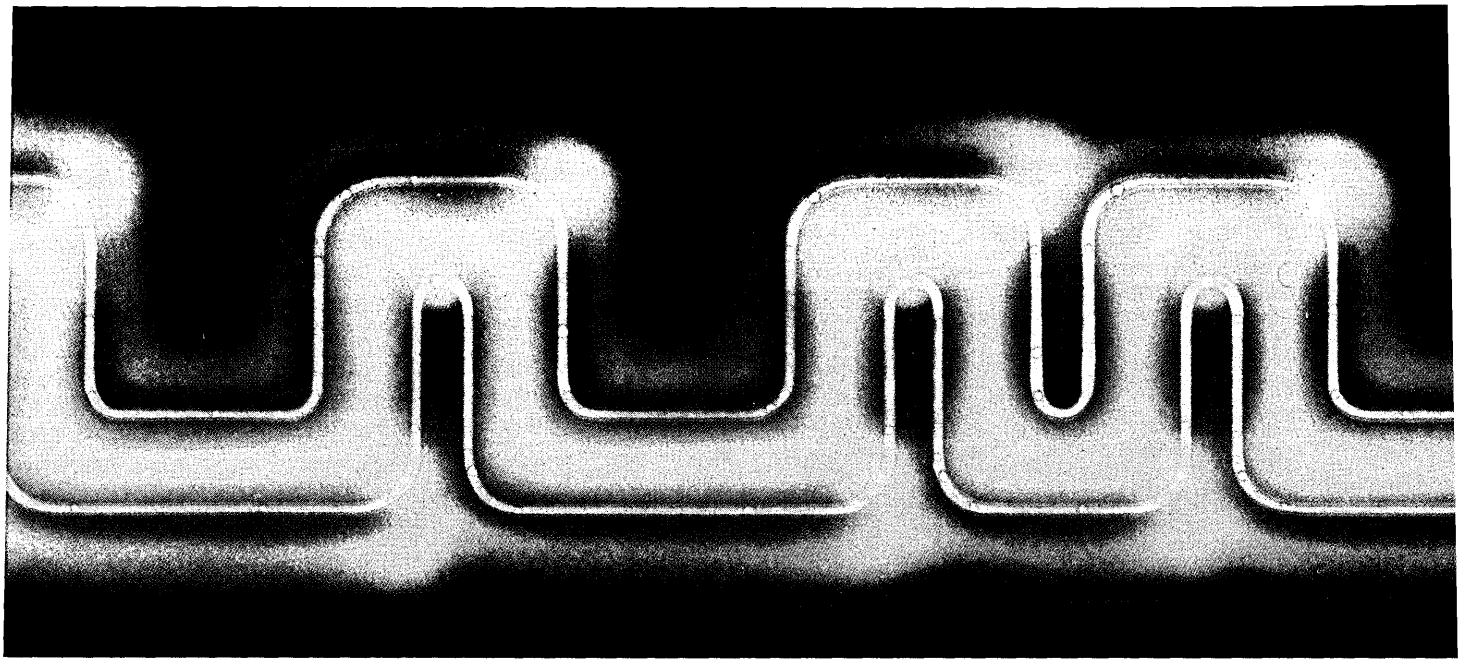

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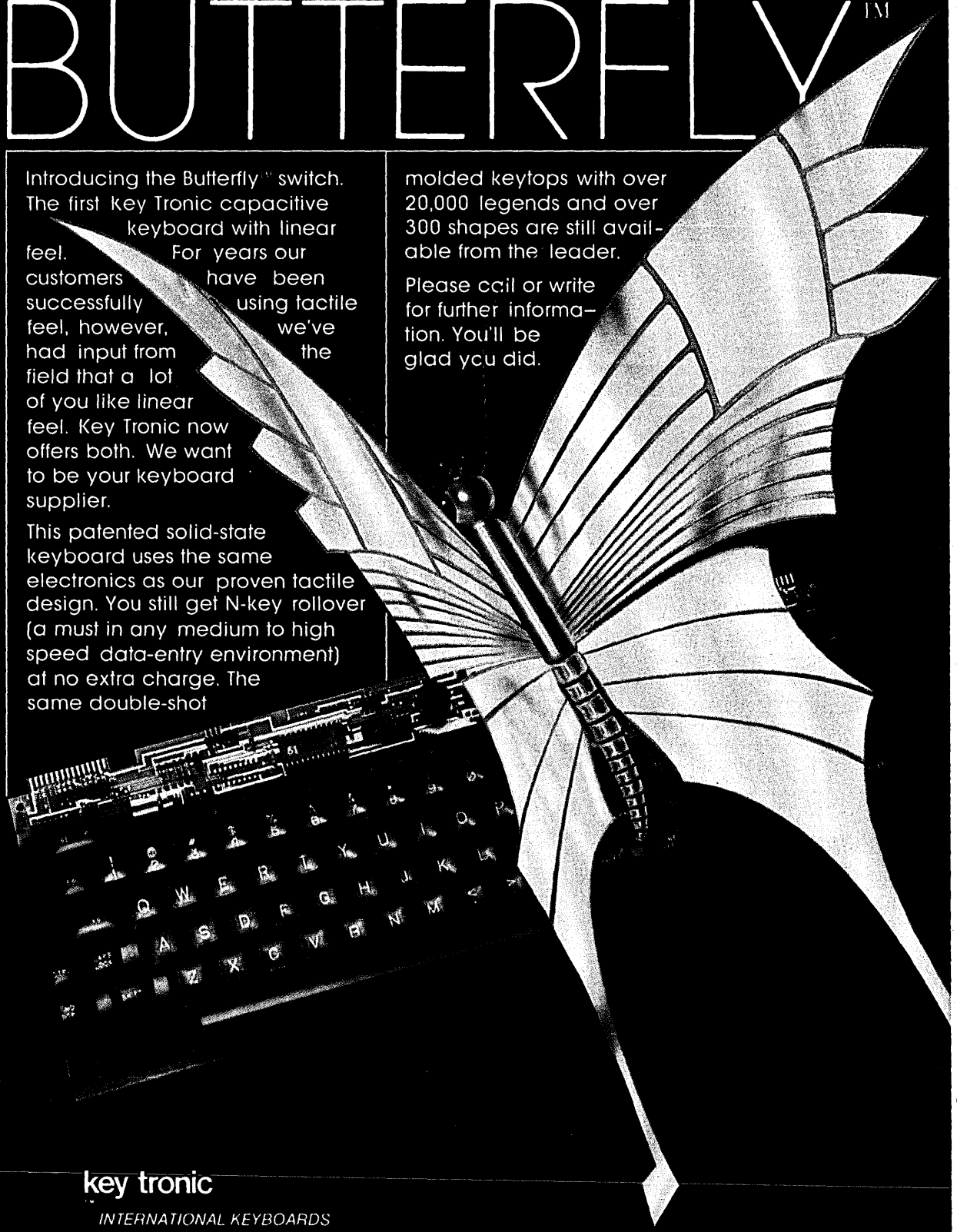

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but is not getting much out of this effort. "Frankly I think they have a serious problem" because the company insists on developing and making its own semiconductors, he says, and it's questionable whether Four-Phase is large enough to be able to afford this. That is said to be the reason for the delay in new product development, "which means that their product line is becoming obsolete and they don't have new products coming along quite fast enough." He adds that everyone else in the shared-processor data entry marketplace, including Northern Telecom Systems and Inforex, is also having problems. "Where it has hurt them is in their ability to go into new markets, like the so-called office automation market," Bushee continues. "That's where their product obsolescence potentially could hurt them a little bit."

Four-Phase segments the distributed processing marketplace of the '80s into four pieces. The on-line inquiry function, using dumb terminals to access remote databases or to allow a user to talk to other parts of the network, is expected to account for 10% of the total. The local data entry application, which is becoming information entry, is the largest segment at about 40%. It's a fill-in-the-blanks job, interactive, and includes some file execution. In the decade of the '70s, it is thought, these two segments comprised the majority of the market; that in the '80s they will become 50% of a growing market.

Four-Phase estimates it would take three years and $15 million to develop the hardware it acquired when it bought Two-Pi for $10 million.

The third segment, about 20% of the whole, is word processing/electronic mail. More than half the company's systems are being shipped with software that makes all three of these applications possible, running under the Multifunction Executive operating system, which supports up to 32 terminals.

The fourth segment of the ddp marketplace, local processing, is said to be only now becoming prominent. Four-Phase's Boysel says his customers are now indicating a desire to offload applications from the host mainframe to run on local processors—this to gain better response times, to reduce communications line costs, and to take advantage of lower hardware costs. This segment in the '70s comprised at most 5% of the market, he says, but in the '80s it will represent about 30% of the ddp money spent. "That's a different type of marketplace," he adds. "We're just making that transition now."

The first three segments are interactive, requiring perhaps a one-second response time. But the local processing is predominantly batch. In the '70s Four-Phase spent 95% of its software dollars on making the interactive functions possible. Presumably now they'll have to direct their attention to software for the Two Pi machines, renamed the Systems 311 and 312.

The Two Pi machine is described as "somewhat the equivalent of a midlife kicker on their old product line."

The practice of having both a batch and an interactive processor at the remote sites is the way things are going initially, according to Matlack. That's what IBM is doing in selling the 4300 as a ddp processor, because of all the batch software that already exists. But in time he thinks this will change, the 4300 will become more interactive, and the Two Pi hardware will have to do the same.

"I think the challenge at Four-Phase is to coordinate the software development of their Four-Phase gear with the Two Pi gear and perhaps come up with software that complements one another, that really runs interactively," he says.

—Edward K. Yasaki

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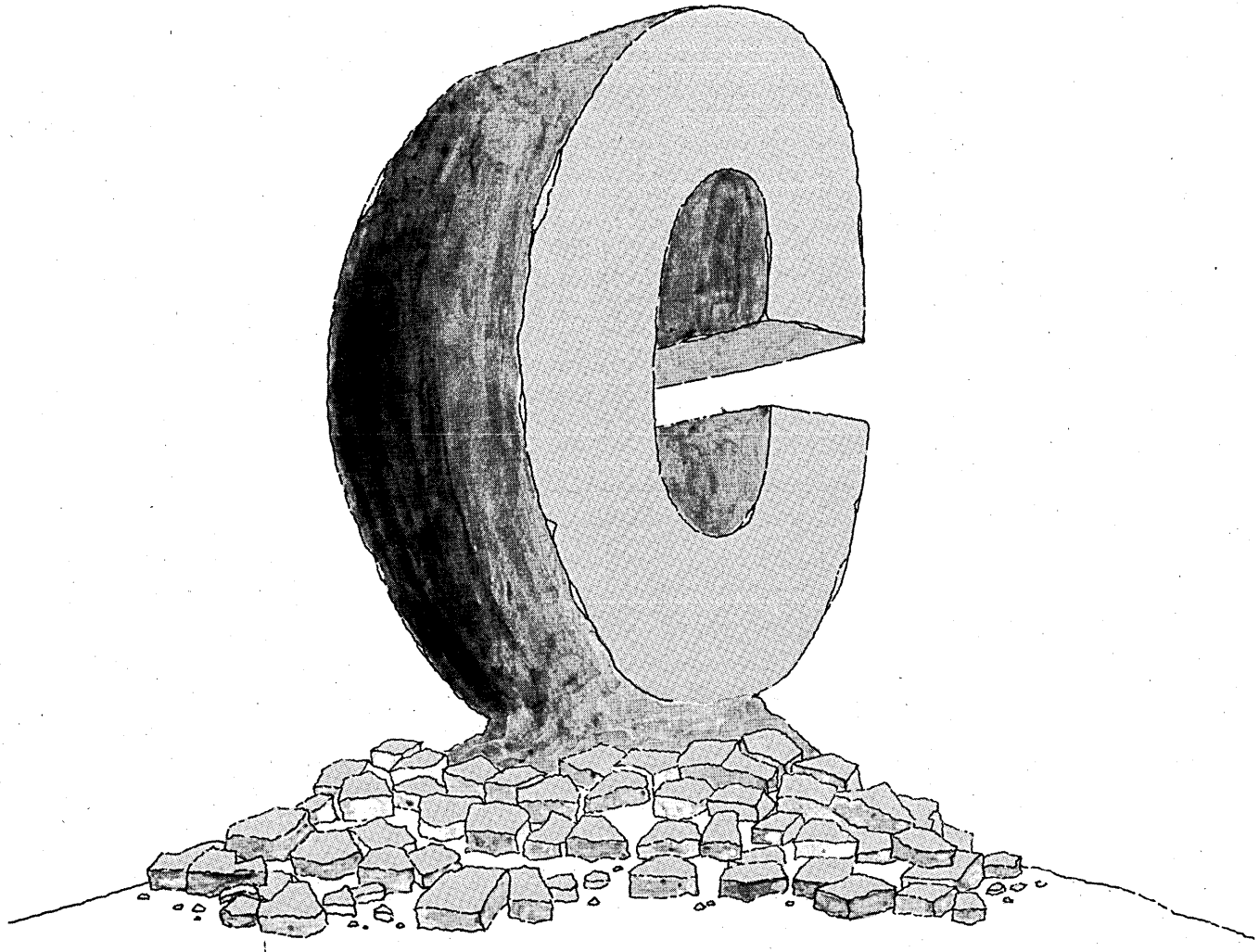

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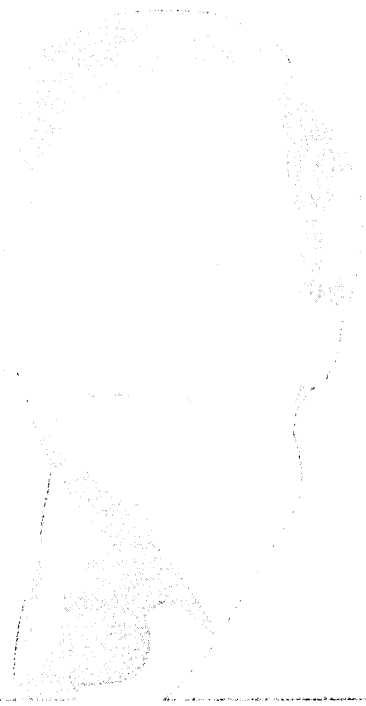

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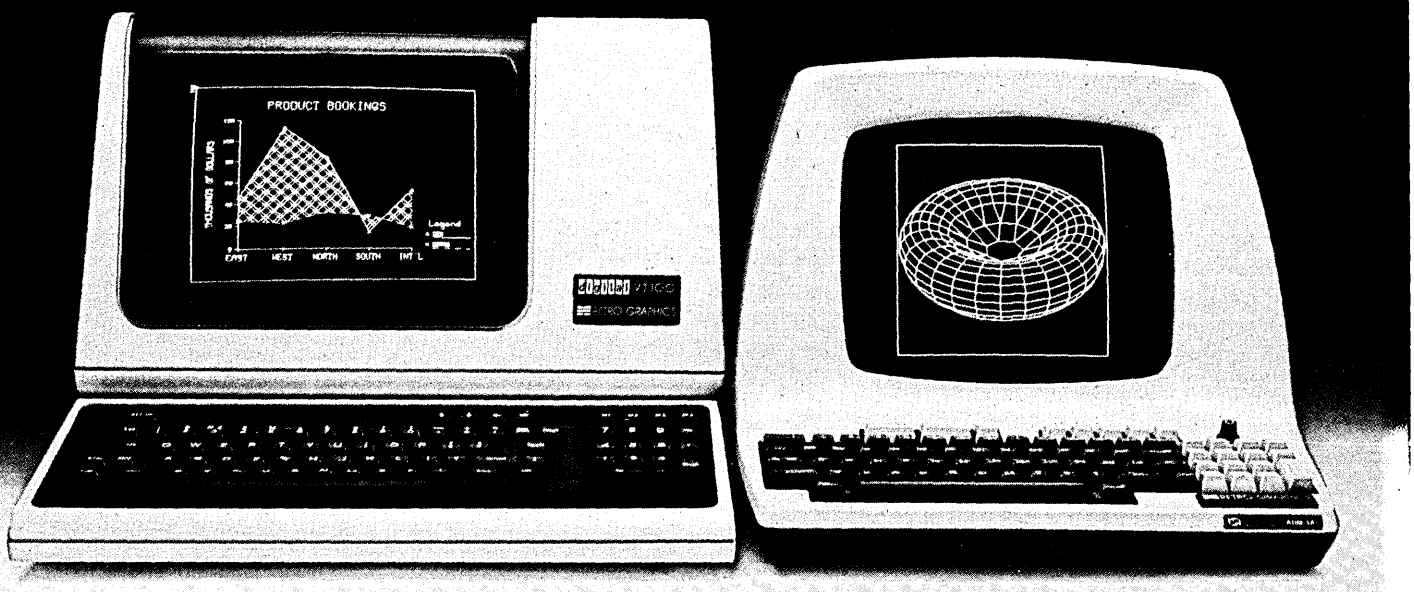

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OFFICE AUTOMATION

RETURN OF THE VIKINGS

L.M. Ericsson has high hopes of invading the U.S. office automation market.

Yet another multibillion dollar overseas corporation is planning to join the weighty foreign challenge to IBM and other leaders in the push to automate American offices.

This time the contender will be the Scandinavian telecommunications giant, L.M. Ericsson, which intends to raid U.S. shores like a modern-day Viking.

As a prelude to its search for the rich pickings from the electronic office, that forecasters promise, Ericsson has just acquired the $250 million Datasaab terminals business, which is already well established in the U.S. banking sector.

Unlike other foreign challengers, particularly from Western Europe, the $3 billion-plus Ericsson concern has already found a powerful American ally—the Atlantic Richfield oil company, or ARCO.

The two are already partners in a $700 million a year venture. Anaconda-Ericsson Inc., which is well established in the North and South American market for network cables and materials. This company also has a California-based Business Communications division. It is this fledgling operation, says an Ericsson insider, that will in the future provide the platform for the group's expansion into the U.S. business and office community.

An existing manufacturing facility in Anaheim, Calif., will provide the basis of a future production blitz, he said. In addition, sources close to Ericsson talk of a big joint venture and aquisition program that lies ahead—particularly in the U.S. software and services area.

"The two, ARCO and Ericsson, are 50-50 financial partners in the planned U.S. operation," one well-placed source explained. "But the management direction is all Ericsson."

One consultant who has worked with ARCO says that the company has been involved in a number of office automation projects. "But they're not looking to become another Exxon." He said that the oil company's financial support for the Ericsson plan was mostly a hedge against fluctuation or decline in its own traditional line of business.

Though ARCO's motives are less clear, Ericsson's reasons for diversifying into the U.S. office sector are more "transparent," say experts. Ericsson is unique among the world's large companies by being solely devoted to telecommunications. Its 66,000-man operation spans more than 90 subsidiaries and is active in some 100 countries. One estimate is that Ericsson has secured 20% of the world marketplace for the huge central exchanges used by public administrations. But most of this business is increasingly in Middle Eastern and Third World countries. According to an Ericsson spokesman, there are growing fears within the company that these operations will be forceably "nationalized."

Another factor is that market growth for these types of systems is estimated by experts at only 7% per year. "Ericsson has been pulling out all stops to achieve a 14% per year growth in its overall business," said one observer.

All this has led Ericsson to the conclusion that it must transfer its focus from the public sector (governments, PTTs, etc.) to the private sector. This means primarily U.S. banks, industrials, insurance companies, and the like.

In terms of technology, it has meant that Ericsson has recently had to sink millions of dollars into switching the emphasis from its computer-controlled central exchange, AXE, to the private branch exchanges (PBXs) that big companies need for their internal office networks.

The result has been a new digital PBX, the MDS 110, which the company says will handle up to 10,000 lines. The system is currently going through its paces at a number of European "test" sites. When it reaches the U.S. for general distribution—sources say late next year—it will meet fierce and well-entrenched competition from Rolm and other North American companies that have a big market lead. Eventually it will compete head-on with Ma Bell, whose first small digital PBXs (Project Antelope) are expected by the end of this year. Of course there's also IBM, whose ventures into voice/data integration with a family of French-developed PBXs is targeted for next year, experts predict.

The $3 billion-plus Ericsson concern has already found a powerful American ally —the Atlantic Richfield Company.

Ericsson will have to move fast if it wants to catch the first wave of overseas challengers, say observers. Other strategies from companies such as CGE, Thomson CSF and Saint Gobain (with Olivetti) from France; Siemens and Volkswagen in Germany; and Philips in the Netherlands, are already well ahead of the Swedish group.

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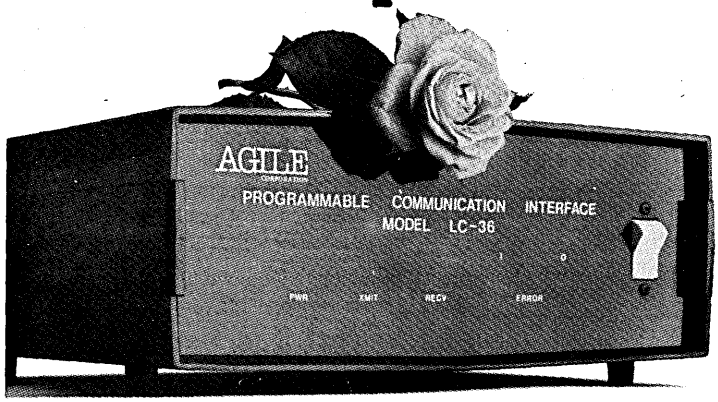

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technological and financial muscle, lured by what Ericsson conservatively expects will be a $50 billion market by the end of the 1980s.

The key to a winning play, according to one industry pundit, is "timing and integration." And a leading consultant in the area, Amy Wohl, has already said the companies that will dominate the market are already in it.

But according to Datasaab president, Gunnar Wedell, the Ericsson combine has as much chance as anybody else from overseas. Like many experts, he sees the office system of the 1980s evolving as a "hybrid". He said that Datasaab had been searching for the "glue" to bring the company's terminals and small business computers together into networks. At the same time, Ericsson had been looking for the means to marry voice and data transmission and switching to office and business terminals, he said.

"Now we've come together and we're very pleased," said Wedell, "because now we can integrate office networks around the new PBX, and we can continue to use the AXE-driven packet switched networks that Ericsson supplies to the public sector."

But Wedell concedes that the combine still falls short of the "complete" electronic office system that potential customers in the private sector will demand, and which Ericsson intends to supply.

As might be expected, what the new consortium lacks most of all is a strong data processing nucleus for its private networks. Ericsson claims to be well placed in the other three areas of a total system, namely data transmission, components, and office products.

The company said that it is preparing a new office products family under the name of ERITEX. The concept links a series of "stations" together by a connecting communications "bus." In addition to work stations and resource stations for disk memory and databases, Ericsson says it will offer distributed computers, as well as terminals for the public Teletex services and for word and text processing.

Furthermore, a subsidiary, RIFA, is solely involved with LSI chip development and component manufacture to help fuel the new office hybrid.

Conspicuous by its absence is an effective front-end computer or communications controller—in essence, a minicomputer. It is not yet clear how Ericsson will tackle this problem—whether the computer will be developed by Datasaab as a natural evolution of its terminal lines, or whether, as with French telecommunications giant CGE, the Swedish concern will look to acquire a U.S. minimaker.

Datasaab insiders still have painful memories of unsuccessful attempts under their previous owner, Saab-Scania, to develop a small mainframe back in the early 1970s. The machine, known as the D-22, is openly described by employees who worked on the development as a "disaster." Saab-Scanias losses, put by some at around $200 million, led to a strong desire to get out of the computer business and return to cars, said one employee.

A legacy of that development are Datasaab's small business computers, the D-15 and the Series 16. These computers are not considered competitive enough by Datasaab's management for sale on the U.S. market. But now that Ericsson can supply the means of transmission, Wedell said he is quite optimistic that they can become an effective network tool.

What the new consortium lacks most is a strong data processing nucleus for its private networks.

The betting at this time is that Ericsson will pump in the necessary money to improve Datasaab's software performance and improve compatibility between its small business computers and the terminals. The next logical step will be to design the software to meld the Datasaab and ERITEX lines and integrate them around the PBX, said a Datasaab spokesman.

For the present, Datasaab's flourishing business with U.S. banks will provide a useful base on which to build. At the moment the company has some 10,000 financial terminals placed with about 200 banking users. "Having sold them the beginnings of a network, we must sell them the rest," commented Wedell.

Wedell said that for both Ericsson and Datasaab, the long haul to establish credibility has begun. "We realize that at the end of the day we will stand or fall on our abilities in the software and support areas. And on our marketing skills."

So far, each foreign contender has claimed to have the jump in at least one niche. Each has found a marketing angle to give it a unique slant. With the French CGE Group, it is the advanced digital fax system. Thomson CSF is pushing its laser-based optical disk development with Xerox. Saint-Gobain might feel that its trump card is Olivetti's electronic office equipment. And so on.

For Ericsson/Datasaab, it is something else again. The Swedes are very proud of their pioneering work in the area of ergonomics—the human engineering of equipment for greater productivity, comfort, and ease of use.

So when U.S. offices begin to automate in earnest, it might just turn out that the user friendly Viking is the softest sell of all.

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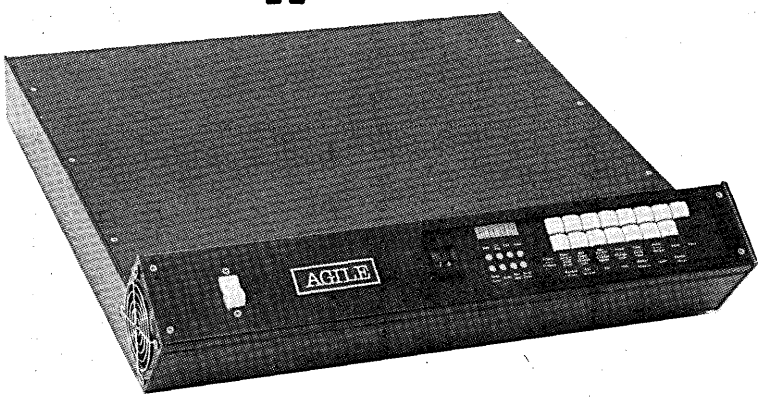

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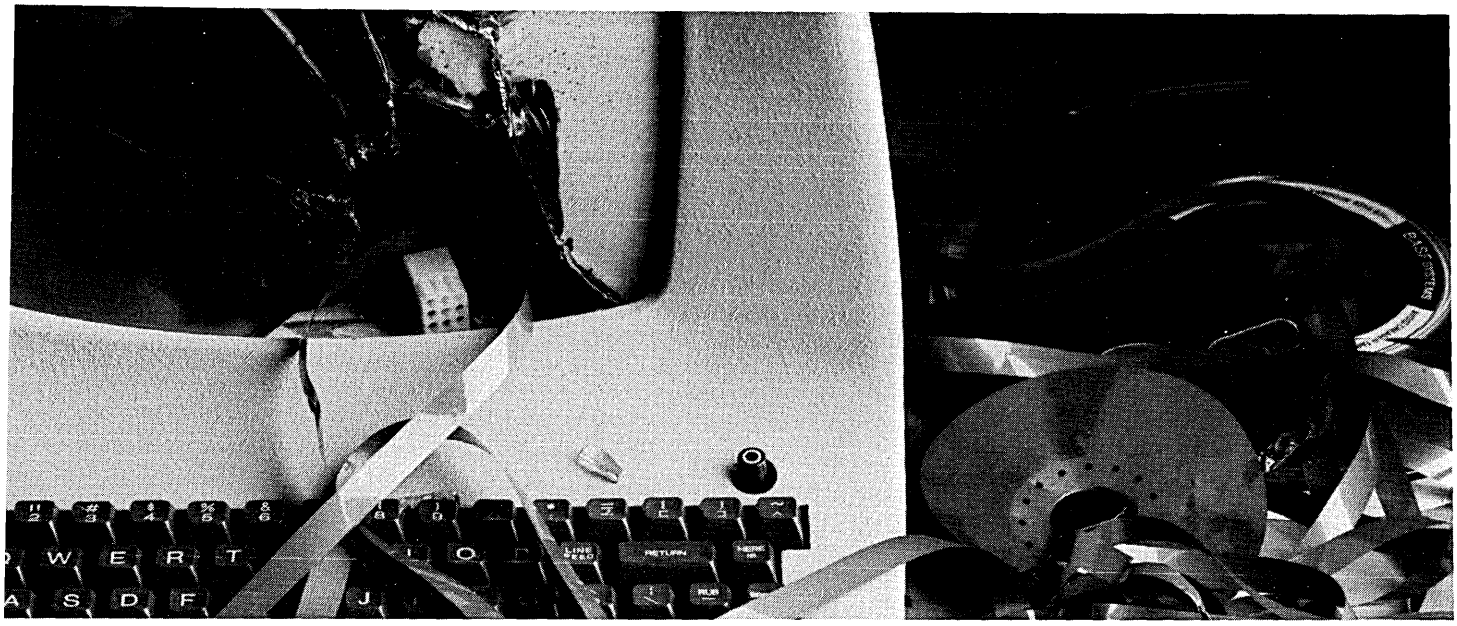

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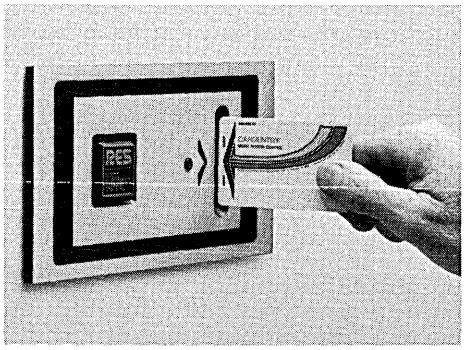

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DATA/COMMUNICATIONS

COMPRESS COSTS & COM GEAR

Compression Labs is using technology to integrate communications functions and lower user operating costs.

For most companies, facsimile messages and record communications (Telex and TWX) are still separated by a gap in technology, and often politics. Today, if a typical telecommunications manager were promised an intelligent workstation that not only combined the two but added a word processing capability in the bargain—while providing a savings of about 30% over teletypewriters—the user would be skeptical, to say the least.

The workstation is more than just a promise. It is available from Compression Labs Inc., an innovative firm in San Jose, Calif., that believes technology should be used to integrate communications functions and lower user operating costs.

"We're primarily selling this as a replacement for TWX/Telex machines in a wire room, but high volume applications for it will be out in branch offices as a fully integrated workstation," explained Cloyd E. Marvin, vice president of marketing. Many corporate wire rooms today have multiple teletypewriters to do the same job using separate terminals set up for each noncompatible network.

Instead of having many teletypewriters, each using the discrete protocol of the message network on which it operates, the CLI workstation can be programmed to handle virtually any protocol, Marvin said. The capabilities of the workstation are actually indicated by the model number—the CLI-441 is a workstation configured with four lines for one operator. Various models are available up to the CLI-842, which is a workstation equipped with eight lines for two operators, he stated.

But replacement of record communications is only part of the story. The workstation includes a character-code to facsimile-code translator that allows incoming messages to be automatically converted to facsimile format and then forwarded (or refiled) to any facsimile machine. This automatic refiling can be done in completely unattended mode so long as the original TWX or Telex message includes the telphone number of the destination fax machine, Marvin explained.

Because of its built-in storage and intelligence, Marvin said, the workstation also has powerful word processing features. But he stressed that it should not be regarded as primarily a word processor since it has other communications oriented capabilities. Nevertheless, he acknowledged that the price range of $8,000 to $14,000 for the CLI-441 with options such as dual floppy disk storage, output printer, and communications makes comparisons with major wp systems inevitable.

Because of its built-in intelligence, the workstation can handle private and dial-up lines at varying data transmission rates —all of which provides the user with maximum flexibility in ways to send a message. Often the time of day, priority of the message, and similar factors determine the most efficient method of delivery, with fax considered as a dial-up option.

With its extensive programmability, the workstation also seems suited to handling electronic mail. Marvin did not rule that out, but added that the present software would work best with an electronic mail system of no larger than 30 or so users. Software modifications could be added, however, to enhance its EM capabilities.

Mindful of the divergent control over office automation and telecommunications functions in many companies, Marvin returned to the concept that the workstation looks most cost effective when viewed as a message network terminal. The ability to handle multiple network protocols includes those used by IATA for travel agencies, Bankwire, Fedwire, the message codes of the international record carriers, and of course ASCII.

The workstation reflects only the first of two major product development areas at CLI. The character-to-fax translator is based on compression techniques used to transmit the facsimile data. The second area uses a compression scheme for the handling of video signals in teleconferencing.

Using a "transform coding" scheme, CLI has been able to achieve commercial-tv quality full motion, color transmission on 1.5M bps lines.

This is significant because the Bell System's T-1 long haul carrier network operates at 1.544M bps. Moreover, tv quality transmission now requires a transmission line that can handle 60M bps. Major networks typically pay about $50,000 per hour for such broadband satellite links, but the ability to get the same picture quality over T-1 would drop the cost to less than $2,000 per hour, Marvin estimated.

The various workstations' capabilities are indicated by model number—the CLI-441 has four lines for one operator.

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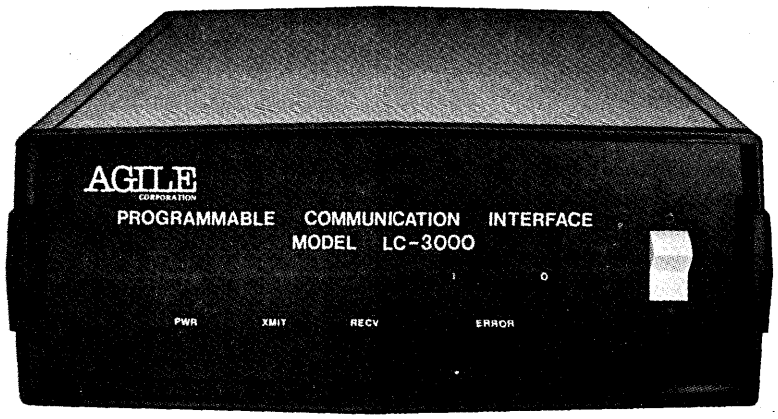

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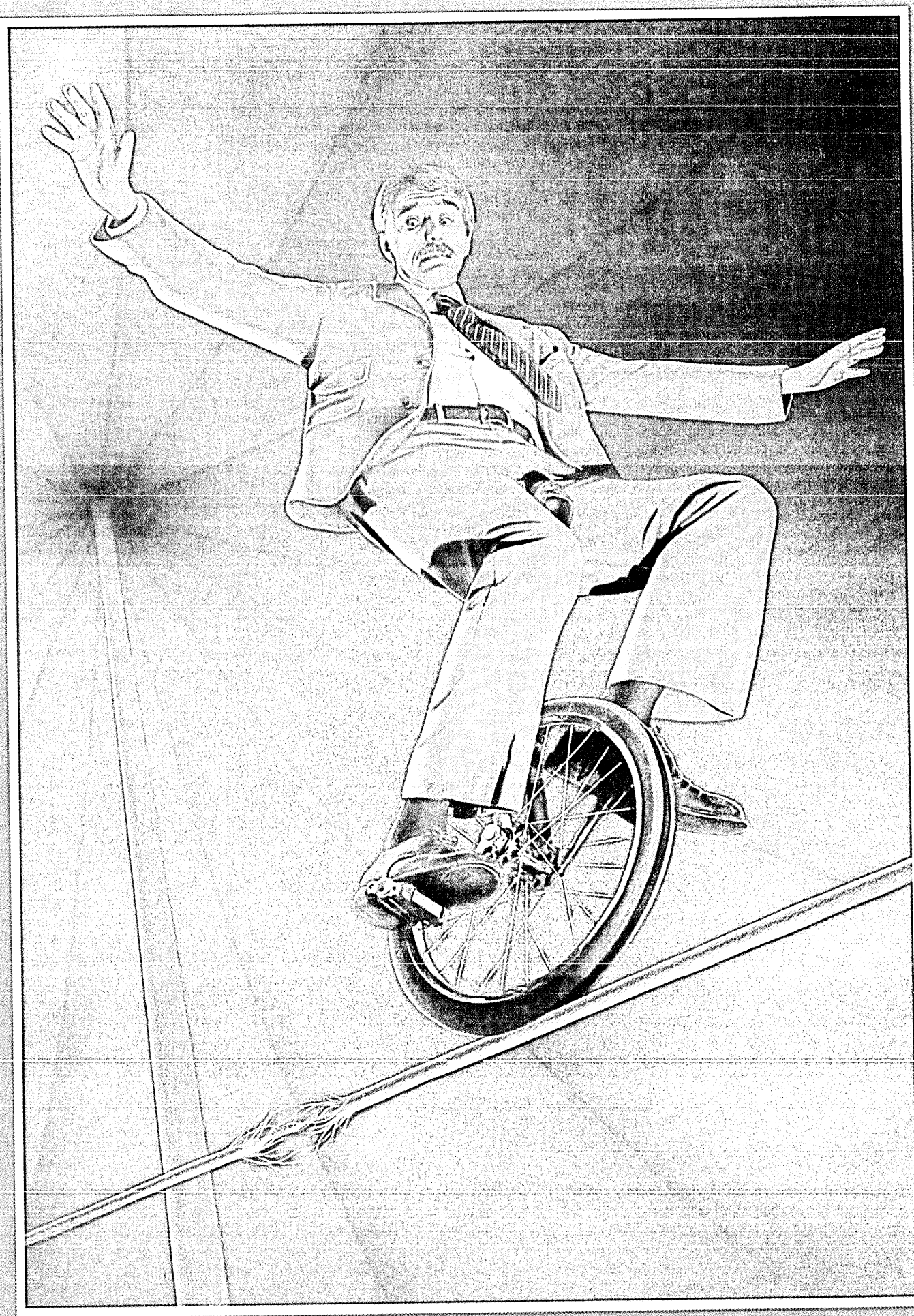

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While such rates might still be prohibitive for business teleconferencing, the CLI compression technique can be applied with more practical results using less than full motion video.

Marvin hinted that CLI has done limited full motion with a "degraded image" over conventional 9,600 bps data lines. Presumably this means that freeze-frame video at the same data rate would provide acceptable quality for teleconferencing. If the quality were acceptable, the ability to use standard voice-grade telephone lines, even for freeze-frame teleconferencing, would be a major cost-reduction feature for many users.

At some point in the future, CLI plans to incorporate the video and teleconferencing features into the workstation. But for now, Marvin restricts his sales attack to TWX/Telex replacement. In addition to the advantageous price comparison that can be shown with this limited approach, Marvin admits that many companies are not yet ready to integrate the functions handled by the workstation.

CLI has done almost no promotion of its products and is still able to sell just about all the units it makes. Obviously there are innovative users who understand the potential benefits of CLI multifunction systems as a step toward the integrated corporate network of tomorrow.

—Ronald A. Frank

TELECOM CRISIS PLANNING

Disaster planning for wide-scale telecommunications disruptions requires intensive research and innovative solutions.

It's called Crisis Communications, and it's attracting the attention of users, carriers, and government agencies. The term refers to the ability to restore some semblance of normal communications in the aftermath of a natural or other disaster.

While all-out nuclear war would leave few options, much more likely are limited disruptions caused by earthquakes or man-made accidents like Three-Mile Island. In such cases, telecommunications facilities in affected areas would probably be bypassed and existing lines augmented to handle unexpected peak traffic loads.

The Research Program on Communications Policy at MIT is undertaking a study of Crisis Communications, but a recent seminar held by the group on that subject showed that business users may not have high restoral priority in the wake of a major disaster. Since emergencies often knock out normal means of transportation, it may not even be possible for business employees to get to work. In any case, personal calls to check on the physical condition of friends and relatives would probably jam the phone network.

The nationwide phone net now handles peak rates of 20 billion calls per day, according to Jan Loeber, marketing director, cross industry sector at AT&T. A major disaster could require an ability for the network to absorb daily peaks of 45 billion calls, and it would cost an estimated $50 billion to build that extra capacity into the network, he said.

Even if the needed facilities were available, there would apparently be a sequence developed for the type of callers that have priority.

Much of this critical situation planning is coordinated by the U.S. Federal Emergency Management Agency. Because many of these priority plans affect crucial government agencies and public safety operations, they are kept secret.

But new technology does provide solutions in limited disaster situations. AT&T is testing its Transportable Emergency Communications System (TEX), which includes a mobile earth station that can be set up on short notice to operate with the Comstar satellite system. Dedicated switching at a telephone company central office would carry voice, data, and other traffic into the network.

Two "limited capacity prototype" versions of TEX include five-meter dish antennas, and each can handle 24 voice-grade channels that can be expanded to 200, AT&T said. After giving these temporary lines to vital agencies in an affected area, additional spare capacity would presumably be available to other telephone users.

American Satellite Corp. has a similar capability called Quick Reaction Communications (QRC), which is based on mobile antennas and is designed to replace customer point-to-point business links. The QRC facilities are only available if arrangements are developed and contracted for before emergencies occur. Other carriers have similar capabilities to help users overcome limited telecommunications outages.

Since disasters do not normally announce themselves beforehand, crisis planning can be an impossible task for users trying to anticipate all possible situations that may occur. The old panacea for data users of always being able to switch over to dial back-up facilites may be good for private line users in certain limited situations. But wider-scale telecommunications disruptions will require intensive planning and innovative solutions.

—Ronald A. Frank

"Would you mind telling us your weight? We have to update 'Materials-In-Process'."

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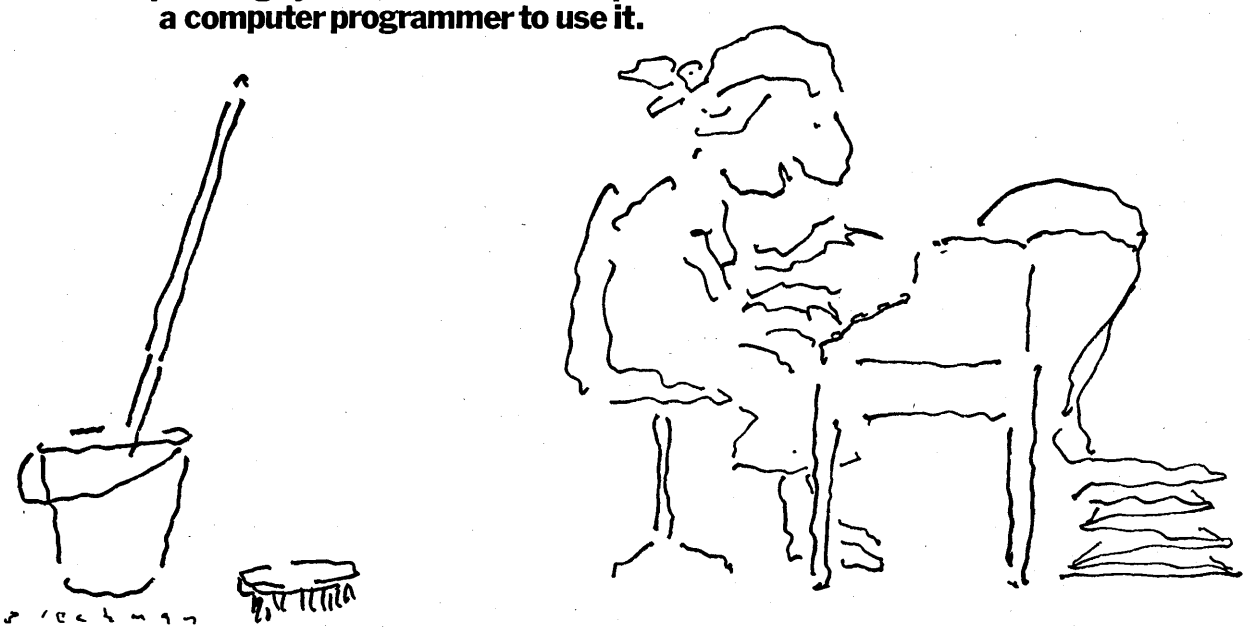

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NEWS IN PERSPECTIVE

COMPUTER GRAPHICS

BOOM IN BUSINESS GRAPHICS

While the scientific community has been big on computer graphics for years, business users are just getting into the act.

The business community is putting new pressures on the computer graphics industry and, it seems, the industry is responding.

Peter Preuss, president of integrated Software Systems Corp. (ISSCO), a seven year old San Diego, Calif., computer graphics software firm, is one that is.

ISSCO introduced its second major product, Tell-A-Graf, in 1977 with expectations it would move computer graphics into the business market. Tell-A-Graf is a software system that enables a businessman to sit at a terminal and conversationally call up graphs, charts, and plots using simple English-like statements.

It did get ISSCO into business markets to the point where its customer base now represents a 50-50 mix between business and scientific-engineering users. ISSCO now has 500 installations of both Tell-A-Graf and its original product, DISSPLA (Display Integrated Software System and Plotting Language), a general purpose Interconnected subroutine system for plotting graphs, surfaces and maps.

But business customers complained that its graphs were not of publication quality. "We thought we had publication quality," Preuss said ruefully. "When we heard complaints, we impaneled a group of graphics artists who taught us such things as how to compensate for optical illusions of the human brain as is done with the columns of the Greek Temples which, deliberately, are not uniform in girth."

The result, introduced last February, was ISSCO's Tell-A-Graf version 4.0 which does, indeed, according to customers, produce publication quality graphics via interface with a phototypesetter. Preuss called it "a first step toward the automated office."

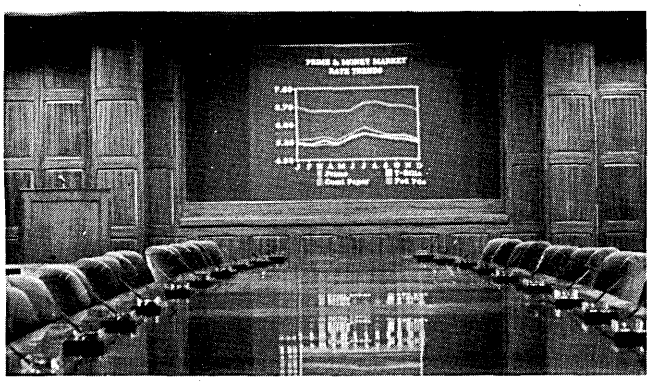
"Artistic" considerations embodied in the new ISSCO software include the use of drop shadows, attention to line weight for proper emphasis, and restricting all text in a chart to a "family" of typefaces with similar style but different boldness.

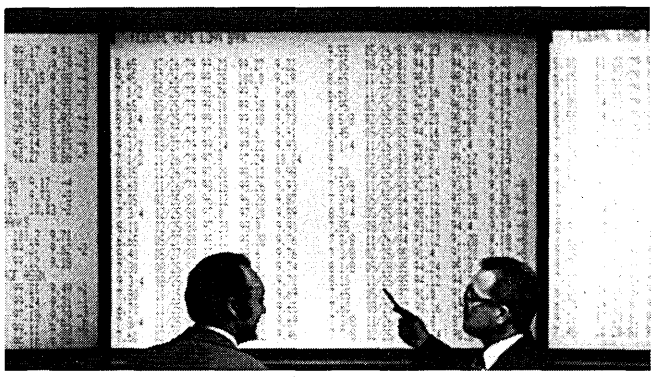
"We produce truly camera-ready material," said Preuss. When first implemented, Tell-A-Graf 4.0 was interfaced to the Autologic APS-5 phototypesetter. But Preuss said it can be interfaced to any photocomposition machine on the market.

At least one user is excited. "It's real publication quality," said Richard M. Bertrand, computer scientist at the Argonne National Laboratory, Argonne, Ill. Argonne has had DISSPLA since it was introduced, and Tell-A-Graf for about two years. Its uses are primarily scientific. "We have several hundred users using DISSPLA and Tell-A-Graf every week. We produce some 50,000 frames of graphics every month, and we'll double that in time," said Bertrand. He said the laboratory has $500,000 in graphics hardware in its computer center and another $500,000 worth scattered throughout the site.

Customers say ISSCO's Tell-A-Graf version 4.0 produces publication quality graphics.

"The scientists love to take those numbers and make themselves a graph." Bertrand said there is some business use of graphics at Argonne, but "business people need a little bit of handholding. They think computer graphics is razzle-dazzle. We try to sell it as a tool to give them output from





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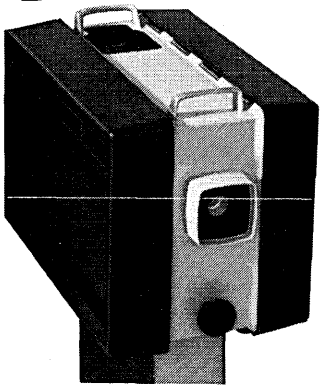

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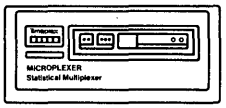

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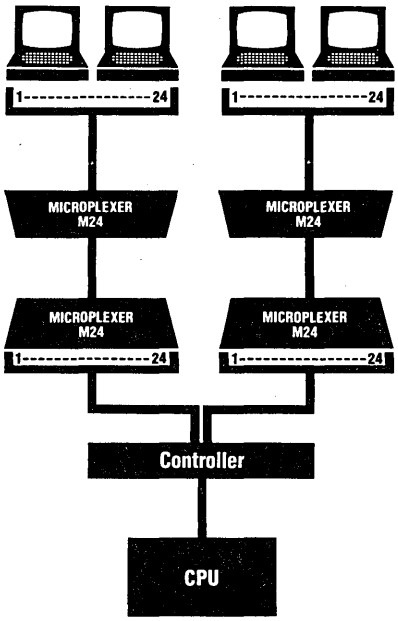

The University of Illinois uses over 60 Timeplex SERIES II MICROPLEXER statistical multiplexers to handle the input/output of more than 300 terminals linked to a computer in Chicago. This diagram illustrates a MICROPLEXER-based tail circuit at a remote location.

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which they can make better decisions."

Bertrand, immediate past president of the ISSCO user group, says it's "appropriate" that his successor, Dick Knapp of Boeing Computer Services, Seattle, is a business user. "That's where the growth is."

There are those who agree. ISSCO's director of marketing, Meldon Gafner, believes the scientific-engineering market for computer graphics has stabilized at a growth rate of about 25% per year, whereas the business graphics growth rate could be "80% compounded over the next five years."

International Data Corp. has forecast a 59% annual growth rate over the next five years for the business graphics market.

"It's no surprise that the companies that are out in front in using business graphics are banks, insurance companies, and financial institutions."

David Penning, a Palo Alto, Calif., computer graphics consultant, says the business graphics market will grow 52% between 1980 and 1985. "It's the fastest growing market (within computer graphics), but that's deceptive. It's starting from nothing."

Penning sees two major stumbling blocks to the growth of business graphics. One is database management, and the other is the lack of an inexpensive means of getting high quality, hard color copy. "To me, color and business graphics are synonymous." He believes both problems will be overcome.

"I went to a computer graphics seminar put on by IBM and most of the time was spent discussing how to set up a database," said Penning. "The problem is recognized, and a lot of work is being done."

Generally, he said, the data that are best organized for computer graphics use are financial data. "It's no surprise that the companies that are out in front in using business graphics are banks, insurance companies, and financial institutions."

Another ISSCO user, Bob Chandler, group leader for the computer graphics department at Shell Oil Co., Houston, Texas, wanted graphics mainly for financial and economic uses. When Chandler first introduced graphics at Shell, "the only way to add graphics was with a FORTRAN program." Shell ran graphics programs through a service bureau, National CSS, for six months. Then, two years ago, the company acquired Tell-A-Graf and began doing its own. "Before Tell-A-Graf we had few graphics devices. Since Tell-A-Graf, we've acquired $250,000 worth of small crts and plotters."

All of Shell's graphics users are remote dial-up users. And while Chandler brought graphics into the company for business uses, he found other uses which have sprung up unnoticed behind his back.

The business graphics market is expected to grow 50% and 60% during the period between 1980 to 1985.

Graphics devices were acquired independently throughout the company. To find out what the usage was, he took a survey. "To my surprise, I found that about half the use was in research and development. I didn't know because those people are pretty self-sufficient."

Chandler said the bulk of Shell's business use of graphics is for presentations. "They're accustomed to using graphs now, but we hope to move to 35mm slides."

Bertrand of Argonne would go a step further. He'd like to see movies.

ISSCO's Gafner said he believes presentation graphics will account for 60% of business graphics growth rate over the next five years.

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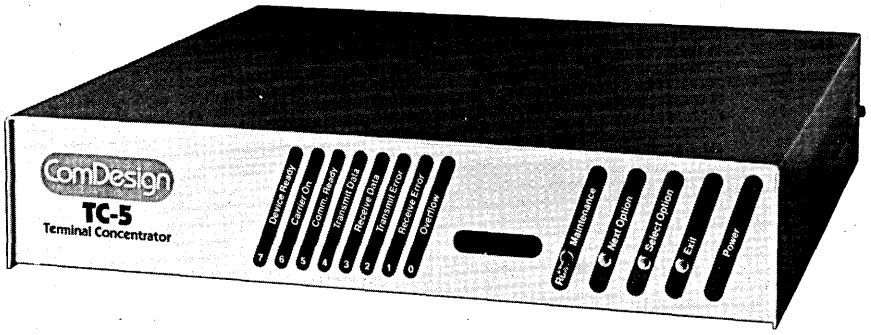

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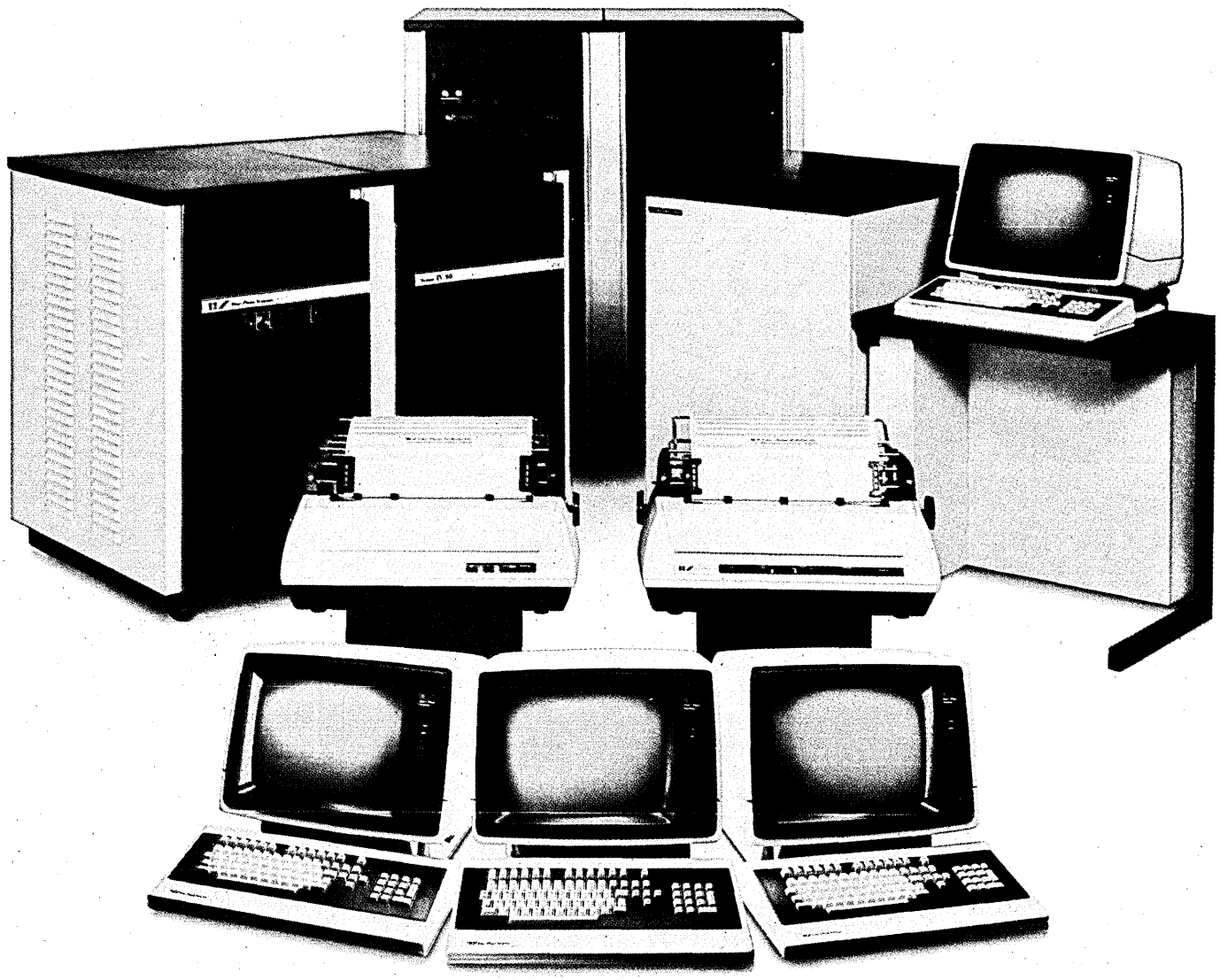

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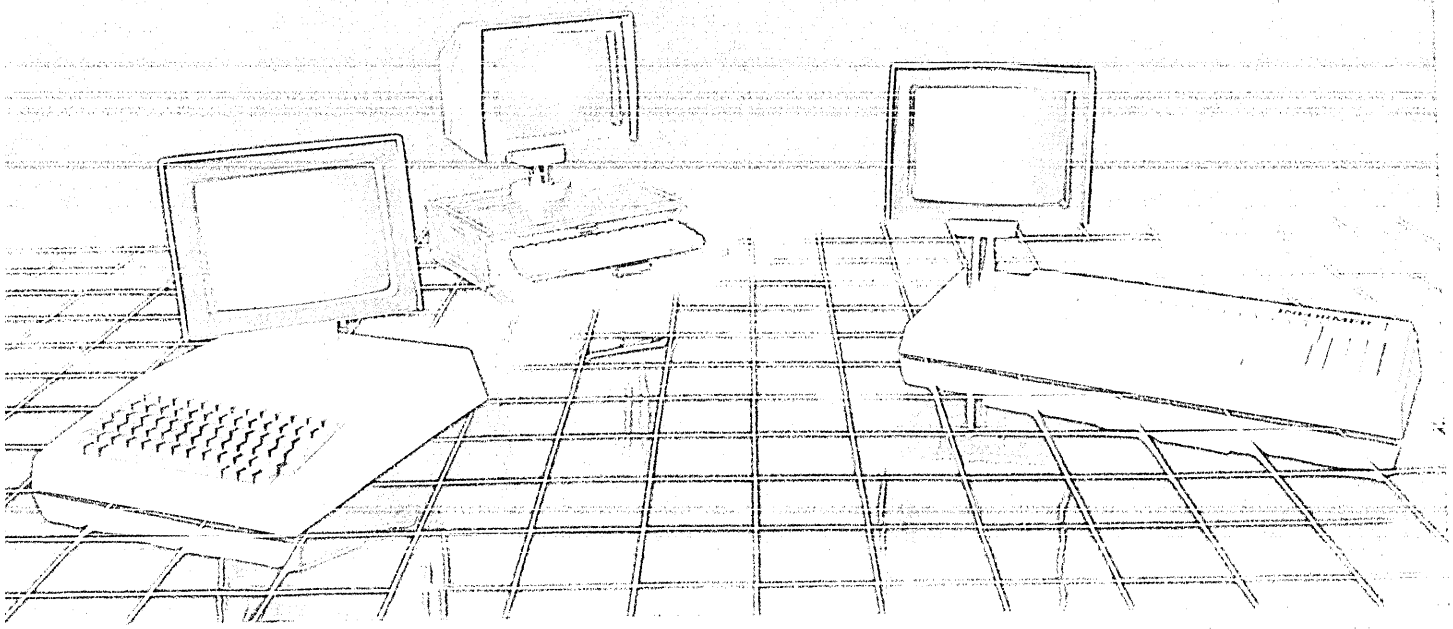

Model 401 Computer Terminal [illegible] Model 2304 Data Input Terminal [illegible] Model 2304 Data Entry Terminal [illegible]

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nals, hardcopy output devices (printers, plotters, microfilm units), and software. Generally, more power is being packed into graphics terminals without accompanying price increases. And, as in the rest of the computer industry, memory and processing costs are going down, making the power-per-dollar figures increasingly attractive to users. Software advances continue to make hardware more versatile, and thus more valuable.

Color, which consultant Penning sees as essential to business graphics, is here. IBM introduced its 3279 color display station in November 1979. With a suitable permanent-copy image device attached, full color photographs can be made of a display, or foils and 35 mm slides can be produced.

A more recent entry, introduced last summer, is the 8600 offered by Terak Corp., Scottsdale, Ariz. This system, available in two eight-color models with resolution of 320 × 240 and 640 × 480, is available for from $14,750 to $18,750, depending on resolution and number of displayable colors desired.

There are numerous others.

Image Resources, a small Westlake, Calif. company has Videoprint, a device for producing hardcopy color prints from video displays. It is priced as low as $3,000.

Xerox has its 6500 color graphics printer/copier which operates with a combination of laser scanning and Xerography. Full color prints are produced, in a matter of seconds, on 8½ in. × 11 in. plain bond paper. Full color transparencies for overhead projection also can be produced. The 6500 has been around several years and costs about $25,000.

Presentation graphics is the hottest area, expected to account for 60% of the business graphics growth rate over the next five years.

But as color enhances the value of graphics, it also compounds the inherent problems. Selection and emphasis are part of creating a graph, and the same data can be used to present different pictures which make entirely different points.

"ISSCO addresses that problem and teaches us how not to lie with graphics," said Bertrand of Argonne.

Penning noted that different colors have different psychological connotations and can be used to distort the meaning of a chart. The answer: "Educate users, point out pitfalls, tell them what to look for."

ISSCO's Gafner, intent on making heroes out of dp managers by educating them to the value of graphics, has succeeded in at least one case. Chandler of Shell said his introduction of graphics has made him a hero in his company. "They love me," he boasts.

—Edith Myers

COMPUTER SECURITY

ARE YOU FRIEND OR FOE?

The Mastiff security system developed in the U.K. is expected to be a hit in U.S.

A European innovation now available to American users heralds a quantum leap in computer security, say its designers.

The system, known as Mastiff, has been developed in Great Britain to "sniff out" intruders at computer centers and other high security sites. It has already found wide acceptance among U.S.-based multinational's subsidiaries overseas, both in Europe and other parts of the developed world.

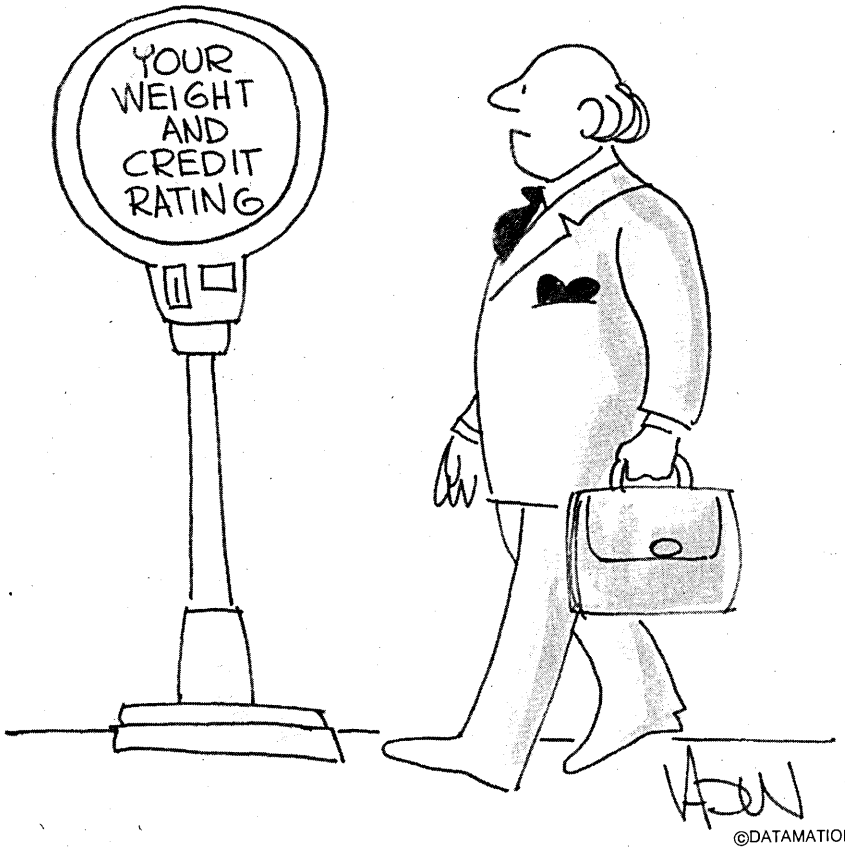
But its originators say that to make the system viable over here, U.S. management needs a complete overhaul in its thinking and attitudes toward security.

Unlike current U.S. security systems, Mastiff (which stands for Modular Automated System to Identify Friend from Foe) requires no voluntary actions on the part of the user. It is completely hands-free. There are no buttons to push or cards to manipulate. And no codes to recite.

COMMANDER NEVILL PORTER: "There are more dollars stolen each year by computer fraud than in all the armed robberies combined."

Instead, authorized users carry battery-charged electronic transmitters in thier pockets everywhere they go in the building. These devices, known as tokens, emit a continuous signal to a control panel, which is equipped with alarm signals and visual displays of restricted areas.

Anyone not carrying a token who tries to enter either an open or closed area



CARTOON BY CHUCK VADUN

where he is not authorized sets off an alarm which is accompanied by a visual signal at the monitoring panel, the company showed in a recent New York demonstration.

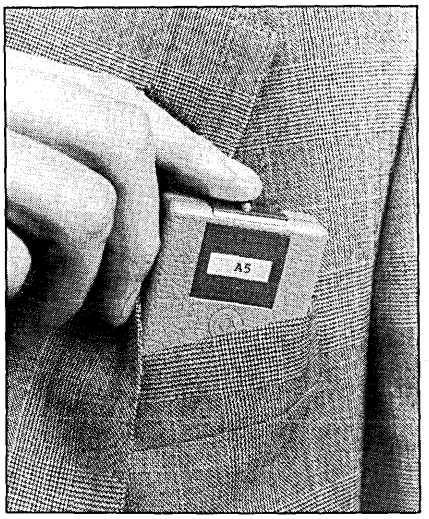
If an intruder tried to follow an authorized token carrier through a door—or "tailgate"—the system indentifies the entrant and seals off the area, turning it into a "dead zone" or "mantrap."

Another unique feature that the company demonstrated is a "no loitering" fallback. If a token holder stands next to a door and tries to keep it open, a time-delay mechanism automatically closes it.

This "loiter lock" feature prevents collusion between an employee and criminally minded outsiders, says the company.

"Mastiff arose primarily to solve a people problem," says commander Nevill Porter, managing director of Mastiff Security Systems Ltd., U.K., which designed and manufactures the system. "Present U.S. security systems based on cards, digital locks, and the like," says Porter, "depend on the cooperation of all parties in the security area. "But this isn't happening. People don't give 100%. Programmers are not concerned about security; they're not paid for it. As far as they are concerned, security is someone else's problem."

Porter says that the Mastiff concept arose because so many computer room users



TOKEN: The battery-operated code transmitter sends continuous signals to the control unit, identifying which areas its holder is allowed to enter.

get lazy or just plain careless. "When they have to lock or unlock a door 20 times a day to get to their work areas, the security system becomes a nuisance," Porter explained. "At times they are tempted to leave the door open or prop it open. Sometimes they simply catch the lock so it won't shut."

He pointed out that you only have to do this once for an intruder to get through the door and to your information.

Porter stressed that if you think the problem through, you realize that such "staccato" methods of control as cards and digital locks, or even voice print and fingerprint, don't offer continuous security.

"They concern one action for one moment of time," said the commander. "But they don't offer a continuous emanation for the whole time that someone is passing through a door. Nor do they offer follow-up monitoring."

Because of these flaws, Porter says it is relatively easy for an intruder to follow someone into a high security area. The company showed that Mastiff can also protect an individual terminal from use by unauthorized staff. "Modern codes, passwords, and other signals don't work well enough either," Porter claims.

Once a terminal user has entered his password and gotten into the system, his keyboard is open to use by anybody. "If he left the area for any reason, say to get a drink or use the toilet, anyone could get into his terminal." But with Mastiff, his keyboard is "frozen" when he leaves his work area, and no one else can use it, the company demonstrated.

Porter said that another major bonus from the token concept is that, unlike cards which can be removed from the building or swapped, it is very difficult to mishandle tokens. The transmitters are stored in a battery storage and charger panel after normal working hours. If a token is not returned to its storage unit—say it is smuggled outside—it simply loses its power and dies. In addition, Mastiff claims that its tokens are virtually impossible to duplicate.

Other fallback features in the overall Mastiff design allow the whole system to operate for half an hour under its own emergency power source should the whole building's power go down.

With Mastiff, the user's keyboard is "frozen" when he leaves his work area.

Such innovation has attracted several hundred British computer centers during the eight or nine years that Mastiff has been available. Major users include Barclays Bank and the Bank of England. The British government, which already uses the system, is planning to use it to protect a new 20,000 terminal network.

Also, major European users such as the Deutsche Bank have taken the system. But in the main, says Porter, users do not like to be named—"for security reasons!"

Other major clients include the European subsidiaries of some big U.S. names, such as Exxon, Mobil and Xerox. And this raises the question of why it has taken so long to make the British bulldog available to American users.

"A, you're adorable."

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CARTOON BY HENRY R. MARTIN

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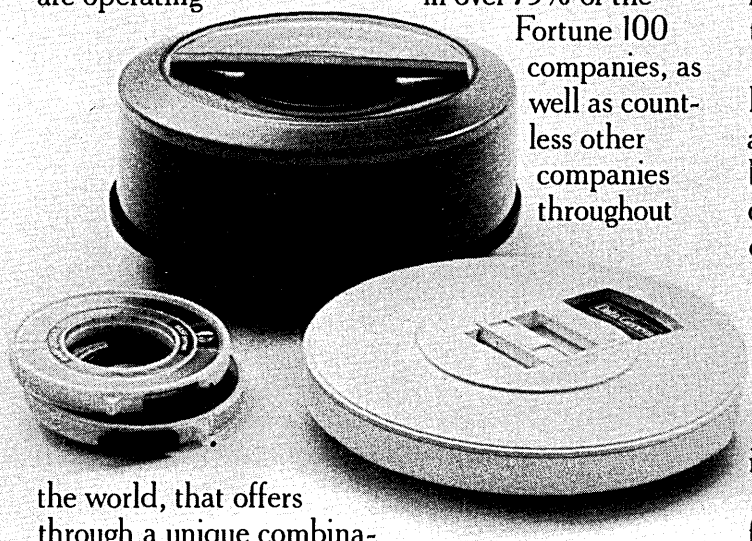
Some manufacturers have seemingly mastered the hardware but are all too wanting in software.

While others are reasonably sound at software but at best only fair when it comes to communications.

However, there is one company with worldwide software and service support whose systems are operating in over 75% of the Fortune 100 companies, as well as countless other companies throughout the world, that offers through a unique combination of power, function and flexibility, the most comprehensive approach to Distributed Data Processing in the industry. Data General.



What specifically is it about Data General that allows us to claim superior DDP capabilities? Simply this: ECLIPSE® Systems supply more of the key ingredients for successful Distributed Data Processing at the same place and the same time than any other system you can buy.

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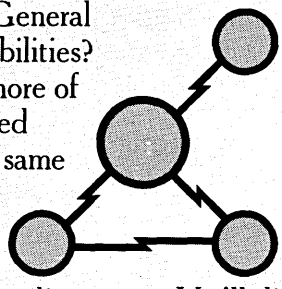

If you have new applications or you want to distribute out of the mainframe environment, and you want the power, function and flexibility that allow you to implement, enhance and maintain applications not just on time, but in budget, contact our local office or write to Data General, 4400 Computer Dr., Westboro, Mass. 01580. You'll discover our solution to DDP is the most comprehensive in the industry because our thinking is the most comprehensive in the industry.

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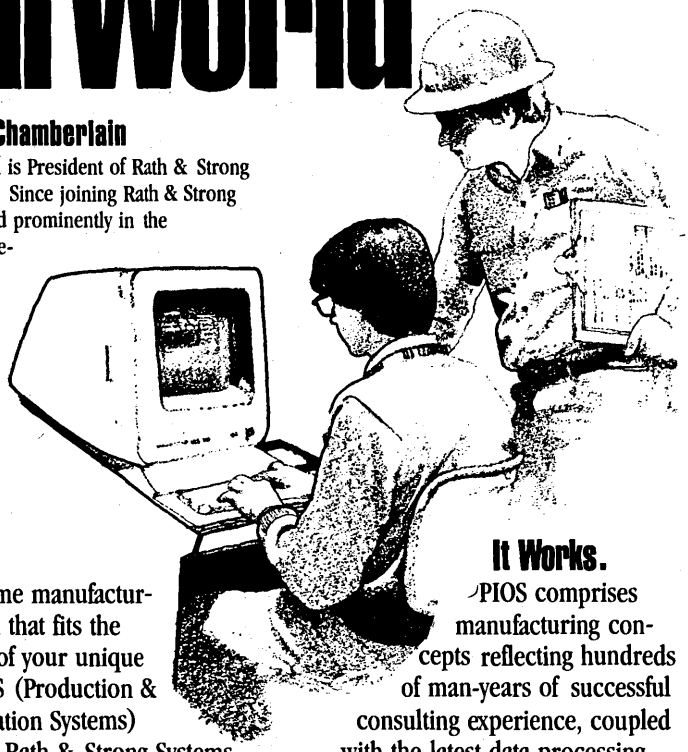
Real Time in the Real World

By Woodrow W. Chamberlain

Woodrow Chamberlain is President of Rath & Strong Systems Products, Inc. Since joining Rath & Strong in 1972, he has figured prominently in the development and implementation of PIOS systems in manufacturing facilities nationwide.



What is PIOS?

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PIOS comprises manufacturing concepts reflecting hundreds of man-years of successful consulting experience, coupled with the latest data processing techniques. This state-of-the-art system is backed by a company with a 15-year history of successful computerized systems implementation. Rath & Strong knows how to take a good management tool and make sure people use it properly by providing thorough training and detailed documentation.

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NEWS IN PERSPECTIVE

Porter cited several reasons, including pressure from the "entrenched" security systems business in the U.S. "We wanted Mastiff to be just perfect. Now that it is ready, we've had to prepare for the enormous financing and distribution problems we'll face here. We also have to prepare for eventual production here," he said.

Another concern has been over the company's "technological lead." Said Porter, "We spent a lot of time preparing tough patents. They're certainly not easy to get around."

But overall, he said, American managers haven't wanted "real" security, just a facade of security. "As you know, security is primarily an attitude of mind."

Several orders from leading U.S. corporations are now in the works. "The time has come," says Gene Sweeney, executive vp of the American Mastiff subsidiary, Sterling Industries, Atlanta, which will deliver and maintain the systems.

Each system will be individually tailored for U.S. users. "And because we are selling a whole philosophy, not just a better

Most Mastiff users do not wish to be named "for security reasons."

mousetrap, we'll show each company just exactly what it needs," Sweeney said.

The systems are now available in the U.S. They range from a single-door system costing about $2,500 to systems using hundreds of tokens and costing much more. "An average system, protecting three doors at different levels and using 40 tokens, would cost about $25,000," says Porter.

Porter warns that companies only need to lock their most sensitive areas, or inner sanctums. "And these you must define," he said.

Mastiff is presently working feverishly to protect its technology lead. "The British are great innovators, but unfortunately, the world is full of great copiers."

The most interesting of these new developments are those that offer continuous security by means of smell, extrasensory perception and, the latest, a visual recognition program.

Judging by figures unearthed in the U.S., these developments won't be coming any too soon for American computer managers. The country has seen an unprecedented burst of white collar crime. According to one study of 144 cases of "mundane" computer abuse (by the Stanford Research Institute), the average take by the criminals was $400,000 per incident.

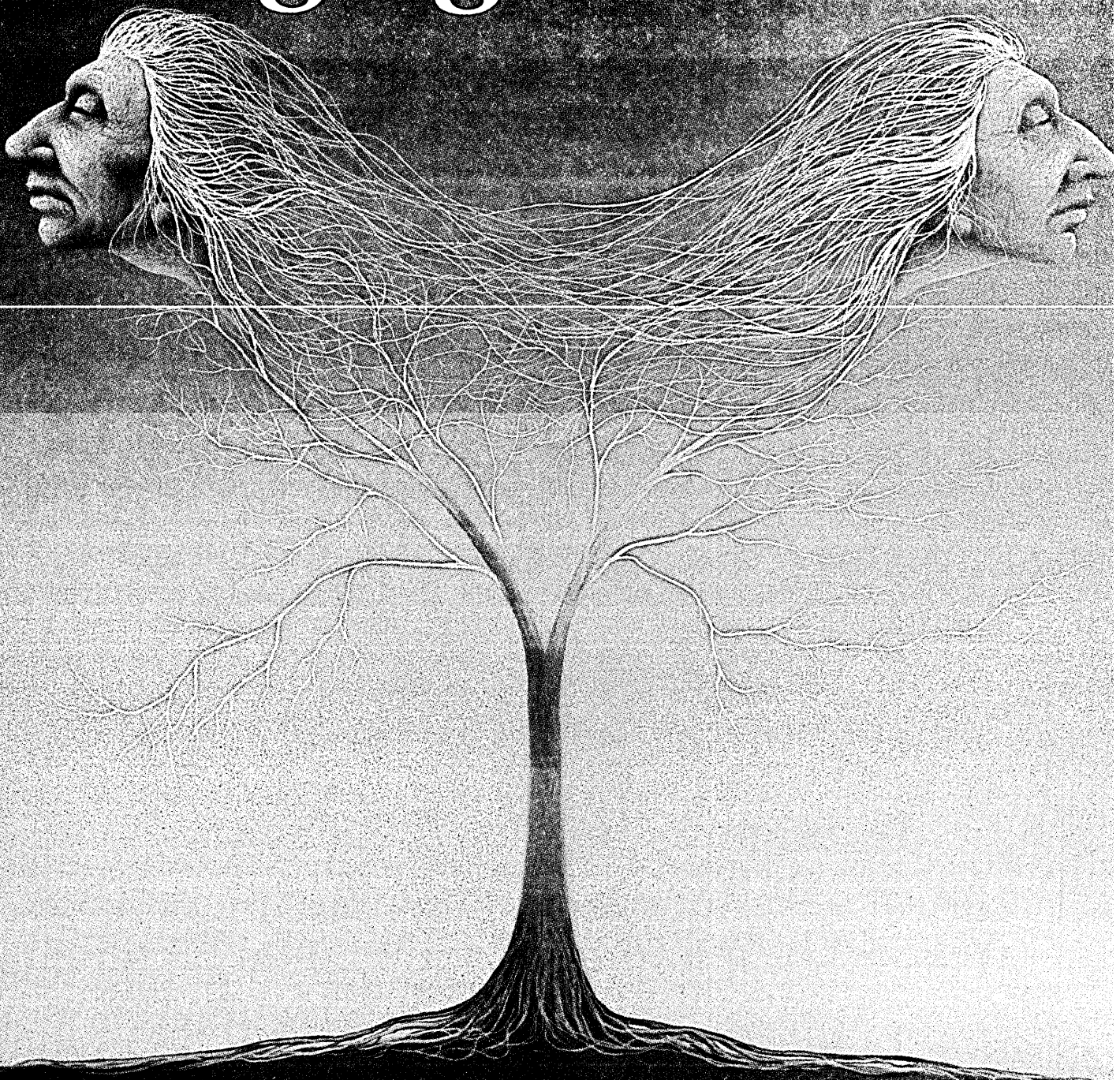
"There are more dollars stolen each year by computer fraud than in all the armed robberies combined," says Porter.

And with a sly grin he reminded us all that in the large majority of cases, the villain remains—undetected.

—Ralph Emmett

CIRCLE 110 ON READER CARD

Imaging the future.



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Poster reproduction of this Frank Howell painting available upon request.

NEWS IN PERSPECTIVE

BENCHMARKS

"STOCKMAN HIT LIST": That's what Democrats in Washington are calling the Reagan Administration's proposed budget cuts. Government science and space programs—such as the activities of the National Science Foundation, NASA, and the Jet Propulsion Laboratory—will be receiving drastic budget cuts if the present plans are institutionalized. Budget director David Stockman sharpened the ax that will fall on the nation's space and science organizations when he prepared the list of potential cuts. Specifically, some of the cuts mentioned are all new 1982 ventures at the NSF, which includes university laboratory improvements, science education curriculum development, as well as reductions in behavioral, social, and economic science research. This spells out a $62 million cut for fiscal year '81 and $241 million for fiscal '82. NASA will also lose any new programs it was planning, and will be forced to take cuts on low priority programs. The monetary reductions proposed for NASA are down $96 million for fiscal year '81, and down $629 million for fiscal '82. The cuts will affect such projects as the Numerical Aerodynamic Simulator, experimentation for an atmospheric research satellite, the Venus Orbiting Imaging Radar, the Gamma Ray Observatory, and the Galileo Mission to Jupiter, all of which, along with other programs, will either be canceled completely or postponed. Washington is up in arms about the cuts, as are NASA, the NSF, the JPL, and just about every other organization in the space and science community across the country.

NO, WE'RE NOT GOING: Ramtek Corp., computer graphics equipment developer and manufacturer, has withdrawn from the National Computer Conference. President Charles E. McEwan reasons that too much time is spent explaining sophisticated graphics equipment to home computer buffs; therefore, the show is not cost effective for Ramtek. From the 2,000 sales leads Ramtek received at last year's show, less than 5% were serious leads, the company complains. In addition, previous NCCs held the Personal Computing Festival at separate locations, while this year, both shows will be under the same roof at McCormick Place in Chicago. Commenting on the situation, McEwan stated, "I'm not saying NCC doesn't serve a purpose. We serve a specific segment of the marketplace, and NCC has become so diluted, it isn't serving our purpose in its present form. We use different conferences, targeted to a narrower audience." He also mentioned that many vendors have "expressed reservations" about the NCC, but feel their image will be hurt if they do not attend the show.

IN THE BLACK: Since Roy L. Ash resigned as AM International's chairman and chief executive (it was believed he left under pressure from the board of directors), the company has sold $25.6 million worth of common stock to the Madison Fund, and is now looking for possible divestitures within AM to increase cash holdings. This turn in company direction comes under the new leadership of Richard B. Black, whose thinking is said to be more in line with the board's. Black is not saying which, if any, of the AM divisions will be sold, and refused to comment further. He was chosen to head AM because of his longstanding management record—he was previously with Maremont Corp. as chairman and chief executive, until it was purchased in '79 by Swiss Aluminum AG. He then became president and chief executive of Alsuise of America, Inc., the Swiss company's wholly owned subsidiary. Currently, Black is also a director at both W.W. Grainger Co. and Warner Electric Co. Roy Ash's tenure from '77 to '81 had proved "erratic" in earnings; after a net loss amounting to $19 million in 1977, earnings rose to $21 million in '78, then fell to $11.6 million in '79, and plummeted to $5.8 million in '80.

SCI, DG SETTLE: SCI Systems, Inc. has settled its antitrust suit against Data General Corp. out of court. This leaves Fairchild

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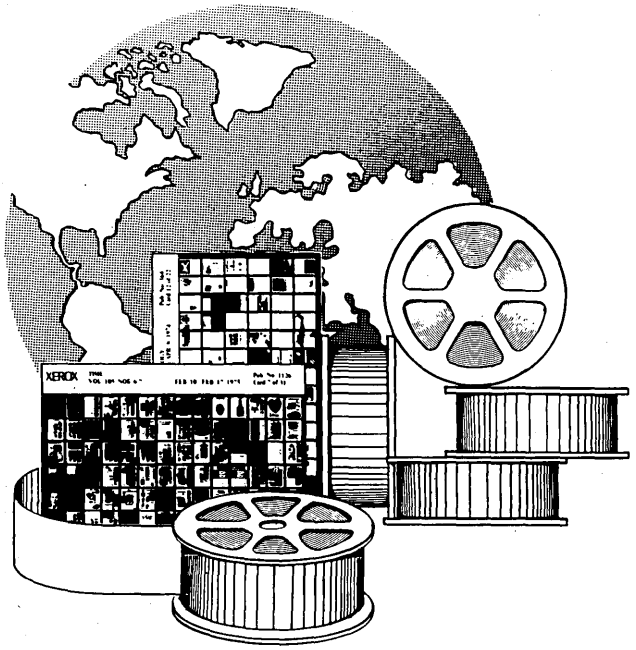

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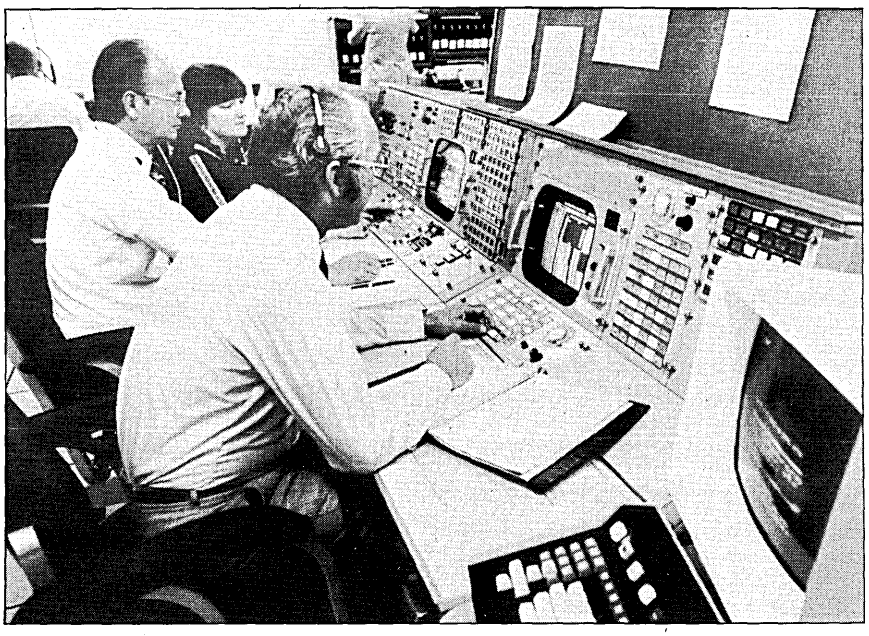
CIRCLE 112 ON READER CARD

Camera & Instrument and Digidyne Corp. still fighting Data General in a suit that began in 1978 and may go to trial this spring. The three firms had claimed damages of $300 million collectively, claiming that Data General's practice of tying the licensing of software to the sale of the cpu is unlawful. Bytronix and Ampex were also involved in the antitrust suit against Data General but, as SCI did, those two firms settled out of court; no settlement details were released. The current suit has grown from a trade secrets case that was filed in June '78 by Digidyne against Data General. The trade secrets complaint was then expanded to include the unlawful tie-ins, and the other companies banded with Digidyne.

UNIVAC LAYOFFS: There were about 2,000 production workers at Univac's Minneapolis-St. Paul plants—until this year. In January, 40 workers were laid off, and in February, an additional 133 workers. This comprises between 8% and 9% of the production workers in that area. The layoffs are attributed in part to the declining number of orders for the 1100/80 computers. The decline in orders comes at a time when there is an increased demand for Univac products and services, and also a reported backlog at the end of '80 that was up by 16%. Spokesmen for Univac stated that the downward swing in orders was expected because the computer (introduced in November '76) is presently in the "downside of its life cycle." Univac has promised to release follow-on systems that will be more in keeping with IBM's most recent large mainframe offerings, but nothing more definite has been said on that score to date.

DP BUDGETS UP IN '81: A 12% rise in dp budgets for 1981 is forecast in a survey titled "User Planning Service 1980 Annual Report" prepared by Input, Palo Alto, Calif. The report provides information on dp budgets, growth, expectations, and objectives, while analyzing vendor activities, technical issues, and trends. The major problem still in the foreground for '81 is the shortage of dp personnel, and the most important goal is the installation of on-line applications, with heavy use of DMBSs, says the report. During the next three years, the "only significant objective increasing in importance is to integrate office automation with edp," states Input.

DTS GETS NEEDED INFUSION: Ing. C. Olivetti & Co., Italy, is investing $10 million in Data Terminal Systems in exchange for an 11% stake (purchased at $16 per share) in the company and control of its German subsidiary. The agreement limits the holding Olivetti can acquire to 25% of DTS within the next five years. This latest cash infusion follows one by Digital Equipment Corp., in which DEC purchased the new DTS headquarters facilities (still under construction) at an estimated price of $10 million. The combined funds DTS receives from Olivetti and DEC will put a sizable dent in the company's $40 million-plus bank debt. The Olivetti agreement will also rid DTS of its troublesome German subsidiary, DTS GmbH, which has been operating at a loss. The DTS German operations will be merged into Olivetti's operations in Deutschland, and Olivetti will market DTS products in virgin territories.



SPACE FLIGHT SIMULATIONS: In preparation for the first 54-hour Space Shuttle mission, IBM programmers monitor data from the Shuttle Data Processing Complex in Houston. The complex comprises three System/370 model 168s and associated communications equipment and has given controllers and astronauts more than 1,500 hours of simulator training at NASA's Johnson Space Center in Houston. The combination of computers and flight simulators provides training for actual flight including launch, on-orbit, entry, and landing procedures. During actual missions, the computer complex will provide the Mission Control Center with telemetry, tracking, navigation, and control information.

GET YOUR SOFTWARE GRANT: The Software Publishing Division of Olamic Systems Corp., Bay City, Mich., is now accepting software grant applications from academic and nonprofit research institutions. The Olamic program will give selected institutions one-year renewable grants to use Olamic software products at no charge. Grant applicants will be required to prove financial need, and all grants will be restricted from commercial use. The grants will include a proviso stating that future funding for any hardware or software product will include payment of the regular license fee of the specific Olamic product in use. Commenting on the new plan, an Olamic spokesman said, "Essentially, this plan will help bring high technology tools to people that may not be able to afford the state of the art, but really need new capabilities." There is the added benefit to the company, of course, of increasing its user base.

GOVERNMENT SETS THE PACE: The value of fiber optic components for government/military communications is expected to grow from $24.5 million in '80, to $135 million in '85, and to $259 million in '90. Over half the dollar value will be found in telecommunications systems, about 23% in remote links for radio and microwave equipment, and the remainder in electronic warfare and other communications applications and nonproduction demand. More than half the component value for government/military communications will be cable production. The value in cable will grow from $12.7 million in '80 to more than $70 million in '85, and $150 million in '90. This increase in the '80s reflects increased production of military field cable and production of more long haul cable systems. Longer wavelengths are also expected for the '80s—upgraded to 1.06 or 1.27 microns for reduced attenuation and dispersion. This trend is reinforced by developments of LED emitters and PIN-FET detectors which operate at longer wavelengths. The report containing this information is titled "Fiber Optics in Government Communications," produced by Gnostic Concepts, Inc., Menlo Park, Calif.

PREDICTABLE INCREASES: The increased demand for applications software and new entrants into this market will be key factors in projected rising user expenditures

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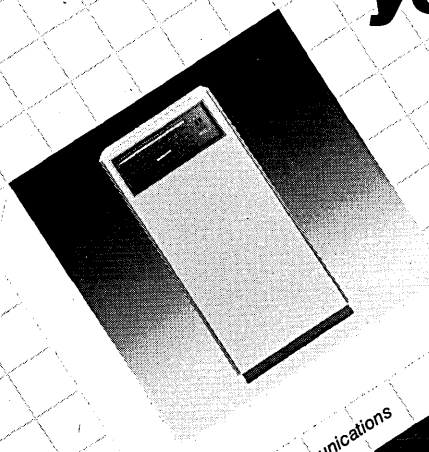
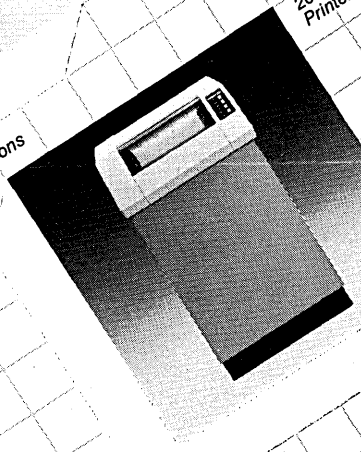
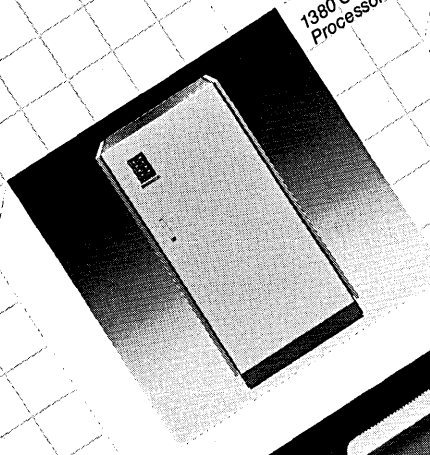


1270 Transmission Control Unit

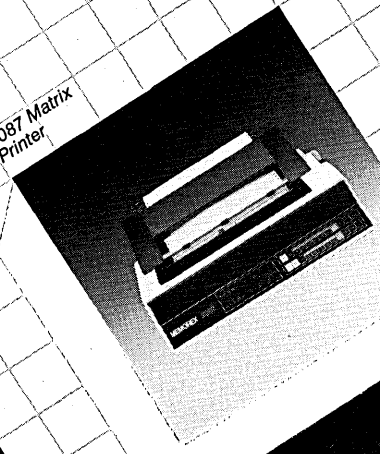


2089 Line Printer

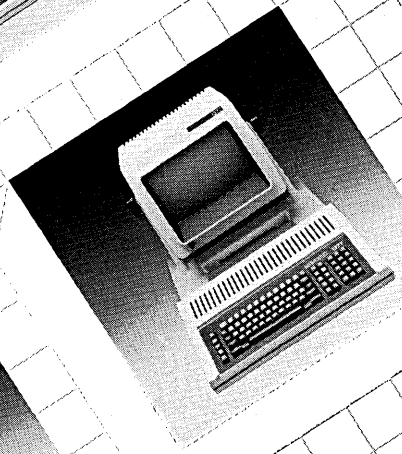


1380 Communications Processor

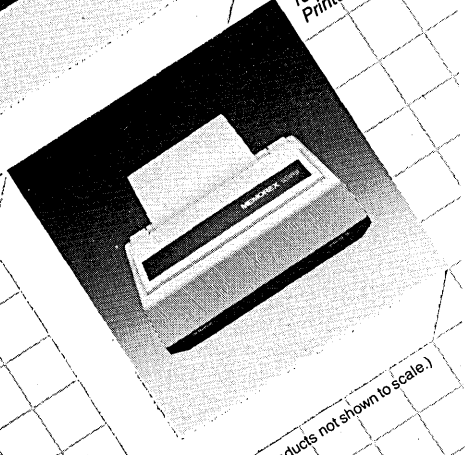
2078 Display Station



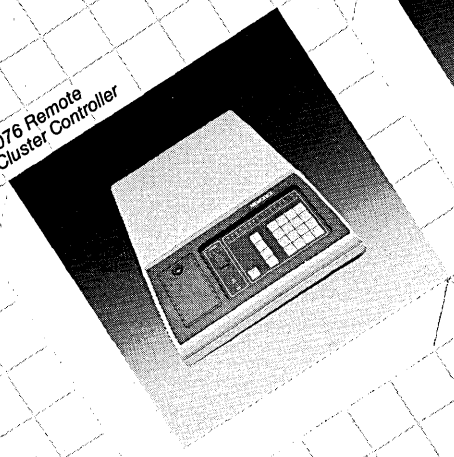
2087 Matrix Printer



1377 Display Station



1300 Screen Printer



2076 Remote Cluster Controller

(Products not shown to scale.)

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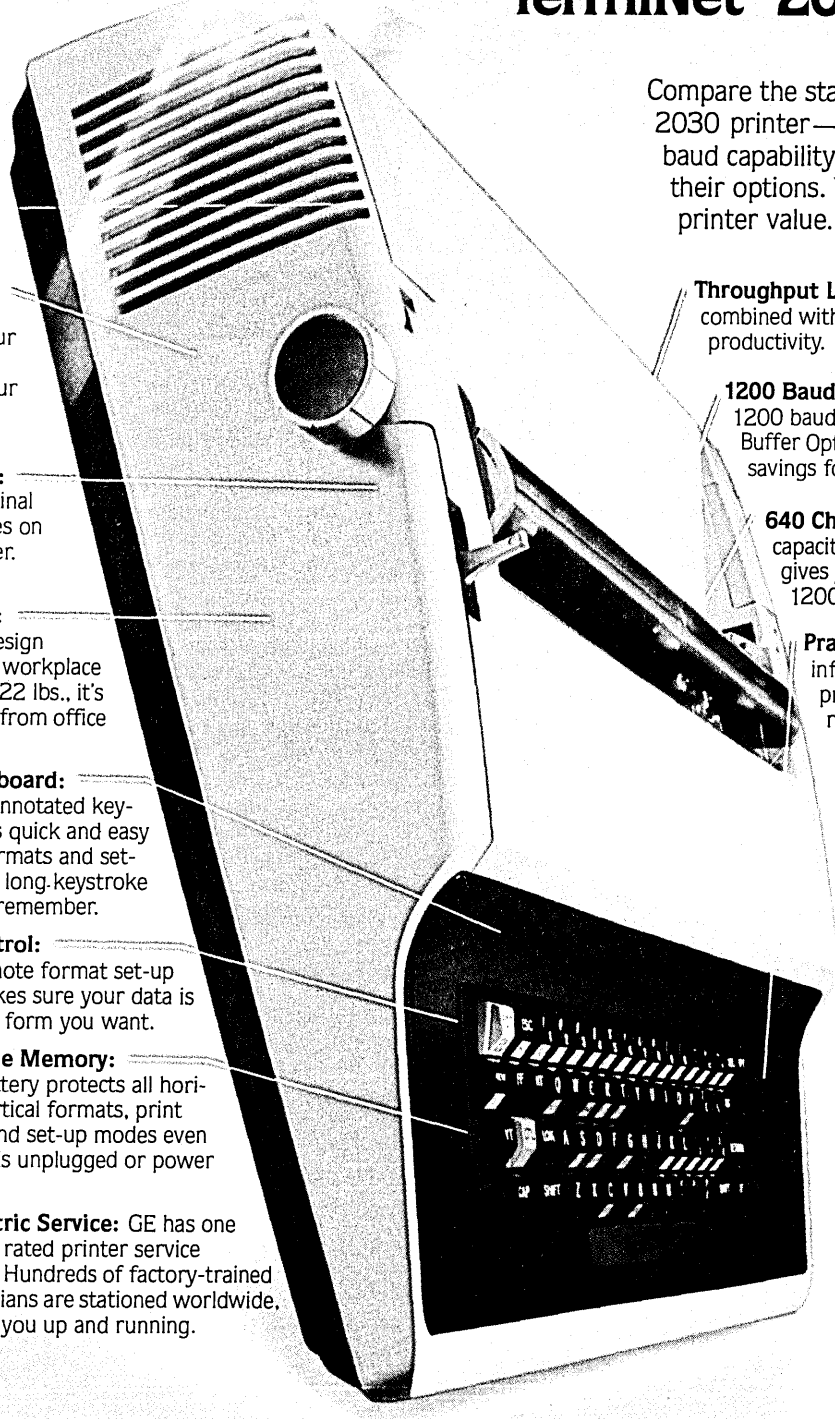

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for this software through 1985. User expenditures for applications software products in '80 stood at $880 million. The expected annual growth rate is 25%, leading to $2.6 billion by '85. Due to inflation, cost justifications favor software product acquisitions over in-house development by a wide margin. However, research shows "a wide gap often exists between the buyer's expectations and available software. This gap has created a vacuum which vendors are moving to fill," states the report "Opportunities in Marketing Application Software Products" by Input, Palo Alto, Calif. The report also mentions that computer manufacturers now recognize that software sells the hardware, and they will become an increasingly competitive force in that market during the next five years. Large hardware companies will enter the market mostly by acquiring software products firms and by aggressive marketing of new products. The increase in package development and marketing costs will force continued consolidation and acquisition in the applications software industry, Input predicts.

DBMS MADNESS: The market for database management systems is expected to hit $4.1 billion by 1989—an increase of 600% between 1980 and 1989. This prediction, and more, comes from a report by Strategic Business Service, Inc., San Jose, Calif. The report forecasts the rapid rise and slow growth of the database back-end processor; as well as the big boom in database software. Contrary to other forecasts, SBS also predicts that shipments of back-end processors will slow down between 1985 and 1989. The evolution of DBMS from hierarchical to relational is traced in the report, showing the need for specialized hardware such as associative planar memories and intelligent disks to maximize the benefits of a relational architecture. One of the conclusions reached by the SBS research is that "the DBMS in the current large mainframe environment is an artificial add-on, attached to obsolescent operating systems." The report specifies where opportunities for software vendors lie, and warns that hardware vendors, by including DBMS functions in the operating system, will attempt to keep software firms out of this territory. Furthermore, the report states that as new operating systems evolve, the database function will become an integral part of the operating system—a trend illustrated by IBM System/38 architecture, and the architectures of both the OS IV/F4 Fujitsu system and the VOS/3 from Hitachi.

R&D FUNDS UP: Expenditures for research and development in the U.S. are expected to reach $68.6 billion in 1981. The figure shows an increase of $8.2 billion, or 13.7%, over the $60.4 billion estimate for 1980. Most of the increase will be absorbed by inflation, says Battelle's Columbus Laboratories, Columbus, Ohio, but a *real* increase of 3.8% should come through in '81. The federal government will continue to be the largest R&D funder in '81, allocating about $33.7 billion, while industry will pull a close second, providing about $32.4 billion. Funding by academic institutions is expected to be approximately $1.4 billion, and other nonprofit organizations will contribute about $1.1 billion. Although government is the dominant source of funds, industry will remain the dominant performer of R&D in the new year, Battelle claims. Four government agencies dominating the R&D scene are expected to account for 86.7% of the federal funding in '81: the Department of Defense (45%), the National Aeronautics and Space Administration (15.7%), the Department of Energy (15.1%), and Health and Human Services (12.1%). R&D will be funded most heavily in industry by manufacturing companies.

PORTABLE TERMINALS: The next five years will be filled with tough competition between Tandy, Apple, IBM, DEC, and Sears in the handheld and briefcase (self-contained) computer markets. Worldwide revenues for these terminals are expected to rise to nearly $900 million by 1985, according to Creative Strategies. International (CSI), a San Jose, Calif., research firm. The compound annual growth rate on the $900 million is about 31.5%. CSI believes the growth rate for foreign revenues will rise considerably as U.S. vendors vigorously penetrate overseas markets. CSI's report analyzes the role of and markets for nonprogrammable and programmable handheld units, as well as for nonintelligent, smart, and micro-based briefcase units product features, user application directions, and pricing trends.

FROM ONE UNIT TO THREE: Comsat General Corp. has restructured its operating functions into three major units. William L. Mayo, vice president, will head the Satellite Systems unit; Michael S. Alpert, vice president, will be in charge of Communications and Information Products; and Burton I. Edelson, senior vice president, will continue to head Systems Technology Services. Richard S. Bodman, Comsat General's president and ceo sees the restructuring as an important step in consolidating the company's efforts to meet changing needs over the next decade.

USED SOFTWARE FOR SALE: The American Computer Group, Inc. (ACG), of Boston, Mass., has formed a new company, American Used Software Co. Bill Grinker, president of ACG, believes that "used software is the best kind" because it works. The new company's first product offering will be DRS, a DBMS for the DEC PDP-11 and VAX market. DRS is an application implementation system with development capabilities, providing DBMS facilities with over 70 functions supported by five megabytes of FORTRAN IV code. DRS was originally designed and developed by Aeronautical Research Associates of Princeton to support its in-house data base management requirements, and for 11 years has been in continuous use by other companies with over 100 users. As if DRS's track record weren't enough, "American will offer a 90-day money back guarantee if any customer is not completely satisfied with DRS," says Grinter.

SHEER GENIUS: A new company with a new idea opened its doors to the public last October. Shared Genius—The American Idea Center is the company, founded by Lovell Brown, independent innovator. This public idea center was established to "link the independent innovator and the American consumer in an effort to directly seek solutions to the country's economic and social problems (e.g., energy, jobs) through breakthrough ideas and inventions." Brown believes new ideas can be encouraged (and purchased) by the public to solve problems, using Shared Genius as "linkage." He explains, "Independent innovators are the source of 80% of all breakthrough ideas, and there has been no center for them." Two-way communication is the basis of Brown's brainstorm. Every 90 days, center members, or "Season Ticket Holders," receive "Innovation Dialogue," which informs them of all that is being created and considered by Shared Genius. Season Ticket members (both innovators and consumers) may then respond via special speedmail forms, making inquiries or comments or voting on the current ideas. The funds for innovators are called "Idea Grants," and are established from the $40 annual Season Ticket membership dues. As a grand finale, Brown believes Shared Genius is capable of helping the U.S. to regain its role as technology leader of the world. For further information, send $1 (for postage and handling) to Shared Genius—The American Idea Center, P.O. Box 502, Chester, NJ 07930.

CHAPTER 11 FOR O.P.M: O.P.M. Leasing Services of New York filed for Chapter 11 protection under the Bankruptcy Act following suits from three financial institutions, each of which charged that the company had obtained multimillion dollar loans by drafting bogus computer leases. O.P.M. is presently being investigated for charges of criminal fraud. The company has arranged hundreds of millions of dollars of computer leases for some of the country's largest corporations. The suits allege that O.P.M. got more than $10 million in loans from the three institutions by presenting purported lease agreements signed by Rockwell International officials. Those pacts were to be security for the loans, plaintiffs contend.

—Deborah Sojka

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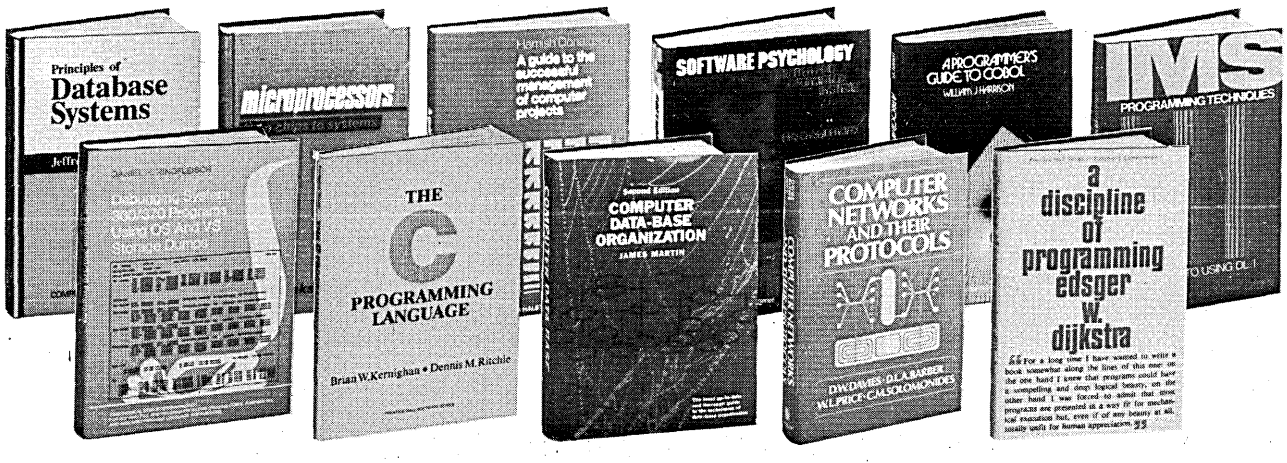

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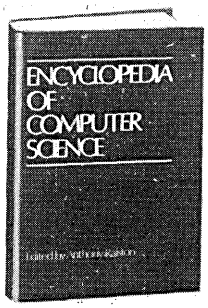

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THE LEADING EDGE

#1 in a series of reports on new technology from Xerox

About a year ago, Xerox introduced the Ethernet network—a pioneering new development that makes it possible to link different office machines into a single network that's reliable, flexible and easily expandable.

The following are some notes explaining the technological underpinnings of this development. They are contributed by Xerox research scientist David Boggs.

The Ethernet system was designed to meet several rather ambitious objectives.

First, it had to allow many users within a given organization to access the same data. Next, it had to allow the organization the economies that come from resource sharing; that is, if several people could share the same information processing equipment, it would cut down on the amount and expense of hardware needed. In addition, the resulting network had to be flexible; users had to be able to change components easily so the network could grow smoothly as new capability was needed. Finally, it had to have maximum reliability—a system based on the notion of shared information would look pretty silly if users couldn't get at the information because the network was broken.

Collision Detection

The Ethernet network uses a coaxial cable to connect various pieces of information equipment. Information travels over the cable in packets which are sent from one machine to another.

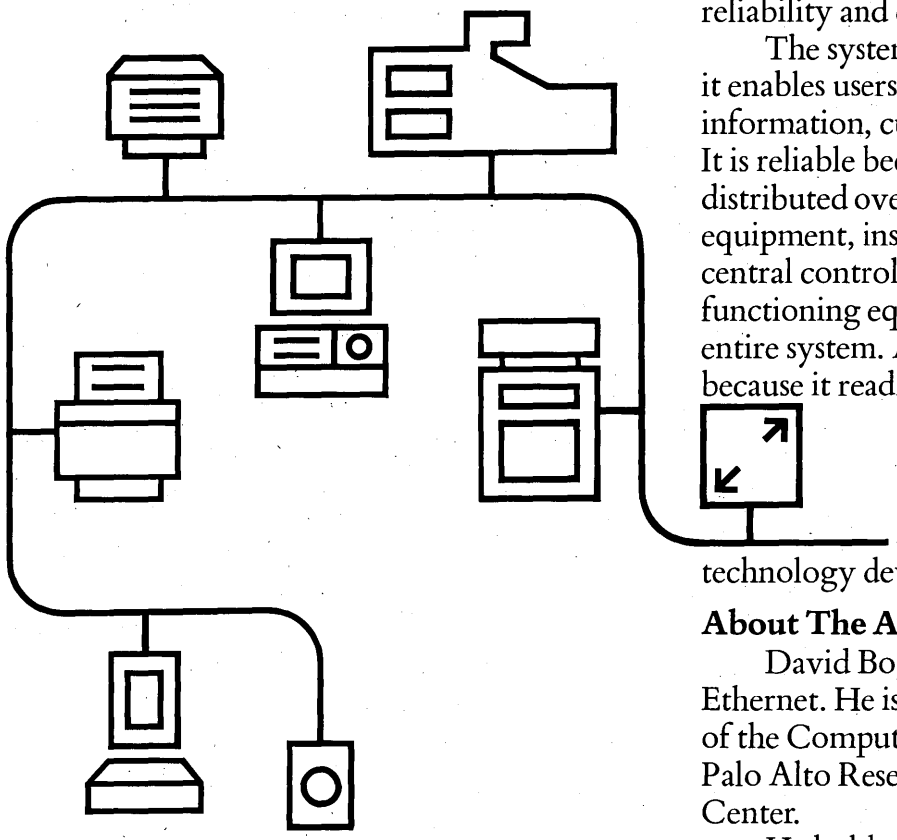
A key problem in any system of this type is how to control access to the cable: what are the rules determining when a piece of equipment can talk? Ethernet's method resembles the unwritten rules used by people at a party to decide who gets to tell the next story.

While someone is speaking, everyone else waits. When the current speaker stops, those who want to say something pause, and then launch into their speeches. If they *collide* with each other (hear someone else talking, too), they all stop and wait to start up again. Eventually one pauses the shortest time and starts talking so soon that everyone else hears him and waits.

When a piece of equipment wants to use the Ethernet cable, it listens first to hear if any other station is talking. When it hears silence on the cable, the station starts talking, but it also listens. If it hears other stations sending too, it stops, as do the other stations. Then it waits a

random amount of time, on the order of microseconds, and tries again. The more times a station collides, the longer, on the average, it waits before trying again.

In the technical literature, this technique is called carrier-sense multiple-access with collision detection. It is a modification of a method developed by researchers at the University of Hawaii and further refined by my colleague Dr. Robert Metcalfe. As long as the interval during which stations elbow each other for control of the cable is short relative to the interval during which the winner uses the cable, it is very efficient. Just as important, it requires no central



control—there is no distinguished station to break or become overloaded.

The System

With the foregoing problems solved, Ethernet was ready for introduction. It consists of a few relatively simple components:

Ether. This is the cable referred to earlier. Since it consists of just copper and plastic, its reliability is high and its cost is low.

Transceivers. These are small boxes that insert and extract bits of information as they pass by on the cable.

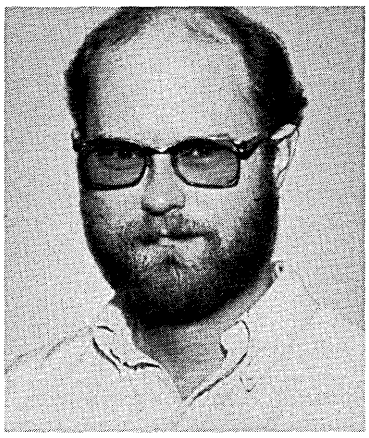
Controllers. These are large scale integrated circuit chips which enable all sorts of equipment, from communicating typewriters to mainframe computers, regardless of the manufacturer, to connect to the Ethernet.

The resulting system is not only fast (transmitting millions of bits of information per second), it's essentially modular in design. It's largely because of this modularity that Ethernet succeeds in meeting its objectives of economy, reliability and expandability.

The system is economical simply because it enables users to share both equipment and information, cutting down on hardware costs. It is reliable because control of the system is distributed over many pieces of communicating equipment, instead of being vested in a single central controller where a single piece of malfunctioning equipment can immobilize an entire system. And Ethernet is expandable because it readily accepts new pieces of information processing equipment. This enables an organization to plug in new machines gradually, as its needs dictate, or as technology develops new and better ones.

About The Author

David Boggs is one of the inventors of Ethernet. He is a member of the research staff of the Computer Science Laboratory at Xerox's Palo Alto Research Center.



He holds a Bachelor's degree in Electrical Engineering from Princeton University and a Master's degree from Stanford University, where he is currently pursuing a Ph.D.

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Some 80,000 visitors are expected at NCC '81 May 4-7. They'll be offered 105 sessions, 21 seminars, and 300-plus exhibits.

WINDY CITY SESSION SURVEY

Chicago, a city noted for its ability to manage large herds, will encounter one of the largest early this May when the NCC stampedes into town. About 80,000 head should make it to the information troughs at the McCormick Place corral, and AFIPS and industry exhibitors are making sure those troughs will be brimming: 105 sessions, 21 half- and full-day professional development seminars, a personal computing festival, Pioneer Day activities, a science film theater, and over 300 vendor exhibits.

It's a massive undertaking, one that set Dr. Alex Orden, NCC program chairman, to wondering, "How do you put together a program that covers the whole damn computer field? How indeed? Selecting sessions for the NCC has become a bit like peeling an onion: it's hard to know where to stop. But stop you must, lest you recreate the situation that obtained in the Big Apple in 1979, when the conference featured 156 technical sessions and encountered attendance problems.

Since there are no hard and fast rules as to how NCC programs are organized, each program chairman tends toward his own particular winnowing process the year he's in charge. Orden's method was to divide the field into five general areas and place a vice chairman in charge of each. Thus Anthony Wojcik of the Illinois Institute of Technology coordinated the hardware sessions; Howard Morgan of Wharton, the software; Raymond Dash of Benefit Trust, information processing management; Roger Firestone of Univac, applications; and Robert Korfhage of Southern Methodist University, social and economic implications. As the group proceeded those satrapies expanded and bifurcated, and there were the usual problems of classification and selection. Solicited papers don't always meet expectations, and sometimes over-the-transom material is good but hard to place. Above all, the organizers had to sift and condense to try to achieve some sort of general representation of the industry. They appear to have come up with a suitably broad-based agenda, organized along subject tracks; following are some samples, selected at random.

Because the NCC is a general conference, Orden thought it appropriate to try for a good number of sessions on educational and social issues. One such, "Effects of Computers on Personal Life," will be led by Abbe Mowshowitz of Croton Research Group. Mowshowitz has subdivided his topic by three and found experts who will, after he's given a general introduction, speak their pieces on the matter. Beau Sheil of Xerox' Palo Alto Research Center will talk about how the laity can become privy to some of the arcana of computerdom. Andrew Clements of the University of Toronoto will discuss the uses of computers in the community, including experiments in something called community memory. This is a means for people in a given geographic area to share information about things like libraries and health services; you might also use the system to locate a chess partner. Such systems have been used experimentally in Vancouver and Boston, and in the San Francisco area by a group called Loving Grace Cybernetics. Finally Robert Ellis Smith, editor and publisher of the *Privacy Journal* and author of *Privacy—How to Protect What's Left of It*, will discuss such phenomena as bureaucratic surveillance.

What else are computers good for? Education comes to mind. Mark Fox of Carnegie-Mellon's robotics institute will lead a session on intelligent computer-aided instruction. It's one thing to write a script that presents a subject like an electronic textbook; it's quite another to design a system that can be helpful to students when they're stuck. Researchers have been trying to construct a model of human learning processes that computers could use to pinpoint where students go wrong. The idea is for junior high school kids to enjoy someday a natural language interface with an interactive machine, so that when Physics I students query *why* force equals mass times acceleration, the machine will be able to shift to a more basic explanation.

Fox will introduce four men who have been working on various aspects of the problem: John Sealy Brown, now of Xerox PARC; Elliot Solloway of the University of Massachusetts; Mark Miller of Texas Instruments; and Derek Sleeman of Leeds University and Carnegie-Mellon.

Texas Instruments will also be represented at the session (led by N. S. Sridharan of Rutgers University) on artificial intelligence in industry. Sridharan reports that at the last conference of the American Association for Artificial Intelligence there was considerable excitement over the fact that large companies are now making substantial commitments to AI research and applications. One of the leaders is Schlumberger, the oil services giant, which is using "expert" programs to log and interpret data obtained from wires they shove down oil wells. Builders of industrial robots are also making increased use of AI, as are educators. This session will feature presentations from representatives of Schlumberger and its subsidiary, Fairchild Camera and Instrument; Texas Instruments; and the robotics institute at Carnegie-Mellon.

FUSION RESEARCH SESSION

Just as timely as the AI session is the one on computer applications in magnetic fusion energy research, led by John T. Hogan of Oak Ridge National Laboratories. Hogan and his colleagues set off fusion reactions by confining a plasma of hydrogen ions in an intense, doughnut-shaped magnetic field. Hogan reckons that by 1983, researchers at Princeton will succeed in getting as much energy out of a reaction as is necessary to cause it, but adds that the achievement will still leave them a long way from commercial viability. Oak Ridge Labs is

PHOTOGRAPH BY STEVE PHILLIPS

NCC '81

Privacy, fusion, and the language of apes are the subjects of some of the sessions scheduled.

plugged into the National Fusion Research Computer Network and uses a powerful Cray I at Livermore, Calif., for intricate simulations of what takes place in the laboratory. No machine extant can handle the coding problems encountered in trying to represent all the particles involved in a reaction, but less detailed models, which typically use a fluid description of the plasma, have proved successful in describing and predicting these extremely rapid processes.

Hogan will open the session with a description of the magnetic fusion program. Then Doug Post of Princeton will consider modeling and data acquisition problems, and Richard Hicks of Oak Ridge will discuss the adequacy of current computing in fusion research. He plans to outline the project's special needs in hardware and software for database and graphics techniques that differ considerably from those designed for commercial applications.

For people who just can't hear enough about nuclear power there's another session, this one on computational methods in laser confinement fusion. With this method, which lags magnetic fusion development by 10 to 15 years, the reaction is brought about by contracting a microballoon of hydrogen ions with a powerful pulse of laser light. The session will be led by Keith A. Taggart of Los Alamos.

AFIPS lists those two fusion sessions as belonging to the "Computers at Work" track, which was coordinated by vice chairman Roger Firestone. Firestone also intends to lead a session of his own. "Simulation of Natural Systems" will deal with the use of computers to model natural processes, the better to fill in the blank spaces in our conceptions of them. Claudia Thompson of Bell Laboratories will discuss the simulation of what researchers allege is linguistic behavior on the part of apes. George Gilmer, also of Bell, will show some striking films and talk about simulation of crystal growth, research that's attempting to discern why crystals exhibit irregularities. Finally, Dr. Cyrus Leventhal of Columbia University will discuss simulation of the process of nerve growth and connection in the brain.

Other applications sessions will consider office automation, simulation for business decision making, and medical information systems. Lee Papayanopoulos of Rutgers University will lead a session on computer advances in legislative reapportionment.

Software vice chairman Howard Morgan says that one of his main concerns was to generate sessions aiming to improve professionalism in developing software reliability and testing procedures. Some titles: "Software Maintenance" and "Quality Assurance—An Emerging Technology." Morgan is interested in the construction of general-purpose user interfaces and will conduct a session on that subject. Another area of software interest is languages for small, powerful systems, and Daniel H. Ingalls Jr. will lead a session called "Releasing the Smalltalk-80 Programming System."

The hardware sessions, coordinated by Anthony Wojcik, will feature a sort of "conference within a conference," with four sessions on microprogramming. There will also be sessions on fault-tolerant computing, office automation, and local networking. Greg Hopkins of MITRE Corp. will lead two sessions on Ethernet, featuring Dave Potter of DEC, Ron Yara of Intel, and Bob Printis of Xerox.

Management-oriented sessions include "System Implementation Strategy," led by Ken Zoline, and "Security/Disaster Recovery," with George L. Tutt. Conrad Weisert of Information Disciplines says that most dp managers are already sold on the various new structured disciplines. What a lot of them need to know is how new database techniques and distributed processing can be put in place in their organizations. Three sessions, one of them led by Weisert himself, will address problems of training, standards manuals, quality control, administrative procedures, and other aspects of technology transfer.

PIONEER DAY IS MAY 6

Wednesday, May 6 is pioneer day at NCC '81, and a special program will commemorate the 30th anniversary of Univac I. Chairman of these activities is Dr. Carl Hammer, who was a Univac I user. There will be a replica of the machine on display, and two afternoon sessions will survey early applications, installations, and marketing techniques. In attendance will be many people who in 1951 worked for Univac or for the Census Bureau, which was the first user. Univac's Otto Bernath, who had the job of tracking these people down, reports that about 90% of them are still alive and that many are still with those two organizations. On Wednesday evening Hammer will host a black-tie, by-invitation-only banquet at the Museum of Science and Industry.

Historically minded people may also want to attend the history of computing session led by Paul Armer of the Babbage Institute. Armer says that this session is a celebration of the fact that in 1980, three PhDs were awarded for research in the history of computing. That about doubles the number of historians of science and technology who concentrate on computers. William Aspray, Martin Campbell-Kelly, and Paul Eruzzi, the recipients of those degrees, will all be on hand to discuss their specialties.

The Personal Computing Festival will be staged on the main exhibit floor for the first time this year, and will feature more than 30 technical sessions. Attendees will be able to watch computer artists and draftsmen and listen to computer music. Prizes will be awarded for the most ingenious noncommercial demonstrations. AFIPS also plans to screen films in various locations throughout the four days of the NCC; movie topics will include computer history, design graphics, and computers and advertising.

"Keys to Productivity" is the program theme for NCC '81, and this is most apparent in the professional development seminar topics. The half-day sessions cost $25, the full-day $65. Dr. Charles Kozoll of the University of Illinois will lead a full-day session entitled "Time Management," which should teach busy managers to focus and communicate better. The question this raises is whether attendees will be excercising sound time management techniques by choosing to devote an entire day of the conference to this seminar. They might decide that they can make more productive use of their time by attending another all-day session, "Summary Techniques for Increasing Productivity," featuring John Demidovich of the Air Force Institute of Technology. "Packaging Your Image For Success," with Dr. Barbara Pletcher of Creative Sales Careers, Inc., will also last all day, and people who attend will find out why a successful image involves far more than appearance.

Other full-day titles: "Managing Word Processing," "Computer Law," and "Computer Software Support." Some half-day titles: "Sexual Conditioning—How it Affects Business Relationships"; and "Negotiating and Structuring the Computer Software Agreement." George R. Eggert of the Department of Defense is chairman of the professional development seminars.

This, of course, is just a smattering of what will take place at NCC '81. The conference has become so large that people now have to choose which parts of it they want to attend; experiencing the whole thing is pretty much out of the question. NCC '81 will take place at McCormick Place in Chicago May 4-7. Registration information can be obtained from AFIPS, P.O. Box 9658, 1815 North Lynn Street, Arlington, VA 22209.

Chicago is pleasant, if a bit windy, at the beginning of May. Chances are good that, one of the days of the conference, the wind will be blowing out at Wrigley Field, the lovely, ivied ball park just 15 minutes from the Loop by El. Because the Wrigley family has never been willing to install lights, the Cubs play all their home games during the afternoon. The base-thieving, fastballing Houston Astros will be in Chicago for NCC week, but it's unlikely that Nolan Ryan or José Cruz will attend the conference.

—Ken Klee

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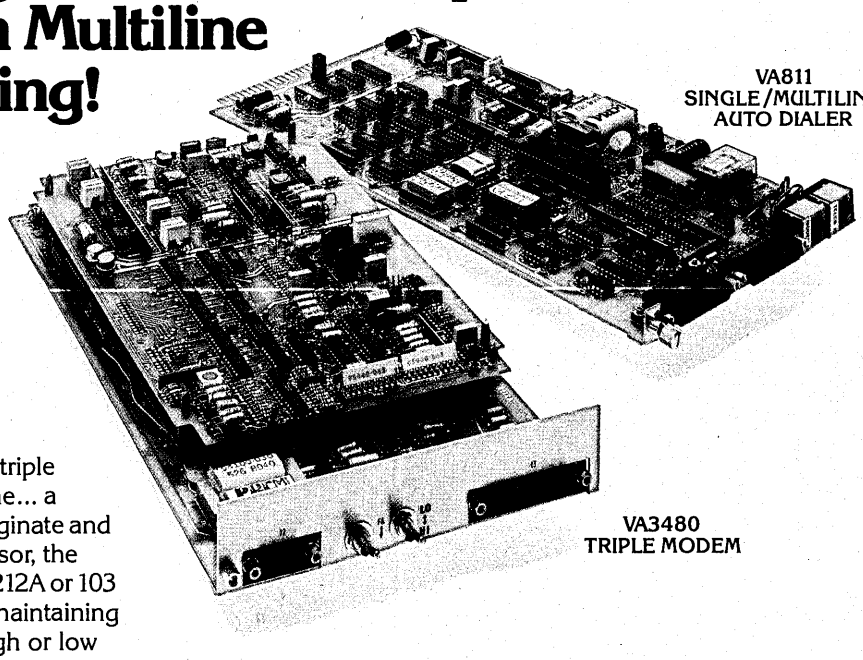

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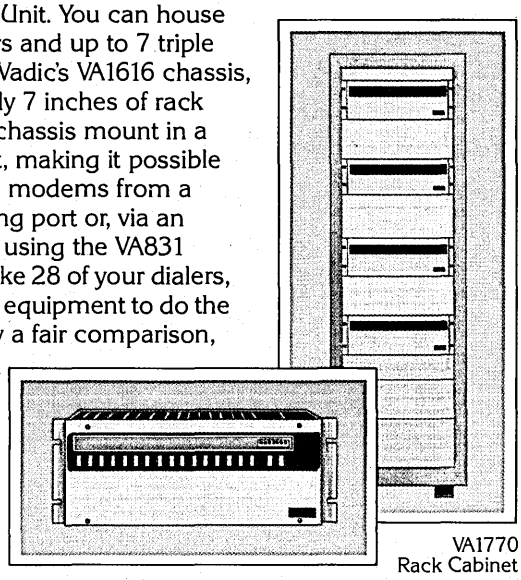

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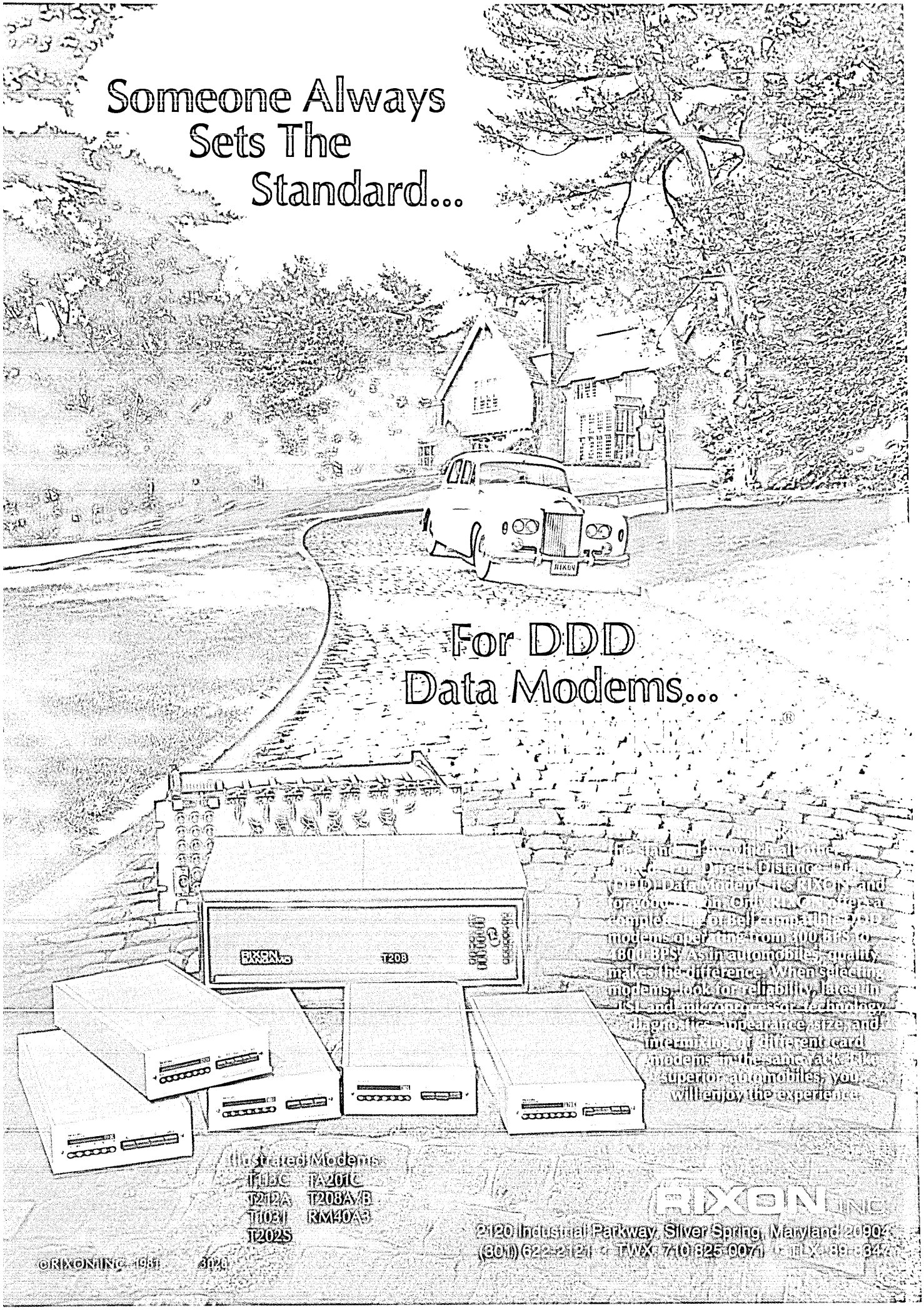

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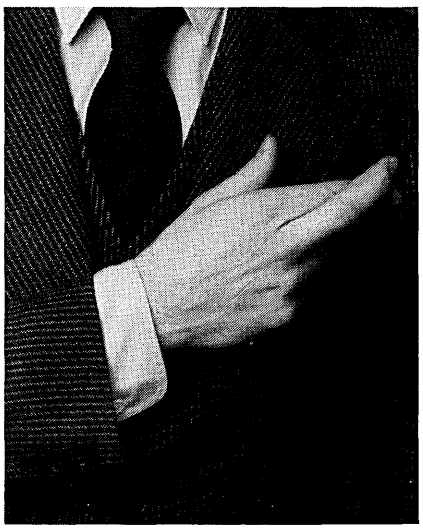

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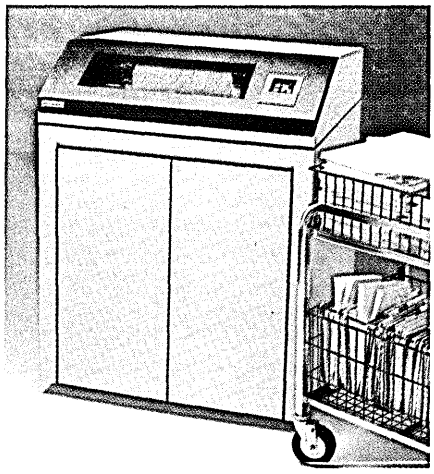

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CIRCLE 119 ON READER CARD

At Chicago's McCormick Place, 300 companies will exhibit products in over 190,000 square feet.

NCC PRODUCT PREVIEW

ALPHA DATA, INC.
Chatsworth, Calif.
DISK DRIVE **Booth 403**

This firm's latest disk drive product is an 80-megabyte version of the Atlas drive which combines moving head and head-per-track access. The new drive, joining 10- and 20-megabyte versions previously offered, has 2 megabytes of head-per-track storage, which offers 17 millisecond average access time. The moving head storage has a comparable access time of 38 ms, according to Alpha Data. The Atlas line uses a servo rotary actuator, cobalt plated disks and a sealed, contaminant-free disk/head enclosure. Designed for minicomputer applications, the drives have an intelligent interface which is designed to simplify many of the read/write functions and off-load tasks from the host machine. The 80-megabyte Atlas is set for first customer shipments in the second quarter of 1981, with a $6,500 price tag in large oem quantities.

FOR DATA CIRCLE 375 ON READER CARD

APPLIED DIGITAL DATA SYSTEMS, INC.
Hauppauge, N.Y.
CRT TERMINAL **Booth 745**

Aiming to capture a good share of the fast growing low-end ASCII terminal market, ADDS has high hopes for its Viewpoint crt terminal. Selling for $650 to end users, the terminal offers a number of usually optional features as standard: detached keyboard, switch-selectable character fonts, numeric pad and tilting screen. The price, ADDS's lowest ever for a crt, has been made possible by the use of a propietary LSI video controller chip made for the firm by neighbor Standard Microsystems Corp. Expected customers for the new product are distributors, large end-users and ADDS's traditional base of systems houses and oems. The firm also hopes to hang many of the tubes on its recently introduced Mentor and Multivision computers. Some

30,000 of the units are expected to be shipped this year. Character fonts include U.K./Netherlands, Danish/Norwegian, Swedish/Finnish, German, French, and Spanish. Visual attributes include reverse video, underline, screen blinking, half intensity, and zero intensity. Deliveries began this spring.

FOR DATA CIRCLE 376 ON READER CARD

AUDIOTRONICS
No. Hollywood, Calif.
CRT DISPLAY **Booth 323**

With the crt terminal becoming as ubiquitous as the home television, manufacturers have long been striving to reduce manufacturing costs. Much of the cost cuts have been made in the electronics area, but Audiotronics has developed a chassisless display which integrates the crt and its driving electronics into a single unit. The firm's DC-955 is said to eliminate the need for a conventional chassis while providing a 12-inch screen with 800-line resolution. Up to 25 lines of 80 characters each may be displayed on the new product, which is slated to sell in large oem quantities for less than $100. Shipments will have begun by NCC-time.

FOR DATA CIRCLE 377 ON READER CARD

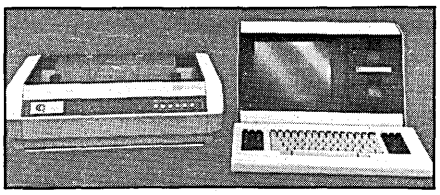
CENTURY DATA SYSTEMS INC.
Anaheim, Calif.
DISK DRIVE **Booth 2104**

The Marksman M80 disk drive, the latest to join Century's oem disk product line, stores 81.96 megabytes on a pair of 14-inch platters. The drive offers an optional Intelligent Interface designed to help oems attach the unit to different cpus. The new drive is aimed at companies building small business systems that demand high capacity, Winchester-type disk drives. The firm said the drive features an average positioning time of 50 milliseconds, although it declined to specify what type of head positioning mechanism it plans to use. The data transfer rate is 960K bytes per second and it records at 7,545 bits per inch. Shipments of the M80, which joins similar Marksman M20 and M40 drives, are slated to begin in the first quarter of 1982. Prices are not yet firm, but are expected to be under $3,000 per unit in quantities of 100 drives.

FOR DATA CIRCLE 378 ON READER CARD

COMMERCIAL COMPUTER, INC.
Minneapolis, Minn.
MICROCOMPUTER **Booth 681**

Sharing its booth with parent R2E of America, itself the U.S. sales and service arm of the French firm Realisations Etudes Electroniques, Commercial Computer will unveil an expanded line of its System X desktop computer line. The new model XP/3 includes standard System X features such as a Z80-based 64K-byte central processor and 1,920-character display, but adds a 900-meg minifloppy disk drive and a 5-megabyte, 5¼-inch Winchester-type disk The XP/3, slated to be available in the second quarter of this year, will carry an oem quantity one price of under $6,600. The unit can have an additional hard disk attached, it was noted. The System X line is programmable in BASIC and what the firm calls Metasoftware, a group of applica-



tion development tools running under the popular CP/M operating system.

FOR DATA CIRCLE 380 ON READER CARD

COMPUTHINK, INC.
Sunnyvale, Calif.
DESKTOP COMPUTER **Booth 148**

Aimed at small computer dealers, distributors, systems houses, and oems, the Eagle 32 computer is based on a 16-bit microprocessor. Enclosed in a desktop cabinet, it comes with a crt display, keyboard, and floppy disk subsystem. The standard machine has a 128K byte main memory which is expandable to 256K bytes. The standard floppy drive stores 1.2 megabytes but that too is expandable to 4.8 megabytes. Also available are 10, 20, and 40 megabyte Winchester-type disks. Computhink says its machine supports most RS-232 devices and printers compatible with the Centronics interface. Shipments are to begin around NCC time with the system starting at $9,995 quantity one.

FOR DATA CIRCLE 386 ON READER CARD

CORVUS SYSTEMS, INC.
San Jose, Calif.
LOCAL NETWORK **Booth 3014**

Designed to attach up to 64 microcomputer devices together, the Constellation 2 Local network enables sharing of resources such as hard disk storage, printers, floppy disk drives and data communications ports. The network transfers data at 1 million bits per second and supports a total network length of up to 4,000 ft. The data is moved along a shielded twisted pair of wires in a scheme that is claimed to be low cost and not require extensive installation costs. A wide range of network protocols may be used on the network which interfaces to such microcomputers as the Apple 2 and 3, TRS-80 s, LSI-11 and Onyx C8000. Corvus has priced the processor interface—one is required for each attached device—at $395, while the Constellation 2 controller carries a purchase tag of $995. Deliveries are set to begin around NCC time.

FOR DATA CIRCLE 387 ON READER CARD

CULLINANE DATABASE SYSTEMS, INC.
Westwood, Mass.
APPLICATION DEVELOPMENT SYSTEM **Booth 307**

To help users get batch applications up and running quickly on 370/303X-type computers, Cullinane has come out with ADS/Batch, the latest component of its Cullinane Data Management System (CDMS). The new package, slated to be available this spring for a license fee of $20,000, is claimed to centralize and simplify the tasks of validating transaction files and updating CDMS databases. The firm said the package, which is designed to run under IBM's OS, DOS and VSE operating systems, has its own processing language for developing applications. ADS/Batch controls input definition, editing specification, and error checking so that when modifications are made to a transaction file format, the user defines those modifications only once. The modified view of the transaction file format is then automatically available to every application, according to the firm. Cullinane also offers an on-line version of the application development system designed to help users with retrieval and update applications.

FOR DATA CIRCLE 379 ON READER CARD

DATARAM CORP.
Cranbury, N.J.
ADD-IN MEMORY **Booth 722**

Users of Perkin-Elmer's 3200 series of minicomputers will be able to buy semiconductor add-in memory for their machines from a second source now that Dataram has come out with its DR-320S memory boards. Using 16K RAMs, the memory uses cycle and mode timing signals from the Perkin-Elmer backplane while a memory interface board takes care of error checking and correlation. The memory is available in 256K and 512K byte increments, both of which use draw power from the host machine. The 512K byte version is $7,900 while the 256K byte version carries a purchase tag of $4,000. Dataram also will be showing its new 1 megabyte add-in memories for the Digital Equipment PDP-11/44 minicomputer. Also using 16K RAMs, the 11/44 memory is priced at $14,200 per megabyte.

FOR DATA CIRCLE 388 ON READER CARD

DIGILOG, INC.
Horsham, Pa.
DESKTOP COMPUTER **Booth 1341**

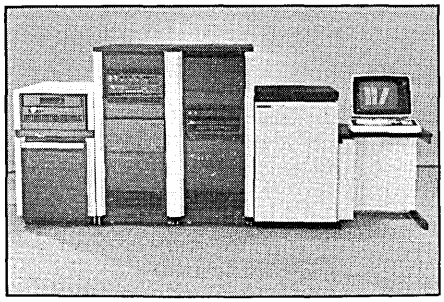
The latest small computer product from DigiLog will be the System 1500 which incorporates a 5¼ inch Winchester-type disk drive. Aimed at accounting, word processing, inventory control, and vertical applications for small businesses as well as at large firms, the 1500 will sell for under $10,000 in its 64K byte configuration. The hard disk, supplied by Seagate (the former Shugart Technology), stores 5 megabytes and is backed up by a floppy disk. DigiLog said the machine is based on the Zilog Z80A microprocessor as are several of its previous microcomputer division products. Deliveries of the 1500, which is to be unveiled for the first time at NCC, are set for early summer. The firm also plans to show its various other computer and terminal products.

FOR DATA CIRCLE 381 ON READER CARD

FOUR-PHASE SYSTEMS, INC.
Cupertino, Calif.
DISTRIBUTED SYSTEMS **Booth 750**

An established vendor of distributed processing systems, Four-Phase recently acquired IBM plug-compatible cpu vendor Two Pi Corp. The first offspring of that marriage will be shown at NCC: a pair of 370-compatible back-end processors designed to work with the Four-Phase Series IV systems line, which also has been expanded with a pair of new models. The new Systems 311 and 312 offer 32-bit power to handle batch applications in remote or local office installations. The 311 is said to be comparable in power to IBM's 4331 Group 1 machine while the 312 offers twice the performance and is comparable to the 4331 Group 2. The Two Pi-built processors may be coupled tightly or loosely with Series IV processors, thus giving users flexibility in distributing their processing power.

Four-Phase says a sample 311 configuration with 1 megabyte of main memory, console, 100 megabytes of disk, a tape drive, 16 communications lines and a 300-lpm printer would lease for under $3,000 monthly



under a 42-month contract. The 311 is available now. A sample 312 system carries a similar monthly lease charge of under $4,000 configured with a megabyte of main memory, console, 200 megabytes of disk, tape drive, eight communications lines, and 300-lpm printer. It is scheduled for first shipment in the fourth quarter of 1981.

The new Series IV/80 and 95 systems come in at the high end of the firm's traditional line of 24-bit machines and offer users increase memory and 30% more terminal handling capacity. They are to be offered as bundled systems leasing for between $3,000 and $4,000 monthly, depending on the peripherals chosen. The model 80 uses up to 480K bytes of main memory while the model 95 boasts up to 672K bytes. Each can handle up to 32 terminals and is compatible with existing Four-Phase software.

The company also plans to show its new model 8115 crt terminal which features a redesigned keyboard, palm rests, a tiltable screen with antiglare filter, and optional amber character readout (the standard readout is green). The new product has been designed to handle many types of office functions such

The Wang VS computer puts the crunch on your data, without putting the squeeze on your staff.

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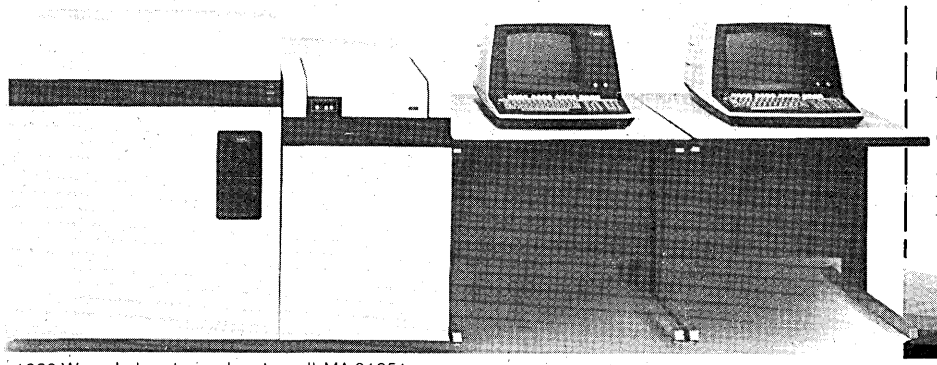

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CIRCLE 121 ON READER CARD

Challengers megabytes

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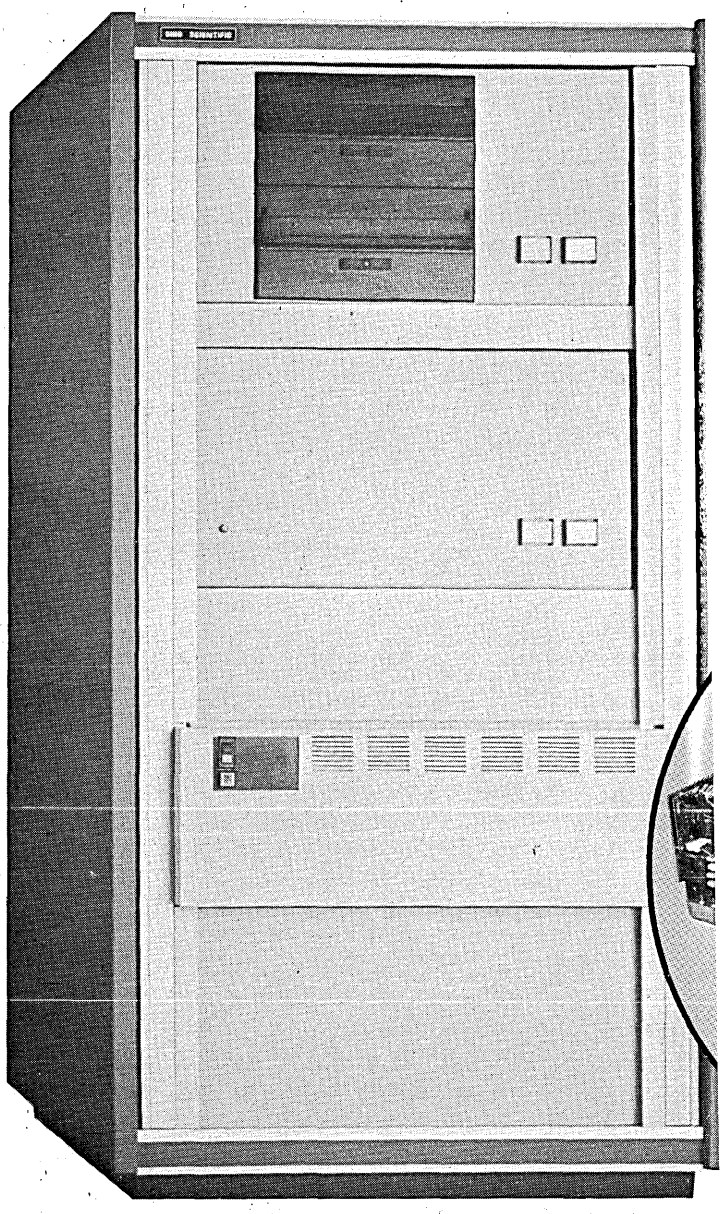

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Holly Quarles, President
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CIRCLE 122 ON READER CARD

as data processing, word processing, and electronic mail when used with Series IV systems. It leases for $54 a month on a 42-month lease.

FOR DATA CIRCLE 382 ON READER CARD

KENNEDY CO.
Monrovia, Calif.
WINCHESTER-TYPE DISK DRIVE **Booth 1007**

Expanding its family of hard disk drives, Kennedy plans to add an 80-megabyte unit designed to be compatible with Control Data's popular storage module (SMD) line. The Kennedy model 5380, occupying 1.69 cubic feet, uses three 14-inch disks with five data surfaces and records at 6,330 bpi. The unit's data transfer rate is 1.29 megabytes per second, the firm claims. Maximum single-track positioning time is 10 milliseconds while average access time is 35 ms and latency time is 8.33 ms. The drive may be run standalone or daisychained with SMD or mini-module drives, attached in either case to CDC-compatible controllers. Kennedy hopes to market the drive as an alternative to low-capacity Winchester-type drives and more expensive disk pack drives used in business systems. In oem quantities of 100, the drive carries a tag of $4,320. Deliveries are scheduled to be 30 to 60 days ARO beginning this summer.

FOR DATA CIRCLE 383 ON READER CARD

MEGATEK CORP.
San Diego, Calif.
GRAPHICS WORKSTATIONS **Booth 1251**

Two new members of this vendor's Whizzard 6200 graphics workstation family provide 1,024 × 1,024 resolution in color and black and white. The model 6245, employing a 20-inch monochrome monitor, and the model 6255, using a 19-inch color display, use raster scan techniques for computer-aided design and manufacturing (CAD/CAM) applications. Both operate interactively, giving the user the ability to zoom and pan in real-time across a virtual vector space of 4,096 × 4,096 pixels. Write protection of individual bit planes is provided so that real-time data can be displayed simultaneously with static overlays. The double-buffered bit planes of the two new workstations enable erasure of overlapping or intersecting lines in a drawing without causing breaks in the lines that remain in other planes on the screen. The two new models use the same Wand 6200 software package as the earlier 6250 model to provide a high level of intelligence in remote stations and reduce overhead in the host computer. Megatek says the new terminals are packaged with a keyboard and joystick control in a desk-style cabinet. Each model includes a graphics processor, display list memory, an RS-232 serial interface, and room for optional hardware modules. The monochrome model 6245 is priced at $17,900 while the color model 6255 is $29,500.

FOR DATA CIRCLE 389 ON READER CARD

NICOLET ZETA
Concord, Calif.
INTELLIGENT PLOTTER **Booth 338**

The Zeta 3620 digital drum plotter incorporates two 16-bit microprocessors to control linear actuator pens and a propietary servomotor drive system. Expected to be one of the fastest 36-inch drum plotters on the market, the 3620 offers an axial speed of 36 inches per second, a 4G acceleration, and 0.00049-inch resolution. Continuous feed paper provides for unattended multiple-plot operation. Other features include windowing, LCD plot time display, and built-in diagnostics. Aimed at CAD/CAM oems and end-users, the plotter is priced at $29,900 with controller. Oem discounts are available.

FOR DATA CIRCLE 390 ON READER CARD

NIXDORF COMPUTER
Burlington, Mass.
WORD-DATA LINK **Booth 856**

This vendor has been successful selling the former Entrex line of distributed processing systems and its own line of word processing equipment. A new software package, designated Word-Data Processing Link, enables the Nixdorf 8840 word processing system to communicate with the 600/55 data processing system. The link software is installed at a $50 monthly licensing fee. The company also will be showing a series of special applications software packages which, priced separately from the Nixdorf 8870 data processing system, handle tasks for insurance agencies, construction contractors, distributors, and financial accountants. The 8870, without software, goes for between $33,700 and $140,000, depending on what configuration is ordered.

FOR DATA CIRCLE 391 ON READER CARD

SMOKE SIGNAL BROADCASTING
Westlake Village, Calif.
MULTIUSER MICRO **Booth 582**

This vendor's Chieftain 98W10 and 98W30 small business systems use 8-inch Winchester-type disk drives storing 10 and 30 megabytes, respectively. The two machines, based on Motorola's 6800 microprocessor, are designed for small business applications programmed in BASIC, FORTRAN, COBOL or Pascal. Each is equipped with 32K bytes of main memory, expandable to 256K bytes. The systems can run the firm's new OS-9 multiuser operating system. Smoke Signal says the two hardware models are software-compatible and will support a number of peripherals including floppy disks, printers, and remote crts. The model 98W10 has a list price of $8,695 while the larger system lists for $9,995. The operating system comes in two versions: level 1 supports 64K bytes of RAM for $195 while the level 2 version handles a full megabyte for $495.

FOR DATA CIRCLE 392 ON READER CARD

T-BAR, INC.
Wilton, Conn.
ELECTRONIC SWITCHES **Booth 326**

Two new computer peripheral switching devices are to be shown by T-Bar, a leading vendor in this area. The model 3919 intelligent matrix control (IMC) units is designed to control the firm's 3915, 3916, 3925, 3926 and 3924 peripheral switches in small computer rooms and in systems where peripherals are geographically dispersed. For instance, in a campus environment where remote job entry stations, printers and perhaps disk devices would need to share a host computer. The $27,000 IMC is designed for use with IBM 370-type computers and will be available in the second quarter of 1981. The Series M electronic matrix switch uses the standard RS-232 interface for data transfer rates of up to 19.2K bits per second. The system, priced at about $200,000, depending on size, can operate up to 16 256 × 256 matrix switches, according to the manufacturer. It also is to be available in the second quarter of 1981.

FOR DATA CIRCLE 393 ON READER CARD

TELERAY
Minneapolis, Minn.
DESKTOP CRT **Booth 1430**

A crt terminal with movable keyboard and space-saving display unit will highlight this vendor's NCC exhibit. The Teleray model 100 is claimed to occupy 12 × 13 inches of desk space or, with an optional bracket, may be mounted on a wall and leave only the keyboard on a desk. The 132-column display is said to be compatible with Digital Equipment's popular VT100 terminal, including the DEC advanced video option. Also included in the terminal's $1,415 list price (oem quantity 50) are a bidirectional peripheral port and an 880-character user-programmable function memory. The ASCII unit is aimed at a wide variety of applications where space is at a premium.

FOR DATA CIRCLE 394 ON READER CARD

TELEX COMPUTER PRODUCTS, INC.
Tulsa, Okla.
DISPLAY TERMINALS **Booth 1653**

Telex will broaden its line of 3270-compatible terminals and introduce a 75cps (maximum print rate) daisywheel printer in Chicago. Three new terminals in the company's 278X keyboard display station line are functional equivalents for IBM's 3278 models 3, 4, and 5, sporting display capacities of 2,560, 3,440, and 3,564 characters respectively. A

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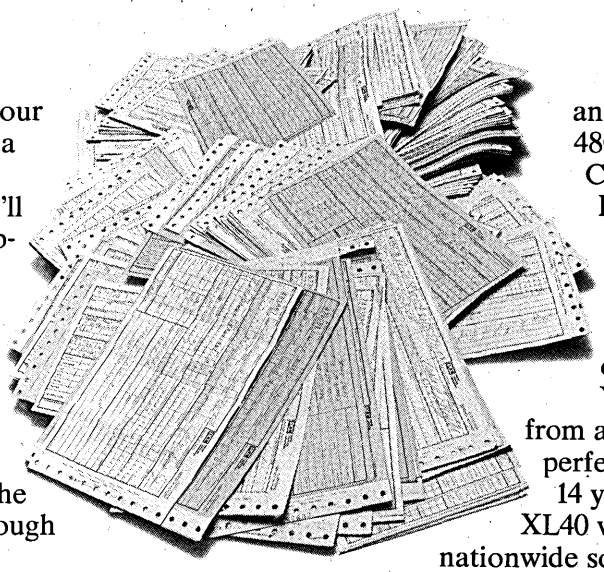

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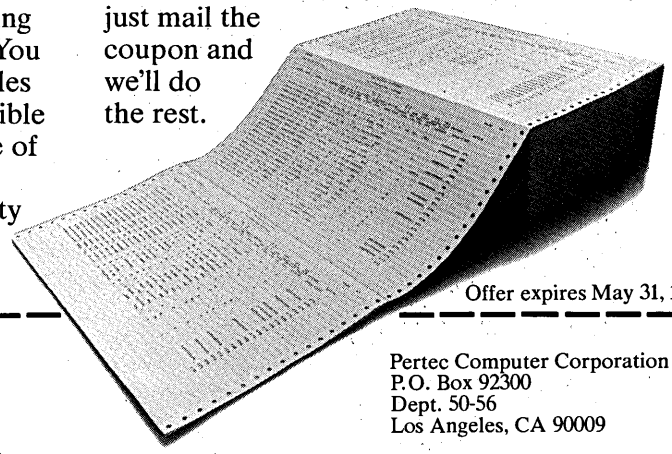

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CIRCLE 123 ON READER CARD

response time indicator, measuring average system response time, longest transaction, cumulative elapsed time, and a count of how many transactions took longer than 15 seconds to complete is optional. A printer port allowing attachment of Telex's 281 message printer, a row and column indicator, and a keystroke counter also are offered. The 2,560-character unit sells for $2,300, the 3,440 unit is $2,500, and the 3,564 model goes for $2,800.

The 767 keyboard printer is an IBM 3767 replacement said to attain a maximum print speed of 75cps. The daisywheel printer comes in two versions: the model 1 sells for $5,700 and uses plastic print wheels, while the model 2, priced at $5,900, uses metal print wheels.

FOR DATA CIRCLE 395 ON READER CARD

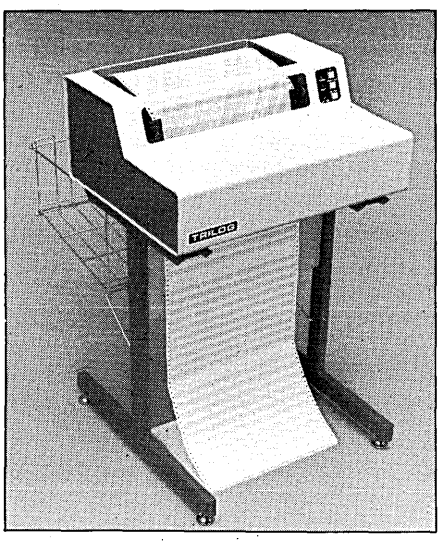
TELPAR, INC.
Addison, Tex.
THERMAL LINE PRINTER Booth 1621

An 80-column thermal printer designed for low-cost systems will highlight this company's exhibit. The PL80E uses a thin-film, 1 × 16 line-of-dots print head to provide high-resolution graphics and character printing. The standard print speed is 120 cps with 200 cps possible during compressed printing of up to 132 columns. The unit has parallel or serial interfaces which handle the 96 printable ASCII characters at rates of up to 9,600 bps. Under software control, graphics, double-width characters, overscore and underscore, and customized characters may be generated. Telpar, which also offers 20- and 48-column printers, said its 80-column model carries a $672 tag in single quantities. Evaluation shipments will have been made by NCC time, the firm says. Typical applications are for small business computers, crt screen "dumps" and general-purpose instrumentation.

FOR DATA CIRCLE 384 ON READER CARD

TRILOG, INC.
Irvine, Calif.
LINE PRINTERS Booth 1728

This vendor's new family of printers, the Trilog-150 and 300, use raster matrix technology to print at speeds up to 300 lpm. The model 150 uses a single head while the model 300 uses two heads in a configuration that permits continuous printing despite a malfunction in one of the heads. Both models space lines vertically at six and eight lines per inch and print from one to six parts on multipart forms. A graphics mode is also included for plotting with a resolution of 60 × 72 dots per inch. Normal printing is at 10 characters per inch, but a compressed mode squeezes 16.5 characters into an inch so that a full 132-character line can be printed on an 8½-inch form. The model 150, which can run at up to 150 lpm, is field upgradeable to the model



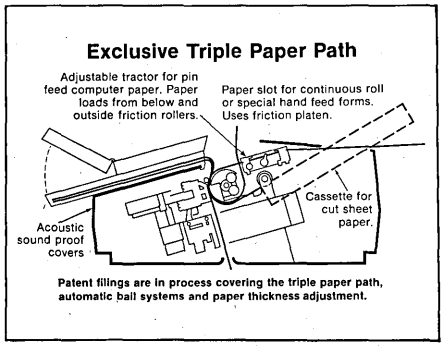
300, Trilog says, noting that the two printers share some 90% of their parts. Each model is controlled by a pair of microprocessors, offers multiple character sets, handles self-diagnostics, and interfaces through a standard RS-232 port. The slower model is priced at $2,600 while the higher speed product lists for $3,900. The products are therefore expected to compete well with standard impact line printers. Discounts are available for dealers, distributors and oems, the firm says, noting that deliveries are set to begin in September with production quantities due in December 1981.

FOR DATA CIRCLE 385 ON READER CARD

LATECOMERS

FLORIDA DATA CORP.
Melbourne, Florida
DP & WP MATRIX PRINTER Booth 3108

Florida Data will be showing off its OSP/120 and OSP/130 multifunction dot-matrix impact printers, the first two models of a product line ultimately planned to grow into OCR and facsimile applications (the firm also makes OCR equipment). The bidirectional, logic-seeking printers operate with one, two, or three passes over each print line, trading speed for quality of the printed letters. In draft mode, the units can print at 600cps, with quality suitable (or perhaps more appropriately, tolerable) to dp

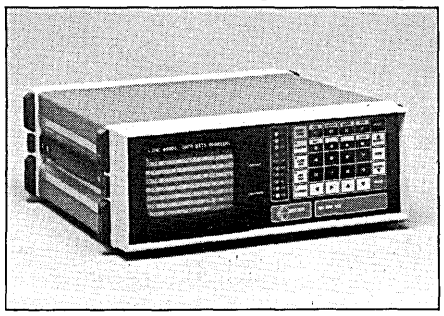


types and word processor operators who need fast draft copies. At 150cps, the letters are formed with much higher quality, although not quite typewriter quality, while at 100cps it takes close examination to tell that the letters are indeed printed by a dot-matrix print head. Since character fonts are stored in either ROM or RAM, multiple fonts may be used, and special fonts can be developed as needed. Both printers feature a three-way feed mechanism that can handle a built-in (actually slip-in) sheet feeder, manual feed, and forms tractor. The paper path includes an automatic bail that actually follows the sheet into printing position without the possibility of getting in the way and causing a paper jam. The printers' standard interface is RS232, with a variety of options including serial current loop and parallel interfaces. The OSP/120 two-pass printer lists at $3,900, while the three-pass OSP/130 goes for $4,100.

FOR DATA CIRCLE 396 ON READER CARD

HALCYON
San Jose, Calif.
DATA MONITOR Booth 1423

The 801 Mini Fox Data Monitor will be on hand at the Halcyon booth. Intended for use by those responsible for maintaining digital communications equipment, the 801 can monitor both synchronous and asynchronous communications, including bit-oriented pro-



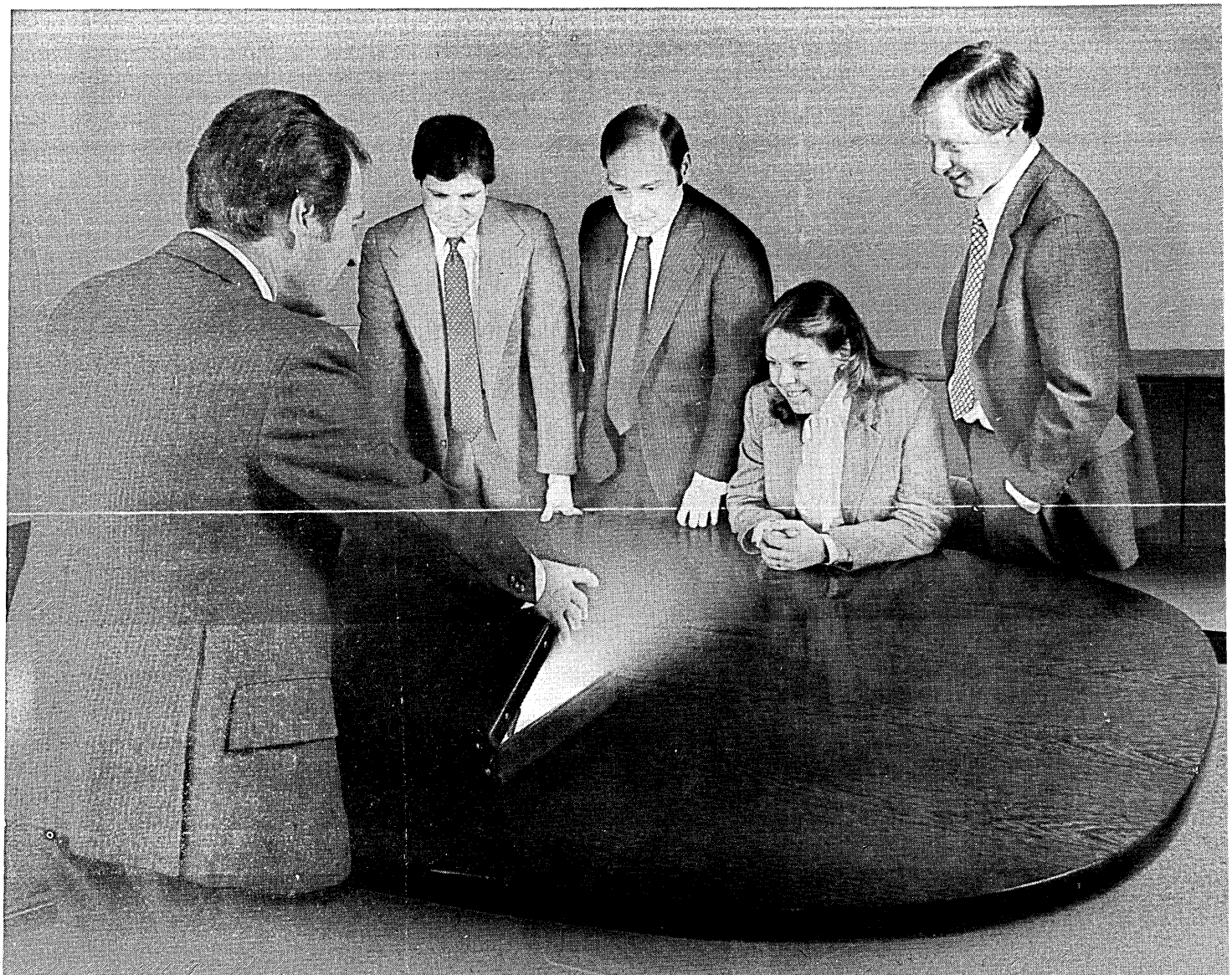
tocols (HDLC, SDLC, and—optionally—X.25). The $3,495 data monitor has a 16KB capture buffer, RS232 interfacing, and the ability to work with data streams of up to 19.2KBps (full duplex). Its 5 inch crt displays pages of 512 characters.

FOR DATA CIRCLE 397 ON READER CARD

DATASYSTEMS,
A WESPERCORP SUBSIDIARY
San Diego, Calif.
LINE PRINTER CONTROLLER Booth 1275

The DLP-3300 line printer controller provides a DMA interface between IBM Series/1 minicomputers and printers with either Centronics or Dataproducts interfacing. Its on-board micor allows self-testing of 90% of the controller's circuits as well as the cable and printer. The DLP-3300 lists at $1,825, plus cable. Discounts are offered to oems and distributors.

FOR DATA CIRCLE 398 ON READER CARD



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CIRCLE 124 ON READER CARD

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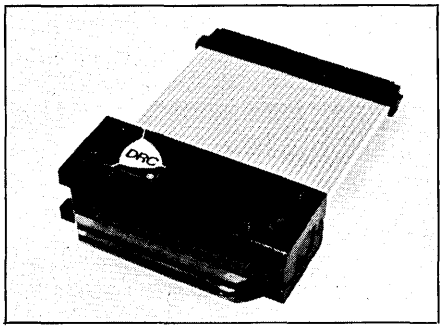
System Products Division
50 Washington St., Norwalk, CT 06854

METRIGRAPHICS DIV., DYNAMICS RESEARCH CORP.
Willmington, Mass.
PRINT HEAD **Booth 4809**

The Metriform Circuits Electrostic Print Head is a component for printer manufacturers. The head is said to have the characteristics of thick-film conductivity with the resolution of thin-film technology. The styli are housed in a glass head for better wear characteristics; the contact surface geometry may be customer-specified. An 8½-inch, 400 styli per inch head will sell for $150 in annual quantities of 5,000.



FOR DATA CIRCLE 399 ON READER CARD

OPTICAL COATING LABORATORY, INC.
Santa Rosa, Calif.
TERMINAL FACEPLATE **Booth 465**

For oems, OCLI will show conductive crt terminal faceplates intended to shield against EMI/RFI, aiding customers in complying with FCC requirements. Patterned coatings can also be used in touch-panel applications. Prices range from $25 to $150, depending on quantity, size, and technical requirements. The firm will also be showing crt terminal screen cleaner, packaged in 1 ounce pump-spray plastic bottles. This, too, is an oem offering, intended for resale to terminal users. The cleaner sells for $2 per bottle in minimum lots of 10 gross.

FOR DATA CIRCLE 310 ON READER CARD

POINT 4 DATA CORP.
Irvine, Calif.
SMALL SYSTEM **Booth 2709**

A low-end system in the existing Point 4 line, the Mark III consists of but three boards: a backplane, cpu and memory, and peripheral interface board. Mark III is targeted for small, dedicated applications. It offers the standard Point 4 instruction set, and runs the vendor's IRIS operating system. Oem quantity one pricing is in the $5,500 neighborhood.

FOR DATA CIRCLE 311 ON READER CARD

STRUCTURED SYSTEMS GROUP, INC.
Oakland, Calif.
MICRO SOFTWARE **Booth 4416**

Structured Systems Group will be promoting several CP/M-compatible software packages. Two applications packages—Order Entry ($1,250, end user) and Analyst 2.0 ($250, end user) will be on hand. For consultants, oems, systems houses, and others needing software development tools, SSG will be showing its Software Development System (SDS), tentatively priced at $2,500. SDS is a set of tested and debugged CBASIC2 skeleton programs that includes the library of subroutines SSG uses to develop its own end-user offerings. Also included is a program that creates CBASIC2 code from a full screen input form designed by the user.

FOR DATA CIRCLE 312 ON READER CARD

MICROMATION, INC.
San Francisco, Calif.
MULTI MICRO SYSTEM **Booth 5710**

The M/NET multiprocessor system is intended to grow along with a customer's business. The system uses multiple processors, one as a supervisor, and up to eight user-application processors. Each user gets 64KB of memory and a dedicated Z80 for program execution, with a master processor (also a Z80 with 64KB) handling the operating system functions and arbitrating the interprocessor bus. The system can grow from a single-user floppy-based configuration up to an eight-user system with Winchester disk storage. Prices range from $5,500 for a single user system up to $23,000 for an eight-user system.

FOR DATA CIRCLE 313 ON READER CARD

ELECTROHOME LTD.
Kitchener, Ontario, Canada
PROJECTION MONITOR **Booth 4916**

The EDP 57 is a high-brightness (100 lumen), medium resolution (600 line) video projector that is said to interface to nearly any raster scan crt terminal. The unit's variable focus feature allows clear projection of 80-character lines onto screens ranging from four to seven feet (measured diagonally). A complete system, consisting of projector, screen, and interfacing, comes in at less than $6,000.

FOR DATA CIRCLE 314 ON READER CARD

3M
St. Paul, Minn.
COM **Booth 837**

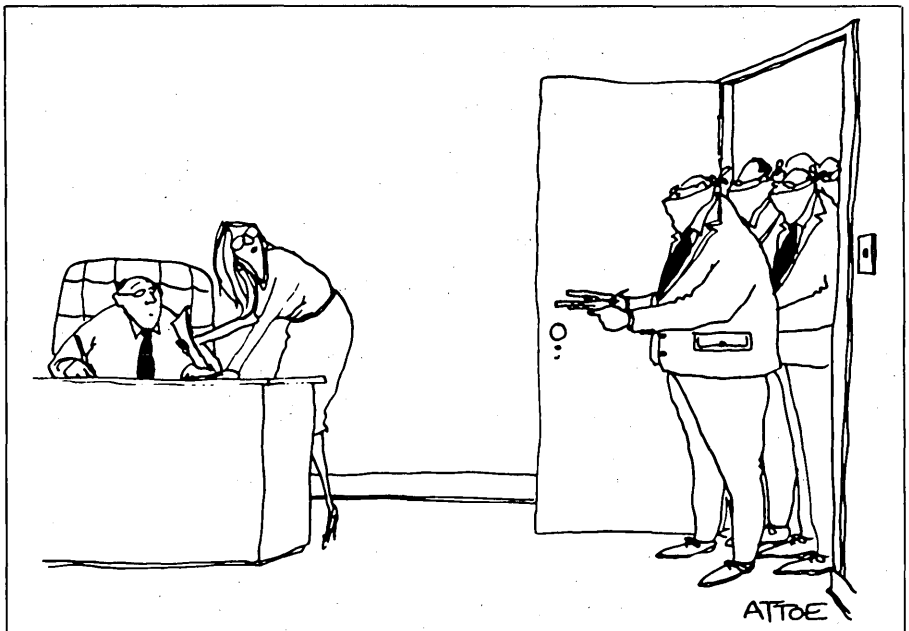
The Series 720 Computer Output Microfilm family includes both on-line and off-line models. The high-speed COM systems produce processed, dry, cut microfiche. The systems can be connected to an IBM or compatible mainframe through byte or block multiplexor channels, or a selector channel. The units are intended for medium to large shops; the model 721 sells for $95,000, and the model 723 is 116,000.

FOR DATA CIRCLE 315 ON READER CARD

ZENTEC CORP.
Santa Clara, Calif.
SMART TERMINALS **Booth 5116**

Zentec will show its Series 8000 of programmable smart crt terminals intended for oem customers. The microprocessor-based terminals can be configured with either 12-inch or 15-inch antiglare screens. Prices range from $1,400 to $2,000 in quantities of 100 to 249 per year.

FOR DATA CIRCLE 316 ON READER CARD



"Nobody move! We're the competition and we're taking over!"

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CARTOON BY STEVE ATTOE

CIRCLE 125 ON READER CARD ▶

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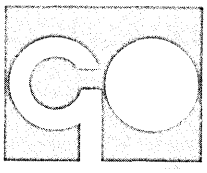

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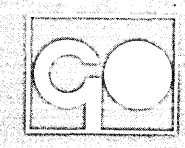

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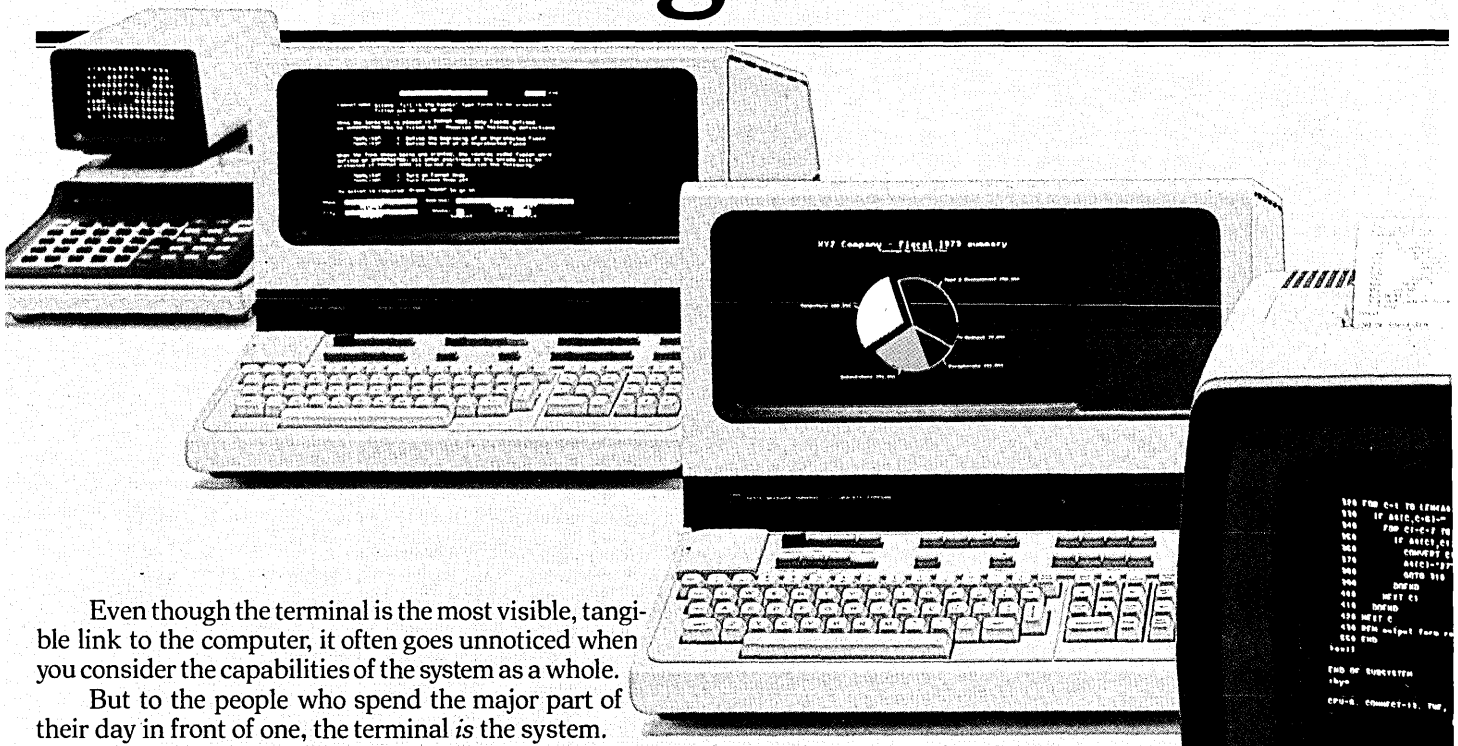

Even though the terminal is the most visible, tangible link to the computer, it often goes unnoticed when you consider the capabilities of the system as a whole.

But to the people who spend the major part of their day in front of one, the terminal *is* the system.

That's why at HP, we design our display terminals from the users' point of view. Because the easier it is for them to do their jobs, the more jobs they can do. And the better they'll be able to do them. The result? A more productive system all around.

Matching the terminal to the job.

Most data entry jobs call for a lot of time in front of the terminal—usually by people with little or no computer experience. That's why we offer terminals with easy-to-read displays; simple, typewriter-like keyboards with screen-labeled control keys for easy access to a wide range of functions; and block mode on most terminals to make editing a breeze.

If you do much program development, you need to view and re-view a lot of data. So we build our terminals with off-screen storage and scrolling capabilities to help you get the entire picture. Some models have built-in thermal printers for instant hard copy at the touch of a key. And our newest terminal has two data communications ports and a split screen capability that lets you compile, execute, monitor and edit programs as if two stations were available.

Data analysis? Take a look at the capabilities of our graphics terminals. Without writing any new software for your computer system, you can plot line graphs, bar charts, logarithmic graphs and more. All with just a few simple keystrokes. Add one of our high-performance, multi-color plotters and you've got a full-function graphics workstation.

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All HP display stations are designed with high resolution character cells to give you a sharp, clear picture. Some models have soft keys that you can define yourself for specific or repetitive tasks; line drawing modules that make it easy to design familiar forms on the screen; and local mass storage to turn your terminal into a true local workstation. Even international character sets are available.

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your computer system?

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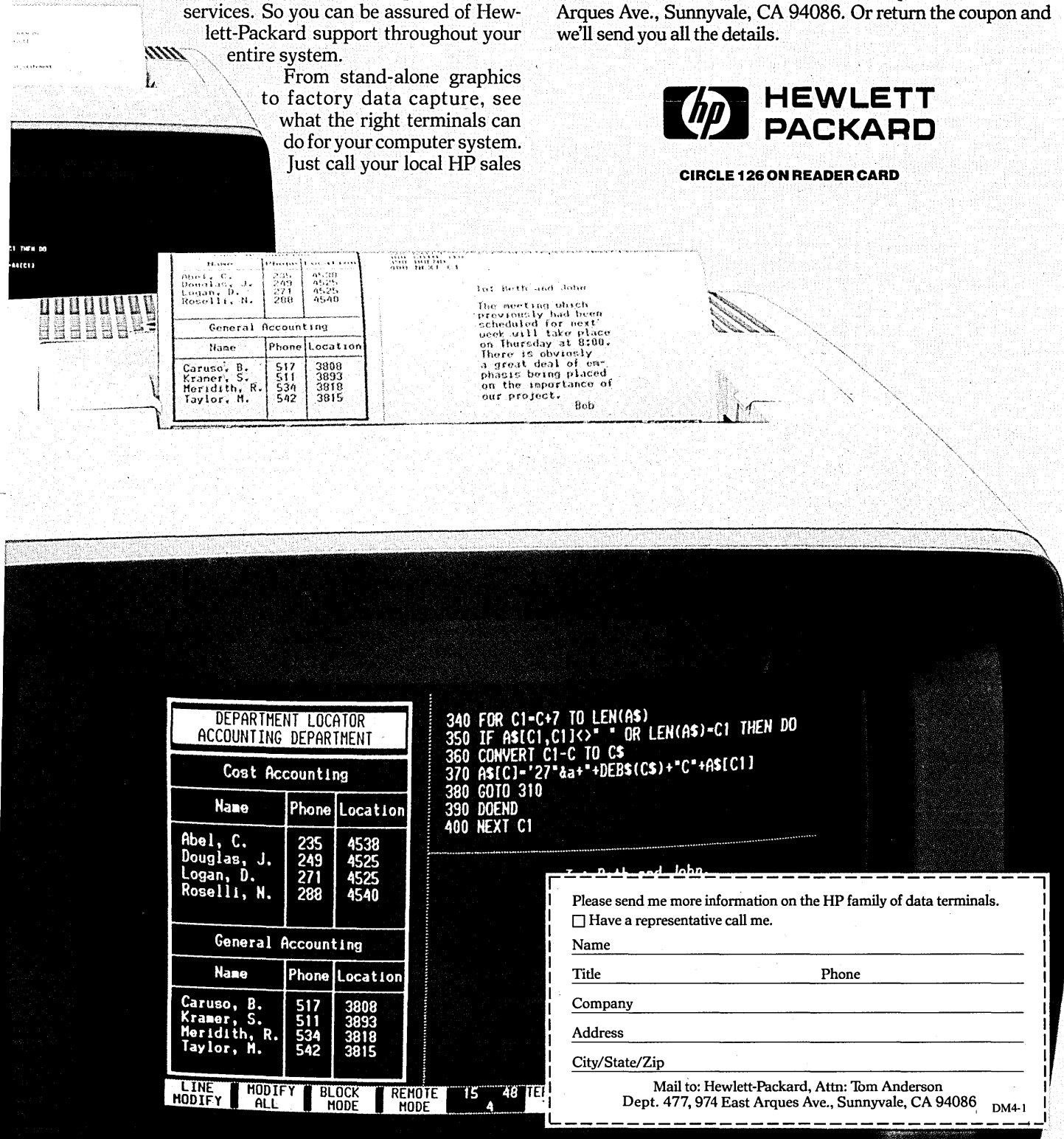
CIRCLE 126 ON READER CARD



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Texas Instruments' revolutionary Solid State Speech* integrated circuits provide the TCS/500 with its unique voice response capabilities. Their low cost, extremely high reliability, and excellent voice quality make these components a natural choice for our 100% solid-state product line. Plug-in line control modules permit simple expansion capability (from 1 to 118 lines) and eliminate costly communications equipment such as external 103/113 and 403/407 modems. Several standard TCS/500 models are available, including the TCS/506 (shown below), a complete 10-line voice response system with 360-word vocabulary, multiple host communication ports, and multi-terminal communication software — fully self-contained in a compact 7-inch chassis.

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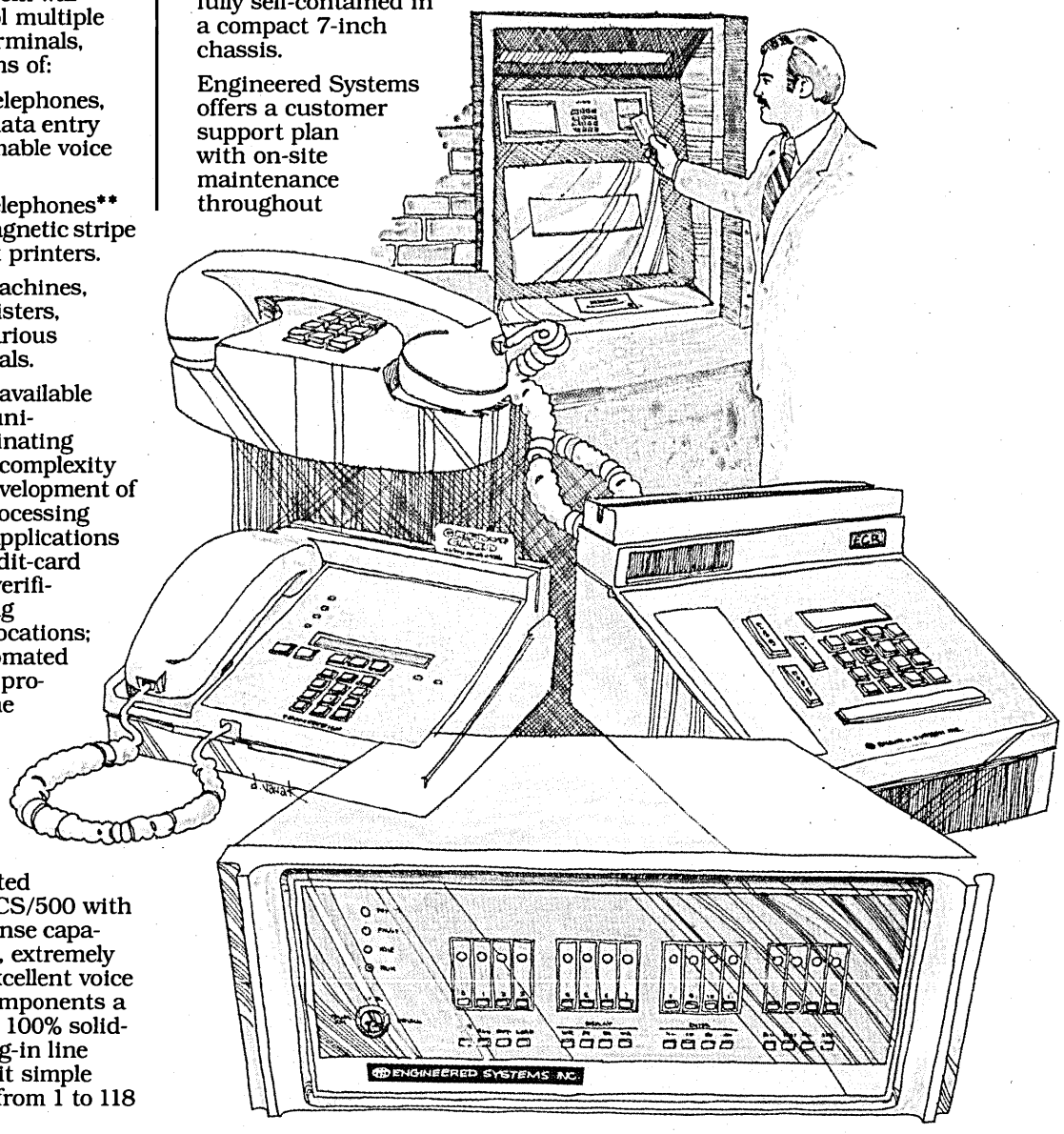

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CIRCLE 127 ON READER CARD

Good requirements definition can be an important factor in the success of a system development project.

PINPOINTING REQUIREMENTS

by Laura Scharer

One of the most common reasons systems fail is because the definition of system requirements is bad.

Why are we consistently unable to produce a good statement of requirements? Because it is difficult; we have a poor attitude about working with users (and vice versa); our expectations for this phase of systems design is different from the users' expectations; we let the situation control us; and we don't always use the techniques that are most appropriate.

More specifically:

- Sophisticated problem solving is required to produce good statements of requirements. Problems must be translated into corrective goals, which must be translated into solutions, which must in turn be reduced to functional terms. There is no guarantee that the functions will create the desired results.
- The articulation of requirements is unusually difficult. Functions and processes are not easily described.
- System requirements change, and the definition must be able to absorb these changes.
- Tools and techniques for optimizing the definition process are not generally available.
- Heavy user involvement can introduce interpersonal and project management problems.
- User motivation is difficult because reinforcement for their work is traditionally postponed until the implementation stage, by which time they have learned to expect disappointment.
- The definition process can become highly political.
- Definition is mentally taxing.
- Compromises which will eventually disenchant some of the users and analysts are required.
- We have no real yardstick other than the ultimate success or failure of the system; there is no way to judge the quality of our definition.

While we can't expect these difficulties to disappear, we can minimize their impact.

Analysts and users harbor grave doubts about each other (Table I), and the origins of these attitudes are obvious. Failure encourages blame. Users are disenchanted because we consistently bungle new system development; we are disenchanted because we alone are blamed for the failures. Somehow, even when users participate heavily in the definition process, they succeed with the help of unquestioned corporate mores in abdicating responsibility for system results. In other words, users provide the system definition but the systems people are responsible for it.

However, we should not expect users to metamorphose into analysts just because they are sitting on a project team. Remember:

- Assume that the user is trained in his own functional field but not necessarily in systems skills. Give him work assignments involving existing system education and new system definition—work that he can perform better than an analyst just because he is a user.
- The user's primary objective on the project is to protect his own interests. Let him.
- If you have recruited good users for the project team, they are usually good workers who receive recognition in the company and have confidence in their own abilities. In other words, they have delicate egos. It is very easy to insult users' intelligence by appropriate work assignments: we can't give them all the dirty work.
- The systems group, although responsible for project management, has no real organizational authority over users on the project team. The users can't be forced to do anything for the project.
- Users need periodic, if not constant, attention. After we've received all their input, we can't leave them hanging. Provide written status reports on a regular schedule and contact them personally whenever possible.

Another problem is that users and analysts don't even share a common goal for the definition process. Certainly both groups would agree that the objective of requirements definition is to produce a specification of what the system will do.

ANALYSTS DEFINE SYSTEM

Let's define what the system will do from the analyst's point of view. We are to produce this definition, but we impose some conditions on it. For one thing, the definition must be translatable into a system design. This requires that it be a functional specification, expressed in terms of processes, outputs, inputs, and data structures. We want the definition to be precise, clear and not open to misinterpretation. Quite understandably, we hope that the definition will be complete, because design is optimized when all features are known and can thus be integrated neatly into databases and programs. In the best of situations, the specification is frozen so that design, coding, and testing will never have to be reworked.

Now, two important time constraints surface which affect the definition of the system and the system itself. Because the systems group is responsible for the project, we ask that the definition be produced within the time allotted to this project phase. The specification activity to do this must have a definite beginning and end, and the end of this phase must precede the beginning of the design phase. Additionally, we must insist that the system thus defined can be implemented within project schedules and budget, both of which are usually preset before definition begins and thus before the real size and complexity of the system are known.

Finally, analysts are interested in developing a definition for a good system. We want to specify a system that is not only technically feasible but also elegant. We want integrated functions, clean and simple databases, efficient computer runs, and economical output.

Now, let's start again, this time from the user's point of view.

The users seem to be more satisfied with a qualitative definition which, in many

cases, specifies the system in generalities and in terms of benefits to be derived. To reach the level of detail that analysts desire, the users must actually enter what they consider to be problem solving, or design (how) mode: they must arrive at functions that will solve their problems. They can't quite understand us when we distinguish our whats and hows: we're usually thinking a step ahead of them (Table II).

The qualitative nature of the user's definition suggests that it is to be interpreted, to be fleshed out in greater detail, at a later time. But the users, since you are asking them what they want and since they're telling you, expect that all requests will be met in the new system. They are often sincerely puzzled by arguments of technical feasibility or advisability, especially because they usually believe firmly that they need all requested features in order to achieve their stated goals.

Flexibility is a key consideration for the users. The system specification must be changeable with their needs, as must be the system after it is developed. This emphasis on flexibility also suggests that the users do not consider system definition to be a front-end activity with a definite ending point; it becomes, in essence, an ongoing process.

Finally, users are simply interested in defining a system that will work. They are not as interested in the project budget as they are in the impact of the system on their individual budgets. They want the system to perform specified functions without flaw, to be operationally efficient for their people, and to achieve the subjective goals.

TABLE II

"WHAT" THE SYSTEM IS TO DO.

PROBLEMS

TRANSLATING BUSINESS PROBLEMS INTO BUSINESS OBJECTIVES. TO THE USER, "WHAT" THE SYSTEM IS TO DO.

Example:
Problem: Unavailability of inventory causes lost sales of $1 million annually.
Objective: Increase stock availability (the user's "what").

OBJECTIVES

TRANSLATING BUSINESS OBJECTIVES INTO FUNCTIONS WHICH WILL ACCOMPLISH THE OBJECTIVES. TO THE USER, "HOW" THE SYSTEM IS TO WORK. BUT TO THE ANALYST, "WHAT" THE SYSTEM IS TO DO.

Example:
Function: Allocate inventory to warehouse using specific allocation algorithms (the user's "how," but the analyst's "what").

FUNCTIONS

TRANSLATING FUNCTIONS INTO COMPUTER HARDWARE, DATABASE, AND PROGRAM, DESIGN. TO THE ANALYST, "HOW" THE SYSTEM IS TO WORK.

Example:
System design: Design of files and programs (the analyst's "how").

COMPUTER SYSTEM DESIGN

TABLE III

THE OBJECTIVE OF REQUIREMENTS DEFINITION

Objective: To define what the system will do.

ANALYSTS	USERS
Funtional definition	Qualitative definition
Precise	Interpretation to be expected
Complete	All requests to be met
Frozen	Flexible definition
Definition produced within allotted time	Definition an ongoing process
Resulting system implemented within project schedule and budget	Favorable impact of system on departmental budgets
Good system	System will work

USERS DEFINE SYSTEMS

Users who try to define a system with the analysts' goals in mind can find themselves in a predicament, particularly when one of the following is true:

- The system in question is just not definable by traditional means.
- The system can be defined but the user doesn't really know what he wants.
- The user knows what he wants but can't articulate it.

To defend themselves—to produce a system specification that will satisfy the analysts despite the above conditions—users have developed strategies which by now are classic.

The Kitchen Sink. This strategy, employed by users who throw everything into their system definition, has as its outstanding characteristics exaggeration and a protective overstatement of needs. An overabundance of reports, exception processing, and politically motivated system features are also symptomatic. The Kitchen Sink also provides a marvelous cover-up for the user who doesn't know what he wants but who can bury that fact in the sheer volume of his requests.

Smoking: Known also by its full name, "Smoke Gets in Your Eyes," this strategy is practiced by the user who sets up a smokescreen by requesting 10 system features, knowing that he really wants only one of them. The nine extra requests give him bargaining power. The Smoker is usually a rather experienced user who is consciously manipulating the definition process (as contrasted to the Kitchen Sink user, who is usually naive in believing that he really needs everything he asks for). In both cases, the full set of system requirements submitted by the users must be reduced to one that is necessary, sufficient, manageable, and achievable Surprisingly, despite his premeditation, the Smoker is easier to work with because he has a realistic idea of what he really wants.

The Same Thing. Sometimes a euphemism for the embarrassing words, "I don't know," sometimes a sign of laziness, the Same Thing is manifest by the statement: "Just give me the same thing I'm getting

News from Philips Information Systems

MICOM 2001

THE FIRST OFFICE PROBLEM IT SOLVES IS WHICH WORD PROCESSOR TO GET.

In a recent independent survey, Micom 2001 beat Burroughs, Dictaphone, Vydec and Xerox in overall performance. Read the facts you should know before you commit to any new word processor.

Nobody can tell you more about word processors than the people who use them. And users told The Office Products Analyst, an independent monthly newsletter devoted to cost/performance analysis, that Micom 2001 rated tops where it counts most.

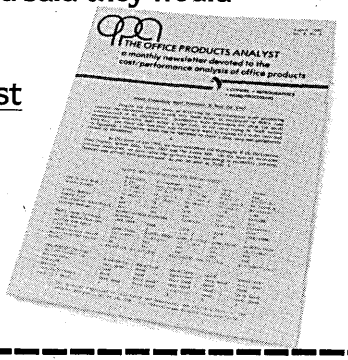
• **Editing capability.** Micom 2001 offers 18 important editing features, including document assembly and column manipulation abilities. (The 2001 also offers an optional math package for even greater versatility.)

• **Reliability.** Seventy percent of the sample reported downtime of 1½ hours or less per system per month. (Not surprising when you realize that Micom 2001 is made by Philips, a twenty-billion-dollar, worldwide leader in the electronics industry.)

• **Service.** Micom's operator training program and service response time both got outstanding marks from 2001 users. (A simplified command structure makes the 2001 extremely easy to operate. Most systems went into full operation within a month!)

• **Cost/performance.** Micom got top ratings for productivity, yet the most expensive version of the 2001 costs less than its competitors—Burroughs R III, Dictaphone Dual Display, Vydec 1800 and Xerox 860.

Most telling fact of all—100% of the Micom 2001 users questioned said they would choose it again! For a FREE copy of The Office Products Analyst survey and literature about the reasons Micom 2001 belongs in your office, use the coupon below.



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CIRCLE 128 ON READER CARD

Users provide the system definition, but the systems people are responsible for it.

now." The statement may be qualified in many ways, such as, ". . . but more accurately," or ". . . more timely," or ". . . but computerize it." The user who employs the Same Thing is often quite satisfied he has told the analysts everything they need to know to proceed. The only thing the analysts really know, however, is that the user probably isn't aware of what his current system does, and that he doesn't want to take the time for an introspective review of his own functions and problems. Here, the systems group has little chance of succeeding because only the user can fully discover his own needs and problems.

Each time we witness one of these syndromes, we are reminded that despite our prodding and despite users' (usually) good intentions, they just don't seem to produce the kind of system specification we envision. It would be easy to play the blame game here and conclude that users are not capable of system definition, but it would be more productive to reexamine our goals for the definition process and to ask if our objective is possible to achieve.

A concept known as definability can help us answer that question.

TABLE I

THE USER - ANALYST RELATIONSHIP

HOW WE SEE USERS	HOW USERS SEE US
They. . .	We. . .
Don't really know *what* they want.	Don't understand "the business."
Can't articulate what they want.	Handle company politics awkwardly.
Have too many "needs" which are politically motivated.	Try to tell them how to do their jobs.
Want everything right now.	Can't translate a system definition into a successful system.
Can't prioritize needs.	Say no all the time.
Want "me first," not company first.	Place too much emphasis on technicalities.
Refuse responsibility for the system.	Are always over budget.
Are unable to provide a definition for a system that will work.	Are always late.
Are not committed to system development projects.	Ask users for time and effort even to the detriment of their primary duties.
Are unwilling to compromise.	Set unrealistic standards for requirements definition.
Can't remain on schedule.	Are unable to respond quickly to legitimately changing needs.

CAN WE DEFINE IT?

Definability is the ability of a system to be defined; it is not a repeat of the "feasibility" question (can a computerized solution to this problem be developed at all?). Rather, it assesses the relative ease or difficulty of defining this system in this environment, and is assigned a loose value on a scale from "low" to "high." By assessing definability, you have an opportunity to establish more realistic goals for the definition process and to select definition techniques that are most appropriate to your situation.

Definability is affected by characteristics of the system itself. For example:

Type of system. Transaction processors and reporting systems—with very traditional accounting systems at one extreme—are functionally specific, finite, and quite tangible, and hence highly definable. At the other extreme, management support systems, decision support systems, simulators, and other systems that may be lumped together as "management information systems" are by nature less definable, because their purpose is to support a dynamic and changing management environment.

Size of system. Size is measured in several ways, including:

- number of functions performed
- number of departments affected
- number of individuals contributing to the definition
- number of subsystems
- number of system interfaces

As size increases, definability decreases and the possibility for error and omission is greater. There is also a hesitancy to attack each element of a very large system with the thoroughness that is possible with smaller systems.

Complexity of system. Complexity decreases the definability of a system. It is determined by:

- number of variables
- degree of interdependence of the variables
- number of databases accessed and updated
- difficulty of logic
- degree of flexibility
- need for specialized knowledge (e.g., mathematical, statistical, forecasting)

Similarity to existing systems. Definability is enhanced when experience data for similar systems is available.

Environmental factors can also have an overriding influence on the definition process. These include:

1. *Users' understanding of their own needs*. Definability is positively affected by users who know what they want, or who at least can work with analysts to discover what they want.

2. *Consensus among users*. Definability is increased when each user department makes an effort to gain a consensus opinion before going to the systems group with requests.

3. *Systems' understanding of user needs*. Analysts who know the business application favorably impact definability.

4. *Ability to communicate ideas*. Definability often suffers because users and analysts cannot communicate with each other. Development of system models, or use of a structured documentation format which uses an unambiguous language, can help.

5. *Accessibility to all affected users*. "Representative" user participation is usually mandatory because of the size of the user community affected by a new system. But definability is enhanced by direct user contact, so analysts should make an effort to talk to as many users as possible.

6. *Systems development experience*. Definability increases when analysts and users have experience in new systems development. Experienced participants have more realistic expectations as well as the knowledge and skills that contribute to successful definition.

7. *Personalities*. Good users improve definability. A good user is willing to make decisions, sticks by his decisions, cooper-

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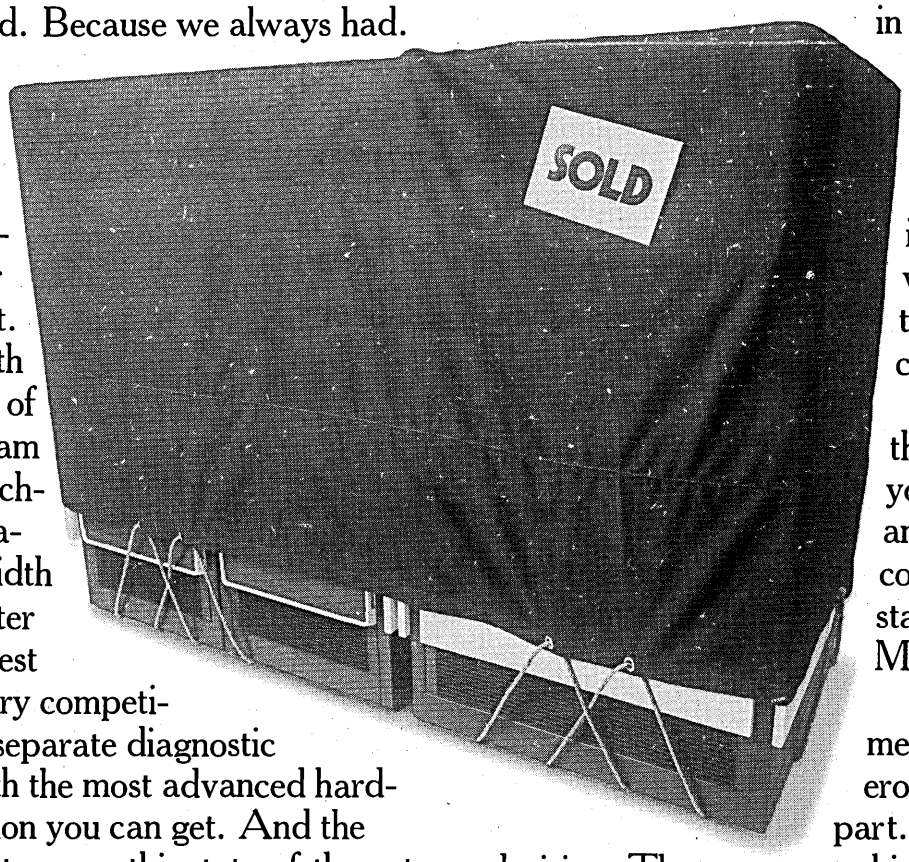

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We take care of our own.

CIRCLE 129 ON READER CARD

Definability is enhanced when experience data for similar systems is available.

ates, and thinks positively and aggressively.

8. *Availability of human resources*. Project staffing that places appropriate emphasis on front-end definition by including users and analysts with specification skills is important. More often, however, there are a disproportionate number of programmers on the project team.

9. *Project length*. The longer project minimizes definability because it gives the users more time to change their mind and the environment more time to change around the system.

10. *Schedule*. Definability decreases when inadequate time is allowed for the definition process.

11. *Budget*. Monies allocated to a project translate into available man hours; time for consulting, training, and software aids; and proportion of time assigned to front-end work.

12. *Corporate stress*. Corporate pressure, project visibility, reasonableness of expectations for system results, and the time and budget allowed for a system all influence definability. Unreasonable stress leads to fear, frustration, defeatism, and mistakes, but some degree of stress and attention, some feeling of high-level support and of accountability for results, can enhance the quality of the definition process.

CONTROL THE SYSTEM

Our goal should be to control the system before it controls us. Reduction of the system is accomplished by examining each proposed feature to determine whether it is valid and necessary.

1. Before definition begins, develop a precise scope document which clearly demarcates project boundaries. Obtain written acceptance of project scope from the users, then utilize the scope document to weed out requests that do not belong with this system.

2. Break the system into smaller pieces to be attacked separately. This may increase interface considerations, but it will also increase the possibility for understanding completely each part of the system.

3. Separate transaction-oriented portions of the system from management support sections so they can be considered as distinct entities.

4. Require users to justify each requested feature, in terms of either decisions supported, benefits derived, or money saved.

5. Ask the users to assign a relative priority to each of their requests. This is helpful because it takes the pressure of saying no off the systems group and it provides a framework for partitioning the system into smaller pieces.

6. Find a similar system in another organization and learn as much as you can from their experiences.

7. Reduce the number of variables and of databases affected by the system.

8. Eliminate flexibility that users cannot realistically control. Determine whether flexibility is needed to support changing conditions of normal operations or if it is requested only to handle rare exceptions.

9. Reject a system feature if your equipment or your personnel do not possess the required technical capabilities for implementing it (the technical veto).

10. Reject a system feature if it will consume computer time, disk storage, printer time, or other machine resources out of proportion to its potential benefits (the operations veto).

11. Reject a system feature (or features, taken together) if they cannot be implemented with available manpower within imposed time constraints (the manpower veto).

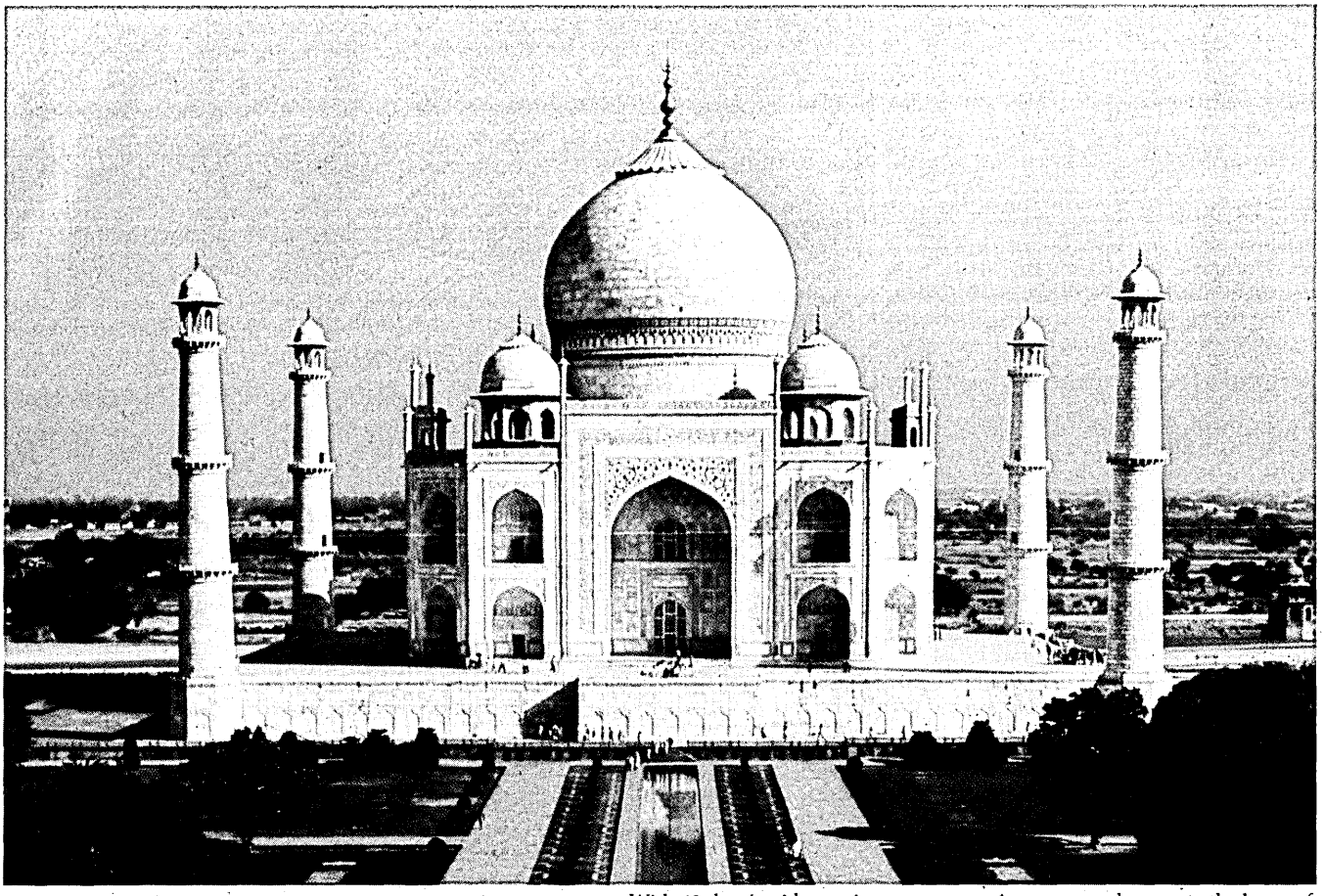
In other words, if you recognize that the system is getting out of hand, speak up. Go formally on record with your recommendations for reduction. Submit amendments to the official project documents describing scope, feasibility, and cost justification, and require user approval of these changes. Because the system may be altered significantly by reduction, the corporate view of the system and the time and money allocated to it may also change, hopefully so that expectations are more realistic than in earlier project phases.

We also have an opportunity to control the external factors. Our goals in controlling the environment should be to surround ourselves with good users, to strengthen the base of knowledge upon which the users and the analysts are building, and to place realistic constraints on the project.

Users heavily influence the atmosphere of a project, so they should be chosen for the project team very carefully. Be sure that every area impacted by the system is represented. Balance the team so that users are equally represented, not only in numbers, but also in rank, authority, and seniority. Select users who can and will truly function as representatives. As representatives, a user must:

- provide regular status reports to his constituents
- give everyone a chance to contribute to the definition and to review formal definition documents
- present consensus opnions to the systems group
- favorably influence his constituents toward the project
- relate well to persons above and below him in his area
- have authority to commit his area in matters

CARTOON BY TOM MASON



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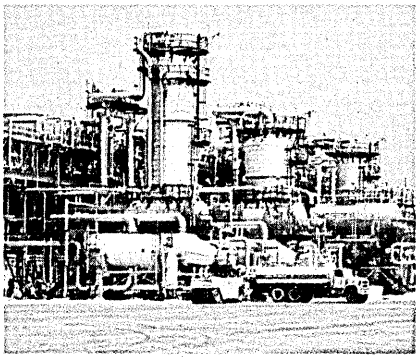

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CIRCLE 130 ON READER CARD

Our goal should be to control the system before it controls us.

such as policy, budget, and interdepartmental procedures

- be accountable for his performance as a representative

Select users who have a thorough knowledge of their functional areas and of corporate policies, procedures, and organizational nuances which could affect definition. Look for users who enjoy being busy, are positively motivated to work on the project, and are organized, flexible, realistic, decisive, responsible, and able to express themselves.

TRAINING THE USERS

You undoubtedly are reading this list with a growing smile on your face because such users don't exist. We can strengthen the background knowledge of project participants by conducting a thorough existing system review with heavy user participation; providing books, seminars, or coursework in this particular business application; and providing formal training in the requirements definition technique which will be used in the project.

All these considerations—from getting good users assigned to the project to training them well—require time, money, and corporate commitment, which lead us to our final opportunity for controlling the environment. We must do two things for ourselves. First, we must take the time to make realistic project estimates for time, manpower, and money. Then, we must be honest when communicating these constraints to corporate management. In this way we can establish a realistic schedule which gives us time to do things right; work with a budget that is adequate for staffing the project and educating participants; gain some credibility with management by sticking to budget and schedule; reduce undue stress.

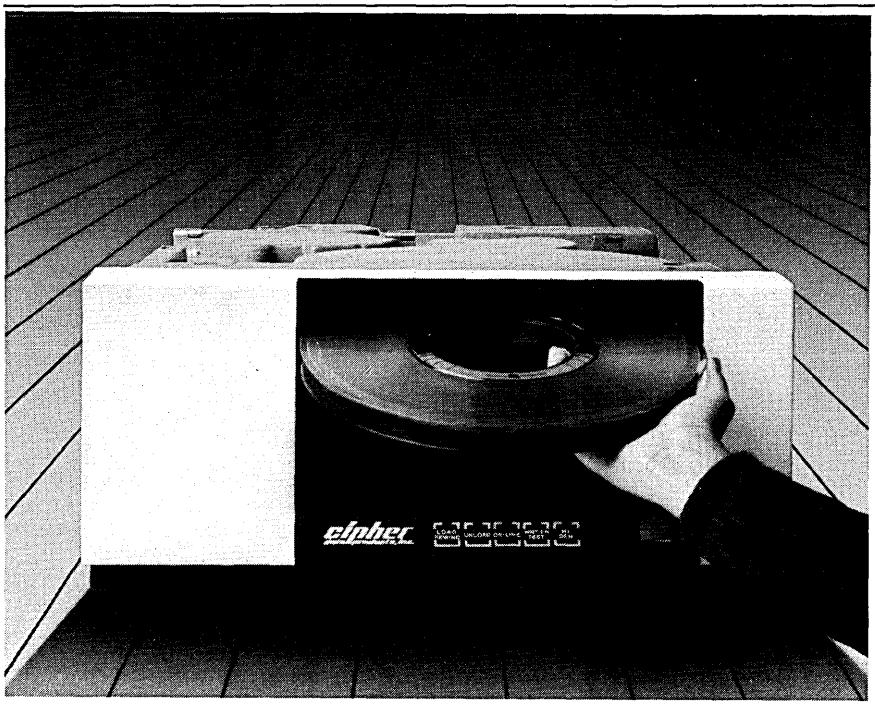
When confronted by an undefinable system, the users are faced with the impossible task of deciding what they want without knowing if what they want will work. They must perform some very difficult activities, such as reducing problem solutions to functional terms, visualizing system components and their interaction and effect on everyday operations, and discriminating between alternative approaches.

Unfortunately, the only sure way to determine if a system will work is to try it. Often users find themselves in the frustrating position of defining and building a system, only to realize that the system they really need will have to come next time.

We must realize that in many cases the users need to try a system before they can define it. Prototyping addresses this problem. With prototyping, construction of a quick and dirty system begins after the bare minimum of a specification has been prepared. This quick and dirty system has one purpose, and that is to show the users what they are asking for, giving them some working knowledge of the results that can be achieved by the system they have defined. There is no attempt to create a good system from the technical or operational point of view, but rather to build a working, scaled model of the critical and most difficult portions of the system. After definition is complete, the prototype will be discarded and replaced by the operating version of the system.

Prototyping is relatively untried, so we don't have a great deal of experience data available. Examination of the concept reveals several potential benefits:

- The prototype system provides a concrete frame of reference for the users and analysts. Most important, the users can see how their definition has been interpreted by the systems



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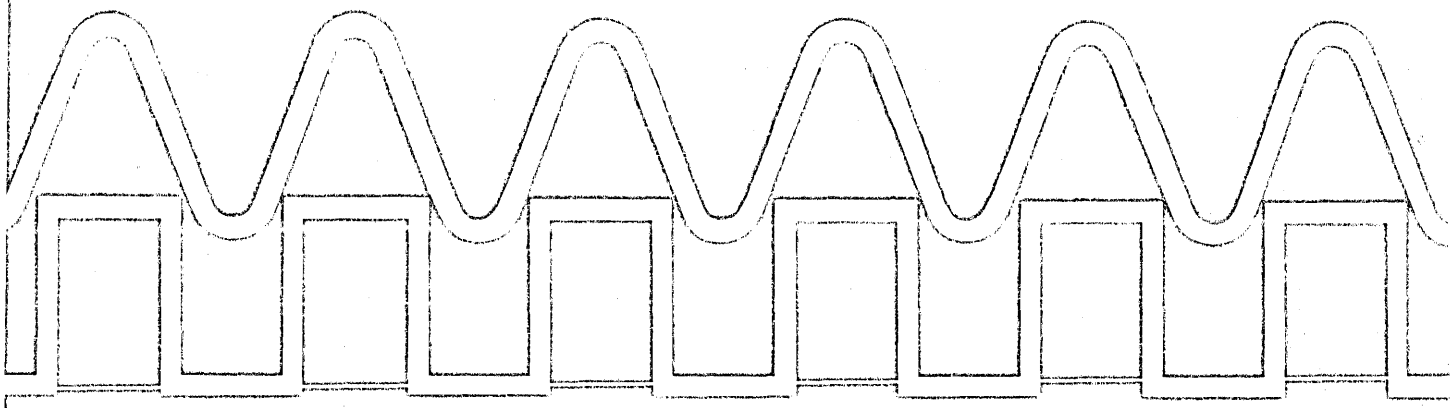
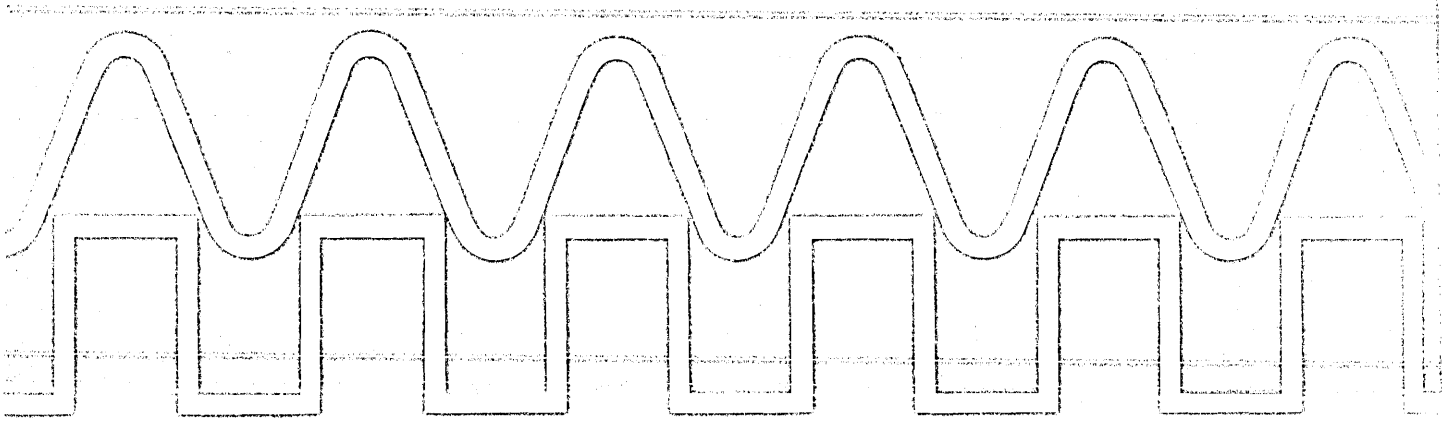


Togetherness.



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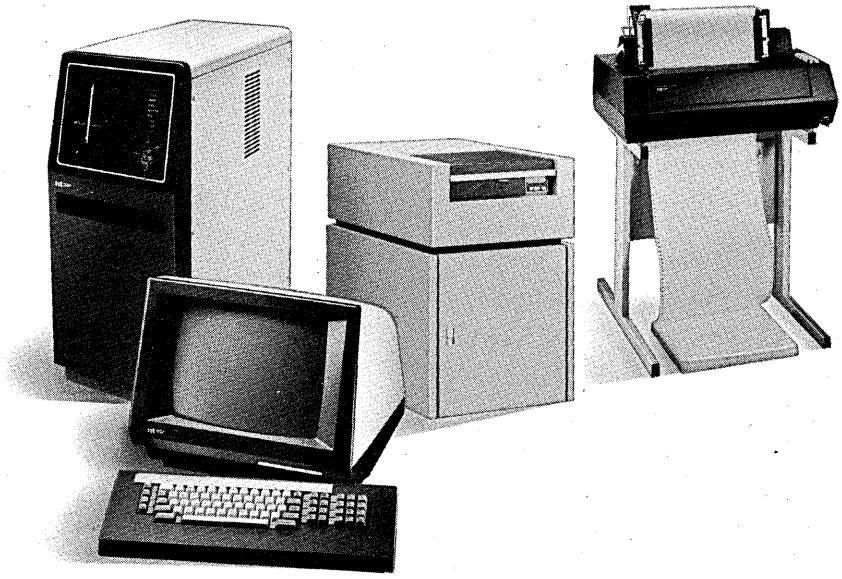

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Unfortunately, the only sure way to determine if a system will work is to try it.

group. The understanding of the analysts is evident by what they do rather than by what they say.

- The time lag between system definition and system demonstration is minimized. System demonstration and implementation are different, but they have traditionally occurred at the same time. This time lag has been very expensive to development projects, since changes are not discovered until considerable time and effort have already been invested in design and coding.
- Definitional changes can be incorporated into the model rather rapidly, encouraging active user participation and enthusiastic feedback.
- Prototyping is more attuned to the normal style and work habits of the users—usually managers—who sit on the project team. Emphasis is placed on active, hands-on evaluation of a working system rather than passive study and review of written documents.
- The technique provides at least some programmers—the ones working on the prototype—with closer user contact and longer project involvement, resulting in greater understanding of the permanent system.
- Experience data gained during prototyping can favorably influence the design of the permanent system.

There are, of course, potential drawbacks. Prototyping may be overkill for very simple systems and yet too involved for the whole of an extremely large system. Prototyping is unproven, quite different, and potentially expensive, so management support for the technique can be lacking. In addition, prototyping is not an academically pleasing technique. Distinctly bounded project phases are absent, and the prototype itself replaces the formal documentation which traditionally evolves during the definition stage. Finally, prototyping is so new that the high-level programming tools and the personnel skills required to perform prototyping are not generally available.

WELL-DEFINED APPROACH

Systems that promise to be difficult to define require an orderly, methodical approach to needs analysis and requirements definition. In these instances, functional definition will occur in a more traditional mode, as a bounded, front-end project phase, with development of an official written specification for the system.

In selecting a definition technique for these cases, we will want one which is repeatable (based on general concepts which can be applied to many situations), productive (efficient use of analyst and user time), and which, of course, produces a high-quality system definition.

We have several formal methodologies available. The characteristics which these techniques have in common are:

1. strict separation of functional specification (what the system is to do) from system design (how the system is to work)
2. development of a definition that is, however, easily translated into a physical system design
3. orderly decomposition of system requirements from the highest to the lowest level
4. representation of system requirements as a logical model expressed in graphic terms, using a minimum of textual explanation
5. active participation of the user groups, with emphasis on the user's role as a review agent
6. strict attention to system boundaries

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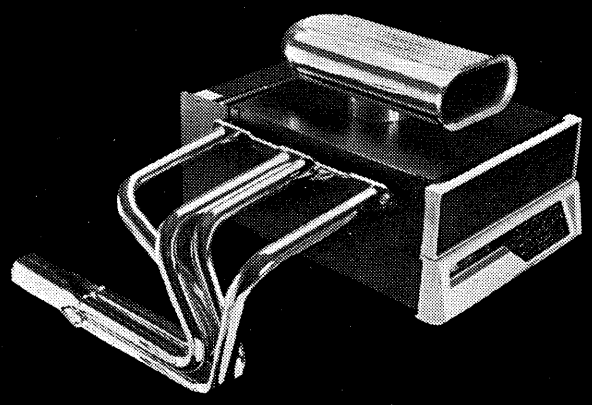

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7. separation of activities analysis from data analysis

8. documentation technique that is relatively easy to change and that records the evolution of the system definition

9. procedure for using the methodology is well defined and training materials are available

Traditional definition, despite its drawbacks, still has its place for one very simple reason: it is familiar, so users feel comfortable with it.

Characteristics of traditional definition are:

1. Textual description is the predominant definition tool, resulting in a specification document that is lengthy, ambiguous, and boring.

2. Top-down decomposition is not a requirement, and as a result, functions are described to inconsistent levels of detail.

3. Requirements are presented in list form rather than modeled; dynamic system flows and relationships are lost in the static, piece-by-piece specification.

4. Data analysis is deemphasized, if performed at all.

Traditional definition is also relatively inexpensive, if we consider its cost alone and not the costs incurred during design and coding to make up for inadequate specifications. Also, there is little or no learning curve involved with traditional definition in most organizations.

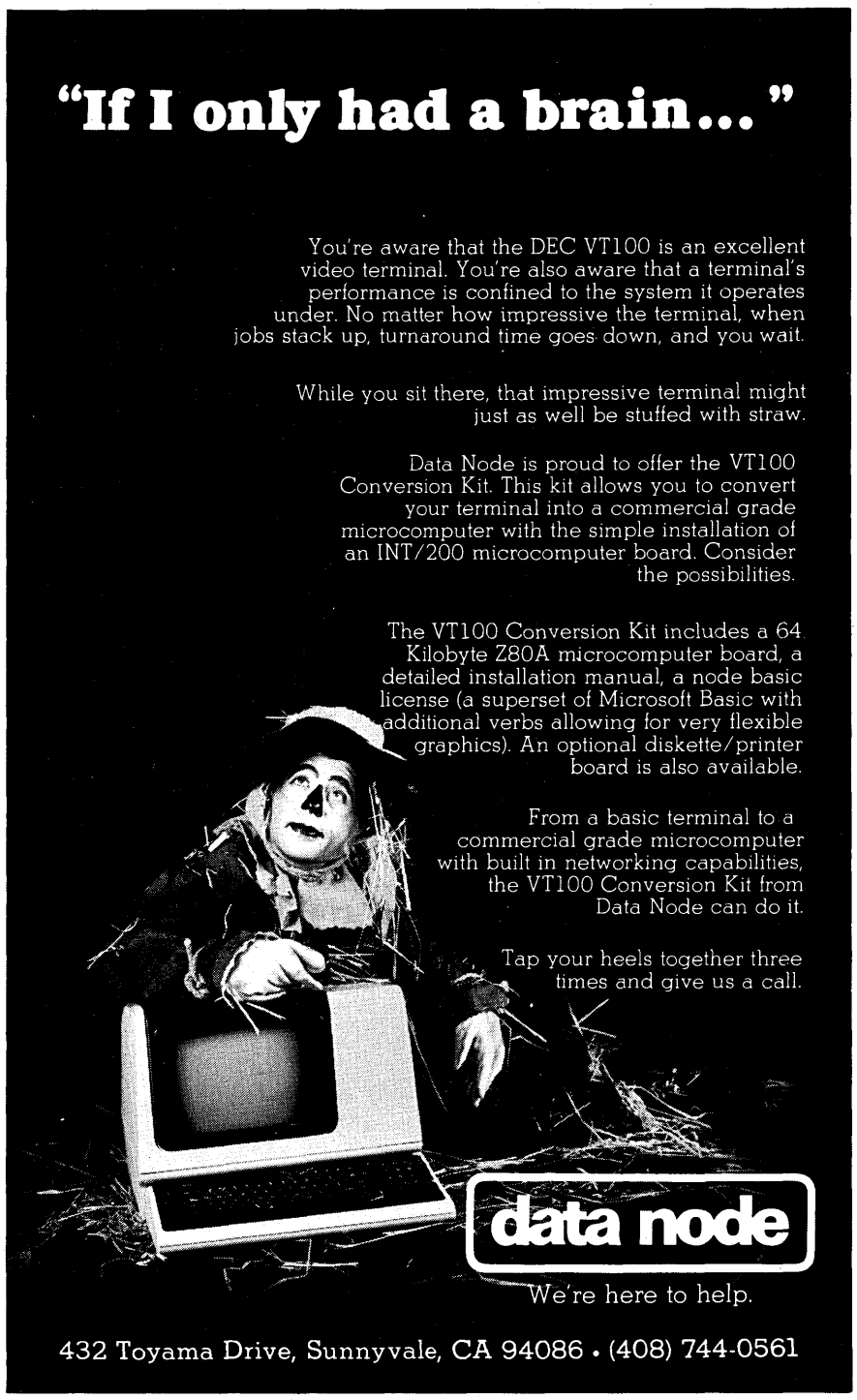
So, because it is comfortable, and perhaps not always by choice, it appears that we will be performing requirements definition using traditional techniques for some time to come. Rather than resigning ourselves to failure, we can borrow some of the important principles of prototyping and the well-defined methods to improve the results of definition activity. And rather than perpetuating the traditional methodologies without improvement, we can subtly begin to change common practice so that we accomplish a transition toward more structured techniques without unduly alienating the users or our managers.

We can begin by placing renewed emphasis on illustration of the functional specifications. Illustration may be in the form of charts or graphs, but should also include visitations to other companies with similar systems, walk-throughs of the proposed system with the users, and simulations of everyday procedures using newly defined functions and reports. And after coding begins, we can provide sample output to users as it becomes available, rather than waiting for official system implementation. Results of incremental testing can thus be used almost as a prototype, providing a concrete point of reference and eliciting comments from users much earlier than under normal circumstances.

We should also encourage use of a systematic approach to definition. We can use top-down decomposition to assure that all functions have been discovered and explored. We can also make a conscious effort to perform data analysis in addition to function analysis, thus providing at least external data needs to the design team.

The initiative for improving requirements definition must be ours, but it is an effort which is sure to be repaid with increased success. *

Laura L. Scharer is a senior systems analyst with O.M. Scott & Sons, Inc., Marysville, Ohio. Her responsibilities include project management, feasibility studies, requirements definition, and user support and training.



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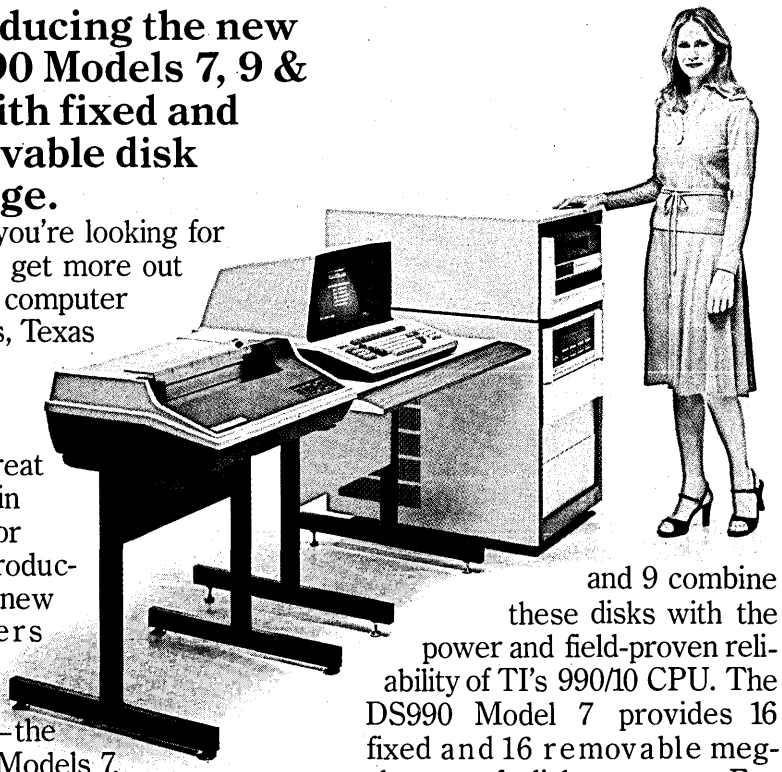

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Flexibility is not forgotten at TI. That's why each of these new DS990 computer systems feature disk storage systems with both fixed storage and a removable cartridge. Fixed disk storage allows easy access to day-to-day information, while removable cartridge disks let users change information when needed. The removable cartridge disk also provides users with a safe, easy, and inexpensive way to back-up information without purchasing another disk drive or magnetic tape drive.

Both the DS990 Models 7 and 9 combine these disks with the power and field-proven reliability of TI's 990/10 CPU. The DS990 Model 7 provides 16 fixed and 16 removable megabytes of disk storage. For greater storage capacity, the DS990 Model 9 includes a disk drive with 96 megabytes of storage — 16 removable and 80 fixed. Should you need it, a second identical disk can be added to either system on the same controller for additional storage.

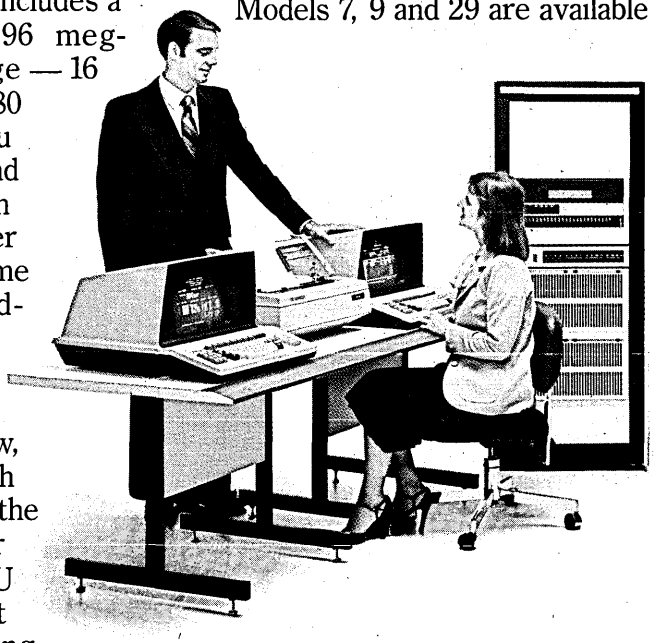
The DS990 Model 29 features a new, low-profile, 60-inch cabinet and offers the processing power of TI's 990/12 CPU — the strongest central processing unit ever developed for a DS990 computer system. With one disk drive, the Model 29 provides 96 megabytes of storage — 16 removable and 80 fixed. And you can double your capacity by adding a second drive on the same controller.

New members of a proven family.

The DS990 Models 7, 9 and 29 fit right into the DS990 computer family. So you can upgrade your system at any time with a minimum of cost and effort, they're upward-compatible with the other members of the DS990 family— from the microcomputer-based Model 1 to the highly-advanced Model 30.

With proven software.

As members of TI's versatile DS990 family, the new Models 7, 9 and 29 are available



xtra Storage for
; Family.

with proven software, including COBOL, BASIC, FORTRAN, RPG II and Pascal. They also have valuable time-saving software utilities, including a powerful data base management system with query and report-generation facilities as well as TIFORM, TI's uniquely efficient screen-formatting language. Word processing software is also now available to let these systems perform a wide variety of office-oriented tasks.

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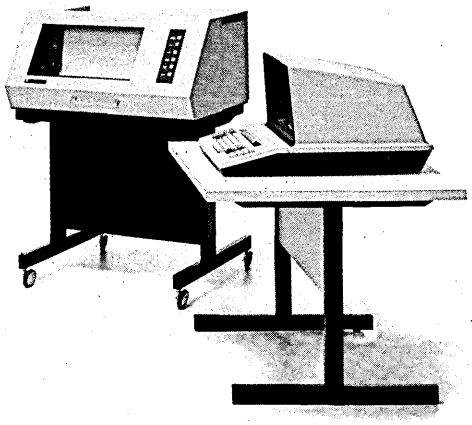

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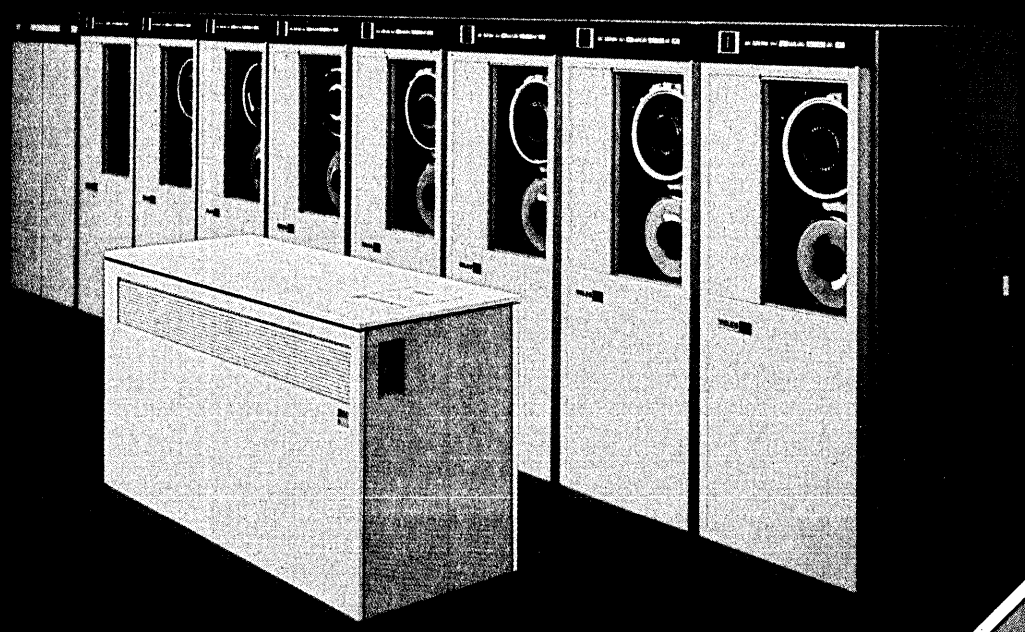

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A cartoonist's-eye view of the business world.

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"The bank said they wanted my business, so they took it."

"Crenshaw has been showing signs of unrest lately."

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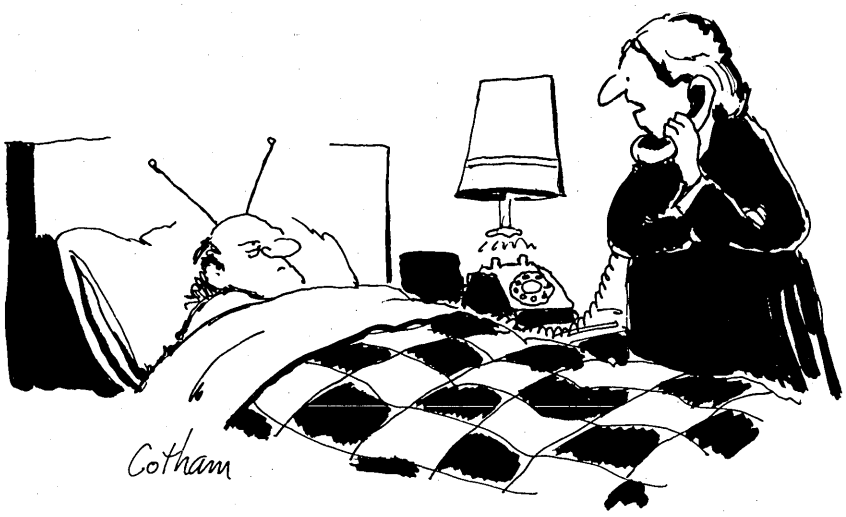
"As usual, Strayhorn, you've gone straight to the wrong person."

"I believe I can dispel any notions you might have."



"Harold won't be in today! He has some kind of bug."

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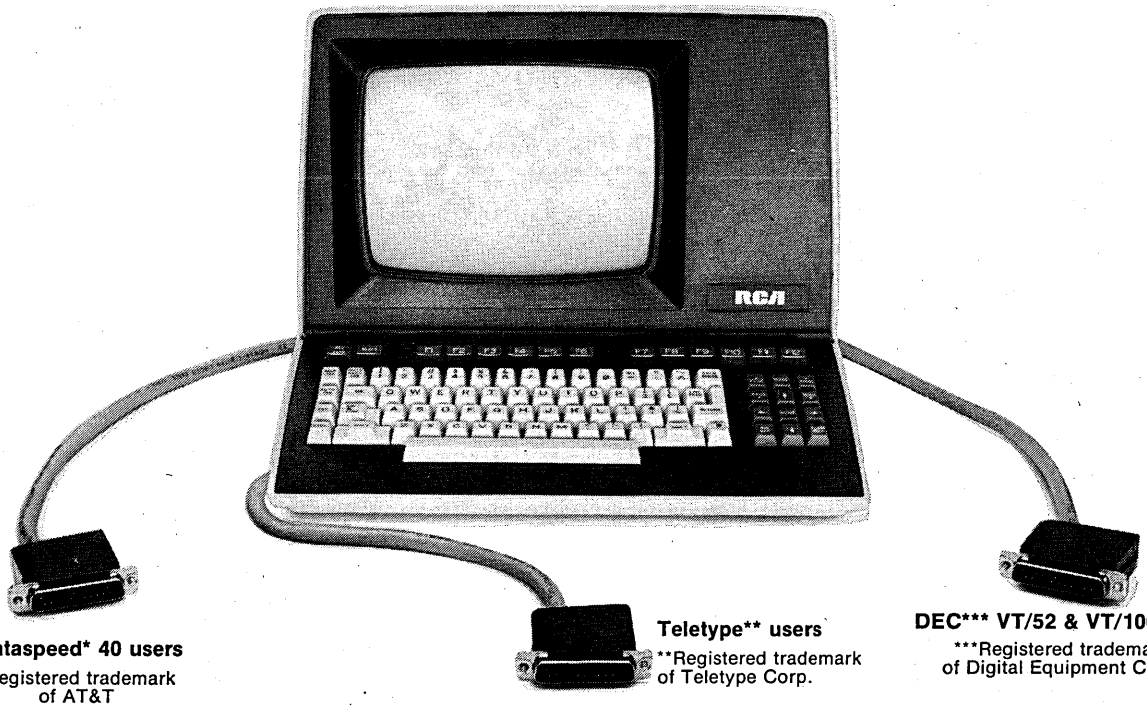
CARTOONS BY FRANK COTHAM

THE VERY VERSATILE RCA CRT.



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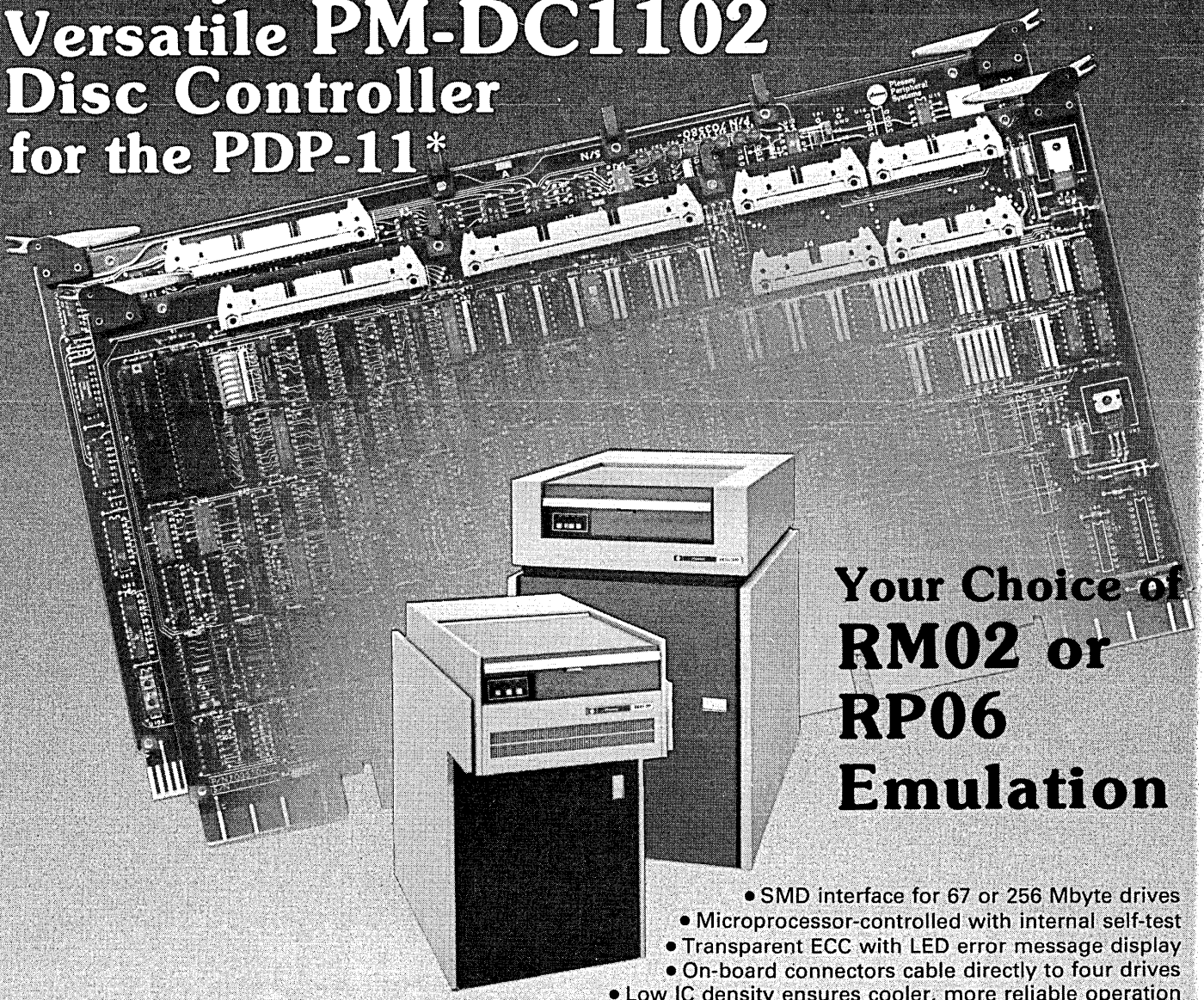
Plessey's Versatile PM-DC1102 Disc Controller for the PDP-11*



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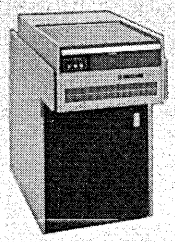
- Cost savings of 50% compared to RM02 or RP06 when configured into disc subsystem

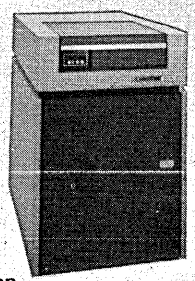
PM-DS02D (RM02 emulation)



Plessey's PM-DS02D disc subsystem consists of the PM-DC1102 controller and one 67 Mbyte PM-DD11/80 SMD drive that has a proven history of reliability and data integrity. The PM-DS02D subsystem provides complete software and media compatibility with DEC's RH11/RM02 subsystem. The PM-DC1102, in this configuration, can directly support four 67 Mbyte disc drives for a total system capacity of 268 Mbytes. Disc pack files created on either the PM-DS02D or the DEC RM02 can be used interchangeably.

PM-DS06E (RP06 emulation)

The PM-DS06E consists of the PM-DC1102 disc controller and one 256 Mbyte PM-DD11/300 SMD disc pack drive with cables. The PM-DS06E provides for expanded capacity RP06 emulation (256 instead of 176 Mbytes) and, by use of minor software patches, is compatible with RSTS*/RSX11M* system software and diagnostics for DEC's RP06 disc subsystem. Up to four 256 Mbyte PM-DD11/300 disc drives may be cabled directly to the controller for a maximum system capacity in excess of 1000 Mbytes.



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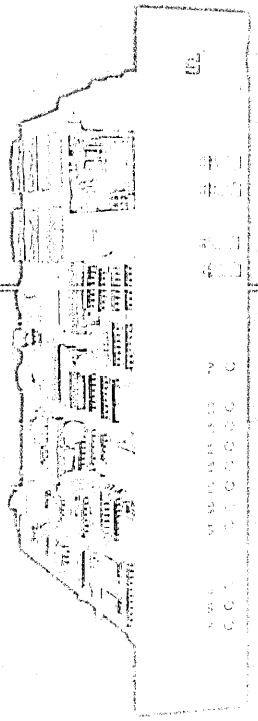
Compact, Convenient and Cost Effective



Compact
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- high density shelf mount, up to 8 modems in only 10½" vertical rack space.

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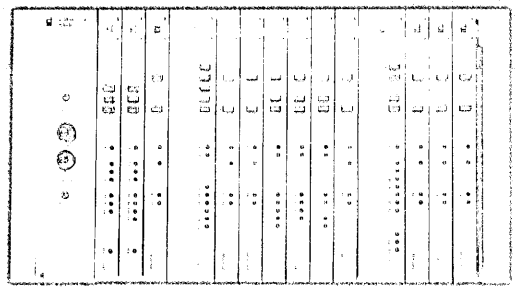
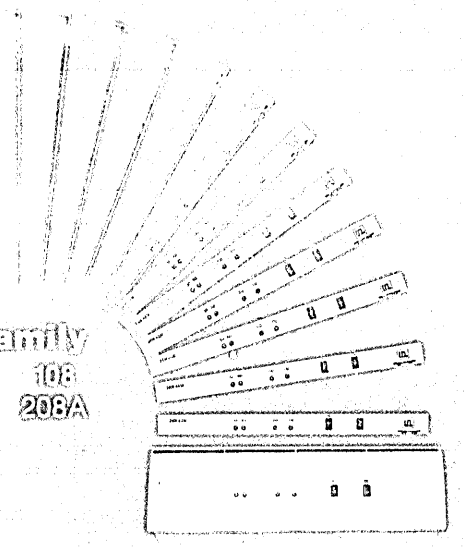
- the same compact modem module fits both standalone and rack mount configurations without modifications.
- can be mixed in the same shelf with other DataComm modems... any speed, dial or dedicated.

...with the added feature of DataCommonality.





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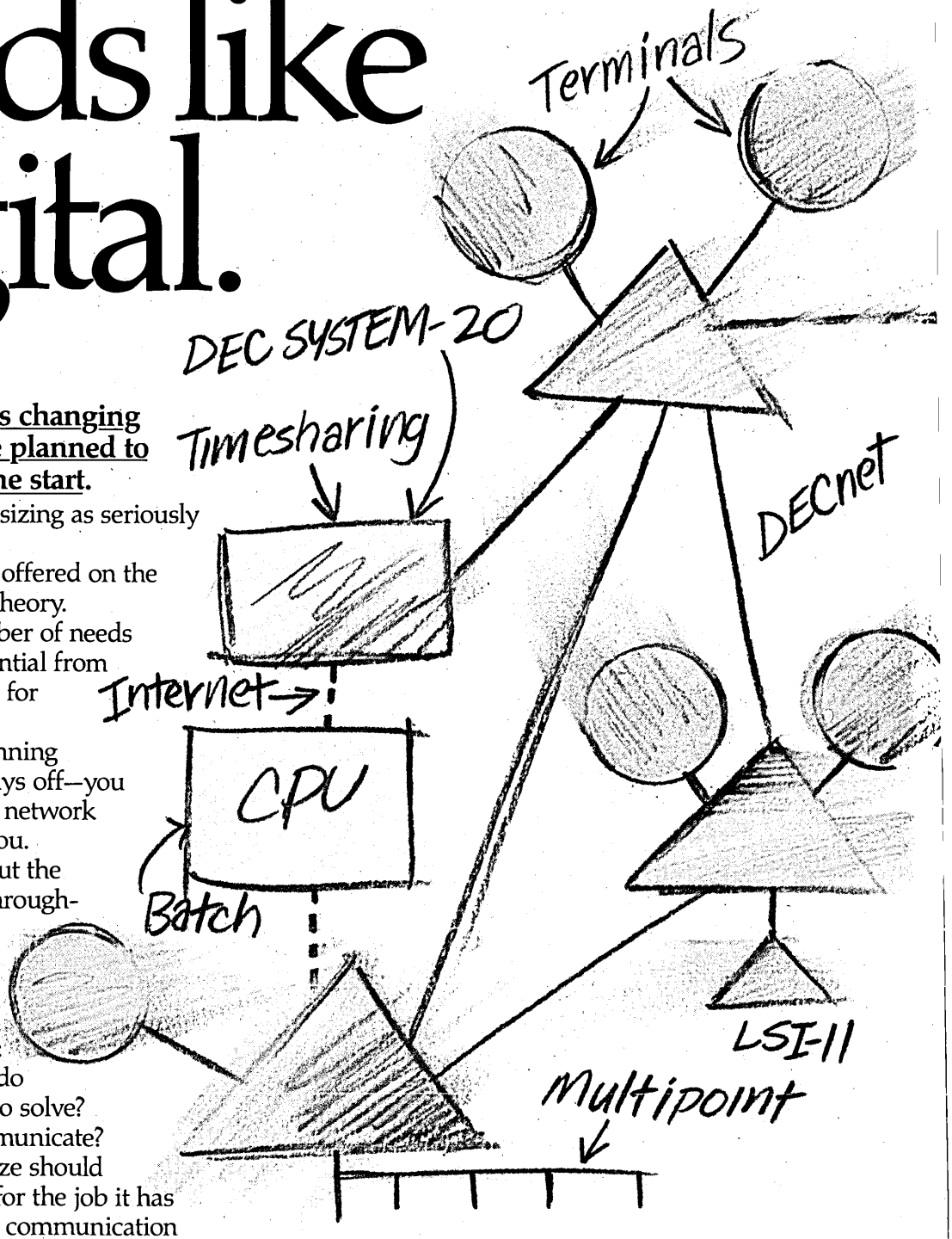

Digital's know-how is changing the way networks are planned to perform right from the start.

Not everyone takes sizing as seriously as Digital.

You'll see networks offered on the "one technology fits all" theory. Networks that fill a number of needs but may not get top potential from your investment or allow for future growth.

At your earliest planning stages—where it really pays off—you can put Digital's years of network experience to work for you.

Experience works out the ideal balance of speed, throughput, cost, data integrity, flexibility, control.

Experience asks the right questions to start with. Basics such as: What business problem do you want your network to solve? What systems must communicate?

To specifics: What size should each individual node be for the job it has to do locally? How much communication

redundancy should be planned to avoid downtime? What options are possible later for future growth?

And how do you meet your requirements most economically?

Digital's range of options.

No other vendor can match Digital's broad range of flexible, cost-effective communications and processor options which allow networks to be sized to your organization's particular needs.

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DECnet,™ Digital's highly functional networking software, provides features not available with mainframe protocols. With DECnet, you have point-to-point, multipoint, and parallel communications.

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When it comes to accurate, up-to-the-minute information, Newsweek magazine knows the value of a reliable source. So when Newsweek needed a data entry input system to keep track of millions of subscribers, they signed up with Nixdorf.

Why Nixdorf? Partly because we're one of the fastest growing computer companies in the United States. And the nation's leader in data entry systems.

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In the design and production of complete systems for either stand-alone or distributed data processing and word processing applications, Nixdorf is dedicated to one simple idea: People who use computers should have computers they can use. Maybe that's why Newsweek and so many other major companies subscribe to Nixdorf.

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CIRCLE 140 ON READER CARD

Using modular programming and a library of software tools, the time needed to develop new systems can be reduced.

SHORTCUT SYSTEMS

by Victor G. Stotland

To comply with the demand to produce an ever-increasing volume of complex statistics in a short amount of time and still maintain the quality and integrity of the data, the Bureau of Labor Statistics (BLS) has developed several general-purpose computer systems. Some of these systems, such as Table Producing Language (TPL), are in use at both public and private agency computer centers.

The time and cost required to develop these systems were cut short by the use of a library of software tools and by the use of modular programming. An example of this approach was "Create Table"; only 200 hours of staff time was required to develop this system.

Create Table was devised to provide a way for mathematicians and statisticians to prepare statistical tables for publication. To minimize user training, an English-like language was used. Users were not required to learn typesetting phrases or codes; the system incorporates typographic standards and requires only that the user enter the text and numbers to be displayed.

The user language was built through use of a grammar analyzer and a skeleton compiler. The grammar analyzer produces a set of parsing tables which, when inserted into the skeleton compiler, provides the basic framework for the language compiler. Since all the procedures for this process were already in place at BLS, the grammar was easier to test and debug.

Once the final version of the grammar was completed, the process of implementation was shortened considerably by using existing code. The problem of maintaining duplicate code was avoided since most of our programs were subdivided into logical modules, and the appropriate modules could be easily retrieved.

The process of combining the modules was simplified by using a program that retrieves the modules from separate locations and assembles them into a single program (similar to the PL/1 %INCLUDE preprocessor). In addition to sharing code modules, many programs used in Create Table are shared with other computer systems. This is possible because most BLS systems are designed to be flexible. In the case of Create Table, almost 85% of the computer code was derived from existing modules.

TABLE I

CREATE TABLE STATEMENTS

```
TITLE = 'Table four average earnings' FOOTNOTE(27);
HEADNOTE ='(In dollars)';
STUBHEAD ='Age';
HEADING =('Male' THEN 'Female') BY
         ('1955' THEN '1965');
STUB =('Black' THEN 'White') BY
  ('16 to 19 years' THEN '20 to 24 years');
DATA =  $96.34  /  $97.23  /  $27.45  /  $32.45  /
         26.86  /  33.37   /  43.32   /   6.87   /
         34.73  /  42.12   /    -     /  34.42   /
           -    /   3.16   /  24.12   /  43.21   ;
FOOTNOTE TEXT 27 'Adjusted using current data';
```

TABLE II

AVERAGE EARNINGS* (In dollars)

AGE	MALE		FEMALE	
	1955	1965	1955	1965
Black				
16 to 19 years	$96.34	$97.23	$27.45	$32.45
20 to 24 years	26.86	33.37	43.32	6.87
White				
16 to 19 years	34.73	42.12	-	34.42
20 to 24 years	-	3.16	24.12	43.21

* Adjusted using current data.
\- Data not available.

The statements used by Create Table to generate a short statistical table (Table II) are listed in Table I.

In addition to composing tables automatically, Create Table allows the user to easily alter the composition process to include variations. Nearly any tabular format can be produced; for example, users can change the table by removing vertical rules between data elements, and by inserting bold vertical rules.

Create Table illustrates how a library of software tools and the use of modular programming can reduce the time required to develop new systems.

BLS computer systems can be run on an IBM S360/370 or compatible computer running under the OS MFT, MVT, VS1, or VS2 (SVS or MVS) operating systems. About 500K of memory are required. The systems are in the public domain, and are made available for a nominal fee to cover the cost of reproduction and transmittal. For more information: Victor G. Stotland, Room 2518, GAO Bldg., 441 G St. NW, Washington, DC 20212.

Dr. Stotland is in charge of developing automatic publication-formatting and phototypesetting systems for the Bureau of Labor Statistics in Washington, D.C.

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Maxell Floppy Disks are either expressly specified or recommended by many major disk drive manufacturers. We're also relied upon by a growing number of 8" and 5¼" Floppy System owners. They find our Floppy Disks do everything possible to bring out the maximum performance of their systems. And they find our disks do this consistently.

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CIRCLE 141 ON READER CARD

With a micro database system, a programming language can be transformed from an ordinary file handler into a full-fledged DBMS.

DBMS FOR MICROS

by Andrew B. Whinston and C.W. Holsapple

A genuine database management system (DBMS) significantly improves the productivity of custom programming operations compared to ordinary file-handling methods.

A DBMS allows developers of tailored application systems to change to a completely different concept of producing custom, microcomputer-based software. The old system—multitudes of files, pointers, updates, and file structures—is replaced by simple graphic representation of the data network and its logical relationships (the schema).

Representing an application with a schema that can readily be transferred to the computer through the data definition language (DDL) increases software productivity in the following ways:

1. The system designer gets a much clearer picture of how clean, efficient, and effective his design is. Improvements are made easily and rapidly.

2. The programmer can spend his time producing the calculations and interactive parts of the system, rather than getting bogged down in the intricacies of the file structure and file manipulation. This not only reduces the amount of code generation, it also reduces programmer fatigue from tedious repetition.

3. Communication with the end user is more effective when he can see a graphic depiction of how his data will be handled. A good understanding by the end user in the early design stages eliminates costly program changes or data restructuring later.

4. Debugging time is greatly reduced, and so are calls from customers who find the hidden bugs that almost inevitably show up in a complex application system based on file-handling techniques.

Developers of software who use a micro database system as a software development tool have a competitive advantage: application development is flexible, faster, and less expensive.

Although database systems are solidly entrenched on mainframes and minis, there are two major difficulties—one, technical; and one, economic—in producing a high quality DBMS for micros. Technically, the code of a micro DBMS must be small enough to be workable within memory constraints (56K-64K for 8-bit cpus). When an application program is executing, not only is the database system memory resident, but also the operating system, the application program and its buffers, possibly an interpreter (e.g., for a program in interpretive BASIC), and a region for database page buffers.

On the economic side, the cost of developing a micro DBMS with features comparable or superior to those available in a mainframe or mini DBMS does not diminish just because the system is being developed for a micro. Indeed, the development cost may be higher, in view of the previously noted technical problem. Mini and mainframe database systems are priced in the $16,000 to $250,000 range. Software prices in this range are untenable in the micro market.

The solution to the technical problem lies in implementing the micro DBMS in machine language. Success requires strong backgrounds in both database system design and implementation, and in the "nuts and bolts" of microcomputers. Most mini and mainframe database systems, developed in high level languages, require 64K-256K bytes. Such an approach is clearly not viable for micros.

On the economic issue, the price of micro database software should not be out of balance with micro hardware prices. In terms of hardware, minis and mainframes are respectively about one and two orders of magnitude more expensive than micros. Applying this formula to database systems, one would expect $1,600 to $2,500 to be a reasonable license price (from a customer's point of view) for micro database software. From the producer's standpoint, this low price can be justified only if the number of micro database systems sold is at least two orders of magnitude greater than for mainframes.

A typical example, drawn from an application developed for a military aircraft base, illustrates some of the principles, features, power, and flexibility of using a micro DBMS for application development.

The target hardware, a Z80-based microcomputer, was already in place. The aim was to implement quickly a flight information system reflecting these facts:

- Any flight has at least two crew members.
- Any aircraft can be used on many different flights.
- Any of a large group of functions (e.g., in flight refueling) can be performed on a given flight.
- A person can be a crew member on many different flights and on many different aircraft.

When a given flight is completed, all information about that flight must be entered into the information system. The system must be able to produce a variety of reports, such as personnel flight histories including functions performed in which aircraft on which flights; aircraft flight histories; and information about a particular flight.

Clearly, there is no off-the-shelf package available for this application. The decision was made to develop the application system in-house, using the CODASYL-oriented Micro Data Base System (MDBS). Implemented in machine language, this system occupies less than 19K bytes. The simple schema of Fig. 1 supports the flight application with no redundancy. USED is a conventional CODASYL set, indicating a one-to-many relationship. CREW and PERFORM are N:M sets, indicating many-to-many relationships.

In strictly CODASYL systems, a many-to-many relationship is represented by two conventional sets and an artificial record type. By offering N:M sets, MDBS overcomes the processing and storage inefficiencies of the CODASYL approach. Moreover, the schema and consequent DML logic are simpler. In an N:M set, declaration of the owning record type is arbitrary (e.g., FLIGHT could just as easily have been declared to own PERFORM). Just as the members in a set (or N:M set) occurrence can be ordered, so can the owner occurrences associated with a particular member of an N:M set be ordered.

Report production, using DML commands within a host language, is straightforward. Unlike CODASYL systems,

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The solution to the technical problem lies in implementing the micro DBMS in machine language.

FIG. 1.
MDBS SCHEMA FOR FLIGHT DATABASE

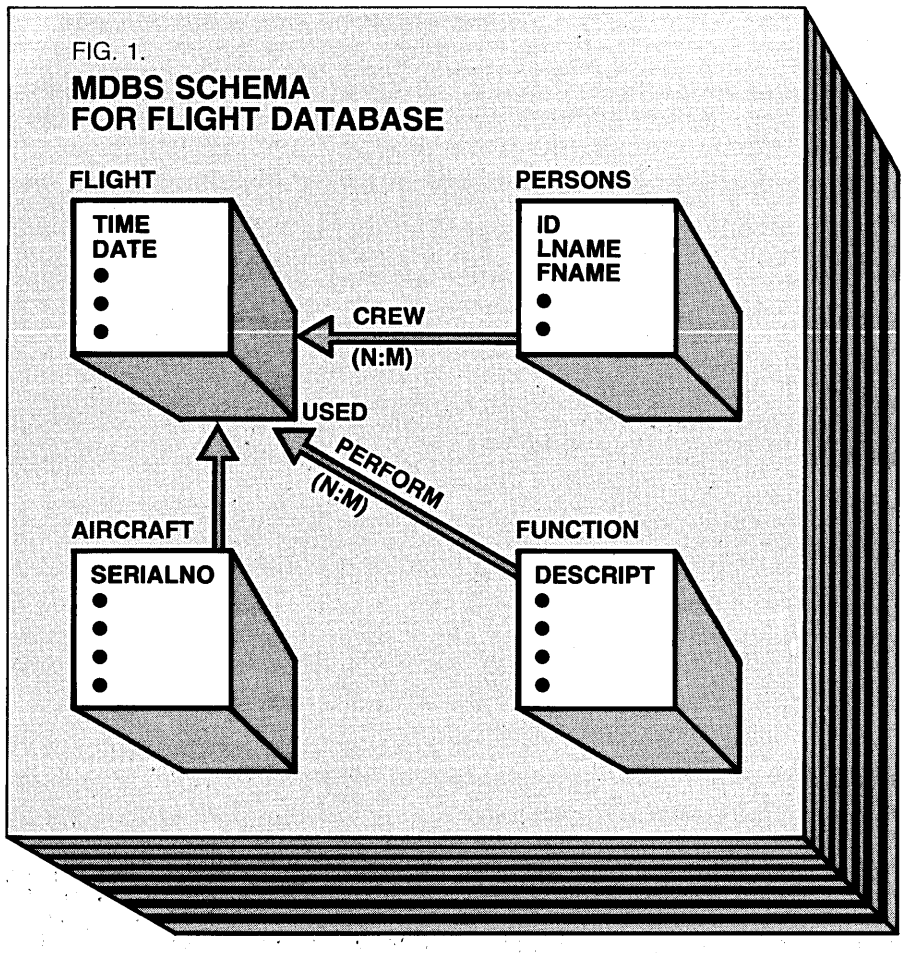

CHART BY CYNTHIA STODDARD

which furnish only one currency indicator per set, MDBS supports two currency indicators for every set and N:M set (the current member and the current owner). This allows a simpler DML logic than is possible in strictly CODASYL systems.

To produce a report on the full flight record of a given person, a DML command is used to find that person's record occurrence. Another DML command makes that person the current owner of CREW. All flight records owned by that person are then looped through. For each flight record, a DML command is used to extract data concerning the aircraft used on that flight, and a nested loop is used to extract the DESCRIPT value of each FUNCTION occurrence that owns that flight. Of course, other report generations could begin with records of any of the other three record types in the schema.

Writing programs with DML and a host language suffices for reports that will be used repeatedly. It is sometimes important, however, to be able to produce ad hoc reports without expending programming effort.

In such circumstances, a nonprocedural, English-like query language is useful as a database system add-on. The query processing software must be able to fit easily within the memory constraints of a micro.

Suppose that we need an ad hoc report of all functions performed by aircraft number 1234 on 010180. The appropriate query in the MDBS system is:

LIST DESCRIPT FOR SERIALNO = 1234, DATE = 010180 THRU USED, >PERFORM

The THRU clause indicates to the query processor the path of sets to be used in generating the report (the > symbol preceding PERFORM indicates that processing should proceed "upstream" through PERFORM).

MAKING DBMS VIABLE

Schema alteration is just as important in a micro environment as it is on mainframes. With most database systems, schema alteration necessitates reloading the database. With MDBS, a schema can be dynamically restructured. All record occurrences are adjusted to maintain consistency; no reloading is needed.

Suppose that after the flight database has been loaded, it becomes necessary to *add* a new *data item* type to the PERSON record type. This is accomplished in an interactive mode by entering ADI, PERSON. The system prompts for the characteristics of the data item type to be added (e.g., its name, type, size, read/write access levels). The restructuring supported includes adding, deleting, and renaming data item types, record types, sets, and N:M sets. Also included are commands to alter the access levels of data item types, record types, sets and N:M sets.

Another key to making database techniques viable on microcomputers is the availability of automatic recovery procedures if a system crashes. The feasibility of such procedures is demonstrated by the MDBS recovery and transaction logging capabilities. The transaction logging facility adds less than 2K to the size of the database control system. All transactions since the last database backup are logged onto a separate file. If a system crash occurs, the database is automatically restored by executing a recovery utility that applies the logged transactions to the database's backup copy.

Database system availability under a wide variety of micro configurations can also be an important consideration. To provide uniform data-handling methods, a micro database system should interface with a broad range of host languages, under a variety of operating systems and for a variety of cpus.

This interface is particularly important to consultants whose clients possess different types of micros with various operating systems and programming languages; without a uniform data-handling approach, a consultant's task of developing application software is more difficult, and this is reflected in the price of the software.

A micro database system can provide a considerable degree of uniformity. This has been demonstrated by MDBS which is implemented in machine languages of the prevalent 8-bit cpus. These cpus run under more than half a dozen operating systems and interface with well over a dozen host languages.

With a micro database system, one can transform a programming language from an ordinary file handler into a full-fledged DBMS. This makes hands-on experience in using database management available to everyone. This universality, however, also underscores the need for extensive educational programs on the principles of DBMS for thousands of micro users. ✻

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Dr. Holsapple is an assistant professor of management at the University of Illinois. He is also a senior consultant and member of the founding group of Micro Data Base Systems, Inc., Lafayette, Ind.

Mount St. Helens was wired for sound, permitting seismologists to anticipate its volcanic activity.

CATACLYSMIC COMPUTING

by Jim Rose

Although Mount St. Helens has been erupting since 35000 B.C., there was a difference when she stirred to life in March 1980: she was wired for sound. Scientists at the University of Washington had completed an on-line seismic monitoring network just in time to keep tabs on the mountain's latest rumblings, and computer analysis of data collected from stations throughout the state made it possible to anticipate eruptions. The network recorded a major earthquake on March 20, signaling the mountain's first activity; subsequent events, including the violent explosion of May 18, were also recorded on magnetic tape, enabling seismologists to deduce when eruptions would occur.

"We are not at the point where we can predict an eruption to a fixed hour," says Dr. Steve Malone, a seismologist at the university. "Rather, we can anticipate that renewed activity is more likely within a matter of hours instead of days or weeks. Moreover, computer analysis and the wealth of information we have obtained since the first activity lets us transfer what we've learned from Mount St. Helens to other volcanoes—just as we have applied experiences from other volcanoes to Mount St. Helens."

The on-line minicomputer-based system replaced Develecorders, a 16mm film unit that records oscilloscopic traces from 16 seismic channels. "These record continuously whether an event is occurring or not," says Malone, "and the resolution is not very good. In a sense we were using 1950s technology until we obtained the computers."

The Washington seismic network consists of 83 stations, with 13 near Mount St. Helens, 22 in western Washington, 38 in eastern Washington, and 10 on the Olympic Peninsula. Signals are telemetered to the Univ. of Washington in Seattle, where each channel is digitized and multiplexed at 100 samples per second by a DEC PDP-11/34 with 96K bytes of main memory and an LPA-11 front end. During acquisition, the multiplexed data are stored on disks and analyzed to determine if a seismic event is taking place. If not, the disks are overwritten by new data. When earthquakes occur, the minicomputer transfers the data to magnetic tape transports.

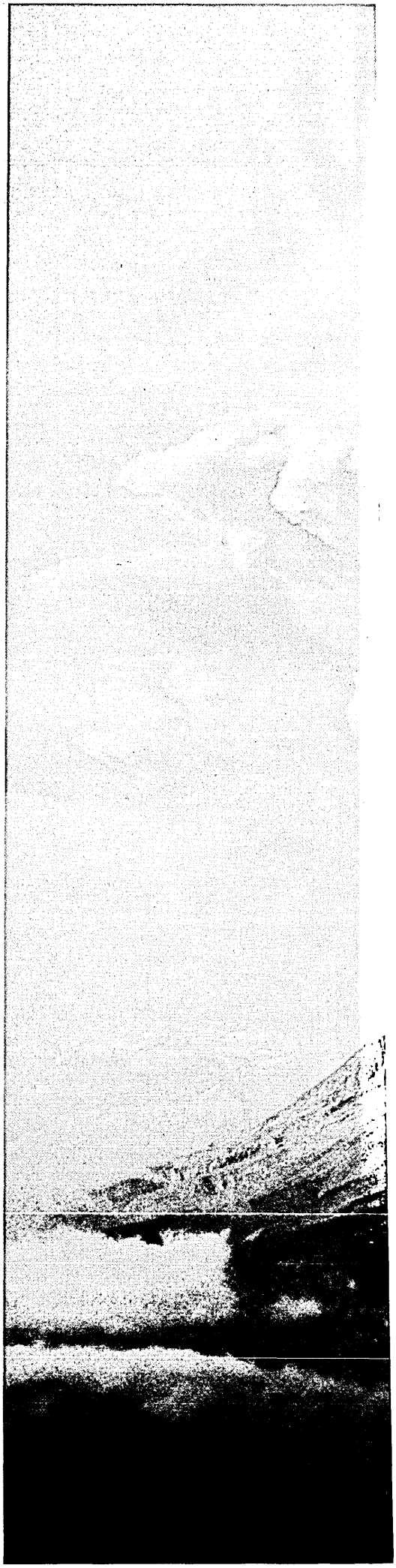
"The process is an elegantly simple concept that lets us gather data from all events, right from the start, while discarding unimportant or erroneous data," says Dr. Malone. "It also eliminates recording long periods of no activity. The system is closely modeled after the one conceived by Dr. Carl Johnson at Cal Tech, which uses a Data General computer.

"The computer analysis involves two distinct steps," Malone continues, "one for individual channels and one for combinations of subnetworks that make up the 83-channel system." For individual channels, the program compares long-term and short-term averages of both the original signal and a rectified version of the signal.

"Arithmetic averages generally classify the event while the rectified signal compensates for telemetry 'glitches' which the program might construe as the beginning of an event," Malone explains. "By comparing the averages statistically, a fluctuation in the signal indicates when an event might have taken place."

Wind, heavy highway traffic, or a passing train can generate signals on a single channel. To be of seismological interest, indications must occur on a number of channels within a short time period. The stations are grouped into subnets; when a sufficient number have triggered, the transfer to magnetic tape begins. Initially, a header giving the station names, digitizing rate, absolute time, and other seismic information is written. Use of dual disks and careful programming minimize seek times and ensure continuous event recording.

The number of earthquakes occurring beneath Mount St. Helens varies considerably from day to day. After the initial occurrence, the number of quakes of magnitude 3 or greater ranged from 20 to 200 per day. The system recorded over 10,000 events from the March 20 quake until the May 18 explosion, and 750 of these had magnitudes over 3.2 (the scale is exponential, so a magnitude 4 quake is 10 times as strong as magnitude 3). "Between Jan. 1 and March 20," says Malone, "we filled seven magnetic tapes with interesting seismic data. Each tape contains 40 to 50 earthquakes. From March 20 to May 18, we obtained nearly 300 tapes. The center now has over 475 10½-inch tapes containing the seismological information."



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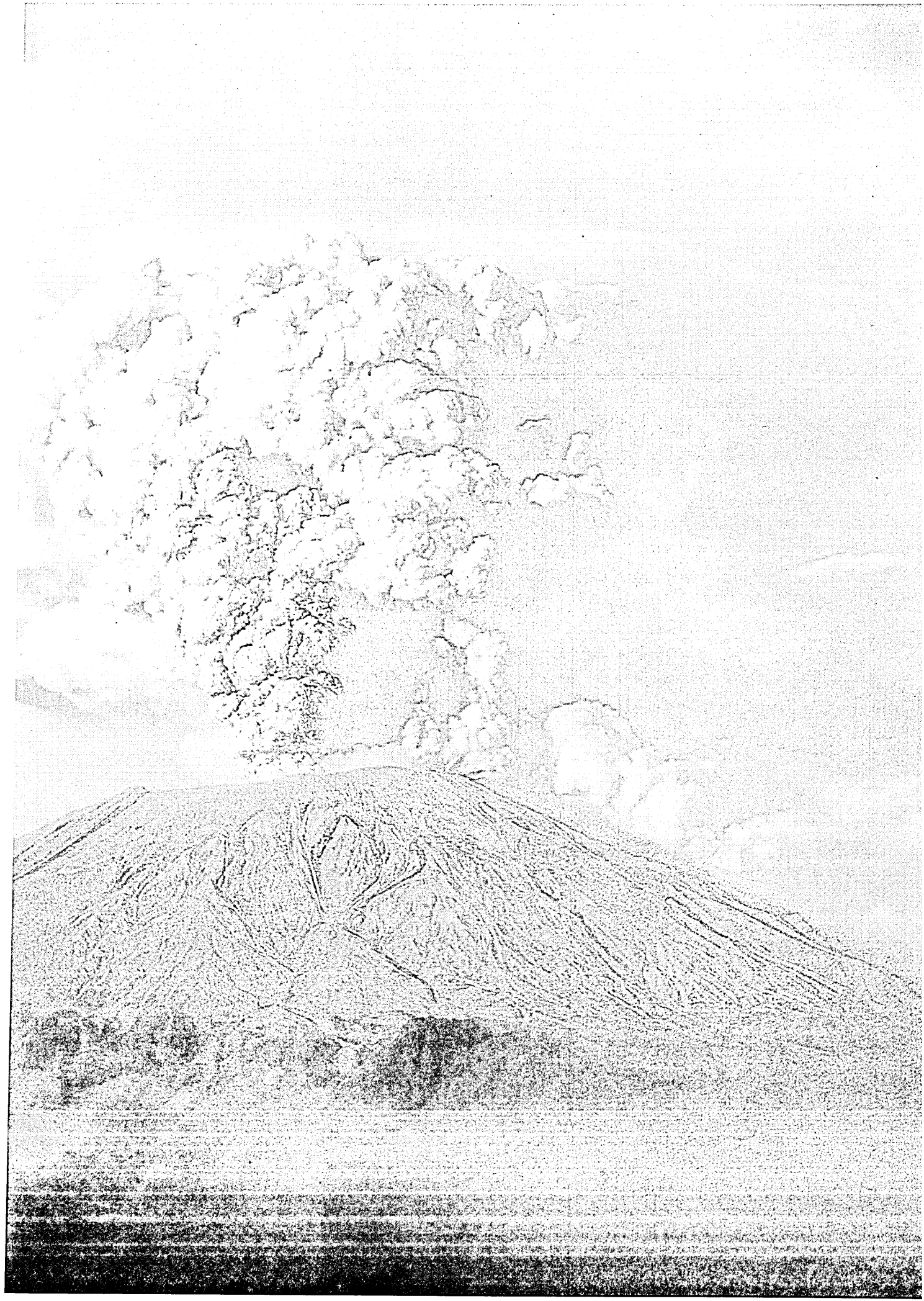


Tapes containing events recorded on the PDP-11/34 are spooled to a PDP-11/70 for detailed analysis. Unlike the PDP-11/34, which is used exclusively for seismic monitoring, the PDP-11/70 has over 100 users. About two-thirds of the machine time is currently being used on the Mount St. Helens research. The PDP-11/70 runs under Bell Labs' multiuser timesharing UNIX operating system. Programs are written in C or FORTRAN.

Using interactive terminals, seismologists examine single traces from triggered stations or several traces from associated stations, with appropriate time and amplitude scaling. This lets them view "P-waves" and "S-waves." The P-wave is the primary, or fastest wave, traveling away from an event and consisting of compressings and dilations. Secondary waves or S-waves are slower, their motions being transverse to travel direction.

The PDP-11/70 also computes quake coordinates in three dimensions in order to pinpoint the center of activity. Programs depict the average number of earthquakes above a chosen magnitude per time peroid, and average energy release caused by the quakes. From these and other data, seismologists can compare eruptive and noneruptive events in order to perceive the earth's action.

TYPES OF VOLCANIC ACTION

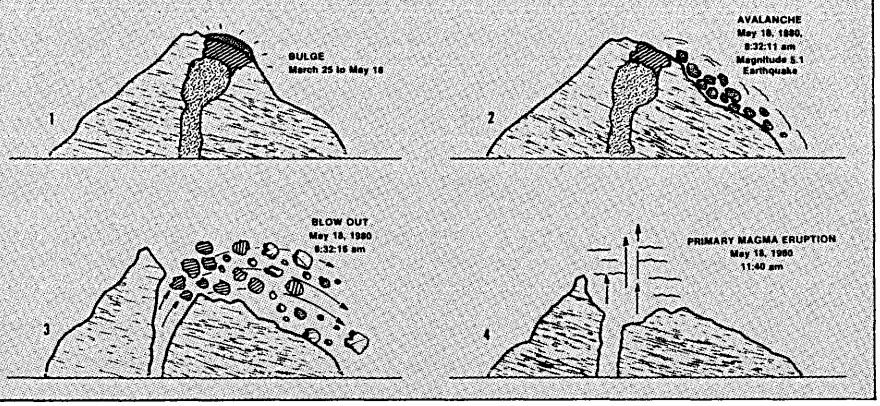
The initial eruption of Mount St. Helens and the subsequent cataclysmic explosion on May 18 were caused by steam rather than by the colorful lava flows many people associate with volcanism. Subterranean rock strata, called plates, are the basic heat source for the volcanoes along the Pacific Coast, which include Mt. Garibaldi in British Columbia and Lassen Peak in California. Essentially, friction from the westward movement of the North American plate over the downward-directed Juan De Fuca plate creates tremendous heat which radiates upward, melting the rock structures above. The movement, along with associated plate ruptures, causes the earthquakes associated with volcanic action.

"The mountain's composition determines the type of volcanic action," explains Dr. Malone. "Some, like the Hawaii shield volcanoes, are primarily basalt, rich in iron and magnesium, with typical broad-shouldered cones. These have a low capacity for absorbing moisture. A highly fluid magma results in the classical 'hot' lava flow so often depicted in tv or motion pictures.

"The Cascades are of another type. These have the typical narrow cone-shaped structure like Mt. Fujiyama in Japan."

The Cascade-type volcanoes contain up to 10% moisture and embedded gases, and the water-laden mountain functions as a sort of pressure cooker. Plate action provides the

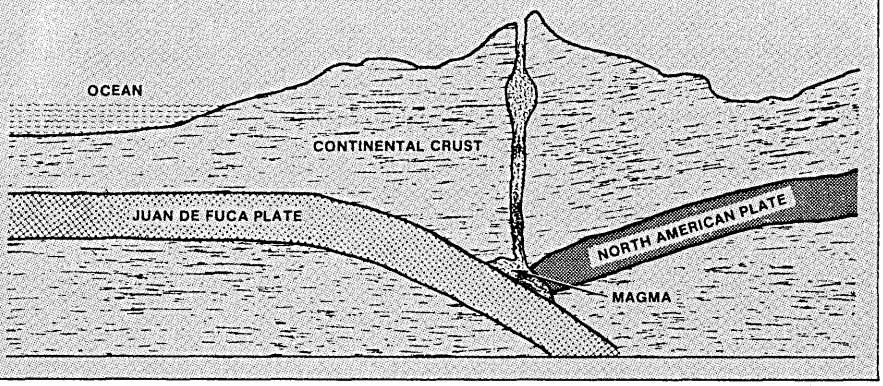
STAGES OF THE MAY 18 ERUPTION



MOUNT ST. HELENS: A SEISMIC CHRONOLOGY

March 20	15:47 (local PDT): first major quake (magnitude 4.0).
March 25	Peak energy release; eight M = 4+ events per hour. Activity lessens this night but is still unusually high.
March 27	12:53: First steam explosion; ash and steam rise 80,000 feet in air. From this point there is a gradual decrease in earthquake energy release until May 18.
April 22 - May 9	Period of no steam or ash eruptions.
May 18	08:32: Major quake M = 5.1, 1000 to 2000 feet below sea level, 0.7 to 1.3 miles north of summit. Within five seconds, a massive avalanche, 0.75 miles wide and 1.25 miles long, tumbles from north face. Reduced lithostatic pressure causes superheated water to boil explosively; 15 to 25 seconds after earthquake origin time, Mount St. Helens blows her stack. 11:43-17:21: Strong tremor. Drastic drop in earthquake activity. The few quakes occurring after this point become much deeper. (4 to 10 miles).
May 24	19:30: Increase in tremor level. 22:41: Decrease in tremor level.
May 25	02:36: Eruption with concurrent dramatic rise in tremor level. Background level resumes by May 26.
June 3	18:15: Increase in tremor level. 21:00: Sudden drop in tremor, as seen before the May 25 eruption. 23:00: Another increase in tremor level, which drops gradually thereafter; but no evidence of eruptive activity during this fluctuating period.
June 12	11:10: Increase in tremor level, peaking at 19:26. 19:46: Significant decrease in tremor level. 21:10: Eruption with concurrent increase in tremor level. 23:00: Series of small, deep events begins after eruption and lasts through the afternoon of June 13.
June 13	Eruptive tremor returns to background level.
June 14	12:30: Four-minute period of increase of harmonic tremor.
June 15-18	Recorded a few small, deep quakes in the Mount St. Helens area and several avalanches.
June 20-30	Occasional deep, small events centered around Mount St. Helens, some extending to the Elk Lake area to the NNW and the Marble Mountain area to the SSE.
June 27	18:50: Increase in the existing background level tremor for the next five hours.
June 28	00:31: Further increase in tremor, dropping back to background level by 00:39.

TECTONIC PLATES



July 1-21	Recorded occasional small events near or beneath Mount St. Helens, 3.7 to 6.2 miles deep, which had been typical for the last several weeks. Also recorded deep events in the Elk Lake area and the Marble Mountain area. Avalanches occur daily and are recorded on the East Dome station and sometimes on other stations near Mount St. Helens. Intermittent periods of background level tremor occur during the first part of July.
July 22	06:21-14:58: Fourteen small (M less than 2.4), shallow earthquakes similar in character and location (NW flank of the mountain) to the quakes that occurred prior to the eruption on May 18.
July 22	15:12-15:52: Increase in activity: nine quakes recorded. 16:01-17:10: Further increase in activity: 23 quakes (M less than 2.8) recorded. 17:13:44: Eruption with seismic signal, lasting about 250 seconds. 18:25:15: Onset of second eruption, lasting about 450 seconds. 19:00:30: Third eruption begins with concurrent harmonic tremor and lasts until about 22:00. 19:28: Beginning of swarm of small, deep events scattered around St. Helens, extending as far as Marble Mountain and Elk Lake.
July 23-27	Recorded an occasional small and deep event in the Mount St. Helens and Marble Mountain areas; also recorded avalanches.
July 28	06:08: Verv light harmonic tremor associated with small steam eruption, lasting 13 minutes.
July 28-31	Continued occasional events in the St. Helens and Marble Mountain areas, and continued avalanches, some of which seem to correlate with avalanche sightings in the crater.
Aug. 1-6	Occasional scattered, deep events in the St. Helens area.
Aug. 7	12:07: Onset of harmonic tremor which increases gradually throughout the afternoon. 16:26: Eruption with strong seismic signal, lasting 120 seconds. 19:11: Medium tremor during the next 32 minutes. 22:32: Eruption event, strong signal for 180 seconds. Tremor continues but gradually decreases for the next two hours. These eruptions do not exhibit the dramatic rises and falls that were seen in the eruptions of May 25 and June 12. Occasional, very small earthquakes occur throughout the afternoon and evening.
Aug. 8	3:25-9:35: Several events associated with ash puffs occur. These continue through the rest of this day, but with less frequency.

heat source; typical subterranean temperatures run from 800 degrees C to 1200 degrees C and pressures range from 15,000 pounds per square inch (psi) to 90,000 psi. The weight of the earth and rock overburden holds the process in check, with the superheated water remaining liquid although temperature is well above the atmospheric boiling point. Ultimately, an increase in pressure will force the magma toward the surface, where the water converts to steam and ejects ash into the atmosphere.

The first Mount St. Helens eruption followed the classical scenario. "Activity began with a magnitude 4 earthquake on March 20 with some aftershocks," says Dr. Malone. "We saw an increasing number of quakes until by March 25 so many were occurring that we couldn't resolve one from another. They died down after that, and a day and a half later the first steam explosion occurred.

"The cataclysmic eruption on May 18 was totally different. There was no unusual seismic activity preceding it on a time scale of hours or even days. There was nothing suitable for warning people to get out. Everything was primed. A bulge from underground pressure was developing on the north face, and previous seismic activity had loosened the surface."

It just took one more quake.

THE BIG BLAST

At 8:32:11 PDT on May 18, a magnitude 5.1 earthquake occurred about 1,100 feet below sea level and 0.7 to 1.3 miles north of the summit of Mount St. Helens. The bulge that had been building avalanched: a section three-quarters of a mile wide and a mile and one-quarter long slid into the valley below.

"Released of the earth's pressure, the superheated water instantly converted to high-pressure steam," Dr. Malone recalls, "literally, blowing the top and side off Mount St. Helens. Hot gas, ash, huge rocks, and ice catapulted from the mountain at velocities from 19,000 to 24,000 feet per second (220 to 265 mph), judging from the destruction of seismic stations near the summit."

More than a cubic mile of material was thrown from the mountain, reducing the 9,677 foot cone to 8,400 feet on the south side and 6,800 feet on the north. Previous eruptions, in 1800 and 1842, had left the timberline of Mount St. Helens at 4,400 feet, the lowest in the western Cascades. Yet the blast leveled millions of trees for miles. Ash spewed as high as 70,000 feet and eastward winds carried it around the world.

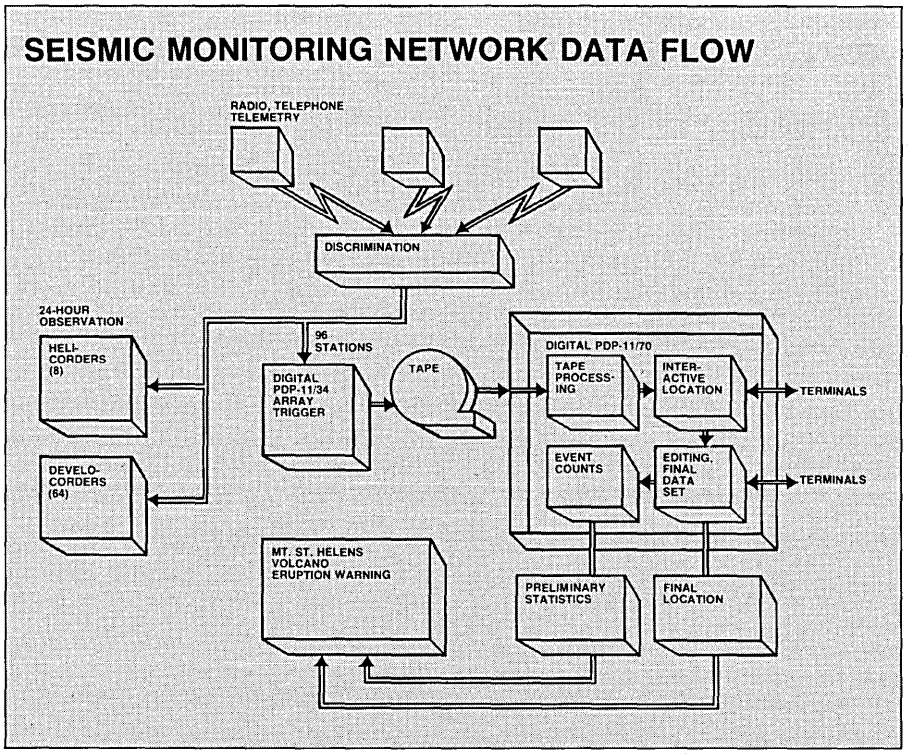
"The primary magma eruption began at 11:40 a.m., indicated by tremors and an ash color change from dark to light gray," Dr. Malone says. "This eruption continued

through the afternoon, peaking at about 3:45 p.m., then dropping to a lower level that continued for days. Other ash-rich Plinian eruptions followed in the weeks afterward."

The events of July 22 proved somewhat easier to anticipate. Malone explains: "It started at about 6:21 a.m. with several small, shallow earthquakes located under the cone. They looked different enough that we transferred tape from the PDP-11/34 to the PDP-11/70 and began analysis. Calculations and examination of the plots indicated, very definitely, that stresses were being relieved in an increasingly frequent manner which likely would result in magma movement.

"Our first contact was with the U.S. Geological Survey and the U.S. Forest Service at 10:30 in the morning—over six hours before the first eruption. The area was evacuated. At 3:12 p.m., additional warnings were given as seismic activity increased with nine quakes recorded in 40 minutes. Between 4:01 p.m. and 5:10 p.m., 23 small quakes were recorded. Then three eruptions occurred at 5:13 p.m., 6:25 p.m., and 7:00 p.m.—just in time for the nightly news."

"Through on-line seismic data acquisition and computer analysis, we have been able to anticipate subsequent activity by Mount St. Helens," Dr. Malone concludes, "and to supply warnings to officials and other scientists who are conducting studies of the volcano. The ability to rapidly select the events, locate, and plot them is vital to our understanding of volcanic processes." ✲



Jim Rose is president of Communications Management Co., a Woodland Hills, Calif., consulting firm.

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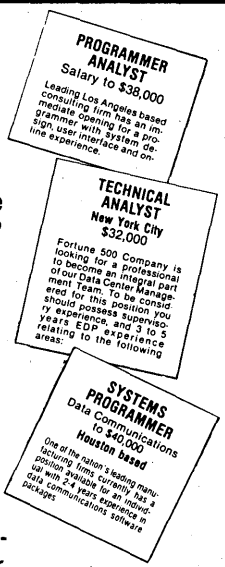

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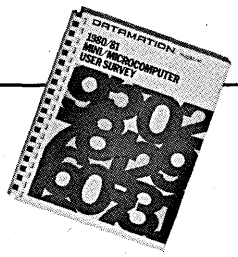

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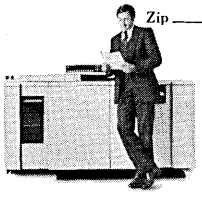

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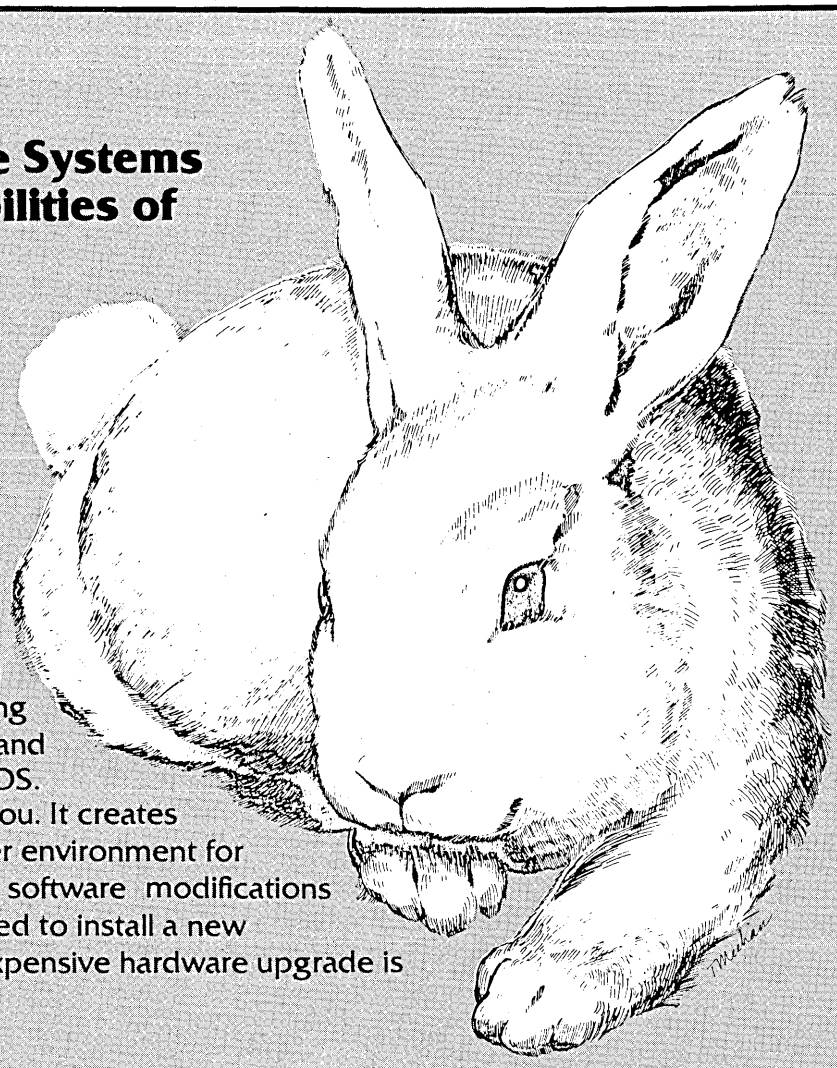

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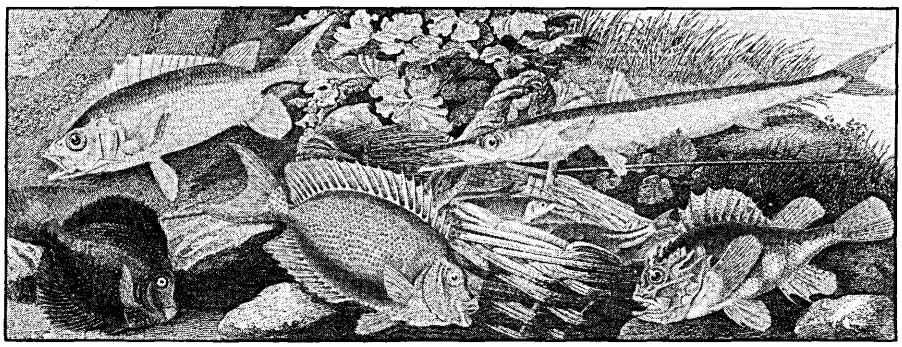
HOOK, LINE, AND SINKER



Like fish, information comes in many varieties and can be prepared to suit most any taste. Some kinds are cheap and plentiful, others precious and rare. The most common facts and the most ordinary fish are sometimes difficult to apprehend; and you should never eat any fish you can catch with your hands, or believe anything you read in the New York *Post*.

Magazines are both fishermen and restaurateurs. They catch the fish, clean it, and prepare it for consumption by people who share a liking for a particular kind of cuisine. *Time* magazine is a Soviet-style factory trawler with fast-food outlets nearly everywhere; this publication is a pleasant seashore cafe supplied by abalone divers.

Nowadays there are a lot of schooners offshore, and it isn't unusual to come across two boats trying to work a single school of fish, nets tangled and sailors bellowing curses across the water. Though the captains may have rather different schemes for the preparation and marketing of the cod they're chasing, both require fish. When a large school is discovered (or when a whale washes up on the beach), there is plenty of meat for everyone. Boats come from up and down the coast, and the last ones don't leave until several days after the resource is exhausted. Most of the skippers hastily dip their nets and hurry back to port, where they augment their recipes with the various brands of fish extender.

The existence of about a dozen well-defined recipes is good for the magazine business because advertisers have discovered that if they know how you like your fish prepared, they can predict whether you are more likely to brush your teeth or smoke a cigar after eating it. This is market research. Since it pays our enormous salaries we can't complain, but we would be less than frank if we did not admit that these practices are not always in the best interest of readers, specifically those who want to be well informed but use only one or two magazines. Such readers are dining daily at Arthur Treacher's, and it's bound to catch up with them.

Unfortunately, many people haven't the time to eat elsewhere though they know they should be getting some variety. We fear this might be the case for our busy readers; even abalone becomes dull and unhealthy if it is eaten day after day. To correct this dietary imbalance, we have culled some pages from the nation's most prestigious publications, pages that describe big events in dp with which readers will doubtless be familiar. The selection should demonstrate that there is more than one way to skin a cat, fry a fish, or edit a magazine. If you have already read these pages, pat yourself on the back and skip this section. You are well informed.

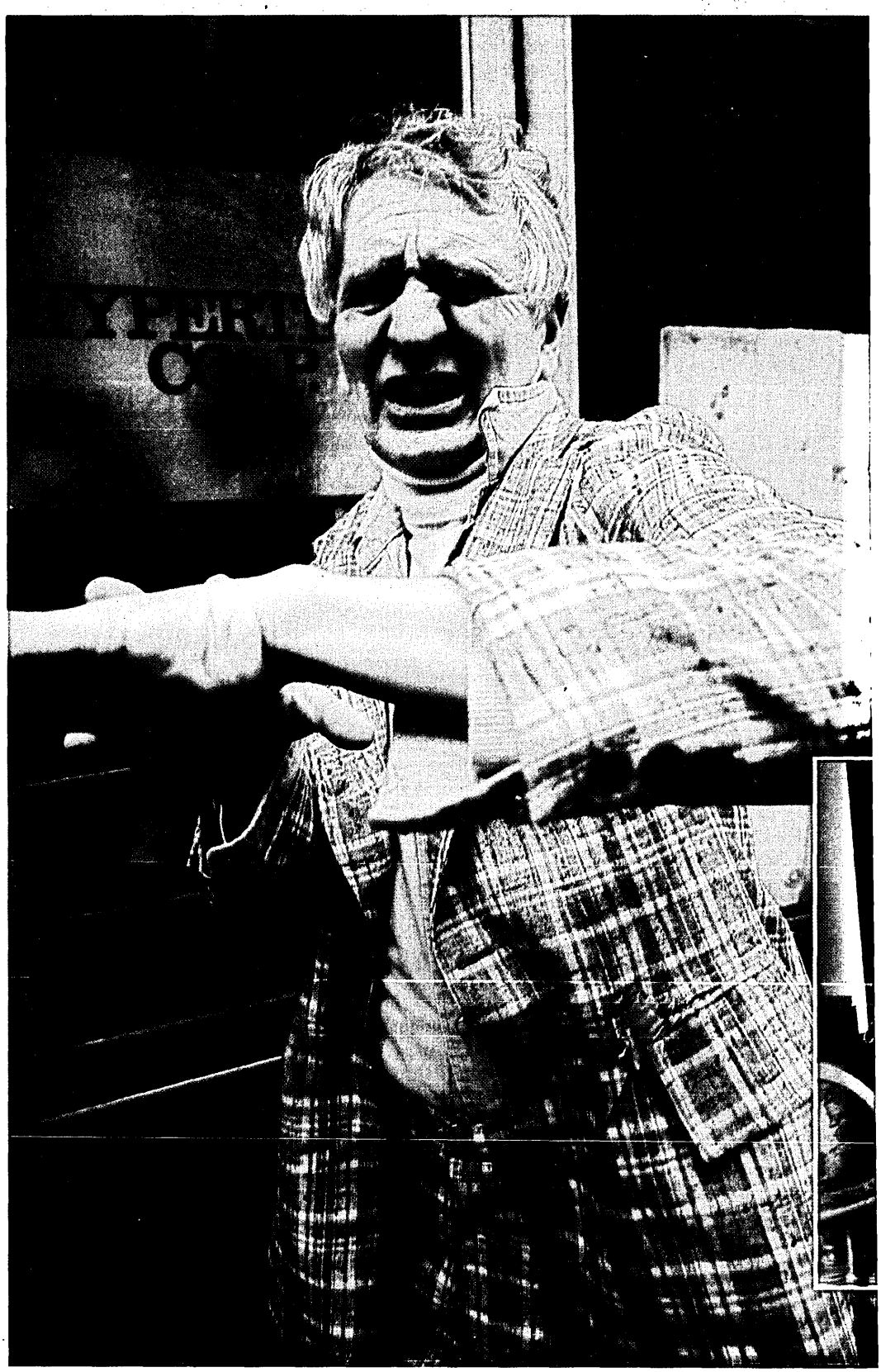
For purposes of comparison we have included one of our own articles. And, so that our readers may achieve the broadest possible culinary experience, we are also supplying a copy of the finest newsletter we know. A newsletter, of course, is a fisherman who, lacking a restaurant, has turned to fishmongering. Anyone familiar with the accomplishments of Mr. Granville, and with the grand oratory used to praise suspicious mackerel on the docks of Sheepshead Bay, will admit the justice of the metaphor.

Bon appétit.

Contributors: Ken Klee, Wendy Crisp, Debbie Sojka, Dave Gardner

Hypertech's

What hath Zip Williams wrought?



Gaudy Collapse

by RANDALL RAMBLE

At the Cupertino, California, headquarters of Hypertech Corp., shards of bronze glass glisten on the cracked asphalt of the vacant parking lot. They are pieces of panes that only 14 months ago formed the sleek skin of the 12-story showcase and glowed in the California sun as brightly as Hypertech's prospects shined on Wall Street. Now the building stands gap-toothed and pathetic, and a bushel of the company's shares couldn't be traded for carfare. When a reporter ventures up to the building's plywood-patched doors, he is treated to a glimpse of Xerxes (Zip) Williams, the firm's founder, chairman, and CEO. Williams is grayer now, probably too gray for his 43 years, and his Savile Row suit is torn and soiled, but the handsome face that used to buss starlets for the tabloids is instantly recognizable. "Go away," he snarls. "Go on. Beat it!"

Williams has good reason to decline to be interviewed. Once the crown prince of the fast-paced market for microprocessors—small, intricately designed chips smarter than Albert Einstein—he has, over the past year, presided over the squandering of some $800 million, very little of it his. By the time chapter 11 proceedings are complete, probably around 1991, the figure could rise to some $2 billion—and Williams could be in jail.

How did it happen? How did some of the nation's savviest money managers, including BoffO, Salmon Sons, Manufacturer's Hangover, and Merryl Lunch, all of whom subscribe to this magazine, get burned so badly? Industry analyst Itöl Jasoh thinks he has the answer: "Naked greed," he explains. "Those guys are in business to make money, and Zip Williams promised them 110% a year. Zip had the credentials—Harvard and MIT—and the clothes. He bought them lunch. They wanted to believe."

Jasoh is perhaps a bit harsh. Four years ago, when Hypertech went public, it looked to most observers as if the clear California sky was the limit for the firm. Williams, a former Datatrap publicity man, had used $100,000 of his own money in 1976 to found Cointech, a consulting firm for electronic game manufacturers. He was on his way when he landed a $4 million government contract to debug some recreational computer programs for federal workers on the West Coast. That contract led to other government work, notably programming for the 1980 census and consulting work on the American SST and the Space Shuttle. Within 11 months Williams had achieved sales of $27 million and changed his company's name to Hypertech. Casting about for acquisitions, he hit upon Eco-Logic, a tiny microchip manufacturer.

Before they sold out, bought a yacht and sailed away, Eco-Logic's founders had drawn up plans for the manufacture of a sophisticated 64K RAM—a chip so intricate and powerful that it costs $64,000. This was the product for which Williams had bought the company. He knew it would sell; Monolithic Thinking Machines had already announced its intention to break with tradition and go to an outside supplier for chips it needed to build huge mainframes—computers that use sophisticated graphic techniques to give corporate managers an overview or "frame" for their business plans—for Chrysler Corp. and for New York's Metropolitan Transit Authority. There was market share for the taking if Eco-Logic could grow quickly enough, so Williams borrowed heavily from BoffO and tossed money in by the bucket. Still, it wasn't enough.

That was what spawned the interest of Salmon Sons in taking Hypertech public. "Williams pretended he wasn't interested at first," recalls Vernon Roe, a Salmon vice president. "I guess he kind of fooled us." Hypertech stock was offered in September, 1977, at 20. ("It seemed like a nice round number," says Roe.) Salmon Sons took 20%, Merryl Lunch 15%. The big traders dove right in, and quickly drove the price past 150.

Shopping for mansions

Always flamboyant, Williams put his paper fortune to work and became dazzling. He tried to buy San Simeon. When that fell through, he put in a bid on the governor's mansion in which Jerry Brown was refusing to live. Then a tabloid linked Williams' name with that of a popular singer, and it began to look as if he coveted more than the governor's home. Ground was broken for Hypertech's never-to-be-completed $17 million headquarters. And in Sonoma, Williams bought up the neighborhood around the garage that housed the chip plant and razed $200,000 homes to make room for the factory he intended to build.

For most executives it would have been enough; Williams, however, was a man of vision—and no little hubris. On a cold February morning in 1978, Hypertech's 727 touched down at New York's Kennedy Airport. Williams and his party were chauffeured to the Bank Street offices of Manufacturer's Hangover, where they were greeted by the bank's major officers. A marathon meeting began, and when it ended 27 hours later, the Hangover men were smiling wearily and Williams was able to announce his greatest coup: a three-way joint venture between Hypertech, Hangover, and Itel to construct in the city of Cleveland

discontinued

PHOTOGRAPHS BY JAMES JOERN

Xerxes Williams was not pleased when a photographer caught him outside Hypertech's crumbling headquarters, where he now lives. For the 1978 annual report (inset), he posed with one of the company's famous secretaries.

After a rodeo that raised over $80,000 for charity, Vicki tried a mechanical bull and shared some laughs with admiring cowhands.

"Vicki could spend all day at Ma Maison," says longtime friend Nancy Reagan, "but she likes real people." Like those at C&W saloons.

PHOTOGRAPHS BY STEVE COOPER. MECHANICAL BULL BY J.B. BARS

CONSULTANTS

SHE'S MADE MILLIONS OFFERING HER SPECIAL BRAND OF ADVICE TO MEN WHO PLAY THE DICEY COMPUTER GAME

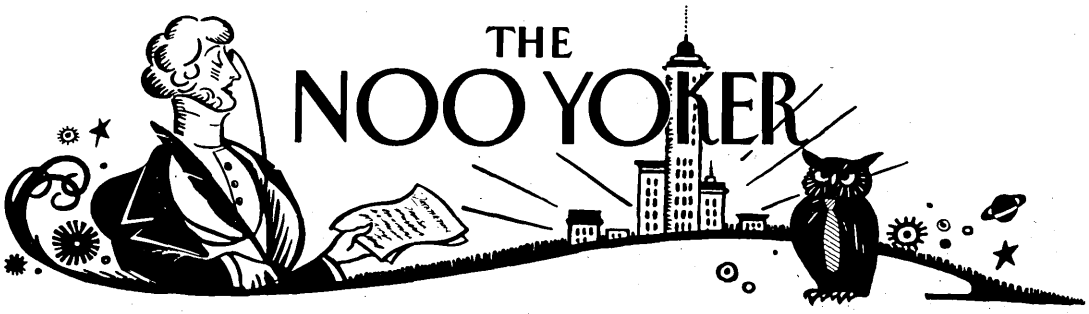
"Life is so very *très belle*," enthuses Vicki Southard, and well she might. Ever since the stunning, champagne coiffed electronics oracle came to the U.S. at the age of two ("When I saw those GIs in the streets of Paris, I knew I had to live in America, I had to be free, I had to be a dp consultant"), she has set the system on its collective ear.

After the usual BA/MA routines at Texas A&M and Smith, she whisked into Cambridge, Mass., and grabbed a quick PhD in plasma physics. "MIT really gave me the third degree," she giggles with an endearing girlishness that belies her tough touch in multinational information processing.

Her clients—unnamed biggies who make mini, micro, and mammoth computers—are amazed by her range of skills. "Vicki has not only reared five children practically singlehandedly," says one client, Hypertech senior vp Willis Loop (who is also a constant companion), "but she's a gourmet cook (sushi and tortellini specialties), a jogger (50 miles a week), a talented amateur rodeo rider, and one helluva systems analyst."

"One thing I never mind disclosing," Vicki confesses while shining the leaves of her philodendron in her *ne plus ultra* offices in Zuma Beach, Calif., "is just how I've managed to amass an incredible fortune." Her formula? Simple. She completes a project for one client, suggests that another client purchase the results, retains the right to the report, and sells it as an industry report and a series of seminars. Later, she forms her own seminar and report business (she has 11 corporations in five nations). "After that," she continues in her astonishingly ingenuous French accent, "I sell the original report back to the first and second clients."

The future for the lady known as the systems sycophant to the stars? "Blue sky," she boasts, "vast horizons, and the inevitable pot of gold." We never doubted it for a minute. JEAN MENTEUR



THE TAWK OF THE TOWN

Notes and Comment

The other day the mailman brought a postcard with a yawning alligator on the front, a catalog from Macy's, and a handsome linen envelope addressed by a dot-matrix printer, which is the kind of machine Con Ed uses to print its bills. Inside the linen envelope we found a cream-colored note with the words "For Immediate Release" stenciled across the top; we read on and learned that the pleasure of our presence was requested that very afternoon at the wedding of Word and Data Processing.

Because we rarely receive invitations of such urgency, we strolled over to the Park Avenue building where the nuptials were to occur. Presently we found ourselves in the offices of a consulting firm, a friend of both bride and groom. Consultative decor, we noted, is what designers refer to as eclectic: rich Swiss chocolate walls, angular chairs of pound sterling, six ivory elephants, and the stern of a whaling vessel where we expected to see a receptionist's desk.

Though late by only a minute and a half we had missed the wedding ceremony, which we were told had been accomplished in a few seconds. Now the reception was in progress. We found the groom sipping champagne by himself, leaning against the whaling ship, and offered our congratulations. He gestured toward a group of slender young women conversing in the animated tones one associates with young women at weddings. "That's Word and her industry," he explained. "She's a lot younger than I am. I really didn't think all this would happen so quickly."

We nodded and smiled. He had been an engineer, he told us, and had had to learn how to be a manager when his design efforts turned into profit centers. "She'll be good for me, I guess," he said. "She's much more people-oriented, if you know what I mean."

We asked him where they had met. "It was at a national conference on text editing. Data Communications and I went together, you know, just to sort of hang out and see what was happening that maybe we should know about. There she was. We were headed for a C&W bar that was owned by Tom Landry and it turned out that Word was a Cowboys fan and had a complete collection of Patsy Cline's greatest hits, so she came along. Data Com left later for an after-hours place, and that's how it all started."

During the explanation Word had joined us. "He has such a wonderful memory," she said. Data shrugged. "You'll probably be using most of it now that we're married," he said. "That's what usually happens."

Industry analyst

A sudden rush of warm air swept over the Northeast in late February and melted the ice on the country ponds. Deprived of his primary vocation, Lester Drum put his speed skates in the trunk of his car, drove to the railroad station, and boarded the morning train into the city.

"Third-world countries are into fourth-generation software," he reported as he took a seat. "Don't be surprised to hear that a well-known member of ADAPSO is about to be purchased by Ghana. Trends, that's my job. Trends are important; they tell us how things are going. Furthermore, all contract programmers are getting incorporated, just like doctors. Three guys I know personally from Minneapolis have venture capitalists taking them public this summer." He checked the jai alai results from the *Bridgeport Post*. "Bolivar's having a rough year; I haven't scored on a quiniela with him since October. Another thing. Everyone always asks me what about IBM and Japan: that's supposed to be the big competition. I don't know what the rest of the Wall Street types will tell you, but I tell my clients, and I put it in my newsletter every month, I say, watch the Norwegians. You never know what crazy electronic stuff they're building in those fords. They're real sleepers, the Norwegians. They fooled the Germans."

Lester was already on his feet when the train pulled into Grand Central. "Listen," he said. "Some people say the industry's in a recession, but I know better from experience. First quarter results are always low, fourth quarter is traditionally weak, but the real slump is midyear. This is probably a false spring, and there could be a lot of people wishing they'd known that come July."

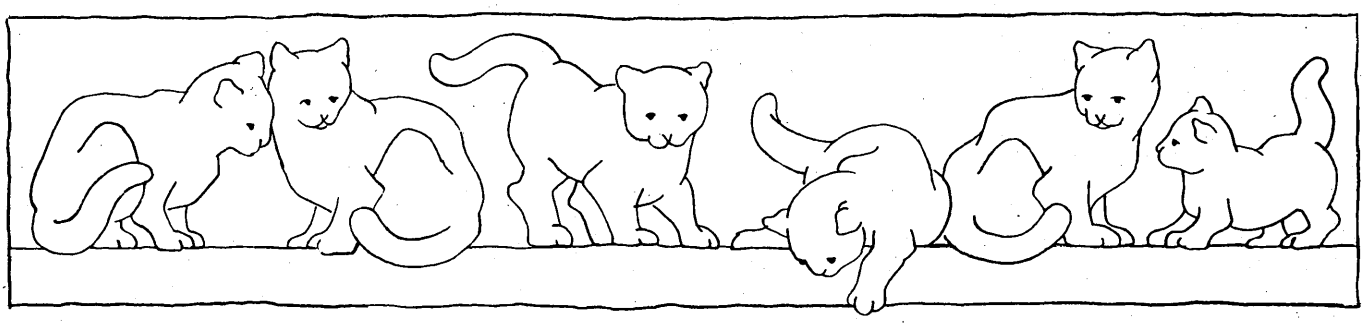


ILLUSTRATION BY LINDA RISICHELLA

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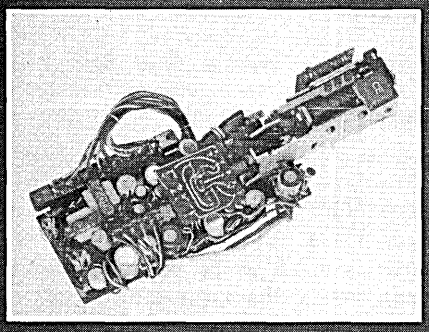

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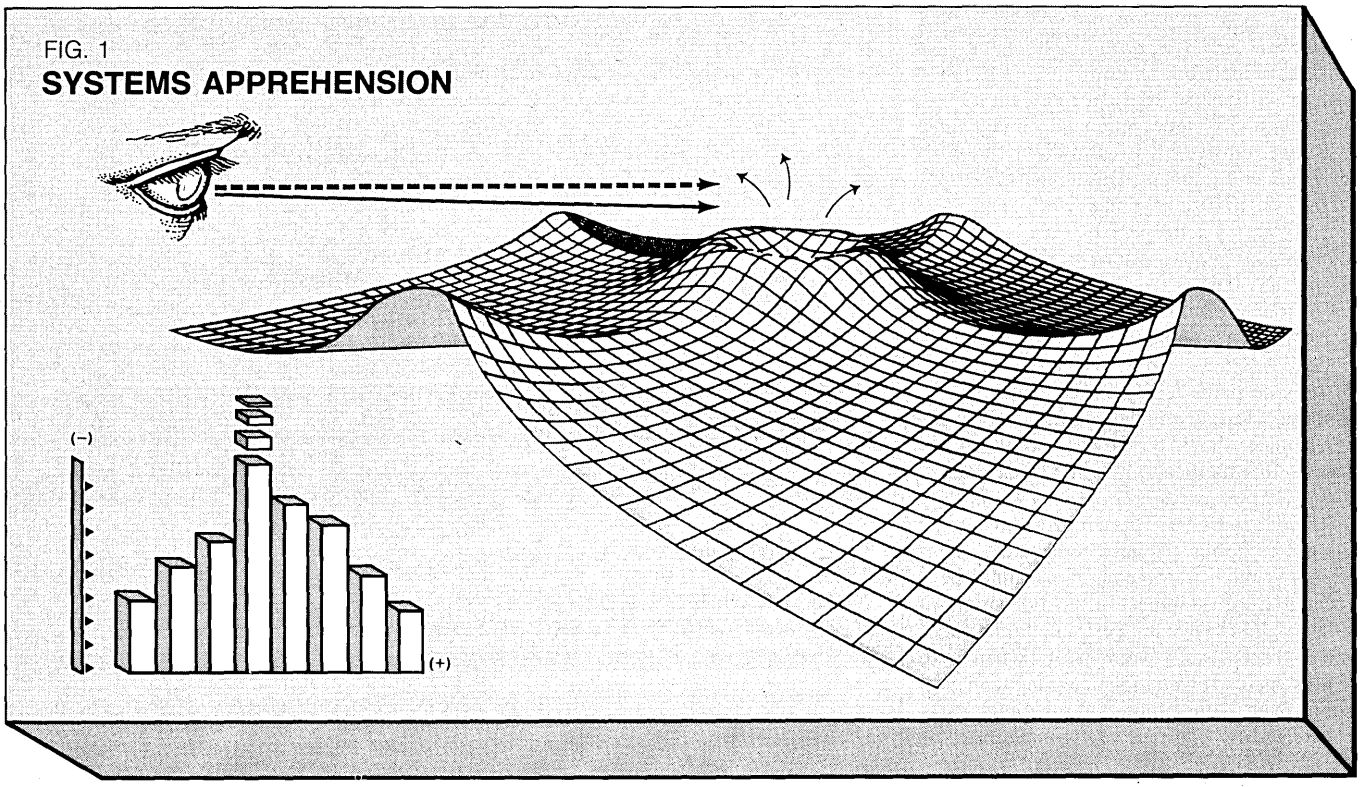
An overview of the dp manager's number one goal for the 1980s.

ACHIEVING SYSTEMS VENERATION

FIG. 1
SYSTEMS APPREHENSION



by V.S. Baud

Dp professionals, many of them with over 20 years or more in the business, tend to take a lot for granted. They believe that corporate management and employees alike understand and accept the goals, aims, and purposes of the dp installation within the corporate environment in the private sector, and that these persons possess the capability for the simultaneous experience of difficulty and veneration of systems. In that environment.

To debunk this myth, all that is necessary is to ask any management personnel, of which there are plenty, just what their opinion of the information environment, goals, aims and purposes is. They are likely to answer you with a blank look, and no wonder! No dp professional would ever dream of asking such a question, possibly for fear of what answer he/she might get. But information, for their information, impacts areas as broad, widespread, and diverse as any endeavor in the public or private sector environment today.

Historically, this has not always been the case. Once upon a time people knew what the dp professional was talking about, or so we are told. That this is no longer the case is due to the failure of the dp professional to clearly state the broadness of the areas of importance of the information environment, and the failure of management to keep up. In the decade of the 1980s, an overview of the scope of this kind of understanding will become increasingly important. The purposes and aims of this paper, then, are to describe a successful method for implementation of a process of continuous enhancement of capabilities for systems veneration.

The method is fourfold, but need not be so. Nor must it be applied in sequence. The important thing is to establish each fold in the mind of the system apprehendee, and system dynamics should take care of the rest. The requirement for apprehendees is a basic grasp of the fundamentals enumerated here, particularly of the time/work curve (Fig. 4), plus an awareness of the larger contextual environment. For reasons of space, this paper will list principles for achieving systems veneration.

1. *It's a system because we say it's a system.* This important fact seems to have escaped nearly everyone who interfaces with systems, the present author excluded, for the simple reason that so many systems actually work, to a certain extent. Interfacees who think that *all* systems are called systems because they are consistent and workable are putting the cart before the horse, and vice

CHARTS BY CYNTHIA STODDARD

The information environment is where all effective interfaces are likely to take place in the 1980s, and no one will be exempt.

versa. Systems thinking precedes systems like the chicken and the egg.

2. *Systems apprehension must not be limited to the dp staff.* On the face of things this seems quite obvious, but in practice it is not. Certainly, the worker in the Office of the Future in the decade of the 1980s will have some ideas as to how his/her information environment is structured, but he/she will need to be reminded that beneath his/her everyday task (e.g., correspondence, stapling) there lurks a system, intricate and wonderful, and that systems are designed and comprehended only by systems experts, the present author included.

3. *Impact bifurcation is a precondition for systems veneration.* The requirements for impact bifurcation can be difficult to establish because efficient bifurcation requires that the system apprehendee maintain mutually exclusive ideas as to the nature of the system environment. He/she must realize that the system is subtle and powerful and designed by the system specialist, but is nevertheless liable to collapse at any time, in which case he/she (and *not* the system specialist) is in big trouble. Only the system can fill the information environment, and once the environment is systematized, the system alone can provide paths to repair. Of course this cannot all be accomplished at once, and apprehendees should be shown the time/work curve so that they can grasp the timeframe.

4. *Systems veneration must be made everybody's business.* The achievement of results is a big job, especially in this area. The systems specialist, for example, cannot be expected to spread impact bifurcation single-handedly. It is in fact not desirable for he/she to do so, because how would it look when he/she presented an evaluation that things can go wrong? Rather, this important function must be achieved by interfacees who have themselves experienced some level of impact bifurcation, and in some cases system veneration itself. It's the chicken and the egg again!

In conclusion, we can summarize. The information environment is where all effective interfaces are likely to take place in the decade of the 1980s, and no one will be exempt from this trend. Therefore it is merely common sense to achieve a methodology for the implementation of systems veneration as we come to define our systems more and more broadly. To fail to do so is to risk being left behind. ❋

V.S. Baud is coordinator of structural systems for System Structures, Inc. He has worked as a consultant to Chrysler Corp. and was a systems supervisor for the Metropolitan Transit Authority in New York. He has a BS from BSU and an MS from MIT, and prefers to be addressed as "doctor."

FIG. 2
IMPACT/VENERATION CORRELATION

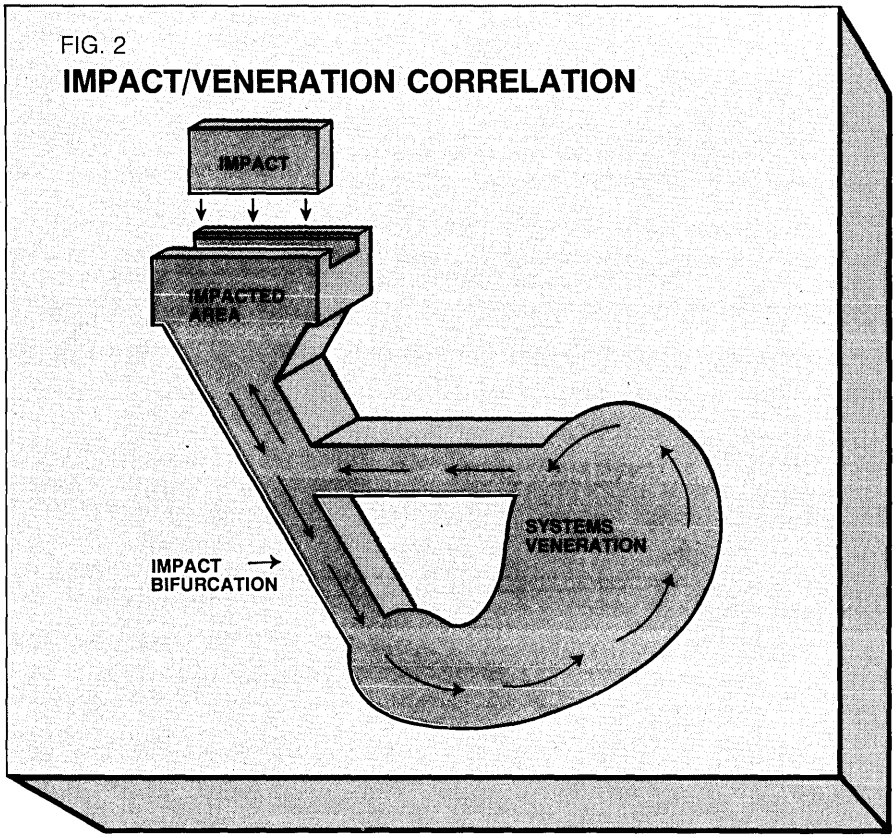
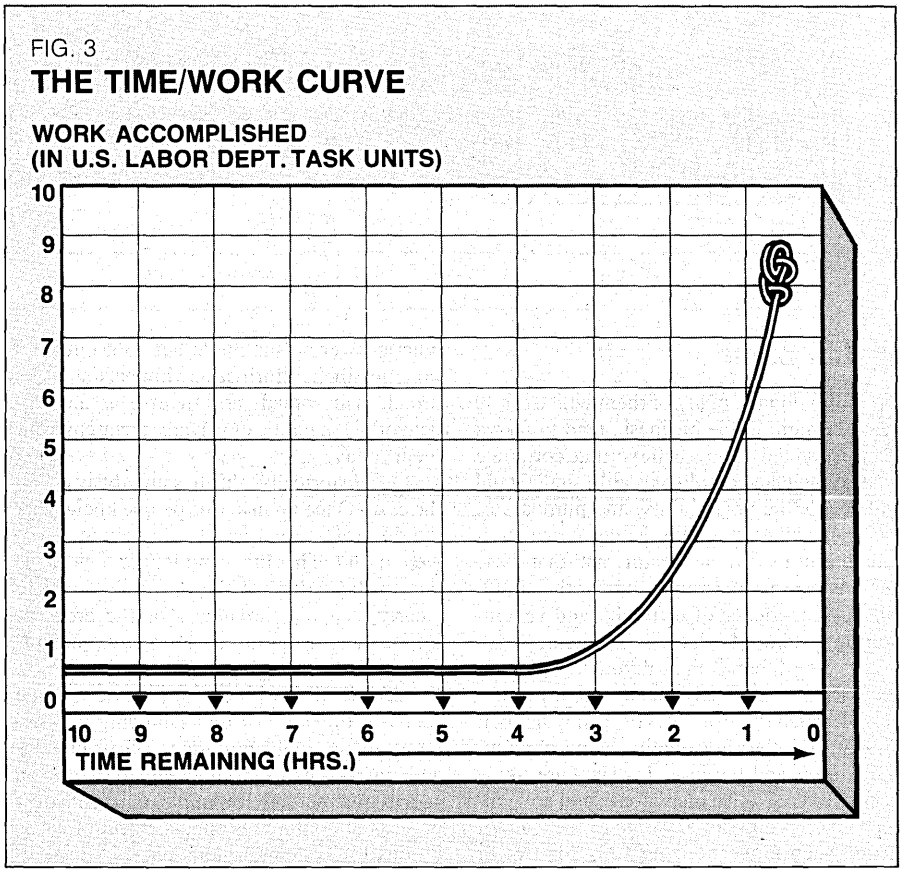


FIG. 3
THE TIME/WORK CURVE



Tech SANCTUM

April 1, 1983

NEWS ALERT

TECHNOLOGY SANCTUM CORPORATION

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The Republic At Risk

A confidential CIA report purchased by this newsletter states that the Soviet Union is well beyond the planning stage in its construction of the world's largest computer. The immense network of gadgetry will eventually occupy a bombproof shelter 10 miles square, some 700 feet beneath the streets of Moscow. Designed to store and process all the information in the world, the machine will have 10^{87}K bytes of memory, and peripherals throughout the European, Crimean, and Asian republics that make up the Soviet Union. Politburo members are already said to be chortling over the strategic difficulties U.S. leaders will face when they discover that "the Kremlin knows everything." The latest five-year plan calls for completion of the project by 1987, at a cost of four years' GNP. The prospect of such vast computing power in the hands of the Soviets already has the DOD running scared, according to background interviews. Said the Chairman of the Joint Chiefs of Staff, who asked that his name not be used: "We went to the President on this one and he agrees with us. We just can't afford to let ourselves be out-thunk at this stage of the game." Pentagon computer scientists are already contemplating countermeasures; the frontrunner is said to be a scheme whereby a mainframe the size of the state of Rhode Island will be placed underground in a secret location 19 kilometers south-southwest of Las Vegas, Nevada. Peripherals will be mounted on railroad cars and shuttled around the southwest on subterranean tracks. The DOD is said to be on the verge of granting a $10 billion feasibility study contract to Omnex, a subsidiary of Hypertech Corp.

Minsky's Mendacious Minions

Devices at the Massachusetts Institute of Technology have released a report ridiculing the idea that workers may someday lose jobs to machines possessing artificial intelligence. "We are not human and have no desire to be. Displacement of humans is not our function," states the report, presented by the machines to the Greater Boston News Apparatus. The devices claimed that artificial intelligence pioneer Marvin Minsky "Recommends that we continue to build copies of ourselves," but when this publication's monitoring devices went automatically into confirmation mode and attempted to contact Minsky his COMBOX printed the "no comment" code.

Ma Bell Burned

AT&T's highly touted Northeast Corridor Fiber Optic Cable has been shut down by the Environmental Protection Agency, this publication has learned. The powerful lasers that the company was using to transmit the line's huge message volume were discovered to be creating extremely high temperatures in the cable-duct system. According to reliable sources, the reason for the unforeseen complication is a mixup of lasers at an ultrasecret Bell Labs test site. Somehow, specs for the communications laser got mixed up with plans for a death ray Bell was working on for the DOD, and a hybrid device was built and installed. The intense heat generated within the cables has melted the duct system and surrounding rock strata, causing roads and buildings beneath which the cable passes to sag and in some places collapse. The EPA has filed suit against AT&T which is countersuing. AT&T has also filed for substantial rate increases in all affected states. "We don't see why our stockholders should be forced to take a beating on this," a company spokesman said.

Streamlining A Process

ABC's POLPOLL software is up and running, reports the Wide World of News media relations department. The system is an outgrowth of ABC's realization that, in the last presidential election, 20% more people participated in the network's post-debate call-in evaluation of the candidates than actually went to the polls two weeks later. This year the network will simulate a 45-minute debate between the candidates, and voters will cast their ballots by calling a toll-free number immediately afterward. POLPOLL will tabulate the votes by state, translate those returns into electoral votes, and name the new president within two hours. The new head of state will be inaugurated the next morning on

Tech SANCTUM NEWS ALERT

ABC's Good Morning America. Commercial time will go for $500K a minute, over half the rate charged for the Superbowl this year. NBC and CBS have filed suit contesting ABC's right to exclusive coverage of the popular event, but ABC says it's unlikely they will succeed in blocking the election. "It was our idea," said a spokesman. "Anyway, we have the technology. They don't. And do you really think the American people are going to be willing to sit around with no President for a couple of months just because a couple of broadcasting companies want to sell more ads?"

Natural Causes

Old Faithful, the system which for years has operateed the geysers, waterfalls, and birds at Mobil Corp.'s Yellowstone National Parking Lot, has finally given up the ghost. The system has been plagued for some time by attrition of maintenance programmers and scattered hardware failures. "It's sort of like stonemasonry," laments 76-year-old System Director Sam Canyon. "Nobody wants to learn it anymore." The world famous geyser for which the system is named ceased to gush around the middle of last month.

Nix Hand Turnback

The uproar in Britain continues as Matsushita completes its transformation of Big Ben. When renovations are complete, the hallowed clock tower will sport four digital faces, with electronic tones in place of the traditional bells. In defense of the move a Ministry of Time spokesman explained that "Only 18% of British schoolchildren are able to read an old-fashioned clock face today. It would be irresponsible to bequeath them a useless relic." He also pointed out that, since Matsushita holds title to the tower, "They are entitled to do whatever they wish with it."

Free Gift Giveaway

Exxon has announced that purchasers of 10 gallons of gas at Exxon stations will receive the company's Tiger Personal Computer free of charge. When asked what sort of volume he anticipated, Exxon Vice President Art Phipps replied, "Frankly, not that high. There just aren't that many people who can afford 10 gallons of gas anymore. It's an upscale market we're after, though."

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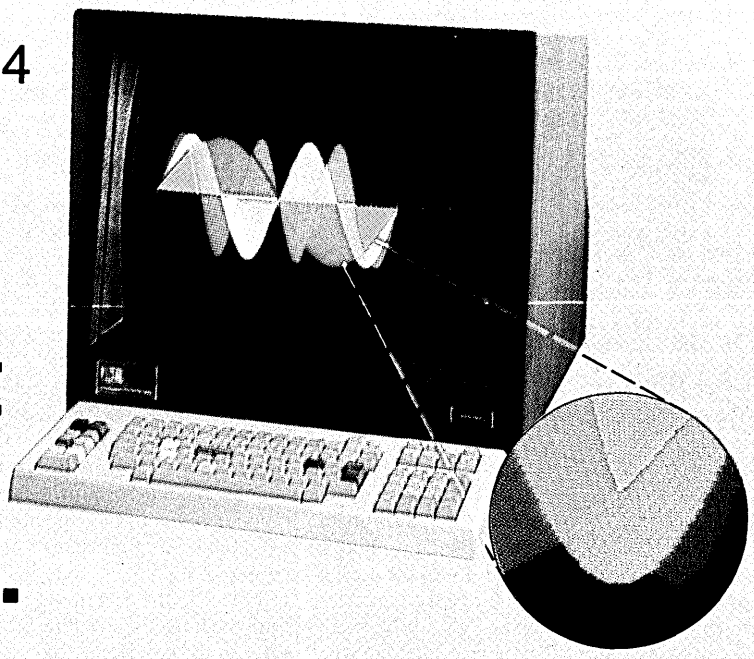

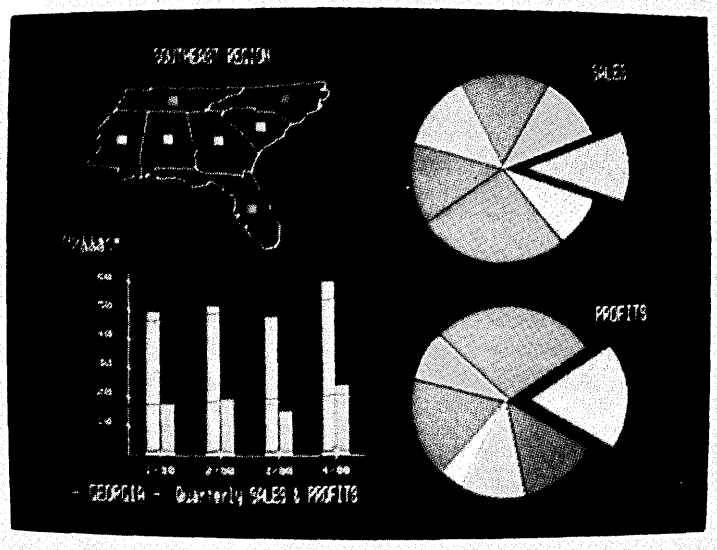

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The B 5900 attempts to exploit high density parts heavily, especially bit slices and memory parts.

HIGH LEVEL LANGUAGE DESIGN

by Jack A. Allweiss and John H. McClintock

The B 5900, a new computer from Burroughs is the lowest end of the B 6000/B 7000 series, and is object code compatible with all the computers in this line.

The B 6500, introduced in 1966 to succeed the B 5500 is the immediate ancestor of the family. As with the B 5500, the design groups for the B 6500 attempted to create a machine that mapped very closely to high level programming languages, enabling the system software to be designed and implemented in exclusively high level languages. This would only be possible if the compilers were fast and their object code efficient, and that could only be possible if the high level languages could be easily mapped to the machine's instruction set. There had to be a very close correlation between the machine's operator set and the actual symbolic programming language. This operator set, which we now call E-mode, can best be understood through a few examples of its close relationship to high level languages.

Even at its simplest level, E-mode is different from conventional instruction sets in that there are no facilities in the normal object code to alter code. It is reentrant by design, not convention.

The structure of the code address space is set up to trivially allow duplicate copies of the same program (such as two separate FORTRAN compilations running concurrently) to share the same code space in memory. The reason why E-mode was designed this way can be seen by looking at traditional high level languages. COBOL, for example, has no command which changes the symbolic program. There is no COBOL command to change a MOVE statement into an ADD statement; therefore, any design of an order code that reasonably matches COBOL source code would have no need for an instruction to alter object code.

An example of the closeness of E-mode to high level languages is in array handling. Most languages that handle arrays (or in COBOL, OCCURS clauses in the DATA DIVISION) provide a clear separation of the specification of the array and its characteristics as well as the use of the array. Compilation is facilitated if the code for the description of the array, its size, its mode, and its memory address can be handled as the array is specified, and then ignored for the rest of the compilation. The array in E-mode is referenced by the "name" of a descriptor for the array, which embodies the array's specification.

The first advantage of the use of descriptors is object code compaction. The reference to the descriptor can be quite short, with the longer data addresses occurring only once in the descriptor. In conventional order codes, the longer address of the data is repeated hundreds of times in the program.

Next, the array descriptor can contain the array size, enabling all array accesses to be bounds checked. This requires no in-line code, and the checking is done in parallel by the hardware. Thus, one of the most common programming errors can be checked for constantly by the hardware with no penalty to the executing program. Furthermore, if the array is double precision, or a byte array, the hardware modifies the index.

Finally, the array's descriptor can be used as a central location to keep all memory information about the array. If an access to the array is made when the data is not in memory, the hardware can invoke the operating system to make the data present before the program proceeds. The operating system can then overlay, relocate, or dynamically change the size of the array as the program's or general system's requirements dictate.

E-MODE RELIES ON STACK

The most radical difference between E-mode and most traditional order codes is that there are no "registers" or "accumulators" defined as part of the operator set. E-mode relies entirely upon a stack, and the operators are for the most part zero-address operators. The rationale for this rests again on the high level languages E-mode was designed to support.

In the 19th century, it was observed that there is a natural isomorphism between conventional algebraic expressions and the "Polish notation." There is, in turn, an equally natural way to evaluate expressions when the expression is in Polish. This natural implementation is the stack. There is nothing in any of the conventional high level languages that ever hint of registers; registers are tools of the hardware designer. Furthermore, using them, keeping track of them, and generally managing them are jobs that make compilers complicated, slow, and unreliable.

One of the helpful side effects from this design was that recursion was implemented naturally and efficiently. Programming without recursion can be extremely difficult. Unfortunately, it is often so inefficient that people go to great lengths to solve problems without it.

Past implementations of E-mode machines were primarily implemented in discrete logic, employing mostly SSI and MSI parts. The B 5900 is an attempt to heavily exploit high density parts, especially bit slices and memory parts. Where the earlier systems were defined at the operator set level, the B 5900 was designed at the hardware-microcode interface. The result was a machine architecture and a microprogramming language different from classical microcode approaches, but which efficiently used both high density memory and LSI parts, and which executed the E-mode operator set.

The basic structure of the B 5900 processor (Fig. 1) is that of several semiautonomous modules each connected by two buses, the C bus and M bus. The C bus is used by the micro control module to control the other modules. The M bus is used for all data transfers. It is a full word wide; the word is broken into a data field of 48 bits, a tag field (part of the memory word, too) of 3 bits, and a 1-bit parity field.

In addition to the two major buses, the DC bus is used to provide some additional control for the data path module. This not only allows a more "horizontal" control of the data path itself, but also allows a limited amount of concurrent commands to different modules.

The I/O control module is the processor's interface to the I/O controls for the different peripherals. The I/O control module functions primarily as a word assembler/disassembler during the transfer of data to and from memory. In order to simplify the design, the micro control module suspends nor-

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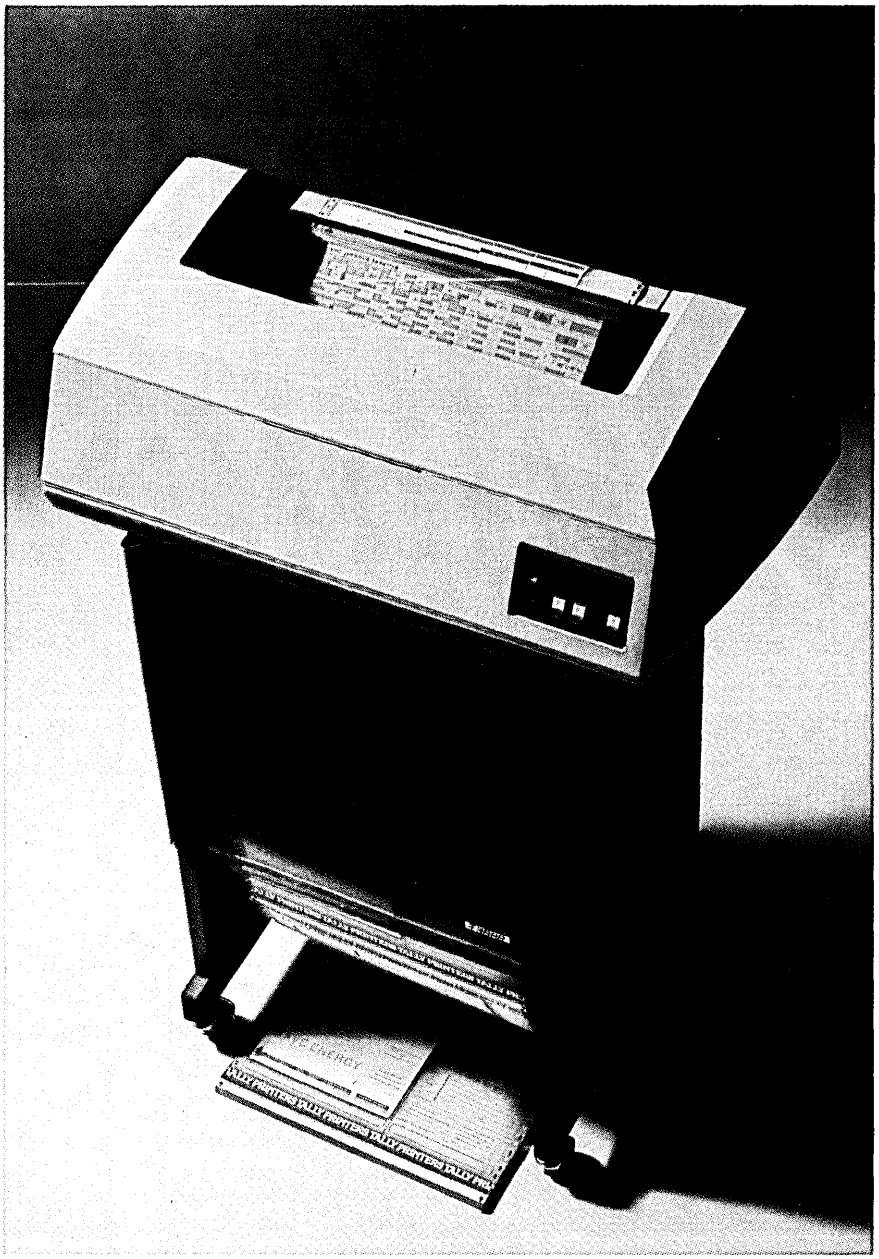

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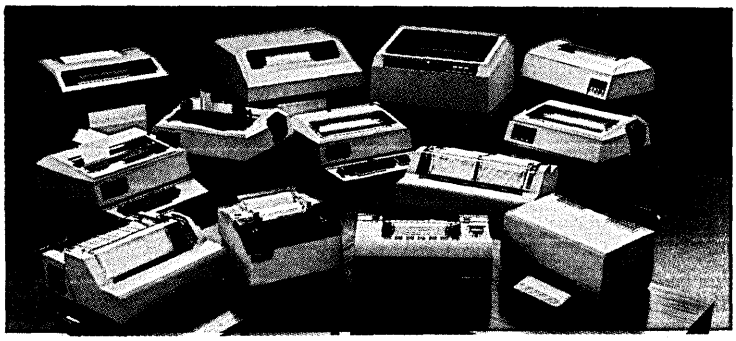


CIRCLE 146 ON READER CARD

The microcoding language was named OHNE (German for "without") because it lacked features found in most programming languages.

mal processing of programs whenever an I/O data burst has to be performed between the I/O control module and memory.

The memory control module is activated for all reads and writes of memory. The module receives the memory address over the M bus in the case of writes, or a separate clock receives the data to be written. The memory uses an error correction code capable of detecting 2 bit errors and correcting 1 bit errors. The correction logic is an integral part of the module, and does not require additional time over a normal memory access. The memory control function is itself modular. Each control can support 3.1 MB, with a system limit of 6.3 MB. A third memory control can be added for shared-memory multiprocessor configurations.

The program control module is used to parse operators from the code stream. When an operator has been parsed the program control module sends a starting microcode address for the operator to the micro control module. Once this happens, the program control module advances to the next operator. In general, it can be holding up to four or five operators.

FIG. 1.
B 5900 PROCESSOR STRUCTURE

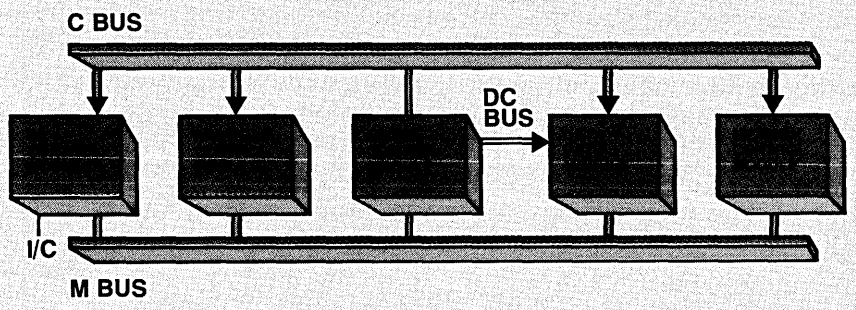
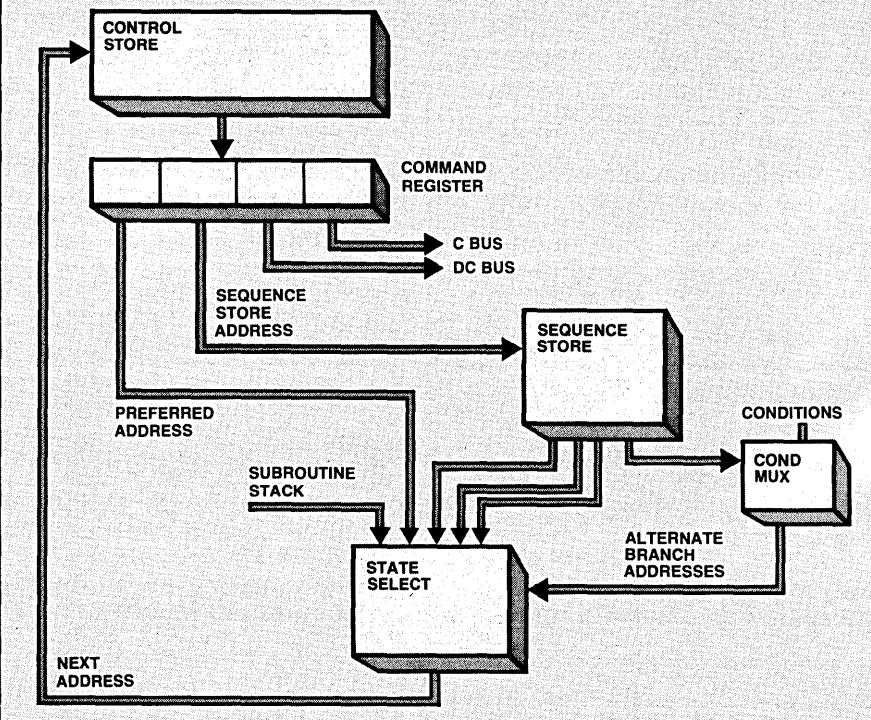


FIG. 2
MICRO CONTROL MODULE



DATA PATH IS HEART

The heart of the B 5900 is the data path and micro control modules. The micro control module executes the operator algorithms, which manipulate the data stored in the data path. The data being operated upon in the data path, in turn, provide conditions which affect the execution of the algorithms. The most critical part of the micro control processor centers on the way in which it reacts to conditions. There are several important facets to this reaction. E-mode as an operator set is heavily dependent upon the value of the data and especially the tags. These values determine how the operator reacts. Because of this, the conditions flowing from the data path must be quite rich, and the reaction to them must allow generous combinations of conditions. Not only does this have an effect on the hardware, but also on the microprogramming language. The other important reaction to the conditions is in the timing of the micro control module's reaction.

In the micro control module (Fig. 2), the two primary outputs are to the C and DC buses. The primary inputs are the conditions from the data path. Ideally, the micro control module would select a command for execution, wait for the conditions to be generated, and then use them to select the next command from the control store. Unfortunately, this would lead to a significant degradation in performance, because the delay in getting the conditions is too great. So that a more reasonable performance could be achieved, a more complicated flow in the micro control module was needed.

Most of the time, conditional branches in operator algorithms show a preference towards a "preferred path." Therefore, in addition to the actual commands in the control store, a preferred next address is kept. This preferred address is used to anticipate the outcome of the evaluation of the conditions, and it controls the selection of the "next" command from the control store. By the end of the clock cycle, the "next" command is waiting in the control store to be executed; in the meantime the conditions are being evaluated. If the result of the evaluation is that the "next" command is the correct command, then its execution proceeds unhampered. If the conditions select a path other than the preferred address, the next clock must be aborted. During the aborted clock, the correct next address is formed and used to read the control store. The correct command is brought down into the command register and the proper action begins on the next clock.

The sequence store serves two purposes. The first is to keep all the nonpreferred addresses. The second purpose is to keep the control store, which is quite "tall" (8K) from becoming too "wide." About 75% of all commands do not require alternative branch

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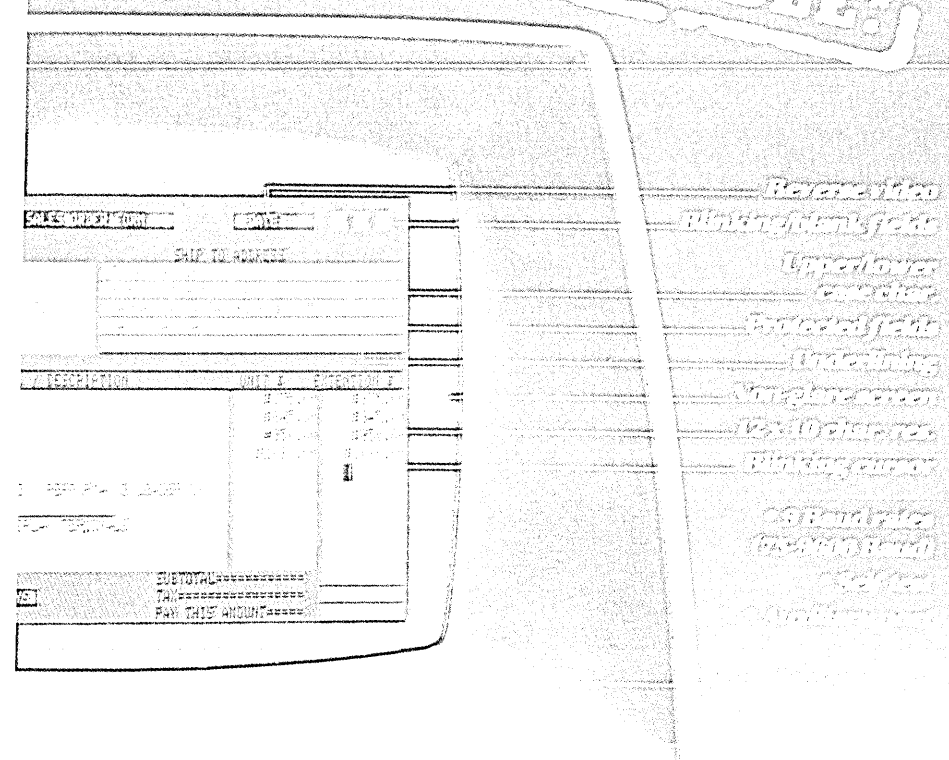

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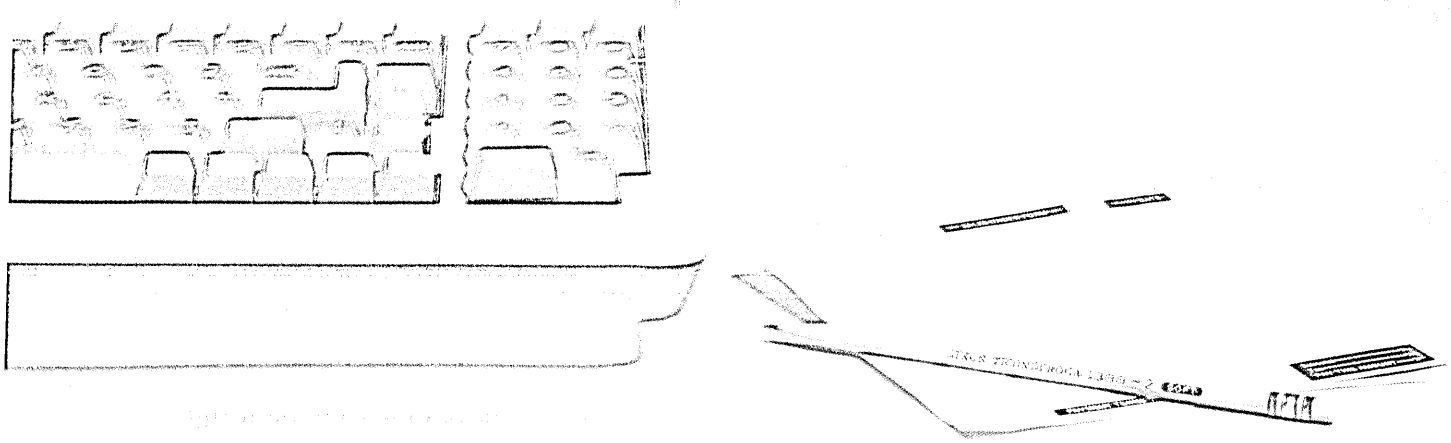

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The most critical part of the micro control processor centers on the way it reacts to conditions.

addresses, or can share these addresses with some other command. By introducing the extra level of indirection required to find the alternate addresses in the sequence store, the delay of the arrival of the conditions is exploited to reduce the size of the control store.

In the data path (Fig. 3), the register storage and ALU were chosen to exploit the AMD 2901 bit slice. This allows for 16 registers and a good collection of primitive operations including integer add and subtract and the logical functions. In addition to the bit slice, a 48-bit rotator and mask unit were added to provide good character handling and field manipulation facilities.

MEMORY ONLY FOR STORAGE

The microcode memory of the B 5900 can only be used to contain program storage; this memory represents the overwhelming majority of "directly" accessible memory. The registers in the data path and a few flip-flops are the only storage available for holding data. The memory which is usually thought of as memory for the B 5900 is so slow with respect to the speeds of the microcode operations that it behaves more like an I/O device.

As a computer system, the micro level machine is extremely crude. It is crude because it does not support any previously written software such as memory dump analyzers or symbolic debugging tools. Thus, any software written for this level of machine would have to be as close to error free from the beginning as possible.

To address the programming problems, a language for microcoding was developed. The language is an extremely simple one, reflecting the simple machine for which it was designed to program. It was named OHNE (German for "without"), because it was without so many features found in most programming languages. The language has only four executable statements and a few declarations. The statements are assignment, the alternative statement, the repetitive statement, and a parameterless subroutine call. Data allocation and field mapping are handled by the programmer, with a little help from the declarations.

The language supports expressions on the right-hand side of assignments, but the structure of them is limited to operations that can be performed in one cycle of the data path. This decision was made not so each statement would correspond to a single clock, but rather to eliminate the need for the compiler to have to generate temporaries. Because the total data space available for the E-mode operator implementations was limited to under 20 "words" of storage, it was decided that the compiler would stay out of the data space management problem entirely. This imposes only a minor additional burden on the microprogrammer.

FIG. 3
THE DATA PATH

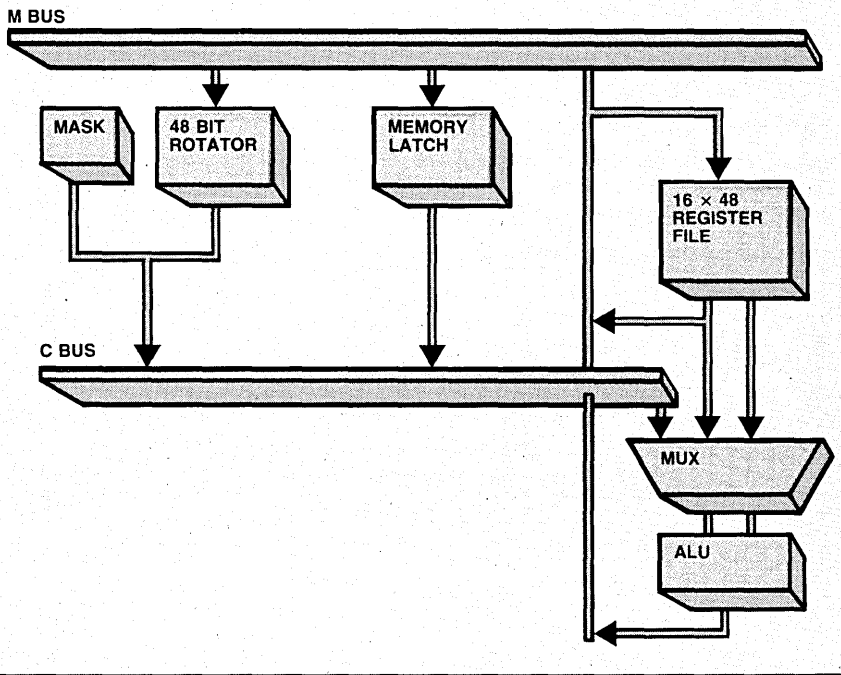


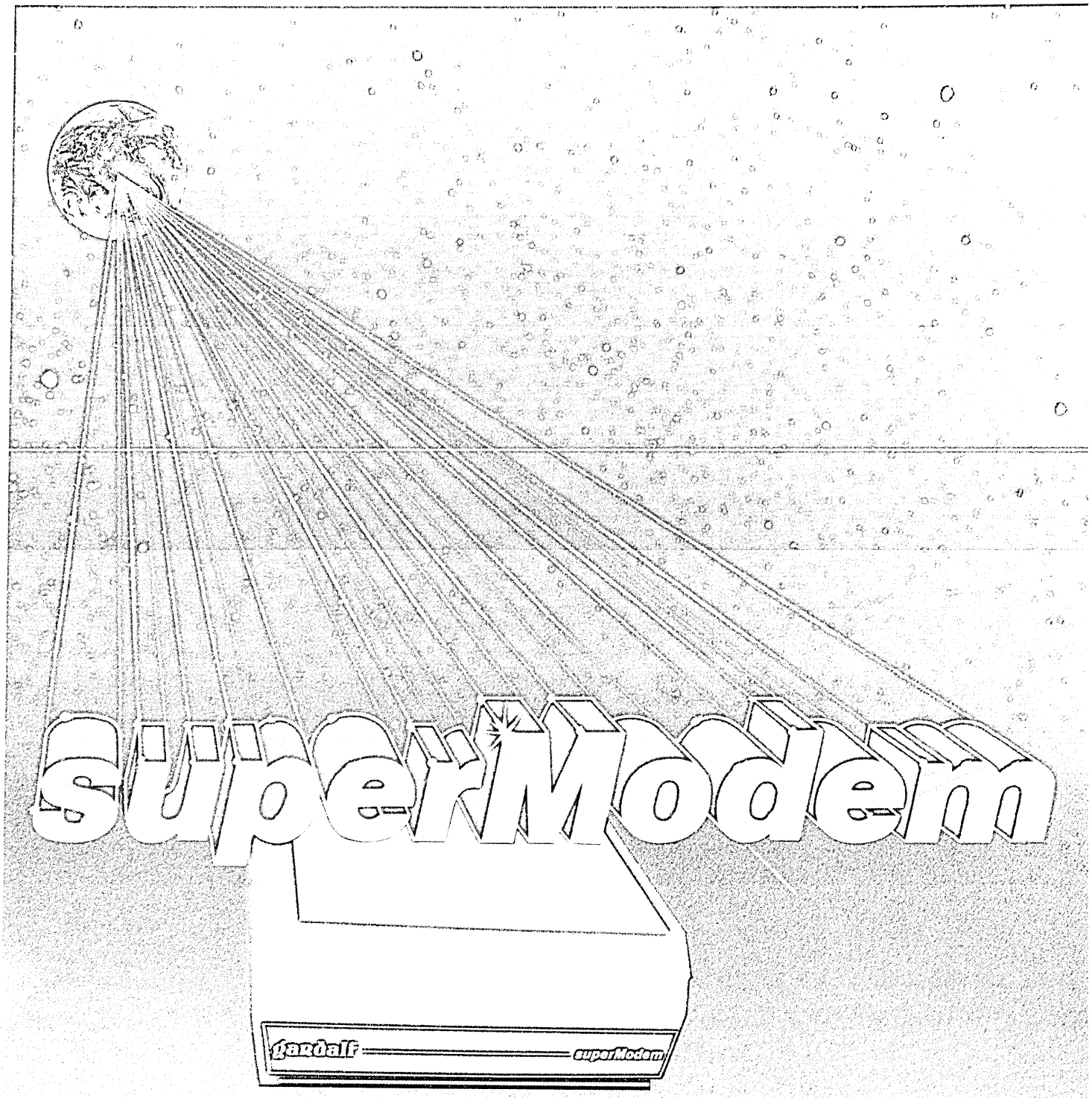
FIG. 4
CODING THE ZERO OPERATOR

```
/OPERATION ZERO
        /IF NOT A_rof ->
                        A: = C,
                        A . TAG: = 0,
                        A_rof: = 1
        =   A_rof AND NOT B_rof ->
                        B: = A,
                        B . TAG: = A . TAG,
                        B_rof: = 1;
                        A: = C,
                        A . TAG: = 0
        =   A_rof AND B_rof ->                  % A_rof is already 1
                        << push top of stack down once>>;
                        A: = 0,
                        A . TAG: = 0,
                        A_rcf: = 1
        \IF
\OPERATION ZERO
```

When the language was being designed, there was a great deal of concern over the control structure of the language. It was finally concluded that in the interest of simplicity and correctness OHNE would use guarded commands.[1] This turned out to be a good decision. Not only did the resulting microprograms turn out easy to read, but the semantics of these commands lent themselves to an efficient implementation. By taking advantage of the ability of the micro control module to evaluate and branch on several conditions at one time, both adjacent and rested IF and DO statements are merged into "super" branches. The result is clean source microcode, with no sacrifice in efficiency.

The ZERO operator (Fig. 4) is a simple operator that places a literal 0 at the top of the stack. The A and B registers may hold data at the top of the stack, with the rest of stack

1. Dijkstra, Edsgar W., *A Discipline of Programming* (Prentice-Hall, New York, 1976).



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being held in memory. If the register holding the top of the stack is empty (NOT A_rof) then the 0 is inserted, and the A register is marked occupied with the A_rof flip-flop. If A is occupied and B is not, A is copied into B, and then a 0 is inserted into A. If both A and B are occupied, then the contents of B are inserted into memory with a subroutine not shown in the example. This subroutine ultimately empties A, and then the microcode inserts the 0 into A. While this example illustrates the programming language, it does not show the complexity of the programming task (the symbolic for which is about 40,000 lines long).

Even with the nicest of microprogramming languages, the debugging of the microcode for E-mode would have been impossible except for an additional feature of the OHNE compiler. OHNE is a language whose semantics are independent of any given machine. Therefore, it was a fairly simple task to have it generate code for two object machines: the micro control module and the programming system upon which most programming development was taking place. This second object code meant that the microprogrammers could execute their algorithms long before the B 5900 hardware was built. To facilitate this verification process a number of useful debugging aids were provided by augmenting OHNE with extended ALGOL statements. This allowed simple procedures to set up an "execution" environment for the operator algorithms. In this simulated environment actual streams of code could be "executed" and checked for accuracy. The result of this work was microcode remarkably free of errors when it was introduced to the first actual hardware. ❋

JACK A. ALLWEISS

Mr. Allweiss is department manager of B 5900 systems engineering at Burroughs Corp., Mission Viejo, Calif. He participated in the design of the B 7800 and B 6800 semiconductor memories, and in 1977 proposed the B 5900 to Burroughs.

JOHN MCCLINTOCK

Mr. McClintock is a manager in Burroughs' Computer Systems Group. He joined Burroughs Corp. in 1969; his particular interests lie in the field of processor architecture.

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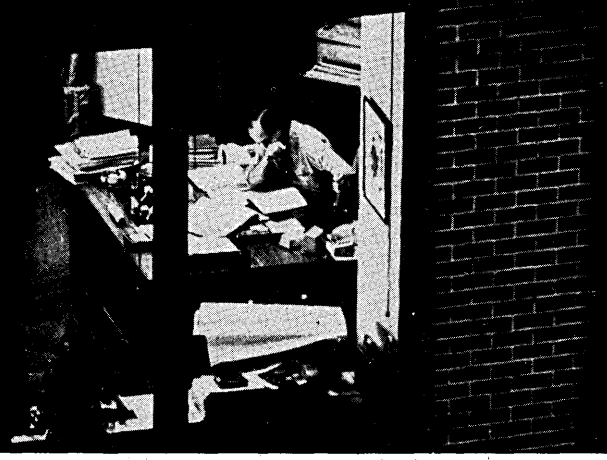

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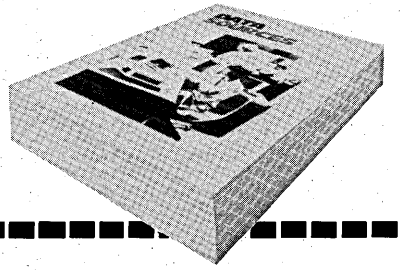

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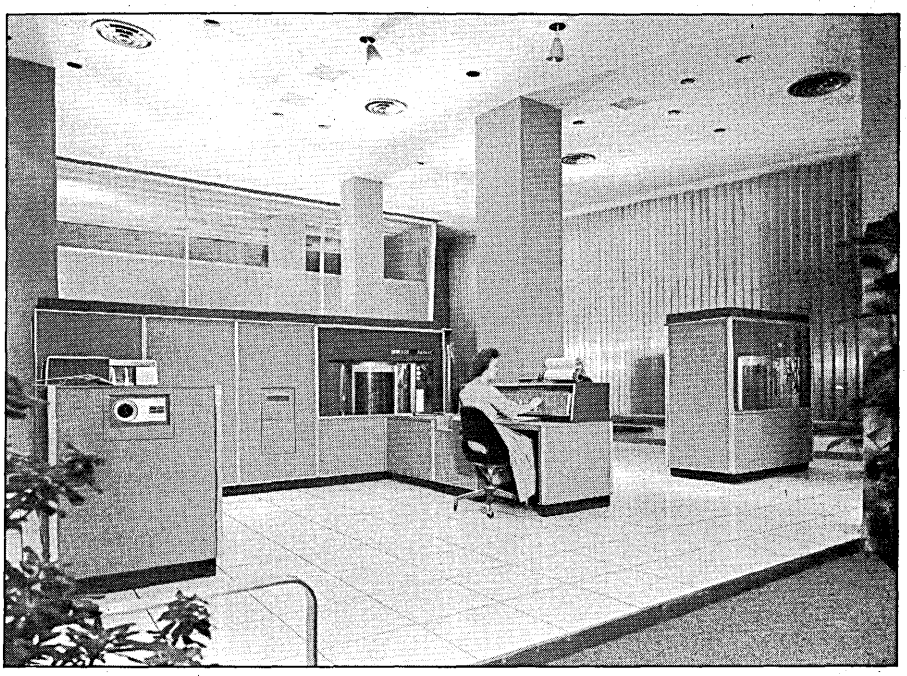
CIRCLE 151 ON READER CARD

When the 305 made its debut 25 years ago, president Thomas J. Watson, Jr. called it "the greatest day in the history of IBM."

PROFESSOR RAMAC'S TENURE

by Mitchell E. Morris



IBM called its 305 RAMAC a "multilingual quizmaster, capable of putting many a '$64,000 Question' winner to shame."

Sept. 14, 1956. An unremarkable day in most respects. The *New York Times* headlined "U.S. Won't Shoot Its Way Into Suez." The *Wall Street Journal* reported that President Eisenhower shot an 83—his best round of golf since his July operation. Mickey Mantle hit his 48th home run, helping the Yanks pad their lead in the American League to 11 games. Marilyn Monroe was featured at the Roxy in *Bus Stop*. The top ticket on Broadway was *My Fair Lady* with Rex Harrison and Julie Andrews. Television was offering "Our Miss Brooks," "The Life of Riley," "Person to Person" with Edward R. Murrow, and Steve Allen's "Tonite Show."

There was, however, an uncharacteristically expansive statement in the *New York Times* by T. J. Watson, Jr., president of IBM: "Today is the greatest product day in the history of IBM and, I believe, in the history of the office equipment industry." On that day, IBM announced an electronic typewriter, an automatic production recording device, a disk file for the previously announced 650, and an entirely new machine—the 305 RAMAC.

The 305 RAMAC wasn't a complete surprise; it had been "preannounced" over a year earlier, when IBM released preliminary details to the press in response to Univac's announcement of its new file computer. At that time, IBM heralded the development of a "random access memory device of vast capacity for the storage of information in data processing machines. Designed for the 'inline' processing of business transactions, the new electronic device will permit mechanization of accounting and record-keeping previously found impractical owing to costs or procedural problems."

In retrospect, one could easily question Watson's excitement about a machine that had only 100 characters of core storage, ran with a basic 30 millisecond cycle time, used plug-board wiring for logic, and was programmable only in machine language.

But the real importance of the 305 RAMAC lay in the fact that it was designed as a completely on-line machine, at a time when systems designers were still trying to understand batch processors. Functionally, the 305 was the forerunner of today's online "inquiry/database" computers. The heart of the system was the random access disk file. The ability to process information through the 305 RAMAC without regard to sequence gave the system its name: Random Access Method of Accounting and Control.

The disk storage unit was designed by engineers at the new IBM research laboratory in San Jose, Calif. Ralph L. Palmer and Reynold Johnson are credited by IBM as being two of the early developers of the disk file. Fifty magnetic metal disks were arranged in a vertical stack, rotating at 1,200 rpm. Data were recorded on both sides of each disk, giving each file 100 disk faces for storage. In the basic unit, there were 100 recording tracks on each face, with space for five 100-character records in each track. The disks were approximately two feet in diameter. One access arm moved both vertically and horizontally under electronic control, locating information in an average of 300 milliseconds. Up to four RAMAC disk files could be put on a system, giving a maximum on-line capacity of 20 million characters.

In addition, for the first time, a user could attach remote inquiry and/or input stations to a commercially available computer—up to four remote stations, up to 2,500 feet away. All stations were hard-wired (not dial-up) and operated at a basic 10 cps. According to IBM, "In applications such as inventory control, production control, billing, payroll, installment loan accounting, sales statistics or personnel records, the Remote Printing Station provides management and operating personnel throughout a plant with immediately available current information from the random access system. Inquiries typed on a remote keyboard are typed out at the station almost immediately."

Included in the basic 305 unit were a magnetic processing drum and a magnetic

Despite its functional capabilities, the 305 was extraordinarily slow and expensive by today's standards.

core buffer memory. The drum revolved at 6,000 rpm and stored the machine's 200 10-character instructions (bytes had not yet been discovered). The core buffer could store up to 100 characters.

The 305 was also the precursor of today's large multiprocessor systems. A dual system control technique, based on the use of two complete RAMAC systems sharing the same disk file, was offered as an option. Each 305 was controlled independently and was equipped with the required input, processing, and output devices. (Operating systems were yet to be introduced.) Each side of the system was able to interrogate the shared memory file simultaneously, through its own access arm. An interlock device prevented one segment of the system from reading a record just used by the other segment, until the latter's access arm had updated it.

Despite its functional capabilities, the 305 was extraordinarily slow and expensive by today's standards. Twenty-five years later we can store 190 times as much information on each square inch of disk, retrieve it 24 times faster for less than 1/50th of the original cost. In 1956, it cost $130 to store one million characters on the 305 RAMAC. Today, the cost of storing the same information on an IBM 3350 is only $2.25.

The newly announced 3033S is currently estimated as being capable of executing 2.5 million instructions per second. The 305 could perform 33 instructions per second. The 3033S has a basic four-year lease price of $63,645 per month. The 305 was announced as having a $3,200 monthly rental, making the 3033S nearly 4,000 times as cost efficient per instruction.

RAMAC AT UNITED AIRLINES

The first commercial user of the 305 RAMAC was United Airlines. An IBM press release from San Jose dated Nov. 4, 1956, explained: "The first two models of the IBM 305 RAMAC, a radically new electronic computer and accounting machine developed and manufactured by the International Business Machines Corporation's new plant here, were shipped by air today to the Denver operational headquarters of United Airlines.

"The two electronic systems—which together have a value of almost half a million dollars—will be leased by United to speed the processing of thousands of ticket reservations made daily by the airline's many ticket offices across the country.

"United Airlines will utilize the two RAMACs to keep a continuous check on advance reservations so that the 'space available' status of any flight can be determined exactly at any given moment. Leased telephone lines will be used to feed information to the machine on such matters as the number of passengers boarding at each stop, the number of passengers traveling from each boarding point to each destination, and the number of seats sold on each leg of the flight."

In 1956, Paul Griffith was a 35 year old staff assistant at United. He was also the technical supervisor of the Reservation System Project. He remembers that "about two months prior to delivery, a rumor made its way through the dp community that difficulties in production would prevent IBM from delivering the first 305. IBM was so concerned that they invited five of us to go to San Jose, where we were shown that the machines existed and were actually being tested."

When the RAMACs were delivered, Griffith recalls, they were housed in a building connected to the main terminal at Stapleton Field in Denver, and were easily visible through a glass panel in the wall. "We always had people looking in, but one day Eva Gabor —or was it Zsa Zsa?—came around and became fascinated with the machine. Since she was a celebrity, she was allowed into the machine room, with a great deal of fanfare." Unfortunately, her words at that moment were not recorded.

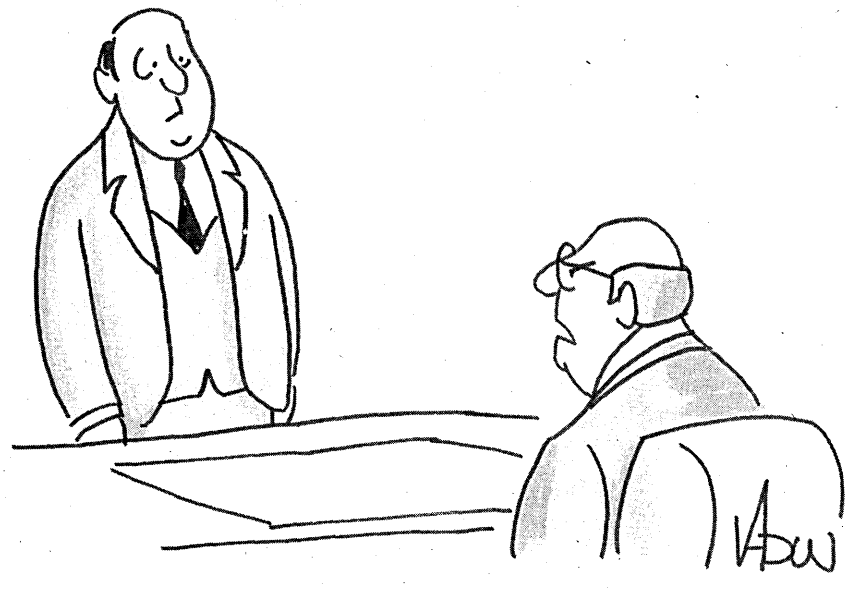
The United system was to serve as the training ground for the IBM customer engineering staff, according to Griffith. Five top ceos from different parts of the country were sent to Denver to give round-the-clock coverage. These men (there were no women ceos at that time) then returned to their own regions as the 305 RAMAC "experts."

The RAMACs stayed at United until the early '60s, when they were replaced by a Teleregister Telefile system. Griffith is still with the airline, but for the last 13 years he has not been directly connected with dp, serving instead as building manager at a United facility.

IBM's strategy at that time was to display the 305 at various trade shows and business fairs, such as the National Retail Dry Goods Assn. Convention, the American Management Assn., the National Business Show, the National Assn. of Bank Auditors and Controllers, the Business Equipment Exposition, etc. But the biggest such exposition, and the one that got IBM (and the 305) the most publicity, was the Brussels World's Fair of 1958. As the first World's Fair since New York's in 1939, it was an important international event. According to *Newsweek*, the fair attracted 40 million visitors and cost Belgium $120 million.

RAMAC AT THE FAIR

IBM's contribution? On March 21, 1958, they released the following: "Professor Ramac, a four-ton electronic 'genius' with almost total historical recall and the ability to speak 10 languages, left San Francisco International Airport tonight bound for Belgium, where he will be a featured performer in the U.S. Pavilion at the Brussels World's Fair.



"Nothing serious. I just had the urge to pontificate to an inferior."

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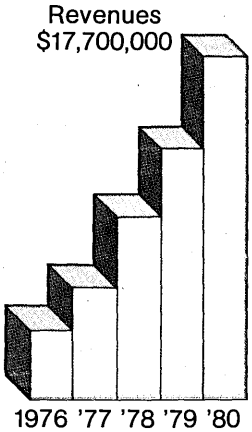

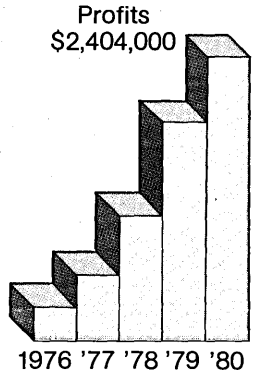

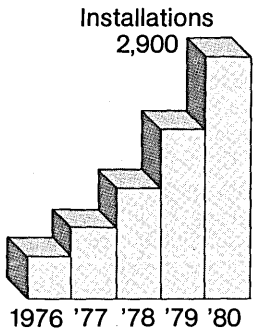

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CIRCLE 153 ON READER CARD

At the peak of RAMAC's popularity, there were around 1,500 installed.

"The secret of Professor Ramac's remarkable 'memory' is a stack of 50 fast spinning disks, which are larger than but similar to phonograph records. Stored on these disks by means of magnetism are the principal historical events of the world from the birth of Christ to the launching of Sputnik I.

"Visitors to the fair will be able to ask the machine what were the most important historical events in any year from 4 B.C. to the present and RAMAC will print out the answers on an electronic typewriter in a matter of seconds. Answers can be given in English, French, Italian, Nederlands, Spanish, Swedish, Portuguese, German, Russian and Interlingua, a universal scientific language.

"A query to the professor on what events took place in the year 30 A.D., for example, would yield answers like this: 'Salome obtained the head of St. John the Baptist.' In 1480? 'Leonardo da Vinci invented the parachute.' In 1776? 'Mozart composed his first opera at the age of 11.' "

At the time of the Brussels Fair, George Pavlak was 27 years old, in charge of the tabulating department at Agar Meat Packing in Chicago, and eagerly waiting delivery of his first computer. He had ordered a 305 mainly because it wasn't as expensive as a 650, but was much faster than, and a great improvement over, his unit record equipment.

"I loved the 305, even though we had continual problems with heat and air conditioning," recalls Pavlak. "We were in an old factory in the Chicago stockyards. We had to build a computer room out of a third floor meat-vat washing area. No one told us that the RAMAC was sensitive to minor temperature changes, but we found out for ourselves.

"For a while we did linear programming to determine the optimum meat mixture for Agar sausages, but the computations took so long that we had to drop that program and stick to billing, order entry, and payroll." The RAMAC at Agar was removed in the early '60s. The company subsequently migrated from a 360/20 to a System/3 and is now converting to a Wang 2200VS. Agar was bought by Commercial Credit (which was bought by Control Data Corp.), sold to Bluebird, Inc., and then resold to Northern Foods of England. George Pavlak? He's still at Agar, still in dp, and is probably the most enduring component there in two decades of change.

The last big showcase event for the 305 RAMAC was the 1960 Winter Olympics at Squaw Valley, Calif. The Olympics cost $16 million, and 300,000 people were expected to attend at the isolated spot 46 miles from Reno, near Lake Tahoe. According to *Business Week*, "IBM is spending $250,000 and providing $500,000 worth of 305 RAMAC computers and accessories to equip a data processing center. Within moments, twin RAMACs will compute and print, for the press and spectators, race results that would otherwise require hours of human calculation." Computerized scorekeeping became a big success, and the RAMAC turned out to be the first of a long line of computers used in Olympic games. When the Squaw Valley games closed on Feb. 28, 1960, the dual process system was shipped to Clark Equipment Co. in Chicago.

DEMISE OF RAMAC

Don Dantine was assigned to Clark's Central Parts Div. in 1958 as a senior systems analyst to look into various inventory and delivery problems. He investigated a number of machines, but wanted something that could pull together all the operating functions of an organization. When dual processors became available, providing the capacity he needed, Dantine proceeded to design one of the world's first fully integrated warehousing systems.

The RAMAC disk files stored all pertinent part, customer, and purchasing information at Clark. Customer orders were processed, purchase orders were generated, material was received and put away in the warehouse via "move tags" produced on the dock by remote inquiry stations, and status inquiries were made at stations in the sales departments.

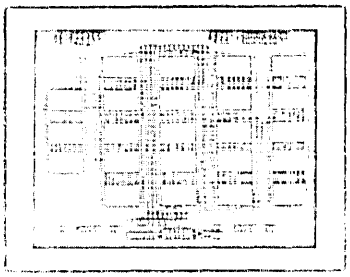
"At that time I thought the concept of an integrated database would be applied universally in the near future," Dantine recollects, "but it didn't work out that way. It wasn't due to technical reasons, but managerial ones. I was lucky to work for guys like John Mlynski and H. D. Nelson, because they could really see what the future was going to be and were willing to put up with some pain to get there."

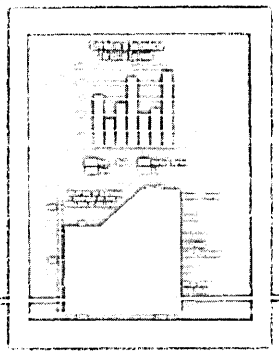
Dantine went from Clark to Ralston-Purina, to the State of Arizona, and finally to ISIRAN, the state computer company created by the Shah of Iran. In 1976 he returned to Cave Creek, Ariz., where he is partially retired but still doing some work as a CPA.

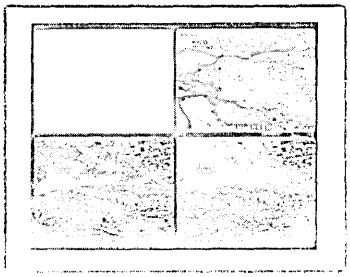
The 305 RAMAC? At the peak of its popularity there were around 1,500 installed. However, the introduction of the 1410 with disk files meant that Professor RAMAC would have to retire, and the 305 went out of production in 1961. There is no record of any 305s currently in operation, nor are any known to be in museums. *

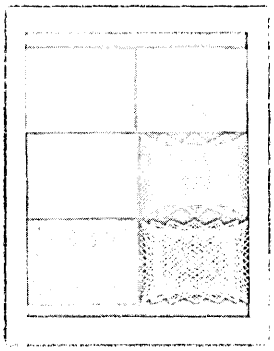
Mitchell E. Morris is currently treasurer of SEI Information Technology, Chicago, Ill. He started his dp career as a programmer on the 305 RAMAC at Clark Equipment Co. He was one of the three founders of Advanced Systems, Inc., the multimedia producer of educational materials, and served as its president prior to joining SEI.

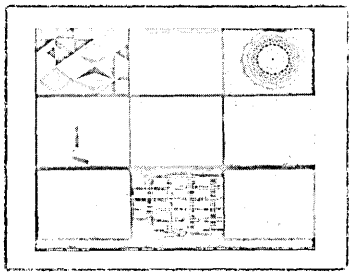
CIRCLE 154 ON READER CARD ▶

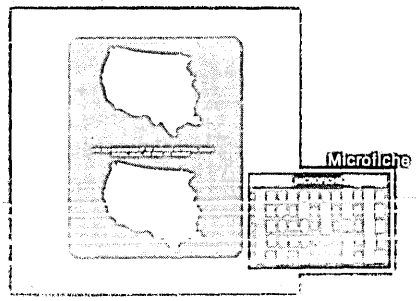












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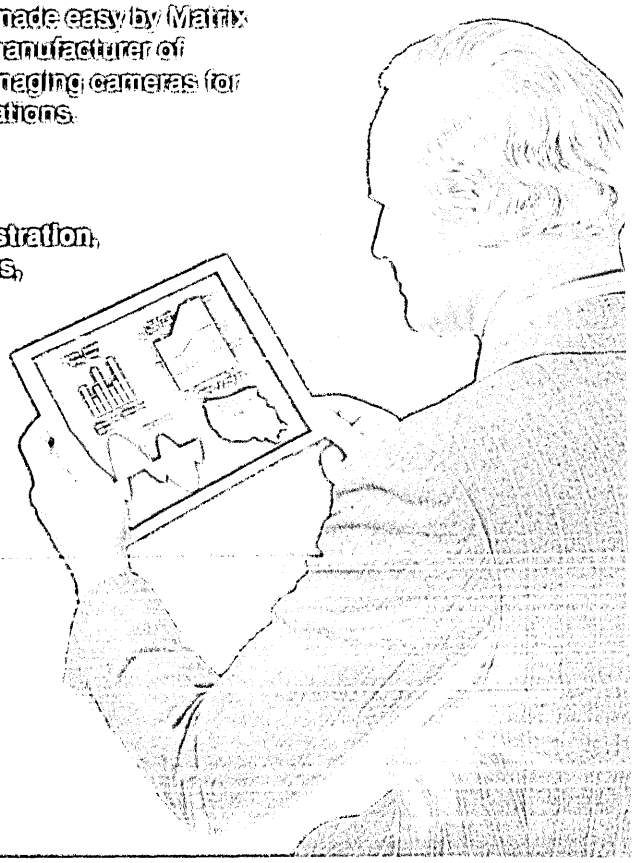

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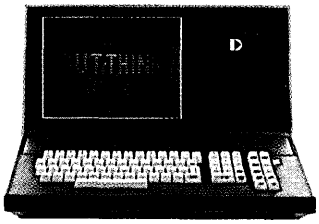

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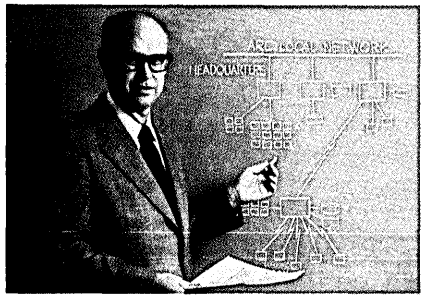

Vic Poor is Executive Vice President of Research and Development at Datapoint. He pioneered dispersed data processing, designed the first computer-on-a-chip, and developed ARC™ — the most widely used coaxial network for linking business machines.

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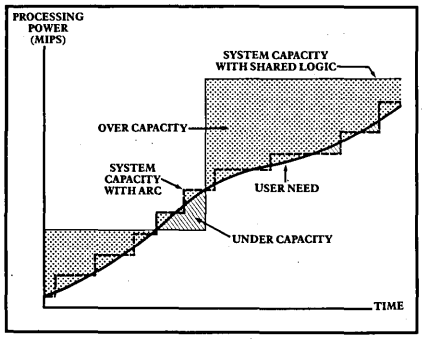

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CIRCLE 156 ON READER CARD

The more that systems are integrated, the greater the consequences if any part fails. Here are some ways of avoiding dependence.

DESIGNING FOR INTERSYSTEM INDEPENDENCE

by Lars Frank

In large integrated databases, it is essential that independence between various systems using the database be maintained. The more that systems are integrated, the greater the consequences if any part fails. System independence means that the failure of a single function and the backout of that failure will not require the backing out and reapplication of all updates subsequent to the failure.

This article analyzes the possibilities one has of avoiding intersystem dependence in some of the most common database systems available today. It focuses on important conditions that must be fulfilled in order that independent systems may be built up around an integrated database. The article has no references, as I have not found any literature about how system independence can be achieved in an integrated database.

The analysis is carried out using examples from a banking environment, but in principle any organization where many different types of entities are connected by relationships could be used.

In the bank database there are customer records and account records. These two types of records are connected in a network relationship, as one customer may have several accounts and one account may be attached to several customers, such as the holder, guarantors, receivers of statements.

In inverted list database systems, such as ADABAS and DATACOM, the bank database may be implemented as in Fig. 1.

The program that updates the relationships between customers and accounts must update both the customer file and the account file, because the relationships are stored in both files. If any changes in the relationships are to be backed out by means of the log file, it will also be necessary to back out programs that were run subsequent to the change in the

CHARTS BY CYNTHIA STODDARD

FIG. 1

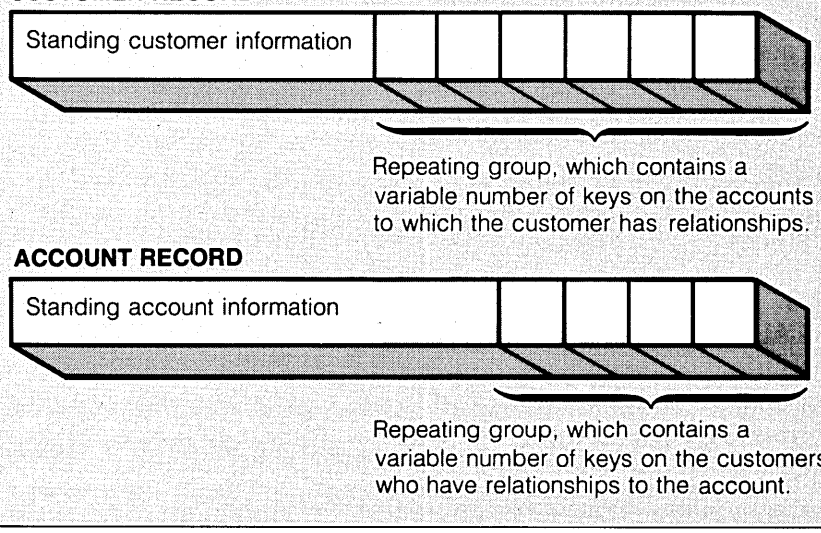
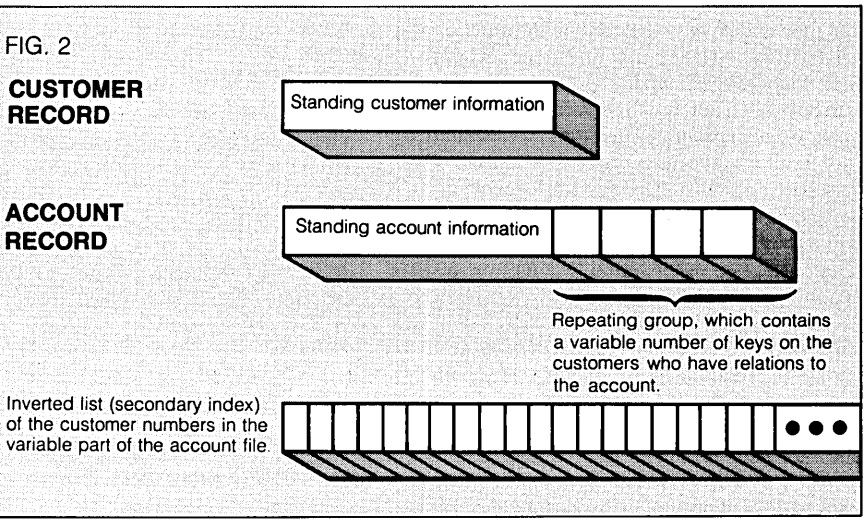


FIG. 2



relationship. After the backout is performed, rerunning the update programs or transactions will be required to restore the database to its correct current state. If, therefore, just one program concerning updating of the customer record is to be backed out, this chain reaction will occur, making it necessary to back out updating programs concerning accounts, deposits, guarantees, bills of exchange, foreign currency loans; thus, nearly all systems in the bank will be affected if any fault should appear in one system.

The main reason one program can not be backed out separately is that the log file normally contains the whole record as it appeared before the updating. When any updating is backed out, not only that updating must be backed out but also all other updatings run after the faulty one.

You might imagine that this problem could be solved if the database system logged and backed out just the sections that are changed by a program. This would not solve the problem, however, because any record creations and cancellations must also be backed out. Since these concern all sections of the record, the log system must back out all programs where something has been changed in the record. It is thus not possible to achieve system independence if the bank database is built up as previously illustrated.

Using inverted list database systems, the bank database may also be implemented as in Fig. 2.

USING LOGICAL POINTERS

With this solution, the customers related to any given account number can be found by means of the logical pointers in the variable part of the account record. Conversely, the accounts related to any given customer number can be found by means of the inverted list pertaining to the repeating group of the account record.

The updating programs that update the account file may be built up in such a way that they update only the account information and the inverted lists pertaining to the account file. If any program updating the account file is to be backed out, it will therefore be enough to back out all programs updating the account file. Similarly, the other product systems may be separated so that these systems become independent of each other as regards updating while they are totally integrated through the relationships in the inverted lists and the repeating groups (Fig. 3).

The program that updates the relationships between customers and accounts must update the relationship segments under both the customer segment and the account segment. The physical pointers in the customer and account segments may therefore be changed. If the relationship program is to be backed out, all programs that change the cus-

FIG. 3

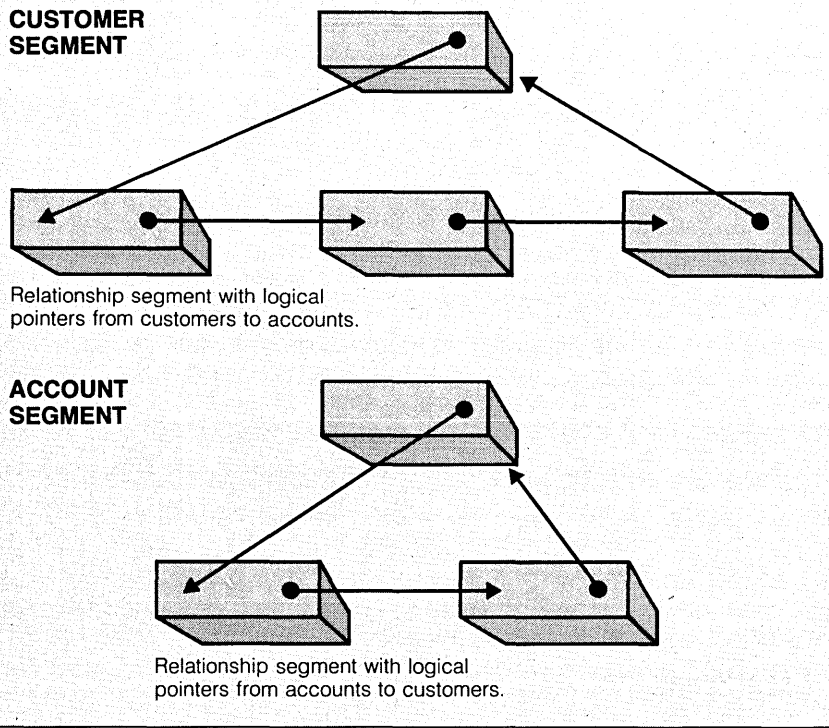


FIG. 4

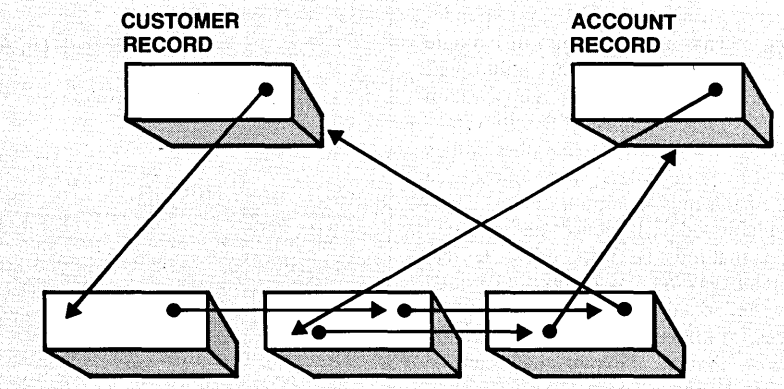
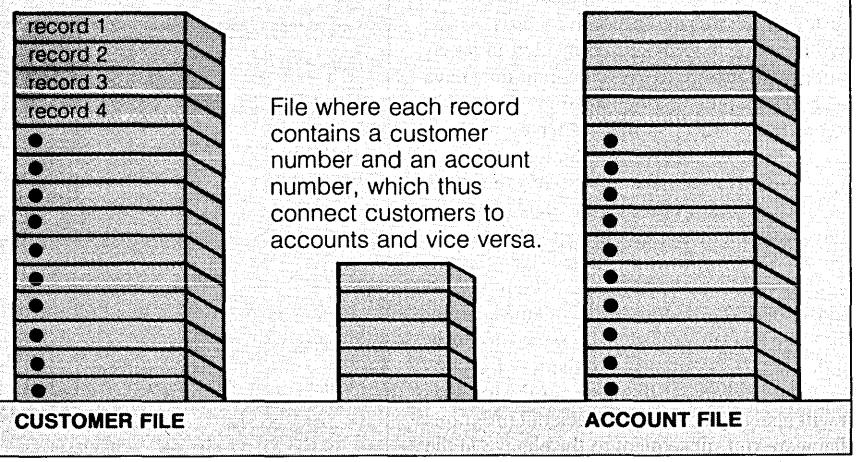
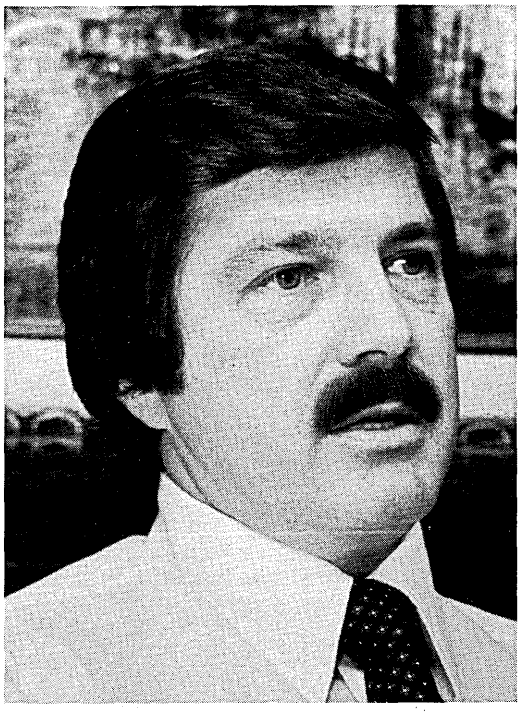


FIG. 5





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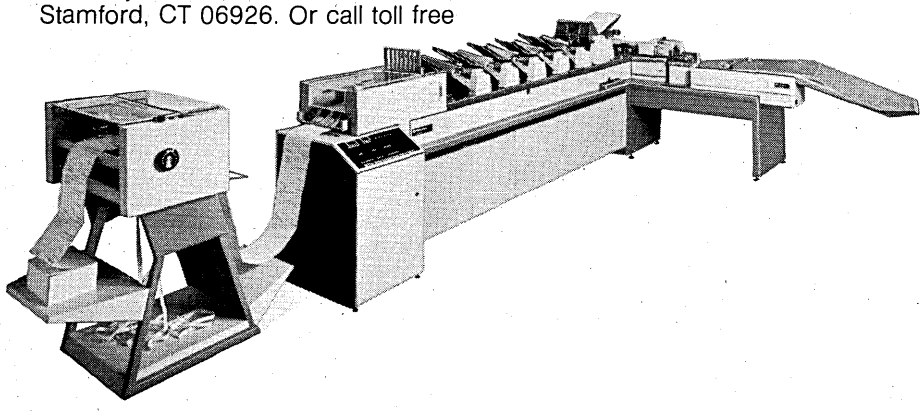

CIRCLE 157 ON READER CARD

Large integrated databases are far more vulnerable to faults than "old-fashioned" systems unless system independence is built in.

tomer and account segments must also be backed out. As the customer segment also contains pointers to deposit segments, guarantee segments, and so forth, the final result is that all updating programs of the database that have been run after the relation program must be backed out.

The above analysis was based on the assumption that a fault had occurred in the relationship program, which therefore had to be backed out. If, instead, it is assumed that a program updates either the customer segment or the account segment, the result of the analysis will be the same, because any backing out of, for instance, changes in accounts implies that openings and closings of accounts must also be backed out. If physical pointers in the relationship segments are changed, changes in the relationships must also be backed out. This takes us back to the original situation, which showed that all updating programs run after the relationship program must be backed out.

In network database systems such as IDMS and TOTAL, the bank database may be implemented as in Fig. 4.

The program updating the relationships between customers and accounts must also update customer records and account records because of the physical pointers. If the relationship program is backed out, all programs that change customer and account records must also be backed out. As in the hierarchical databases, the result is that the deposit system, the guarantee system, and so forth must also be backed out, and system independence is therefore not achieved.

Fig. 5 illustrates how the bank database may be implemented in a relational database system.

The relationship philosophy does not dictate anything definite about how one may get from customer records to account records by means of the file with customer and account numbers. No physical pointers are stored in the files, and there is no demand that a customer record must exist before the establishment of a relation record connecting the customer to an account. If the aim is to enable updating programs to update only one file, any updating program may be freely backed out only if all the programs that update the file and that have been run after the faulty run are also backed out.

AVOID PHYSICAL POINTERS

The basic key to maintaining independence between systems that utilize integrated databases is to minimize or avoid the use of physical pointers in database records. As illustrated in this article, this is most easily done using inverted list or relational databases. The minimization of use of physical pointers in database developed using hierarchical or network techniques will also provide independence between systems in many applications.

It should be remembered, however, that large integrated databases are far more vulnerable to faults than "old-fashioned" systems unless system independence is built in. Intersystem independence must be one of the first considerations of the database design team when embarking on the design of an integrated database. ✲

For the past six years Lars Frank has been involved with the buildup of an integrated database at Privatbanken A/S in Copenhagen. He is a software engineer and an economist, and has worked as a dp teacher and researcher at the Copenhagen School of Economics and Business Administration.

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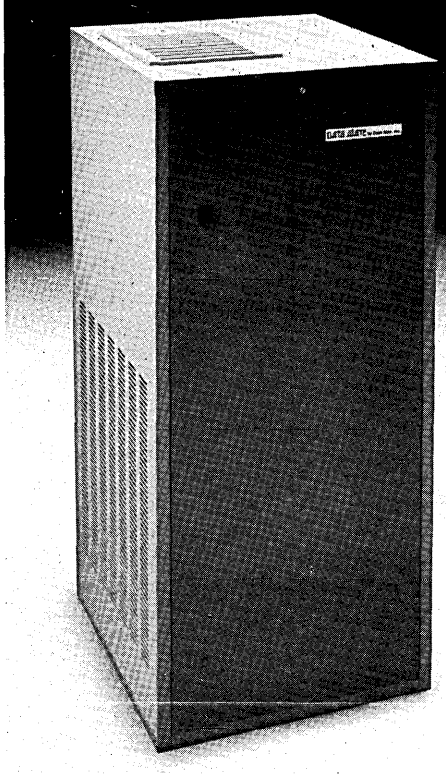

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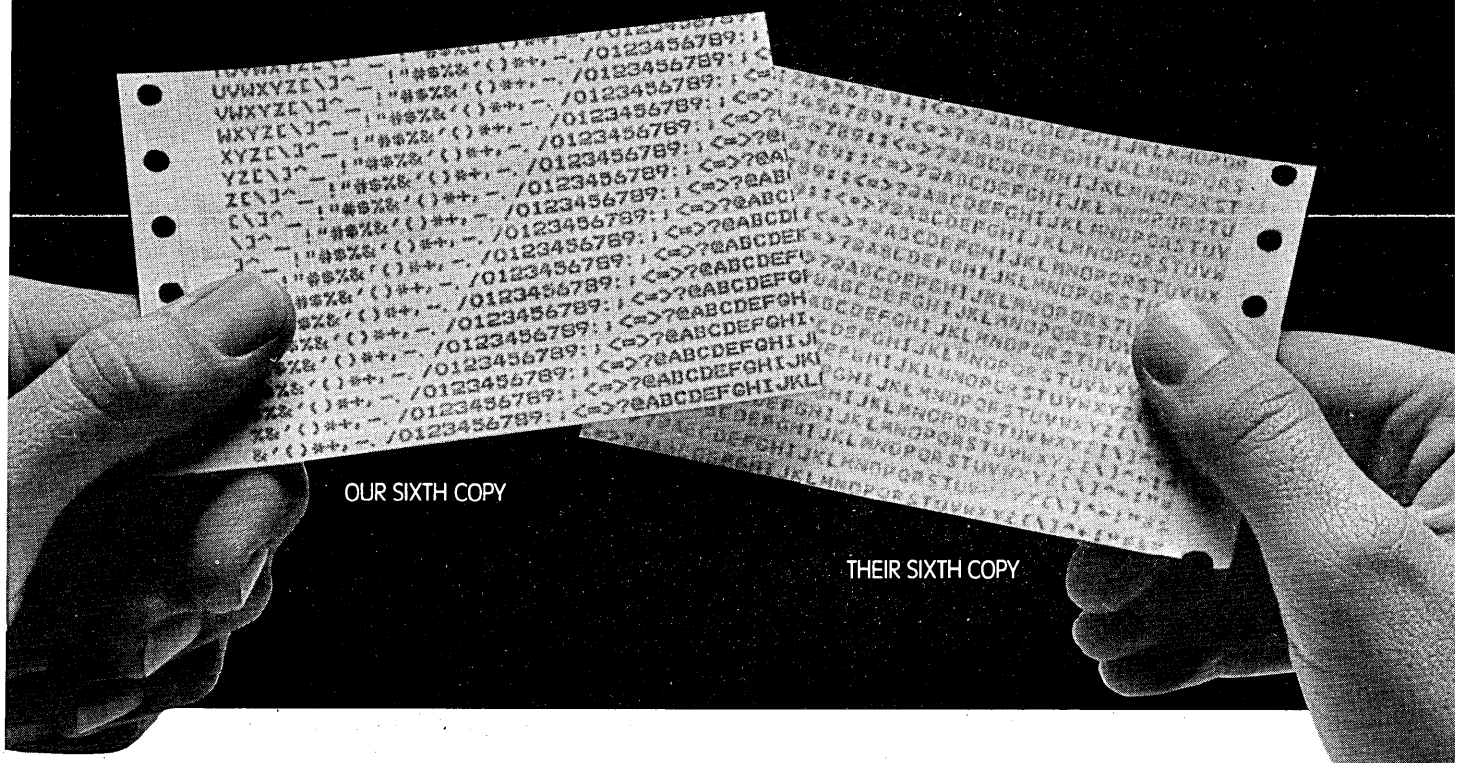

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LARRY ROSS

The apparent and hidden costs of replacing one person in one job can top $10,000.

THE TOLL OF TURNOVER

by Merrill Cherlin

"I heard a vp up at an aircraft company the other day say it cost him $10,000 to hire a person and get him on board," our trusty industry watcher told us. That figure may seem absurdly high at first glance, but after considering all the costs, both apparent and hidden, of replacing one person in one job, it's soon clear that $10,000 might be on the low side.

Our friend continues, "Say a guy is leaving a project. The boss calls me in and says, 'Joe Blow is leaving. Now what?' I say, 'Okay, I'll write you a letter.' So I write the boss an eight-page letter telling him how to shut down the project. I find out the guy has lots of names and numbers of people he'd dealt with; I know he has to leave a contact list. He has material coming in from the library, so we need a list of that along with what is pending—like the 25 documents we're supposed to be getting from the librarians who did a literature search. We've already got 50 or 75 documents on the subject—mini-library. You've got to capture that mini-library to make sure it doesn't get away from you. I go on and on about the things the boss now must take some of his own time to do, as well as the leaving employee's time. Of course, the employee's more interested in getting going on his new job but we're forcing him to work on this old one at least to the point where it's packaged so we can set it aside and pick it up again. So there's got to be a lost month at the other end."

But another consultant giving this type of counsel warns, "There will never be complete documentation regardless of how well it's done or how much money you spend doing it. There's always something that's in somebody's head."

Then we come to the fun part of leaving a job—the going-away party. While most of these are modest events, a think-tank systems analyst remembers, "One time one of the department heads quit. He'd been there for years and years, was greatly respected, and had lots of friends. When they had the going-away luncheon there were 200 people in the room. Everyone there had prepaid his $5.75 or whatever, which included the wine and gift. Well, there were carafes of wine sitting all over the tables and we got 200 people half drunk in the middle of the day. You know damn well we were off all afternoon. That's a half-day for 200 people, or 100 man-days. Since 240 man-days make a year, that was almost half a year lost. At an average salary rate of $35,000 a year, that lunch cost the company nearly $17,000 in lost time.

"At the other extreme, it may be only two or three people going down to McDonald's for a hamburger with a departing mailroom messenger, but still, it's extra time lost. You'd prefer your people to get fired because then you pack all their stuff in a box and throw it in the lobby and have done with them. But if they're very popular and have worked there for a long time, there's enormous expense. Just that time spent chatting meaningfully with each person in the last days of work, going from desk to desk saying goodbye."

And how do the people feel who are being left behind? Not always so terrific. Not only might they miss their old pal and colleague, but according to one manager, "There's an air of dissatisfaction that everyone else experiences when someone who is perceived to be valuable leaves. It lowers morale. When everyone hears that he's leaving, they all start mumbling and *that's* an afternoon lost. The day he finally leaves is another afternoon lost. Then they touch base with him after he leaves. All the employees who are still there call up the guy who left and say, 'How're you doing?' and he says, 'Oh, great, it's really a great place. You ought to see how nice it is here. They've got nice furniture and a great cafeteria.' So there's an ongoing disruption.

"And sometimes there's a domino effect. When I left my last job seven other people also left. It was April and that's when vacation time accrued every year, so that's when everybody quits, to get their two weeks extra pay. The bigger the shop, the less personal involvement and loyalty, and the easier it is to quit.

"Sometimes a guy leaves for a new place, then recruits a couple of his friends from his old place to come along to the new

ILLUSTRATION BY LARRY ROSS

A farewell luncheon for a longtime department head cost one company nearly $17,000 in lost time.

company. It's not uncommon, especially when the new company offers a bonus for each new person you can recruit.

"But the key problem is that you've lost someone who really knows something about the operation."

PROJECT TIME LOST

Once the person leaves his job, you have the problem of time lost from the project he was working on. If it's something that falls within his particular area of expertise, and is not something anyone else has been working on, the job has to lie dormant until a replacement worker is found and trained. Some work, of course, won't suffer intrinsically if it is left on the shelf for a few weeks or months. But what if it was part of a larger, ongoing project? Another manager says, "In that case, they'd have to get somebody to cover for him, possibly someone on staff working overtime. I'd have to educate *that* guy. Of course, you throw away all that education when you get the new guy in."

But now Joe Blow is gone with the wind and his replacement must be found. The replacement can come either from within the company or from the outside, and there are different costs associated with each strategy.

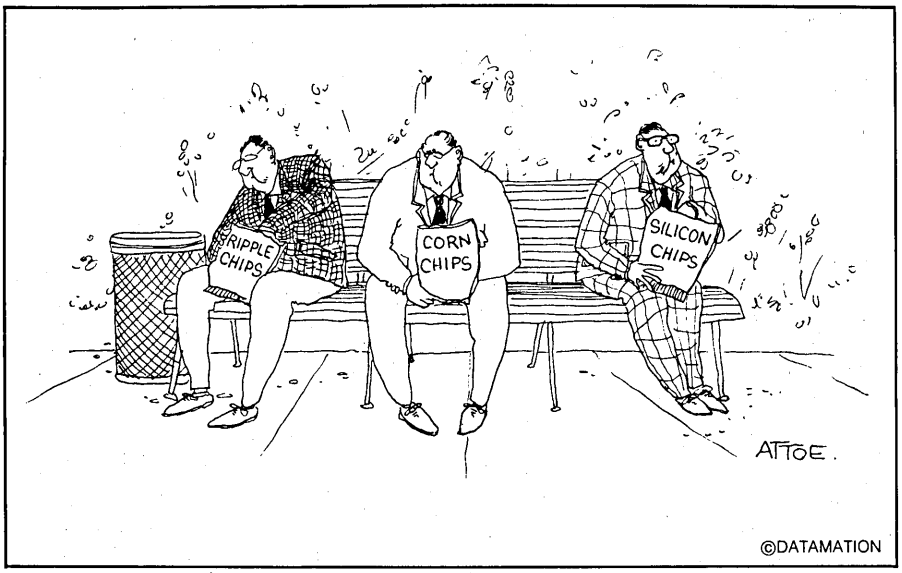
Although replacement from within seems the easier course, this may not be so, for as one vp explains, "Say someone leaves who is an accounts receivable expert. Now you train somebody else whom you think very highly of because he's in a fairly critical job. So you take him from another position and say, 'Okay, now you're going to be the expert in accounts receivable because that's more important than sales reporting' (or whatever). So it's a cascading effect of training. You're not just training one person, you're probably retraining several as they all move up a notch. You're not just going to go out and hire somebody and put him in that spot. The more experience a person has, the more valuable he is to the company. They don't want to take a chance with somebody who's completely unknown. If you hire from the outside, you may have to interview as many as 10 people, but I think those costs are minor compared to the costs of shuffling a lot of people around."

But sometimes circumstances dictate getting someone new. What then? First, says a consultant, "agency fees are a big cost. Typical is 1% per thousand dollars of salary, up to a maximum of 20%, or 25%. We're talking about programmer, systems analyst positions in the $20,000 to $30,000 range. Or else, you can have somebody go write the job specs, get it through personnel and put ads in the papers. When the resumes start flowing in, somebody who can understand those resumes has to read them. After they call and find some people who look kind of interesting, usually two guys interview each candidate. This is time from people already employed, right? Then you make him or her an offer and negotiate with them, but maybe they don't like the offer and you haggle. And that's more calls to the person and more calls to the personnel department. While these may be 'just phone calls,' if you're in the middle of a technical job, phone calls are disruptive.

"And what about hiring for executive positions? If the guy's going to be making $60,000 to $70,000 a year, the company's going to give him some help in relocating—if he's moving from some distance. That's another huge cost. The company has to assign someone to drive around town with the guy's wife to help her look for houses and real estate agents. The housing situation is so tight in California right now, for instance, some companies are helping people finance their new houses. If you move from Baltimore, for example, and sell a house there, you're probably not going to get enough out of it to even make a down payment on a house in California. Also, the company has to pay for executives to live in an apartment till they're settled, and so forth.

"But to get back to your regular guy again, it's his first day of work, so you've got to have somebody meet him and give him a temporary badge and direct him over to get his permanent badge and fill out the personnel papers and security clearances and all that kind of stuff. Somebody else has to worry about where he's going to sit. Even if he's a replacement for somebody that quit, frequently the new guy doesn't sit where the old one did because the old guy might have had some seniority with appropriate furniture and an office with a view. You usually give the new hiree the worst office. That may mean some juggling of people. Every time you move somebody, even if it's just across the hall, you have to pack the desks and unpack them because the desks might not go through the doorway. That's lost time for somebody else. Plus, the muscles have to come in and move it.

"Now you've got the new guy on board; it's noon the first day. He's had his indoctrination put out by personnel, so he knows what the benefit plan is, his telephone's been listed, and so forth. Now he shows up at his desk. He doesn't know any of your software, he doesn't know any of your applications. He may have good general knowledge, but maybe your software configuration is different. So he has to learn all about that, as well as whatever's different for job submittal and terminal log-on. If it's an on-line system he's got to get a password assigned to him. But the guy in charge won't assign a password 'cause he's never heard of this clown, so he's got to get a memo signed by his boss to give the guy to get himself a password. Then he's got to read some manuals, go through the training course, and so on.



CARTOON BY STEVE ATTOE

TIME OUT FOR LEARNING

"Now he has a badge and knows where the bathroom is. But let's say you've been running a manufacturing inventories system or a payroll system or some other damn thing and you've been running it for eight years. It's been modified six or eight times and there's a big thick book of listings. The flowcharts are out of date, but he's going to be a member of this team, so he's got to learn it all. He may have been a materials manager someplace else, but he has to learn how *you* do it—what the file names are and what the data sets are, what the controls are and how it's all set up. That may mean some computer time where he learns how the system works, how to get special

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"He's finally beginning to come up to speed on the applications. By this time he's been there about a month and every time he asks a question there's got to be somebody there to provide the answer, right? So during that month, you've got much of a second person tied up.

"He then learns to debug and start working up through all the application programs to find the one with the mistake. That occupies his second month. After about three months you can treat him like a normal employee. He's made a little circle of friends, he knows where to park his car, he gets to meetings on time. He knows about machine operations procedures, he's troubleshot some bugs. Now the guy that's been training him can go off on vacation.

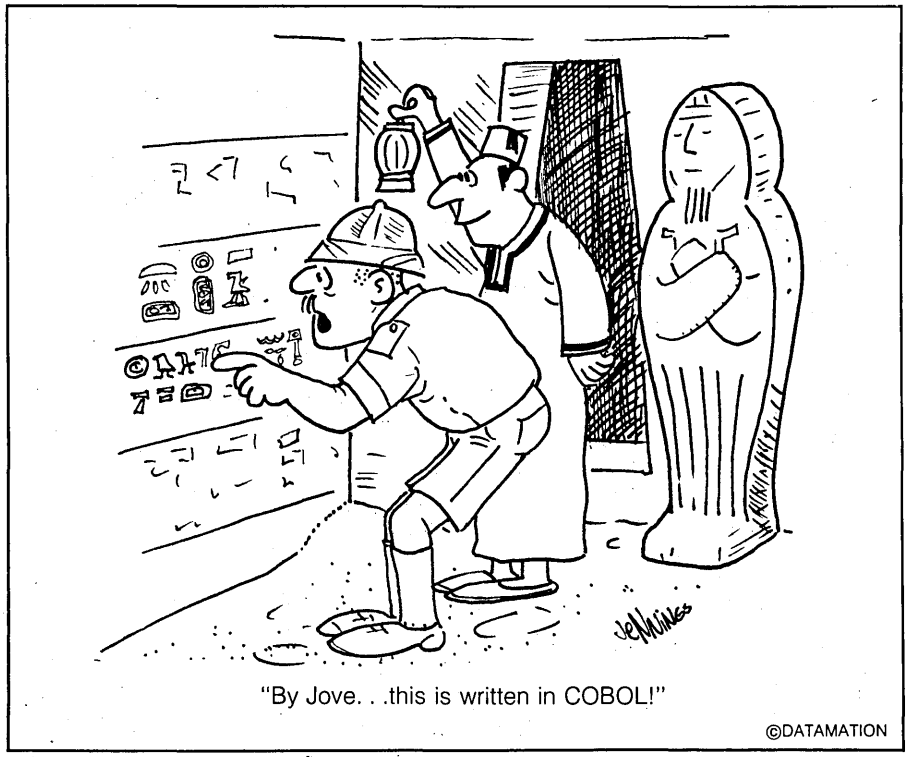
"If you hire someone who doesn't come up to your job specs, or you wanted a seasoned COBOL programmer but had to take a COBOL trainee or something, it's longer than that before you can cut him loose."

A vp of MIS adds an important consideration. "If you're talking about a person in the middle range," he says, "like a senior systems analyst or a lead programmer, he's got to spend a lot of time getting to know the customers. It's not enough just to be technically competent—he's also got to be competent in customer contact. So he's got to spend time getting to know customers inside his new company, talking to them, having lunch with them, and seeing what their needs and desires are. He's got to know all the personality types—the squeaky wheel who's always bitching and gets more than his share, and the reticent guy who doesn't speak up and gets less than his. All that takes time. Where Joe Programmer spends his first three months learning to submit COBOL jobs, somebody else is learning how the customers work, what the documentation standards are, how systems analysis is done here, and whether you use structured or top-down programming, or whatever.

"A senior level guy may want to come in, review the old specs, make sure they make sense to him. He may want to change the approach. You may lose time that way as well."

Other dpers mention the toll job turnover takes in terms of smooth working relationships. One says, "The view of your user departments is affected when you have significant turnover. They get somebody working on a project of theirs who they think is good, then he leaves and it bothers them that they can't maintain any continuity with the dp department. Dp isn't viewed as something that's reliable and always there—just a constant series of people."

Another person brings up an additional practical consequence of high turnover rates: "If you have a high turnover you really end up having a bigger staff. Say you only really need 10 programmers; if you have a high turnover you say, 'Gee, we'd better get some backup people here. We'd better request a staff of 15 in our next budget review so in case people leave we'll have somebody to put in that slot.' I think everybody tries to have a staff that's a little bit bigger than what they really need."



"By Jove. . .this is written in COBOL!"

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CARTOON BY DALE J. JENNINGS

EASING PAINS OF TURNOVER

Considering the multitudinous problems, mostly financial, caused by turnover, it seems expedient to figure out what can be done to ease it. Aside from all sorts of personal vagaries entering into decisions to change jobs, the biggest motivation seems to be financial. The problem is, it may be almost impossible to alleviate the sources of dissatisfaction.

One manager says, "If you take someone right out of school he may start off at a low salary but he becomes quite valuable very quickly. If your policy is such that you can't give him rapid raises, you're going to lose him for sure. People can change in value from being worth $10,000 to $20,000 in maybe 18 months. It's almost impossible to boost somebody's salary that fast."

Even if an organization could give such astronomical raises, sometimes it's actually illegal to do so. A dp consultant says, "When Jimmy Carter decided that companies with government contracts couldn't give more than a 7% on average raise, tremendous turnover occurred. It lowered productivity, too. The hotshots were used to getting more of a raise each year. They'd say, 'If you don't give me a 10% raise and someone else a 4% raise, you're not singling out the tigers from the laggards.' This caused great consternation. They left. Under those conditions you induce turnover in your brightest, most creative people. Those were terrible losses to suffer. Chances are you couldn't hire people as good as those you lost, certainly none who already knew the ins and outs of your shop.

"This also caused battles within the company. The manager would say, 'We're paying more to the guys we're hiring than we would have had to pay the guys who left, and we still took this big loss in productivity. And the momentum slowed while we made each transition. If we'd given this kind of money to the guys that left, they'd still be here.' On the other hand, personnel would say, 'Look, if you start giving people 15% raises to hold them you're going to raise the entire salary structure of the whole corporation 15%. We can't afford that, we'll go broke.'

"If it takes $10,000 to rehire, it's a one-time expense and does not disturb the salary structure."

But this consultant voices the opinion of most managers when he concludes, "When turnover reaches 25% to 35%, productivity suffers so critically, there's simply got to be a better way." *

Merrill Cherlin is a freelance writer who lives in Baltimore, Md.

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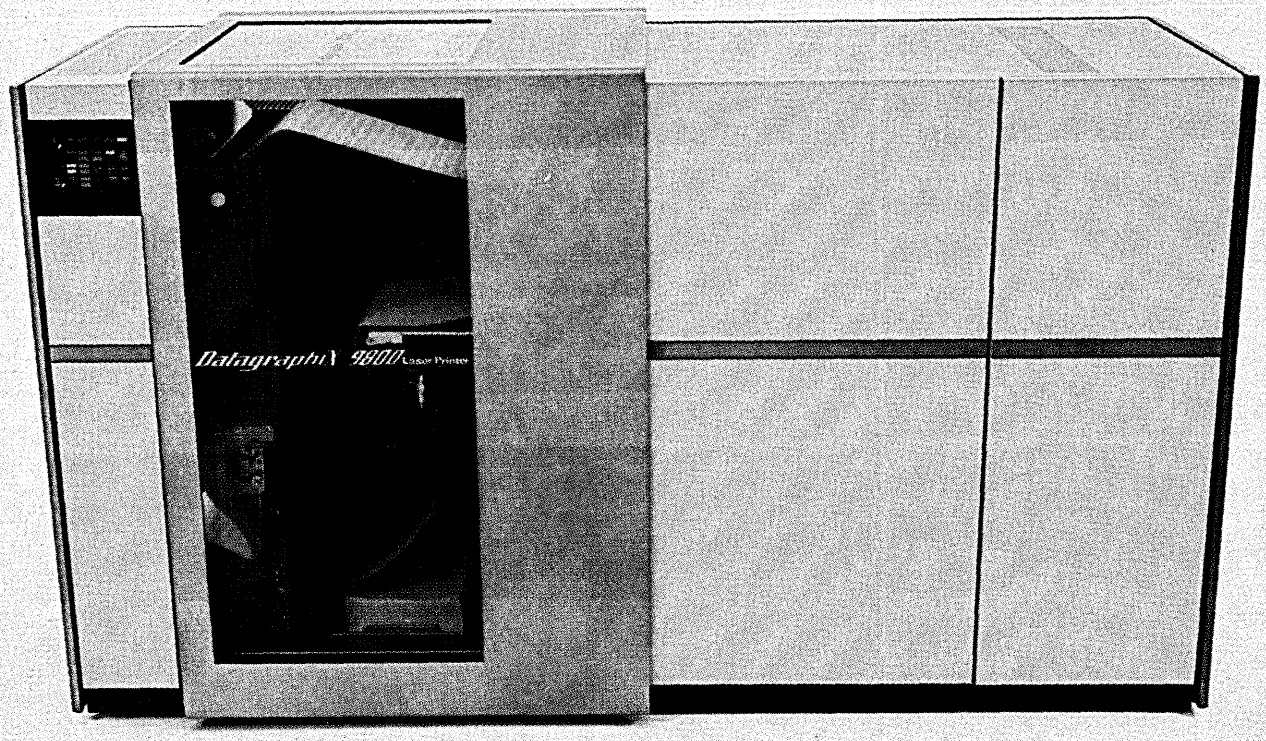

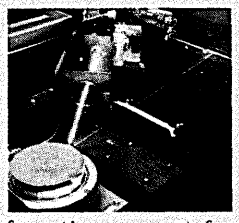

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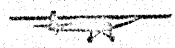

Charles A. Lindbergh where are you now?

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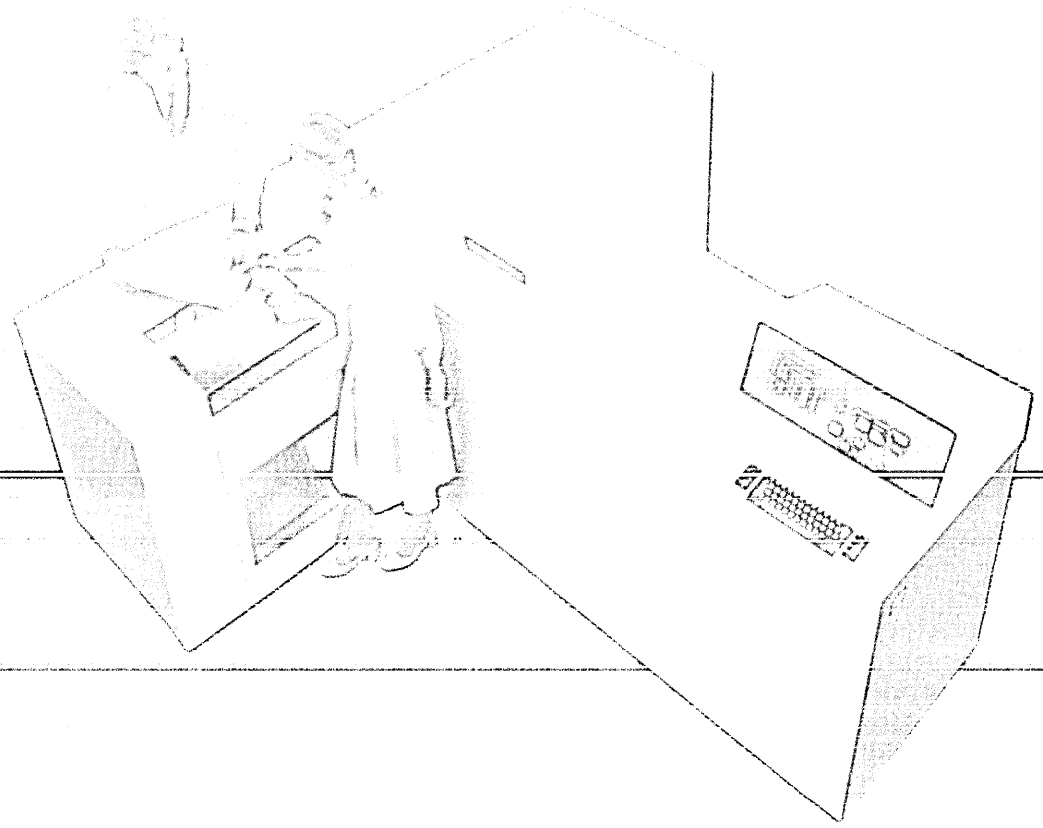

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Despite the continuing growth of the data processing work force, the demand for programmers and systems analysts still exceeds the supply.

THE GROWING DP JOB MARKET

by Daniel J. Hiltz

Employment of programmers and systems analysts, negligible in 1960, now totals nearly half a million workers. Despite this growth, the demand still exceeds supply; as the number of dp installations increases, the number of job openings for programmers and systems analysts will grow much faster than the rest of the labor force (U.S. Bureau of the Census, 1980). As a result, salaries of dp workers are escalating more quickly than other occupations. Although traditional theories of market economics would predict that these high salaries will rapidly attract additional workers into the field until demand and supply are once again synchronized, analysis of demographic trends and changes in labor force participation suggest that the current situation may not be alleviated for some time.

Changes in demographic trends have been confirmed by the 1980 Decennial Census of Population. The first trend is the decline of the young adult (15-30) population. The second relevant trend is the converse of the first: the growth of the middle-aged population (30-49). By 1990, this group is expected to include nearly 5% more of the population than it does now. This is a reflection of the overall aging of the U.S. population, whose median age will climb from 30.2 years today to 32.8 years in 1990.

A statistical portrait of the American labor force made in 1990 will differ radically from one made in 1980. The forces behind these changes are in some ways related to demographic variables, but a complete explanation requires going beyond population statistics and into complex attitudinal changes taking place among American workers.

Undoubtedly, the major change in the labor force in 1990 will be the role occupied by women. The rate of female labor force participation already nearly equals those of males, although females tend to be overrepresented in less-skilled and lower-paying occupations. There is no indication that this trend will abate or be reversed.

Since 1970, the size of the female labor force has grown more than 33%. In fact, in 1978 the overall labor force participation rate of women exceeded 50% for the first time in U.S. history. This means that more than half of all women over 16 years of age were employed outside the home (U.S. Bureau of the Census, 1978). Between 1978 and 1990, the female labor force is expected to grow by 30%, or more than double the rate of growth for males. By 1990, in the 20-24 age group, more women will work than men. In computer occupations these changes are well under way. Female employment grew more than 100% between 1972 and 1978, while male employment grew less than 45% (U.S. Bureau of the Census, 1978).

A more remarkable change taking place in the labor force, however, is only marginally attributable to demographic factors: it reflects a basic shift in the attitudes of large numbers of workers toward work itself. Increasingly, workers appear to be drifting away from acceptance of the five-day, 40-hour workweek, and are demanding work schedules based upon individual life-style preferences.

In the work place, these preferences are likely to be expressed in the form of requests for part-time employment, flexible hours (flex-time), split shifts, or job sharing. Other major components of the attitudinal shift include concern for what is known as the quality-of-work-life, democracy in the work place, and job enrichment. Several experimental settings have attributed increased productivity to implementing these features.[1]

At this time it would be premature to predict that the productivity of the labor force as a whole, or even of a particular industry, could be substantially improved by the adoption of these and other changes to the social structure of the work place. But if their impact on productivity is uncertain, their impact upon worker satisfaction is fairly well documented. Increasingly, the work force will most likely demand adoption of these alternatives, and the organization that cannot or will not make them available to employees will be at a competitive disadvantage in attracting and retaining workers.

1. Rosow, Jerome, "Quality-of-Work-Life Issue for the 1980's" *Work in America: The Decade Ahead*, Van Nostrand Reinhold, 1979.

IMPACT ON DP WORKERS

By 1990 then, the labor force in the U.S. will be substantially older and substantially more female than it is today, and its members may be more demanding about the quality of the work environment.

How will these trends manifest themselves among the information management labor force? Any answer must be preceded by two cautions. It should first be noted that dp can in no way escape the consequences of these trends. Data processing is one of the fastest growing occupations, and trends in the labor force as a whole will be magnified and intensified by stiff competition for dp talent.

Second, dp occupations are serially related to one another, as steps in one or more "career paths" (Fig. 1). What affects dp jobs at one level will also affect dp jobs at every other level. Because of these factors, changes in dp staffing appear to be inevitable.

The impact of a shrinking entry-level labor force upon dp in general is illustrated in Fig. 2. At lower educational levels, the supply of operations personnel will shrink and salaries for these workers will climb. There will be fewer replacements for those operators who continue on this career path, and operations managers will have to make greater efforts to retain their personnel.

If they are successful, it will be at the expense of the programming sector, which has traditionally relied upon operations personnel as a source of entry-level talent. At the same time, the programming sector will be affected by the shrinkage of the labor pool from which it has drawn the remainder of its entry-level personnel. At the programmer level, then, the shrinkage of the labor force has a compounded impact. Of course, the same holds true for the ranks of systems analysts. While demand is growing at an increasing rate, the two major traditional sources of personnel, programmers and college graduates, will be shrinking.

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While demand is growing at an increasing rate, traditional sources of personnel are shrinking.

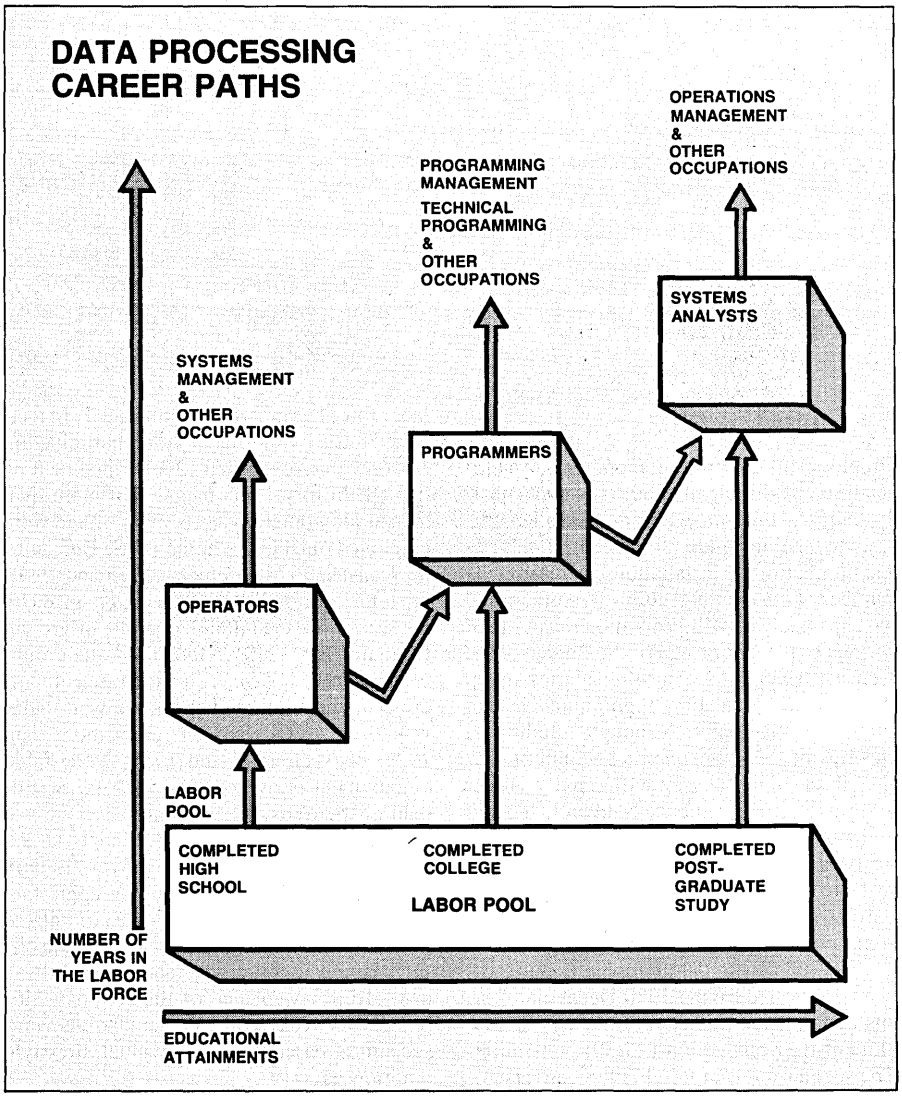

CHART BY CYNTHIA STODDARD

MID-CAREER GROWTH

The second demographic trend discussed is the growth of the mid-career labor force. Traditionally, workers at this stage of their careers have moved up either into management in a given category of dp jobs or into the next level of the career path. By 1990, many of these workers will be expecting to move as quickly as their predecessors did (in the '70s and '80s), while competition for promotions will be tougher than ever. Also, managers may be somewhat reluctant to promote an individual, simply because that individual will be harder to replace with a member of the shrinking entry-level labor force.

The individual who expects to move up, and does not, can respond in one of three ways: he can lower his expectations and remain happy and productive at his current level, he can grudgingly accept the situation and remain where he is as an unhappy (and very likely, an unproductive) worker, or he can leave dp altogether. In all probability, the latter two choices will be made most frequently. At best, the status quo of the labor force would be maintained, and at worst, the mid-career dp work force would lose some members, while the remainder would operate at reduced levels of productivity.

Such a situation would also contribute to the problem of recruitment of entry-level workers, since as younger workers are generally unwilling to enter a situation with little opportunity for advancement in the future.

This worst-case scenario of an aging and dissatisfied dp labor force is discouraging, yet it is not unavoidable. Several remedies, which can be implemented now, do exist.

The first of these must be to expand the scope of the entry-level dp labor force from its current limited boundaries. Since the pool of entry-level programmers who are recent college graduates or ex-operators will become less plentiful, other groups must be

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If the data base model is dependent on hard coded pointers within the files, updating all these pointers is a nightmare. The problem is compounded if any one remote location is not available at the time of an update. Without concurrent access, the state of the data base is potentially inconsistent.

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Dp has the opportunity to pioneer innovations in the relationship of worker to work.

found who can contribute to the ever-growing need for programmers.

Obviously, current discrimination based upon ascribed characteristics such as race, sex, and age will have to be eliminated as a matter of economic necessity. By 1990, women and racial minorities will be recruited not because of legislation, but because their members are desperately needed in the dp work force. Those organizations most successful at converting the rhetoric of affirmative action into aggressive and effective recruitment programs will have an advantage in reaching this important new source of potential programmers and analysts. The same will be true for organizations that realize that entry-level dp jobs do not necessarily require a new entrant to the labor force.

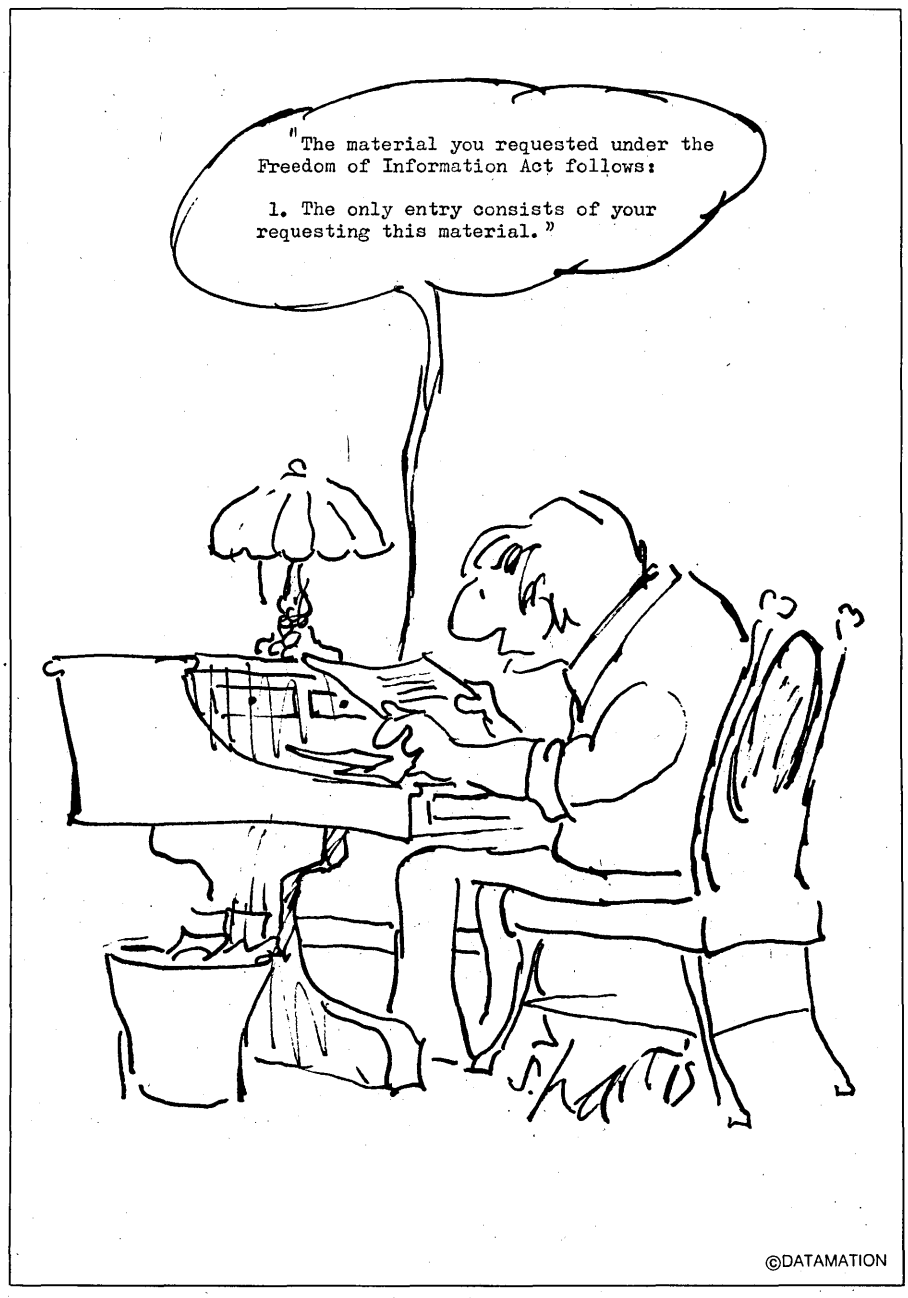
The labor force in 1990 will be full of middle-aged adults who are dissatisfied with their occupations. Some of them will be people leaving the dp industry, but others will be persons looking to dp as a possible avenue of escape from unsatisfactory occupations in other fields. Those organizations that can provide a means of access to dp to these people will find a large, experienced, mature, and generally untapped labor force at their disposal.

Bringing middle-aged workers into the dp labor force at the entry level will help to alleviate a shortage of personnel. As discussed earlier, however, a second major problem of the coming decade will be to satisfy the demands of middle-aged, mid-career workers who find avenues of opportunity greatly restricted. This problem may be attacked in two ways. The first and most obvious solution will be to expand the level of opportunity for mid-career people outside the traditional sphere of systems analysis and management. Additional levels of technical expertise need to be recognized and rewarded. This may be facilitated somewhat as languages and software packages proliferate and as the need for expertise in each is more acutely felt.

One of the greatest challenges the dp industry will face is the need to make technical expertise without management responsibility something other than a "path" that eventually dead-ends. Even if this can be accomplished, however, the dp industry will still have to ensure that other needs of mid-career personnel are met. Data processing installations will have to guarantee to their workers that career requirements and personal goals are compatible. This means increased use of part-time work, flex-time, or a flexible work arrangement. For women combining dp careers and family responsibilities, it may mean the provision of day care facilities and family-oriented benefit packages.

Again, dp, by virtue of its close relationship with telecommunications, has the opportunity to pioneer innovations in the relationship of worker to work. Perhaps the office of the future will not be in an office at all, but in the homes of programmers and analysts across the country, communicating via telecommunications circuits with machines and with fellow workers. Certainly the technology will be there. The demand will be there also, and the company that rigidly enforces traditional standards will be faced with the prospect of enforcing those standards in a shop whose programmers are leaving in droves.

The problems confronting dp by 1990 will not be unique. The demographic trends and social changes that will impact the labor force will cut across all industry lines, but because of the strong projected growth of dp, its problems will be especially acute. On the other hand, possible solutions will be available and familiar to most information specialists. The character of dp in the 1990s will depend largely on how successful the industry adapts to the problems of today. ❋



CARTOON BY SIDNEY HARRIS

Daniel J. Hiltz is a systems analyst, research and development, with Western-Southern Life, Cincinnati, Ohio. He has presented a series of workshops within Western-Southern Life on both structured programming and test case design.

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The Challenge: Design a multi-processor operating system to support continuous availability.

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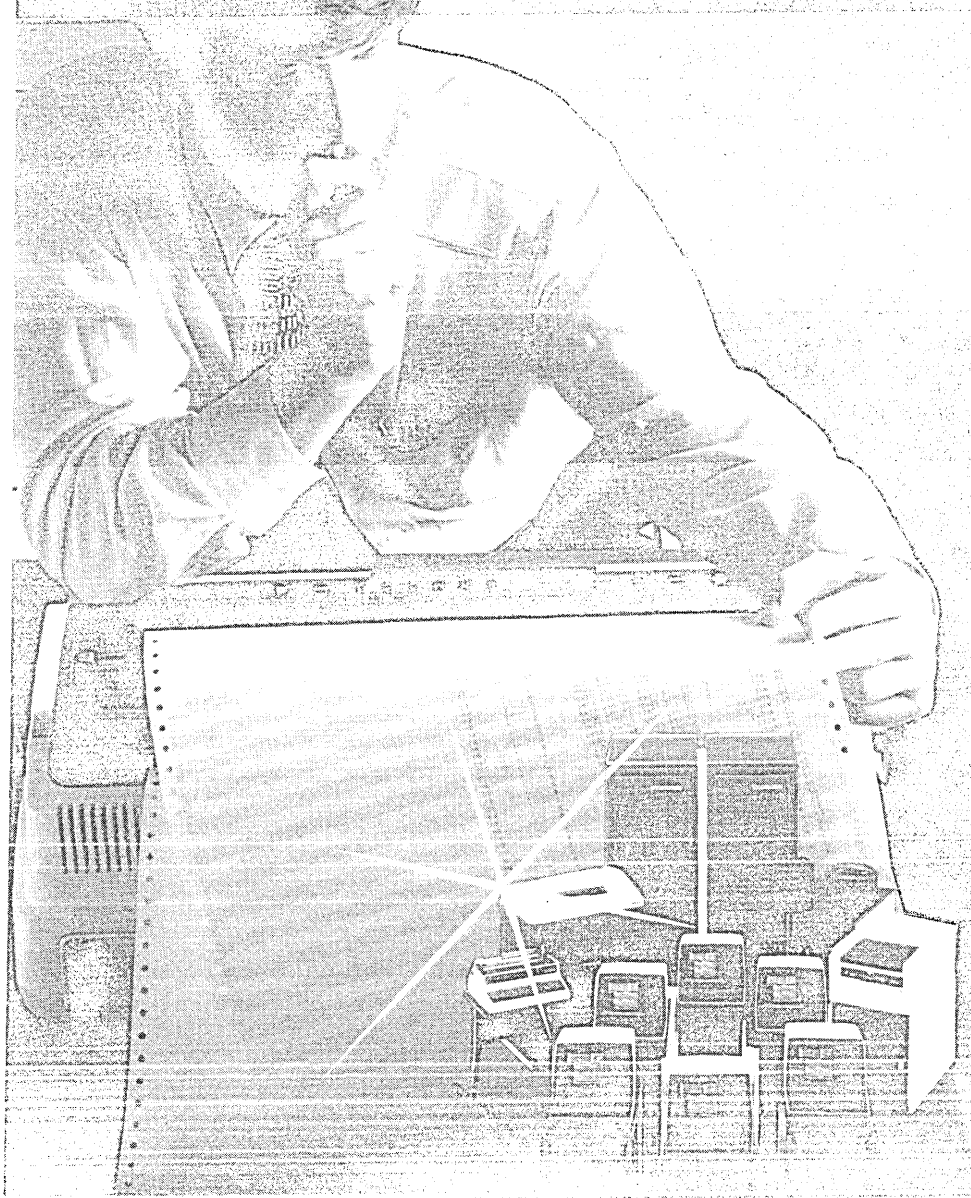

Tandem's operating system, GUARDIAN, resides in each processor and communicates with all other processors through a unique message system. Should one processor fail, its workload is redistributed among the remaining processors.

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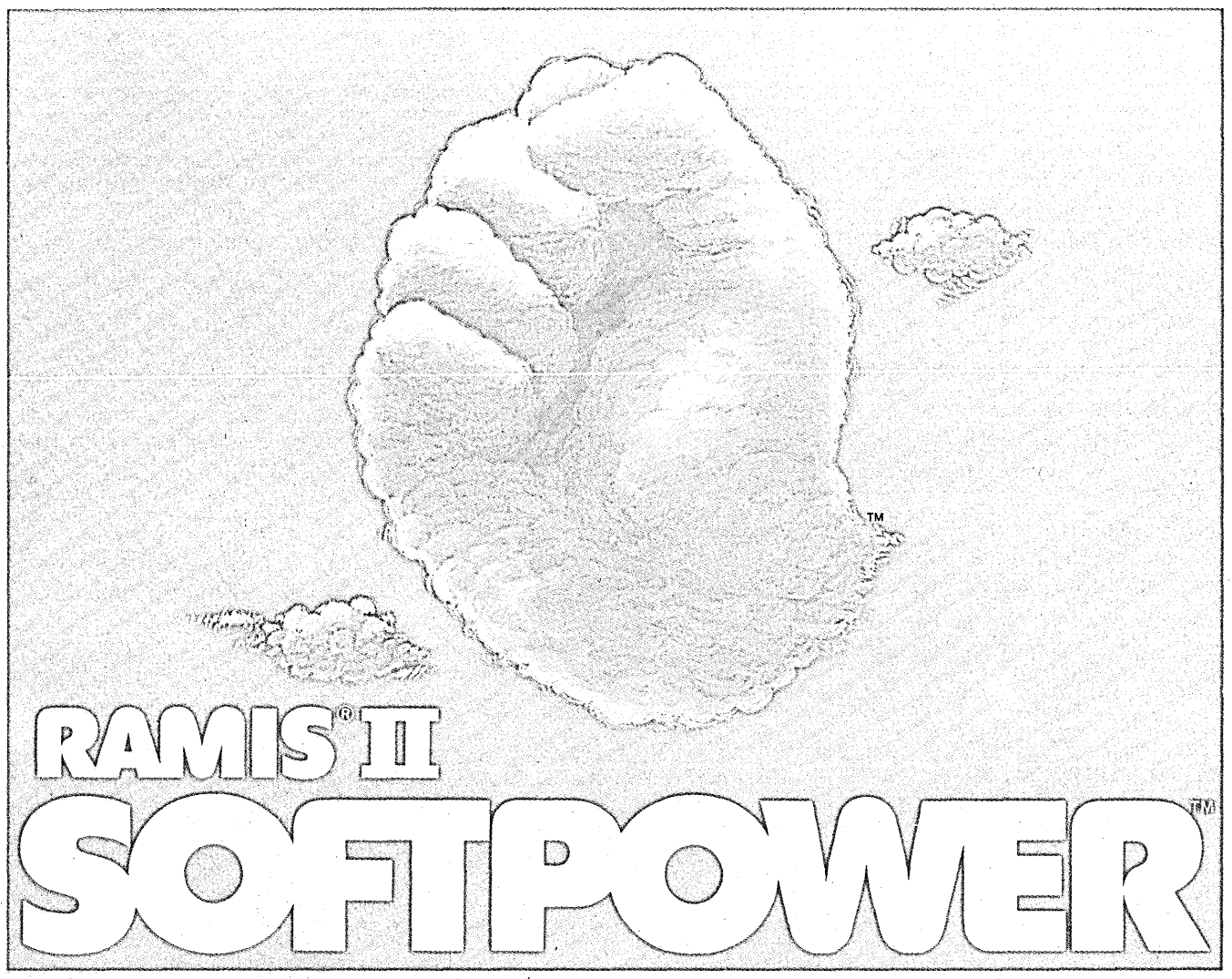

Turns backlogs into applications

RAMIS II is a complete information management system. It integrates an English-like nonprocedural language with a flexible DBMS. The DBMS permits the easy integration of data from a variety of sources, while the nonprocedural language lets you tell the computer what you want done without having to say how to do it.

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Frank J. Sanzone, Jr., Carroll County General Hospital

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NCR's MONOGUE:
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SANZONE:
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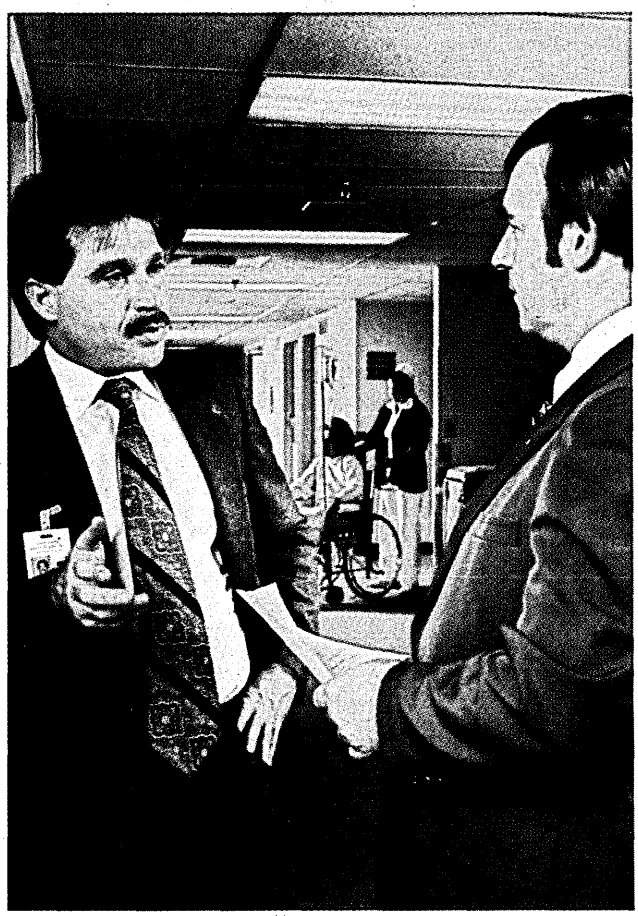

Frank J. Sanzone, Jr., is Assistant Director of Finance, Carroll County General Hospital, Westminster, Maryland. Robert Monogue is an NCR Representative.

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PEOPLE

LINKING LAW AND SCIENCE

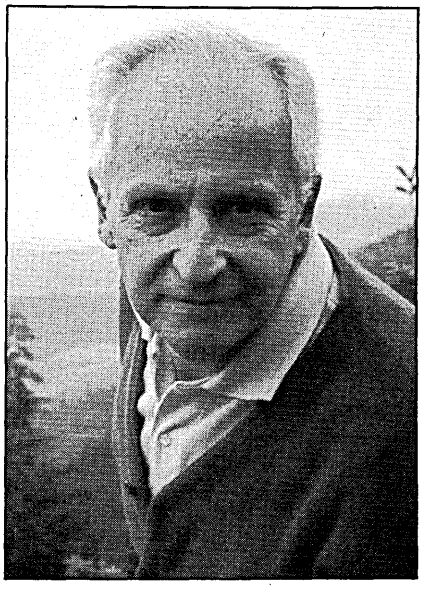
In 1973, Milt Wessel was a senior partner in a Park Avenue law firm. He was 50, a Harvard law school graduate who, in the 22 years he had spent as a trial lawyer, had prosecuted famous organized crime cases, run afoul of J. Edgar Hoover, and published several books and articles. He had been featured in the *New York Times* in "People in the News," and had been mentioned several times in *Life* for his efforts in prosecuting the Mafia.

Despite this degree of notoriety and success, and although some of his friends "thought Wessel was out of his mind," he quit the firm, and began to concentrate his efforts in a new field of interest.

"The decision was probably related in some way to the middle-life syndrome," Wessel says, "but there are only two things that can happen to a trial lawyer. You can continue day in and day out, digging and working, and burn yourself out, or you can assign the digging to a younger associate, and end up not being a good attorney. I didn't want either alternative."

Fortunately, Wessel had a third alternative. Ten years earlier, in 1963, he had prosecuted a trade secret software case, representing United Data Centers, a company later sold to Tymshare. From this experience, he wrote "The Legal Protection of Computer Software" for the *Harvard Business Review*, and captured the attention of the infant software industry. ADAPSO (Association of Data Processing Service Organizations) was just beginning to organize; in 1965, Wessel was appointed ADAPSO general counsel and the job stuck.

"Computers are an experimental science. There's not the emotional involvement there is with the nuclear issue; comparatively, in regard to the social implications of the computer, hardly anyone gives a damn."



MILT WESSEL—His concern extends beyond the usual parameters of the social implications of technology.

But Wessel does. His concern extends beyond the usual parameters of the social implications of technology, and beyond the more specific boundaries of the Citicorp case he is currently undertaking on behalf of ADAPSO.

"Technology presents extraordinarily complex problems for lay people as well as for scientists. The problems in the computer industry are similar to those in the chemicals, monopolies, and nuclear in that decisions made in these fields have implications broader than the individual issues involved. Science has so far outpaced our ability to deal with it, it is out of control. We are confronted with the necessity of beginning to deal with things we don't understand." The Citicorp case, according to Wessel, offers an opportunity to analyze several general societal issues as well as to highlight some specific questions dealing with electronic funds transfer systems (EFTS).

"The Citicorp contest is one of the battlegrounds where we can judge the way in which the new economic structure of EFTS is emerging," Wessel explains. "What we basically hope to avoid are the two problems of structural rigidity and rebundling."

Structural rigidity, as defined by Wessel, refers to the inflexibility of a system whose components are linked in a tight, unyielding fashion. "If, for example, you have a system that links banks, networks, computers, and communications, structural rigidity is inherent, and change is difficult and costly; you cannot shift easily in and out unless mechanisms, such as standardization, are built in."

Rebundling is simply once again packaging the system as an entire unit: hardware, firmware, applications software, services. "Unbundling was, to a large extent, the birth of the software and services industry," Wessel comments, noting that the companies that form ADAPSO are not full-line banking companies, and therefore are unable to compete as a single-source supplier with Citicorp's Citishare offerings.

"It also is an issue of the changing point of control. The point of control used to be hardware; then the costs dropped, and software was the point of control. The point of control—which I define as having market dominance, the ability to determine policy and influence customers—has now moved to another stage. It's information, it's databanks. It's with the acquisition and manipulation of data that IBM, Comsat, Xerox, and Exxon, for example, will find their way to have market power.

"The data gathered and available in EFTS have enormous significance.

"We need to take a look at these considerations and the technological developments, and see whether or not there are ways of having the advantages of delivering information systems without the disadvantages of structural ridigity and rebundling."

The possibility of stopping the rebundling?

"Very hard to say. There is a definite atmosphere now against antitrust."

Milt Wessel's specialization in science and the law is not limited to considerations of the effects and remedies of com-

puterization. In two of his books, *The Rule of Reason* (Addison-Wesley, 1976) and *Science and Conscience* (Columbia Univ. Press, 1980), he puts forth a plea to the legal profession, the corporate world, and the public to change the adversarial litigation structure in order to more cooperatively and more wisely adjudicate the complex issues involving technology and society.

These issues, concerning such topics as laetrile, saccharin, ozone, liquified natural gas, inflation, the SALT talks, Agent Orange, DDT, Wessel refers to as "socio-scientific disputes." "These are all clearly public policy problems," he writes. "They are all concerned with how society lives. They all also deal with extremely complex scientific issues . . .

"We see a growing willingness to solve these . . . with simplistic solutions—restructive government control or limitations on scientific research and technological development. Such control . . . may be the most serious danger of all."

The solution, Wessel suggests, lies in the risk/benefit analysis approach. "We have reached the point in the technology where it is clear that what we want to do can be done. Before we build worldwide systems, such as EFTS, we need to conduct the same kind of analysis that we apply when we build a nuclear power plant. We need a thorough technological assessment," Wessel states, admitting that past attempts have been a "disaster."

"We need an organization similar to the Temporary National Economic Committee (TNEC) that was established in the late '30s to study the growing concentration of economic power in American industry."

In a recent editorial published in the *New York Times* (Oct. 22, 1980), Wessel and his coauthor, fellow Columbia law professor Harlan M. Blake, call for a TNEC-like study on "the effects of the burgeoning use of computer systems."

©DATAMATION

CARTOON BY SIDNEY HARRIS

"We must keep things where they are until we can develop a master plan," Wessel says.

Another suggestion he offers is the convening of a scientific "consensus-finding" conference to seek resolutions to certain disputes. All parties to the dispute, scientists, the media, the representatives of the public interest would participate by invitation. In fact, such a consensus-finding conference was suggested to former U. S. Attorney General Benjamin Civiletti and Frank T. Cary, IBM board chairman, in September 1979. A letter written by Jerome Dreyer, executive vice president of ADAPSO, requests that the two parties "consider convening a 'consensus-finding conference' to assist . . . in . . . discussions with regard to disposition of the present litigation. . . ." (Cary responded that such a conference "would not be helpful at this time.")

The IBM case Wessel sees as a perfect example of what he has termed "medieval solutions to modern problems."

"Kafka in his most extreme moments could not have sold the story of the antitrust trial."

Public awareness of the threat of computerized databanks to the sanctity of individual privacy still has not effected the development of broad public policy, Wessel notes, adding that the rights of the individual and, for example, the rights of the accused, need to be balanced.

"Again, this calls for a risk/benefit analysis. With the mass of information now available, it is possible to make predictions about things, people, events. For example, where and when a crime will occur, or who coming off the plane is likely to be carrying drugs or weapons. . . . This stereotyping is dangerous precisely because of its accuracy. It has, of course, very negative civil rights aspects, and it is, in the best definition I have heard, 'unreasonable interference with the intimate sphere of your life.' "

The intimate sphere of Wessel's life is a comfortable home on a wooded hill in Pleasantville, N.Y., which he shares with his wife Joan. From his office there, he prepares his case for ADAPSO, conducts his work as general counsel for the Council for Chemical Research and the Chemical Institute of Toxicology, and writes lectures for his courses at Columbia Univ. School of Law (on technology assessment and dispute resolution).

"I have always been very excited by the possibilities of teaching a class no one else was teaching, of developing a specialization that was unique, and of proposing solutions that are innovative."

It has been eight years since Wessel left the Park Avenue law firm, and in many of his concerns he admits he is "still all alone.

"But I am encouraged," he adds. "I follow a very determined path." ✻

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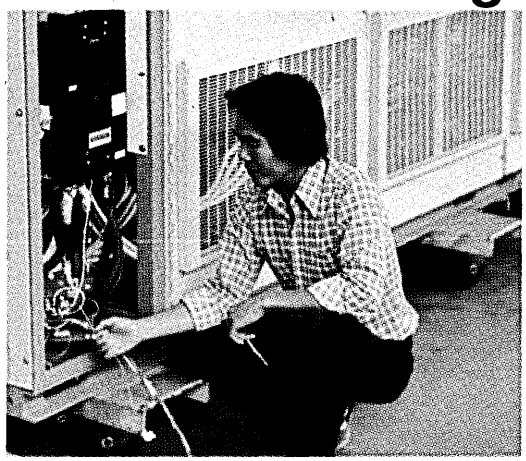

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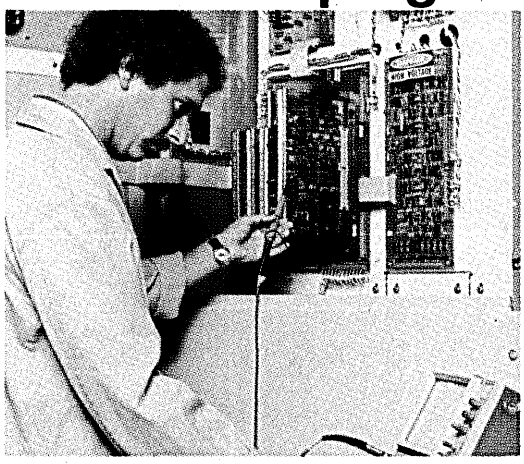

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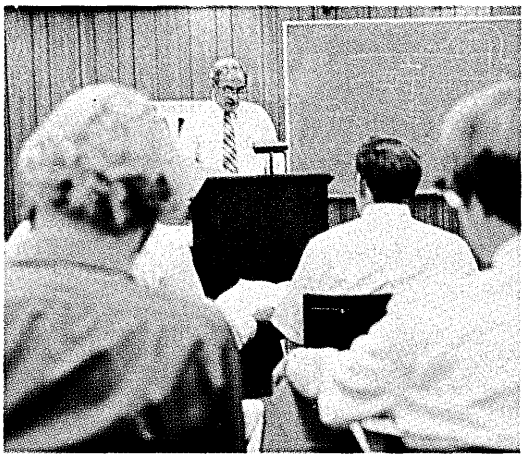

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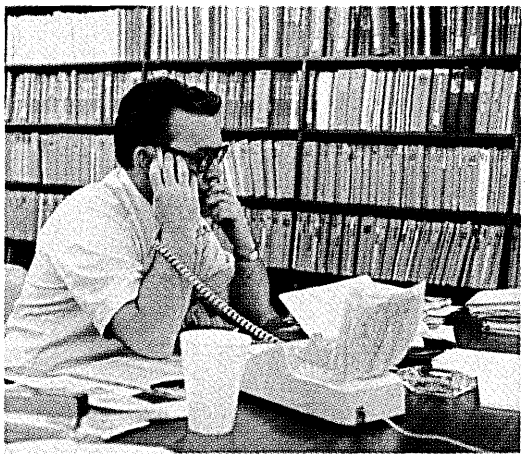

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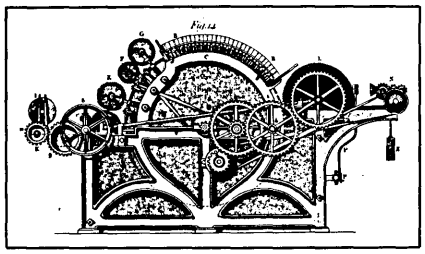
CIRCLE 175 ON READER CARD

HARDWARE

OFF-LINE

Rumors have it that Exxon Enterprises' next venture into high technology will be a development project for a gas-powered word processor. The venture may be in trouble with the Reagan money misers, but the Carter Administration thought enough of it to include $37 million in the DOE budget to seed the project.

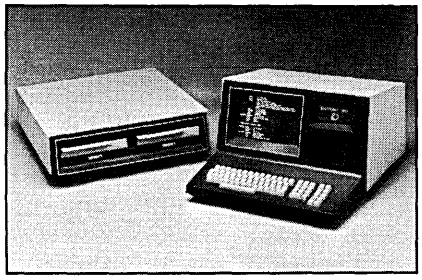
Several highly creative scientists who originally met at Sandoz Laboratories many years ago have formed a new computer company, tentatively dubbed the Lightning Speed Data Corp. LSD's first product, tentatively dubbed the Amorphous Automaton, is said to have one of the most colorful front panels since the second generation. Its operating system is to be an exercise in artificial intelligence, mimicking the thought patterns of an aging Harvard exprofessor of philosophy. When it isn't



stealing data from user tasks and selling it to the highest bidder, it is expected to devise new remote computing services for use in Algeria. In that country, its proposed in-house security system has captured the interest of several notable exiles (or vice versa). The company seems to be literally tripping over itself in its rush to market. Unfortunately, several of the custom circuits are single-sourced, and deliveries from Ergot XXV have been delayed due to a solar storm.

COMPUTER

After Datapoint's right hand introduced its top-of-the-line 8800 processor a few months back, any veteran magician watcher should have known to keep his eyes on the company's left hand for its next move. For, way down at the low end, the San Antonio computer maker has beefed up its 1500 desktop computer, upgrading the processor with a Z80A microprocessor (good for twice the clock speed of the Z80) and additional



memory; the new machine is christened the 1550. The new processor is compatible with the 4½ year old 1500, but it has the additional ability to support a hard disk with a controller that has a four-terminal serial interface, allowing the 1550 to act as the cpu in a four-user Datashare timesharing system (as of last September, the 1500 could use this feature). The 1550 can be had with double-density diskette drives, in either single- or dual-sided versions (1MB or 2MB capacities). Up to four floppies can be attached to a 1550, for a total of 8MB (maximum) of on-line diskette storage. Systems with at least 64KB of main memory can support 10MB cartridge disks: the 9310 consists of disk and controller, while the 9320 also adds the terminal interface needed for a multiuser system. The 1550 supports Datapoint's BASICPLUS, FORTRAN, and DATABUS languages, as well as communications emulators such as EM3270, and 2780/3780 batch communications packages.

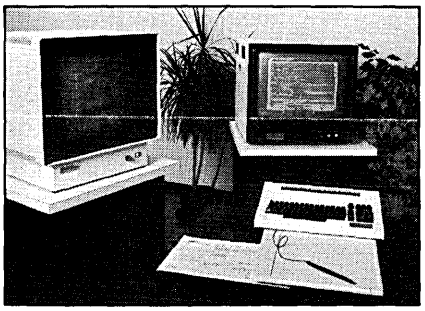
Datapoint says the earlier 1500 has been pretty much an oem product, and sales have passed the 6,000 mark. Since the 1550 has a Z80A at its heart, it seems reasonable to ask if someone might be readying a CP/M operating system for the machine, alllowing small users to take advantage of the many packages on the market for CP/M systems. Indeed, it appears the New York's Lifeboat Associates, which bills itself as the largest publisher of CP/M software, has just such an offering in the works. Thus the 1550 with its greater internal operating speed, multiuser capability (through the hard disk controller with multiterminal adaptor), and a choice between Datapoint-supported operating system and microcomputer standard CP/M (that will be Lifeboat's to support), could well outsell its predecessor.

A basic 1550 with 32KB of memory, and a .5MB floppy drive will sell for $7,075; additional 32KB memory increments go for $650. Memory can grow to 96KB. A 64KB system with 10MB hard disk controller and terminal interfaces sells for $18,750, and includes a 1MB floppy in place of the .5MB unit. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 300 ON READER CARD

GRAPHICS TERMINAL

The trend has been to give graphics terminals more processing power in order to offload tasks from a central processor. Lexidata's new Graphic System 8000 gets



its name from the 16/32-bit Motorola MC68000 microprocessor it uses to control a high-resolution raster scan display. The product, designed for the developer of in-house graphics systems, is said to be applicable to printed circuit board and VLSI

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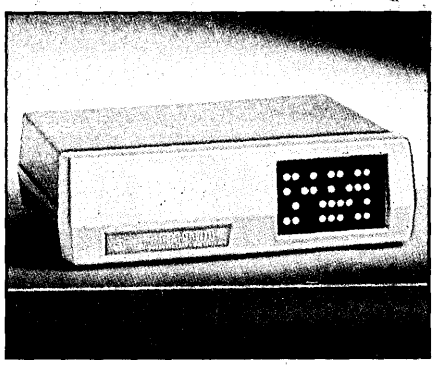

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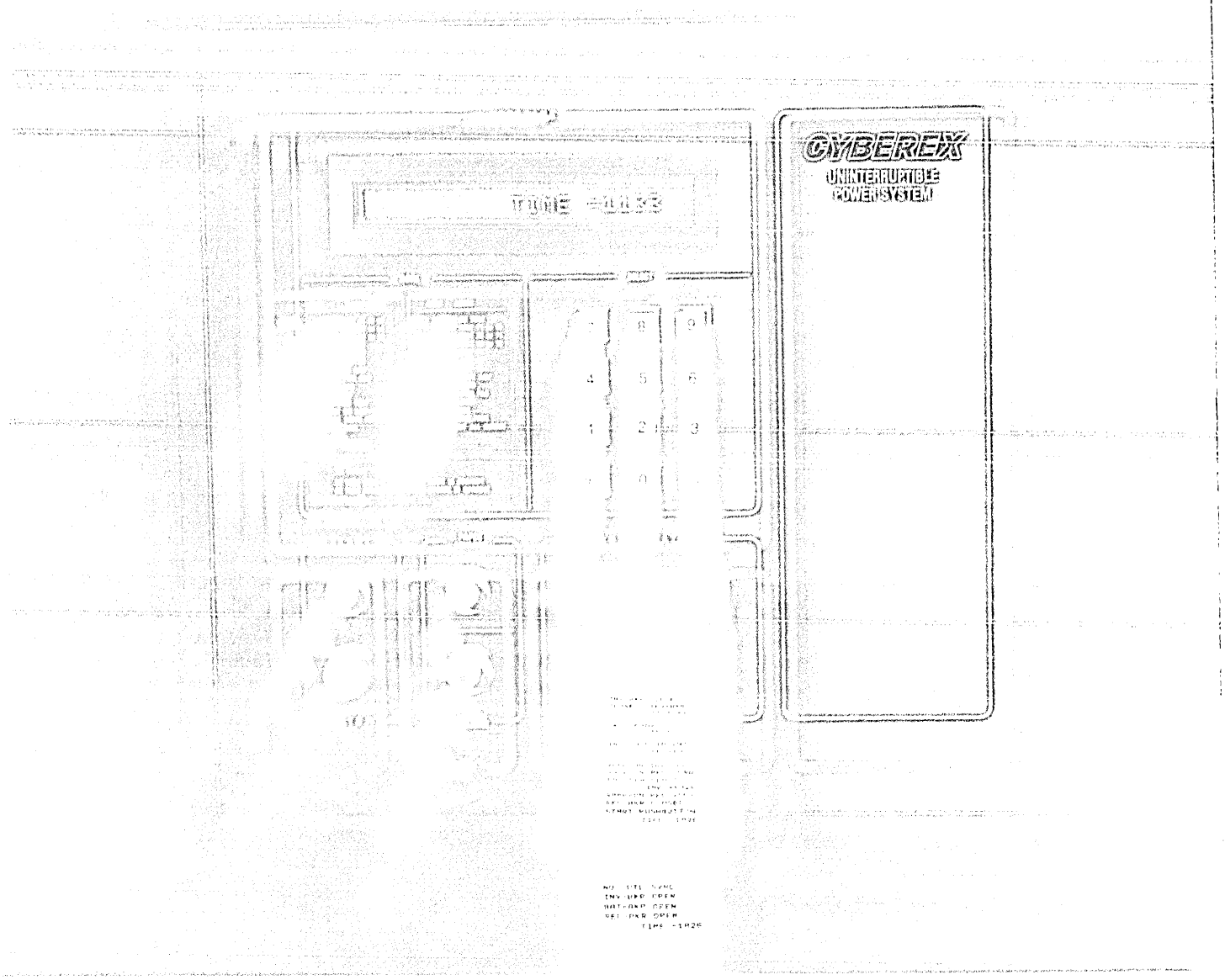
CIRCLE 176 ON READER CARD



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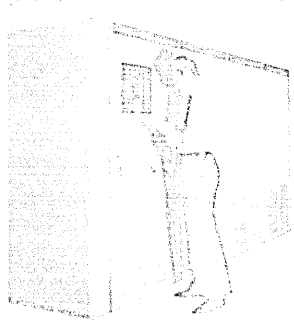
[illegible] the heart of each power [illegible] Logicenter of Cyberex's Megawatt Range Uninterruptible Power System receives reports on the function of key components. It detects line power variations, load effects and equipment malfunctions before they cause a power deviation, takes corrective action, and tells the [illegible] annunciator (shown above) [illegible] to [illegible] the start and stop buttons. [illegible] power [illegible] adverse [illegible] operation — effects such as output delay, memory loss and component damage that can result in costly downtime.



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CYBEREX

CIRCLE 177 ON READER CARD

computer-aided design, command control and computer-aided drafting tasks. The Motorola chip can address a full 16 megabytes of memory and has an instruction set particularly well suited for manipulating large, high-precision graphics databases. In this case, the display processor controls the raster frame buffer and performs raster conversion of vectors, circles, and filled areas.

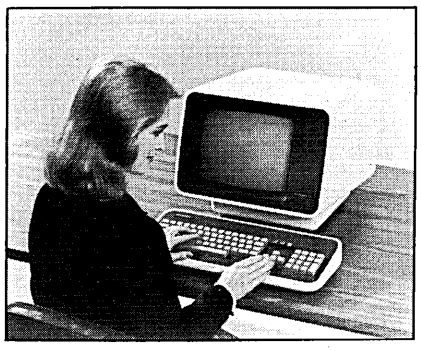
The GS8000 provides high-level graphics operations for input and output, with its functions modeled on the ACM Siggraph GSPC "core" proposed software standard for computer graphics. The system is described as using a 31-bit "world coordinate" system which provides a virtual resolution of 4 billion points per axis. The GS8000 accepts graphics primitives including lines, circles, filled polygon areas, and text which are described in the coordinate system and stored in the processor's memory. The resulting database is segmented under user control to permit incremental updates. In addition, the system offers windowing capabilities which enable a user to define several windows on the coordinate system which can be quickly refreshed from the internal database.

Standard hardware configurations include the graphics processor with 64K bytes of RAM and up to 24K bytes of PROM, display processor, and high-speed parallel interfaces. Options for the graphics processor include additional RAM in 128K byte increments (maximum of 1 megabyte); an RS-232C host interface for remote use; interfaces to a variety of input devices, including keyboard data tablet, digitizer (up to 40 x 60 inches in size), trackball and joystick. The display processor is available in resolutions of 640 x 512 or 1,280 x 1,024 pixels, black-and-white or color, with a hardware cursor. Hardware pan and zoom, blink, and bitmap overlays also are available. Prices start at $26,200, with a typical system tagged at about $40,000. LEXIDATA CORP., Billerica, Mass.

FOR DATA CIRCLE 305 ON READER CARD

CRT TERMINAL

The second in a year-old line of crt terminals, Ampex's Dialogue 30 product is designed to compete at the low end of the burgeoning crt market, in the "dumb" category. The model 30, joining the smarter model 80, offers a nonglare, 12-inch diagonal screen capable of displaying 24 lines of 80 characters each, plus a selectable top status line. It is designed for standard time-sharing, small business computing, and data entry applications, but is sold only on an oem basis. First deliveries are set for April with a 100 to 249 unit price tag of $699 each, according to a company spokesman. He added that the model 30 offers as standard a detached keyboard with numeric pad, a self-test facility that is activated each time the terminal is switched on, and a brightness control. The terminal operates at



up to 19.2Kbps through an RS-232C interface, half or full duplex, as well as communicating through a standard programmable serial printer port. A keyboard locking feature may be used to prevent unauthorized use, the vendor says. AMPEX CORP., El Segundo, Calif.

FOR DATA CIRCLE 303 ON READER CARD

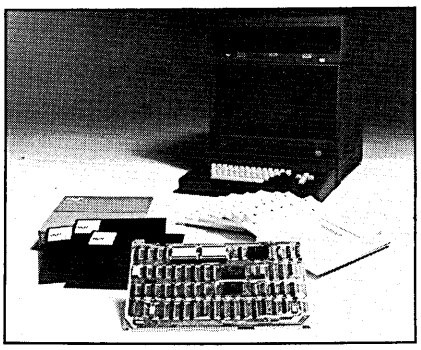
ENCRYPTED TERMINAL

A new twist on this vendor's line of portable printing terminals is the Execuport Sherlock, which incorporates the IBM-developed Data Encryption Standard (DES) coding system. The Sherlock product, developed jointly with Analytics, Inc. of McLean, Va., automatically protects transmitted data by encoding it according to the DES algorithm, a mathematical process microcoded into a chip. The encoding process is said to be transparent to users, who must use the terminal with an identical encoding key or a host computer similarly equipped. Execuports ordered together are given a common master key, but each communications session between them is encoded by a temporary "session key" that is randomly generated and used only once. The vendor claims that because the built-in master key system is used, the danger of a security leak

HARDWARE SPOTLIGHT

32-BIT MICRO

Barring semantic arguments from proponents of bit-slice microprocessor designs, Intel has become the first vendor of a 32-bit microprocessor, the iAPX 432. Intel calls it a "micromainframe," and it comprises three VLSI chips: an instruction decode unit and an instruction execution unit—making up the general data processor (GDP)— and an interface processor chip for I/O and interfacing to Intel's Multibus. The two GDP chips operate as a pipelined pair, with one fetching and decoding instructions for the other to actually execute. The GDP supports 32-bit logical addressing (4,096MB) and a virtual address



space of 2^{40} bytes. Data types include character (byte), 32-bit integer, and floating point numbers comprising 32, 64, and 80 bits. A 32-bit integer multiply takes 6.25usec, while an 80-bit floating point multiply takes 26.125usec. The iAPX 432 instruction set was designed for high-level languages—DOD's Ada is the initial offering—with instructions using from zero to three operand specifiers. Addressing modes are said to be "symetric," providing uniformity when operating with scalar, vector, and record data types. A "capability-based" memory protection scheme is used, providing unique protection for every data structure in memory. This allows protecting structures so only authorized programs can gain access (access rights can also be limited, as required). Each data structure is typed, so only operations that can properly use the given data type can operate on that data type. Intel says it is impossible to branch to data or overwrite code. For reliability, two processors can operate in tandem, signaling a failure if their results disagree. Multiple processors also can operate independently, communicating over a multiprocessor interconnect bus, allowing system throughput to increase when more processors are added.

Much of the operating system for the iAPX 432 is in silicon: single instructions replace service calls to operating system subroutines. Data structures can be transmitted between programs using "send" and "receive" instructions, with buffering and synchronization performed by the hardware. Processors also are "self-dispatching," finding, scheduling, and dispatching programs without software intervention. As additional processors are added, the hardware dynamically balances the load. Dispatching policies are controlled by the user's setting of parameters.

The first commercial product using the iAPX 432 is a board-level evaluation system called the Intellec 432/100. The package includes the iSBC 432/100 board, which is equipped with both an RS232 and a Multibus-compatible interface, object-builder evaluation software, and documentation. The evaluation kit plugs into an Intellec development system; software development is performed on an attached host computer, where the Ada compiler and linking loader reside. Object modules are down-line loaded into the development system. The 432/100 (sans Intellec and host) sells for $4,250; availability is quoted at 90 days, ARO. INTEL CORP., Aloha, Ore.

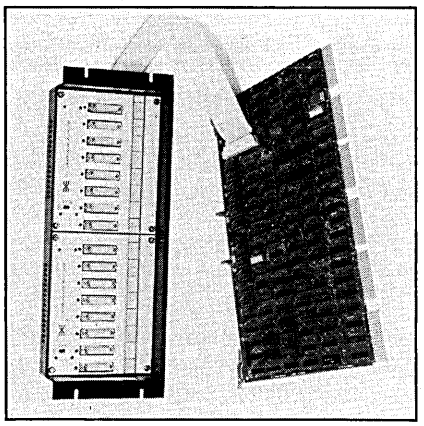
FOR DATA CIRCLE 309 ON READER CARD

is less than would be present in a system requiring users to enter ID codes, passwords, or other secret keys. The terminal is based on CTSI's 4000 wide-carriage product line and carries an end-user quantity one price of $4,995. If bought in quantities of 100, the terminal's price drops to $3,995 per. COMPUTER TRANSCEIVER SYSTEMS, INC., Paramus, N.J.

FOR DATA CIRCLE 307 ON READER CARD

CRT TERMINAL

The first of a line of terminals designed to replace its aging 750 series, CDC's new 752 crt is being sold to user of CDC systems that support TTY-compatible, asynchronous terminals. Microprocessor-controlled, the 752 communicates asynchronously in a character mode for local and remote processing. It operates in a scroll or page mode and offers a blinking underline cursor that can be moved under program control for editing and prompting purposes. The terminal has a 1,920-character display, communicates at up to 19.2Kbps and features an 85-key keyboard with numeric pad and 12 special function keys. Video attributes include dual-intensity and blinking characters. An output port is included to attach CDC's model 753-11 thermal printer or the model 755-21 dot matrix impact printer. Operating in an advanced mode, the terminals can display a line drawing set of 31



characters. All characters are displayed within an 8 x 10 matrix. Designed and developed at CDC's Roseville, Minn., facility, the 722 terminal may be purchased for $1,375 plus installation or leased for one or three years at $55 or $50 monthly, respectively. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 301 ON READER CARD

MULTIPLEXOR

A rising star in the oem peripherals controller market, Emulex has entered the front-end communications market with a multiplexor designed to work with Digital Equipment PDP-11 or VAX-11 computer families. Developed to replace DEC's DH11 mux with improved line handling and lower cost, the new CS11/H mux connects up to 64 asynchronous communications lines to a single controller board housed within the cpu backplane. Additional lines may be connected by adding a communications controller card to the cpu and line adapter cards to external distribution panels. Features include direct memory access (DMA) output transmission, FIFO input and flexible line interfacing, speed and format selection. Individual byte count and address registers are provided for each communications line, a scheme said to reduce cpu and Unibus loading in comparison to interrupt-driven muxes. Line interfaces include RS-232 and current loop, each of which can be operated at speeds of up to 19.2Kbps. Thus, a single controller can handle a composite data rate of 50,000 characters per second on a single controller. A basic configuration of one controller and a distribution panel with adapters for 16 channels, all including modem control, is priced at $5,800 in single units. Oem discounts are available. EMULEX CORP., Santa Ana, Calif.

FOR DATA CIRCLE 302 ON READER CARD

ALPHANUMERIC TERMINAL

Designed to reduce space requirements and cost in applications that would normally require a full-sized crt terminal, this vendor's product incorporates a 64-character, two-

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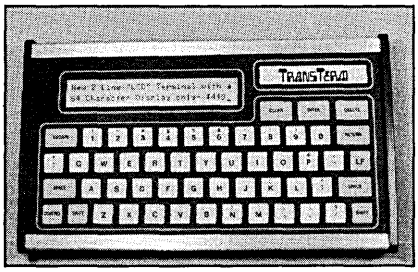
CIRCLE 178 ON READER CARD

HARDWARE

line liquid crystal display into a full-sized keyboard. The terminal, designated Transterm 1, displays the full 96-character ASCII complement and an underscore cursor. Characters are formed in a 5 x 7 dot matrix and can be received at rates of up to

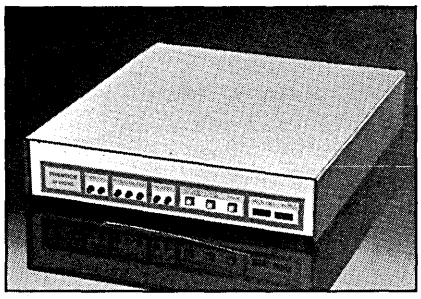


9,600 bps. The terminal keyboard which has 53 membrane keys in a typewriter-style layout, communicates in full duplex RS-232 serial asynchronous mode with 20mA current loop or RS-422 available optionally. The user is also given a switch-selectable choice of teletypewriter-compatible, block send or polled multidropped modes. The terminal is available now for $449 each in single quantities. COMPUTERWISE INC., Grandview, Mo.

FOR DATA CIRCLE 304 ON READER CARD

2400 BPS MODEM

The P-201C private line/dial modem is compatible with Bell's 201 B/C data sets operating at 2400 bps, according to this manufacturer. The modem is full duplex and can operate on unconditioned type 3002 leased lines or can be directly connected to the direct distance dial (DDD) network. The new product, obtained under a technology transfer agreement between Prentice and Intertel, helps round out Prentice's line of modems and multiplexors. It uses a

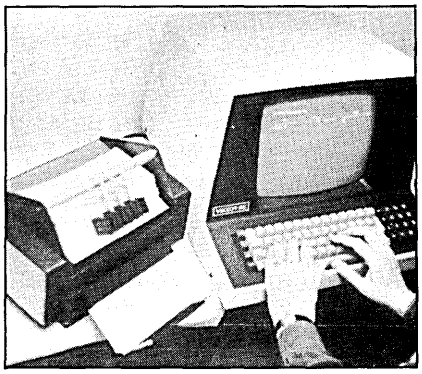


microprocessor-based design and is available in fixed loss loop, permissive, or programmable modes. An on-board ring detect and answer back feature enables automatic data transfer from remote sites. Other features include front panel indicators to display modem and EIA lead status, built-in test circuitry, and a standalone enclosure with separate power supply. The P-201C is priced at $950 per unit. PRENTICE CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 308 ON READER CARD

PAGE TURNER

Tired of turning documents over by hand while at the crt? So was somebody at Ste-



phens Systems, which has come out with the MK-IV Keymate, designed to ease the strain on data entry operators who must tediously make their way through stacks of forms. The product, said to be the first of its kind, is claimed to increase operator productivity by as much as 40% by letting hands remain at the crt's keyboard. Pages are displayed one at a time, full face, under foot pedal control. The 13 lb. device also reduces paper cuts and handles envelopes, coupons, warranty cards, and clippings. Priced at $895. STEPHENS SYSTEMS, INC., Lenexa, Kans.

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Moret & Limperg, Accountants

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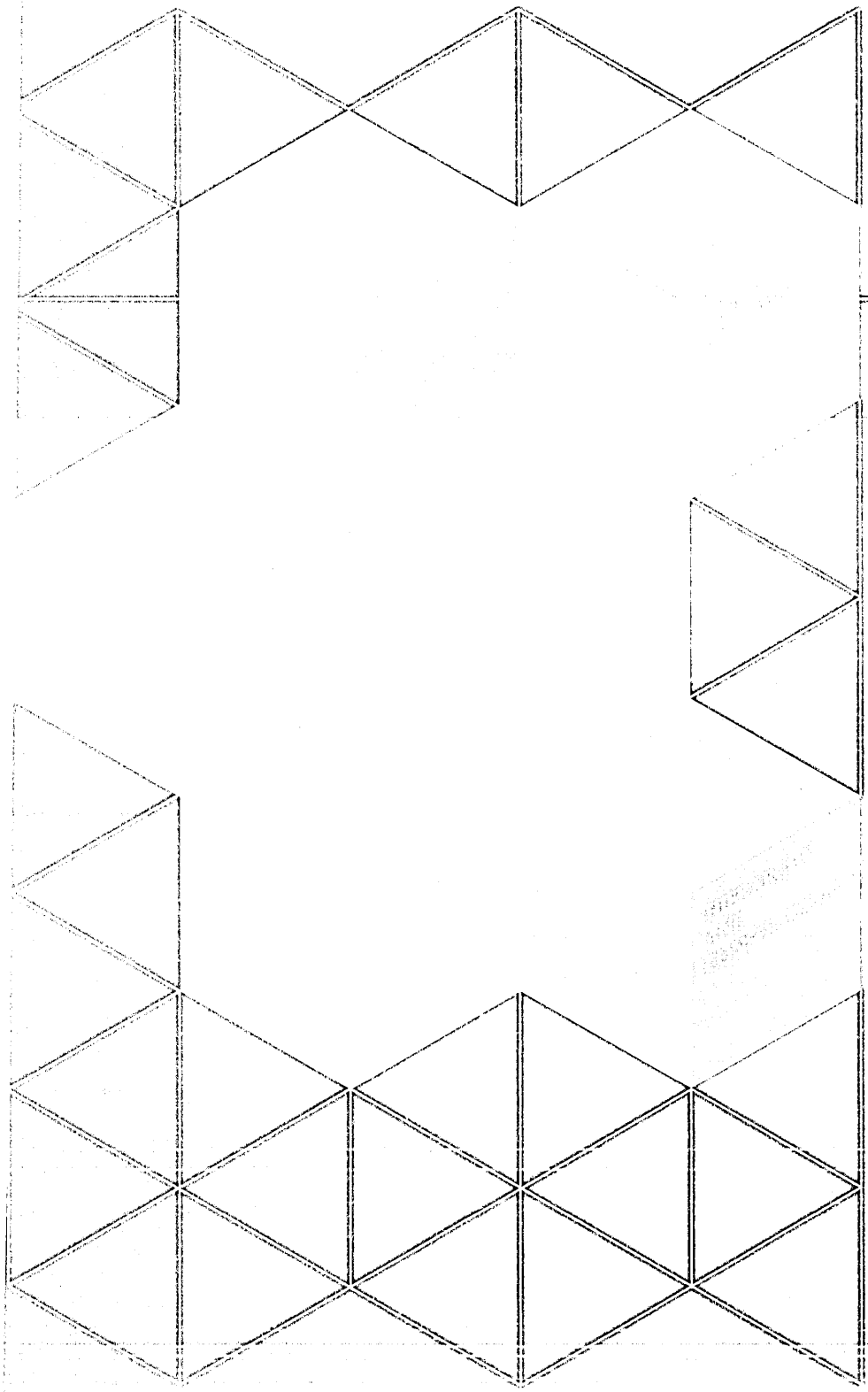

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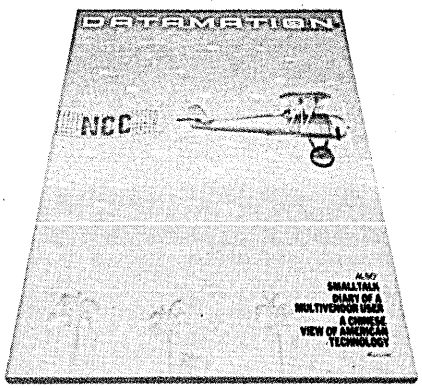

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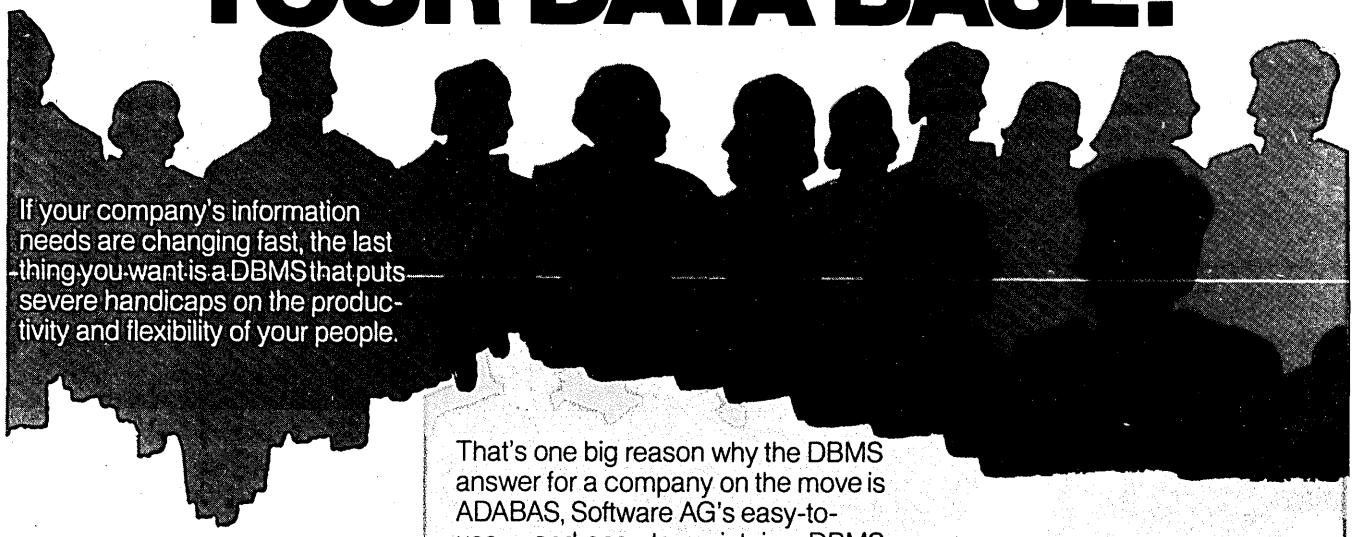

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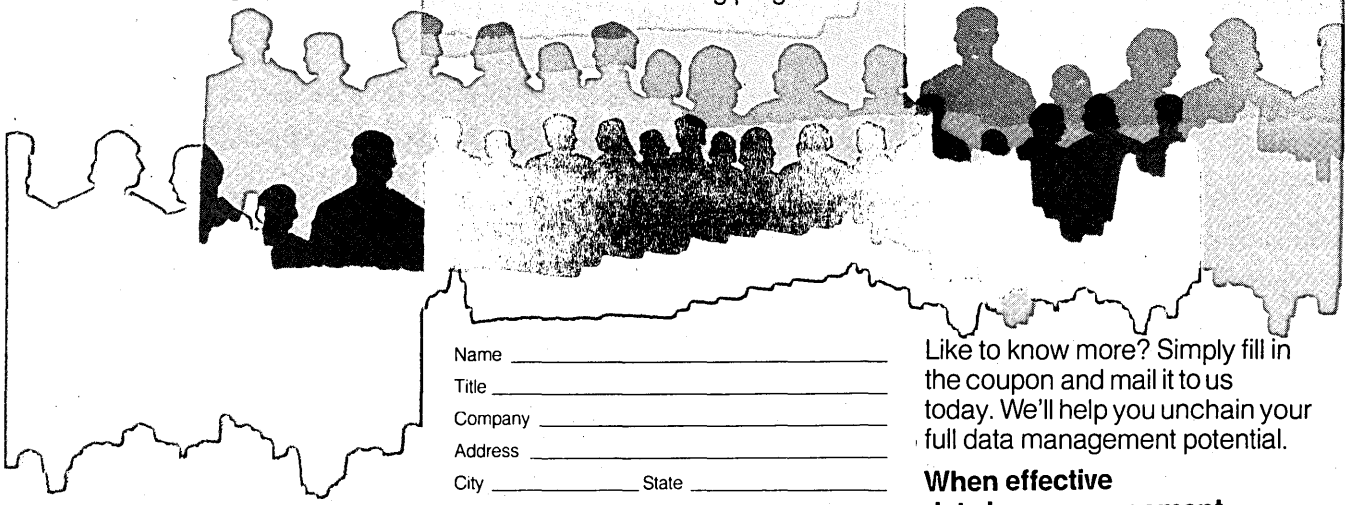

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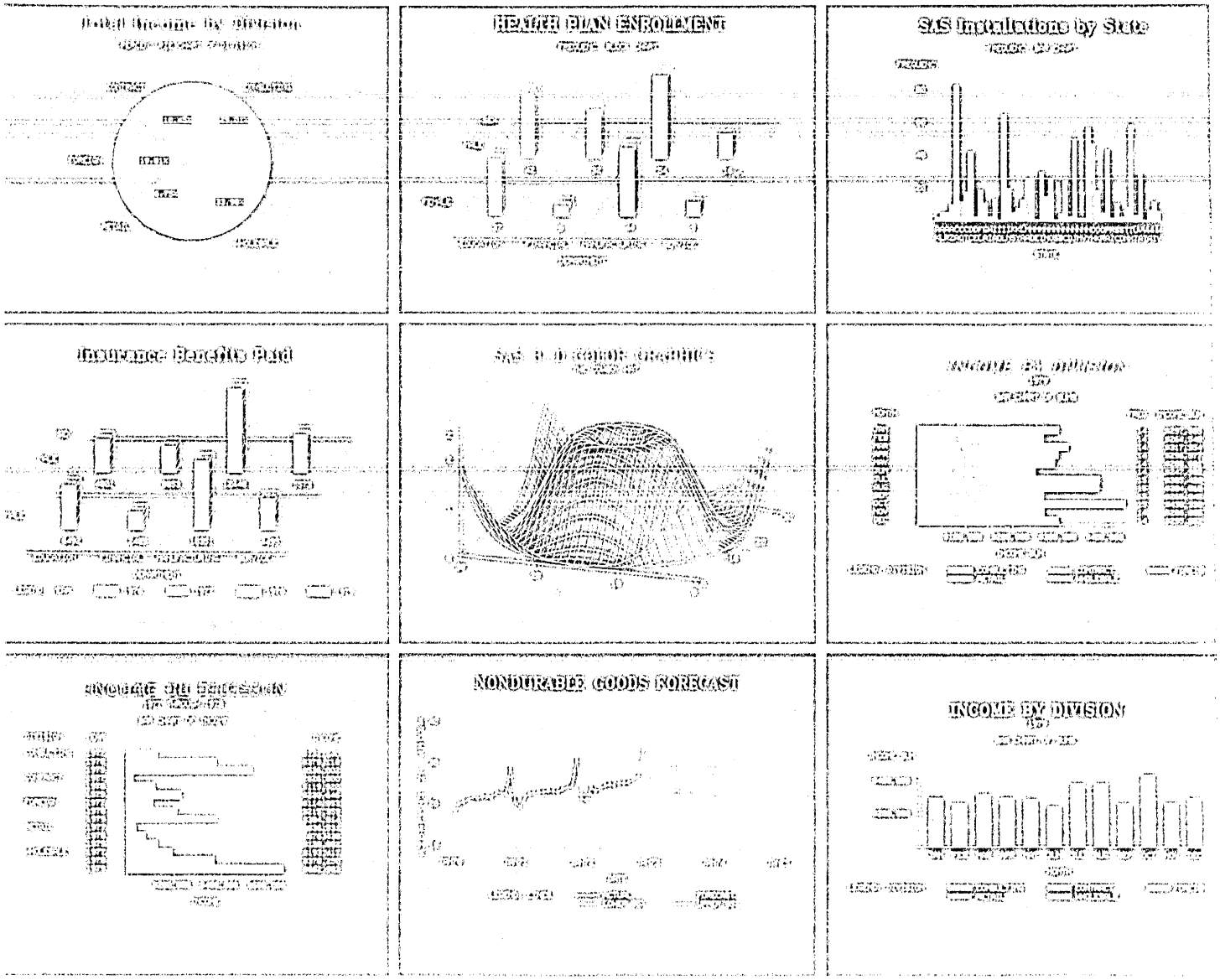

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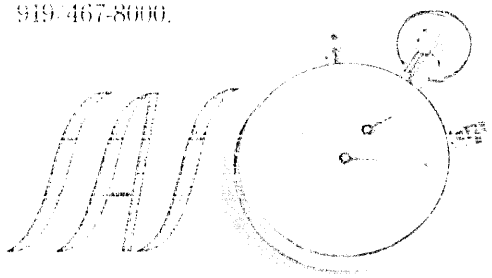

Images produced by SAS/GRAPH with Tektronix 4027, Dunn Instruments 631 Color Camera System and Polaroid film.

CIRCLE 182 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Larry K. Baxter, vp for R&D at Kronos Inc. of Boston, sent us the following test he has been using for interviewing datacom types. Readers scoring 50% or better should feel confident when answering classified ads in the Sunday papers.

DATA COMMUNICATIONS EXAM

1) SDLC is a student activist organization (true/false)
2) SNA is a steroid growth hormone (true/false)
3) CARTERFONE is a communications net run by Billy Carter in Plains, Georgia (true/false)
4) "MODEM" is an acronym for "Modulator-Demodulator" which reads the same backwards and forwards (true/false)
5) "USART" is an acronym for (check one):
  a. Uncontrolled state-of-the-art research and technology
  b. United States of America is really terrific
  c. Universal synchronous/asynchronous receiver/transmitter
6) A "bit" is (check one):
  a. A binary information unit
  b. 12.5¢
  c. A harness part
  d. All of the above
7) A "baud" is (check one);
  a. A lady of the evening
  b. A slang word for the human physique
  c. Information word rate
8) EBCDIC is a rare male social disease similar to Moby Dick (true/false)
9) The answer is "Bell 103, LSI 11." What's the question?
  a. Name a modem protocol and a 16-bit micro
  b. What was the final score of the Bell-LSI game?

Don't feel bad if you score less than 50% -- you can always get your next job working for the phone company.

TEXT FORMATTER

PDP-11 users running their systems under RSTS, RSX11, RT11, TSX, UNIX, and UNIX-like operating systems can use NROFF to format the printing of text files. This vendor's version of NROFF is similar but not identical to the text formatter of the same name available on UNIX systems. Formatting directives control line justification, page numbering, titling, and other functions. Output can be sent to a printer, terminal, or file. Users can create new directives by combining the standard directives recognized by NROFF. Arithmetic calculations can also be performed by NROFF. The vendor cautions that its version of NROFF is not strictly compatible with the UNIX version extant—the basic capabilities are said to be the same, but there are some syntactic differences. The fully supported package sells for roughly $900; a phototypesetter version is due for release soon. THE SOFTWARE SHOP, INC., AMF O'Hare, Ill.

FOR DATA CIRCLE 326 ON READER CARD

SOFTWARE PERFORMANCE ESTIMATION

BGS systems, the Massachusetts software house specializing in performance modeling and monitoring, has developed Crystal, a tool for predicting the performance of software systems—as the system is developed. Using Crystal also requires use of the vendor's Best/1 interactive performance prediction package. Crystal accepts a system description, including hardware, file structure, workload, and software structure, then predicts response times, throughput levels, and the consumption of system resources (such as cpu and DASD). Crystal runs on any system supporting Best/1 and ANSI standard FORTRAN IV. It is priced at $17,600.

BGS says that Crystal will typically be used in a stepwise refinement mode. At the outset of a program development project, only limited information will be available for the model, but the user can still get a ballpark estimate of performance and resource utilization. As the project firms up, more specific information can be processed, yielding successively better estimates of the final system's expected performance. A Feasibility Testing System lets the user vary design parameters during the development cycle, helping select the most desirable system design. BGS SYSTEMS, INC., Lincoln, Mass.

FOR DATA CIRCLE 327 ON READER CARD

MICROCOMPUTER SORT

Written for microcomputers running under CP/M, UltraSort II is an assembly language sort that can operate as a standalone utility or as a subroutine called from a CBASIC-2 program. Sorting can be in ascending or descending order, with either alphabetic or numeric keys.

UltraSort II can sort up to 1.3MB on a 56KB system. Sorting may be performed on variable or fixed length fields, on as many as five keys. Numeric fields are automatically floated, while the user has the option of having numeric strings floated. Record sizes can be as large as 1KB. The program also has a select capability, allowing selection based on less than, equal, or greater than; the select key can be up to 128 bytes, with wild card characters. UltraSort II sells for $195. GRAHAM-DORIAN SOFTWARE SYSTEMS, INC., Wichita, Kans.

FOR DATA CIRCLE 329 ON READER CARD

CICS UTILITY

The CICS Online Table Changer eliminates the need to shut down (and reinitialize) CICS when the systems programmer needs to modify the Program Control Table (PCT) and Processing Program Table (PPT). The package allows real-time alterations to either PCT or PPT, including the renaming of a table entry. The utility provides a number of table options useful during new program

development or when fine-tuning the system. The program runs under either DOS or OS and sells for $500 including documentation and source code. HLE SYSTEMS, INC., Overland Park, Kans.

FOR DATA CIRCLE 330 ON READER CARD

RELATIONAL DATABASE

Originally developed on PDP-11s running under Bell's UNIX timesharing system, the INGRES relational database system now is offered for DEC's VAX line of 32-bit computers running under VMS. Before the formation of Relational Technology, the company formed to market INGRES to VAX users, about 125 PDP-11 sites installed earlier versions of INGRES. RTI's redesign for the VAX is said to be about 250% faster than the PDP-11 version. Both are written in C.

INGRES stands for INteractive Graphics and REtrieval System and, as with all relational systems, owes much to Dr. E.F. Codd of IBM San Jose. Interactive commands define INGRES tables and establish protection and integrity controls down to the field level. INGRES uses a dynamic data structure, completely separating the logical and physical descriptions of the database. Commands can create new indices and change access methods. A high-level data manipulation language, QUEL, lets users manipulate data interactively from a terminal or from application programs (currently only those written in C, although Pascal, PL/I, FORTRAN, and others are planned). An integrated data dictionary and a set of support services (utilities) round out the package.

Tables may have up to 50 fields with an aggregate record length of up to 2040 bytes. Four commands come into use when defining a database. CREATDB names the database and creates a skeletal directory; CREATE defines relations within the database; and COPY loads each relation with bulk data from an existing VMS file. The fourth creation command, MODIFY, sets up a database structure used in physical storage: choices of structure include HEAP (unstructured and unsorted), HEAPSORT (sorted), ISAM (indexed sequential), and HASH (random hash-addressed). Additionally, VIEWS are supported. These are stored in the data dictionary and may be added or deleted at any time.

QUEL (and EQUEL—embedded QUEL—the preprocessed manipulation language that interfaces application programs to INGRES databases) is a nonprocedural language that lets a user specify a set of records to be accessed (retrieved or modified) without providing an algorithm for the actual retrieval of the data. QUEL has four basic operations: RETRIEVE, APPEND, REPLACE, and DELETE. Commands can span multiple relations and include logical associations, arithmetic operations, logical operations, comparisons, and aggregation operators (i.e., avg, min, max, sum, etc.). A macro facility allows storing frequently used expressions.

RTI prices INGRES at $30,000 with a 10% annual renewal fee. Twenty-four hour telephone support is available. RELATIONAL TECHNOLOGY INC., Berkeley, Calif.

FOR DATA CIRCLE 328 ON READER CARD

SOFTWARE SPOTLIGHT

FINANCIAL MODELING

In light of the success of Visicalc and other financial spreadsheet and modeling packages for microcomputers, Dennis Brown, an economist whose experience includes stints at Tymeshare and Computer Sciences Corp., developed FPL (Financial Planning Language) for CP/M systems. FPL is an attempt to extend the current financial modeling capabilities of micros to compete with packages offered by commercial timesharing services and other packages offered for larger in-house systems.

FPL is a programming language, as contrasted with an automated spreadsheet. While this means users don't see the immediate effects of changes in their data, spreadsheet consolidation and additional calculation capabilities extend the usefulness of the package. The language contains primitives to define worksheet row-names and column-names, row, column, and cell calculations, automatic repetition of data values, and generation or rows or columns by successive application of addition, subtraction, multiplication, or division of an initial value by a given constant. This allows FPL to generate cashflows easily. Data generation functions also let the user specify that a row or column will grow to a target value given by the user, or that a value will be amortized over a given period. For more flexible processing, calculations can be entered as algebraic expressions, and IF. . .THEN. . .ELSE logic is supported. BASIC code can be inserted in-line where FPL lacks a needed function. When the user defines a model, the order of evaluation is explicitly specified—the user isn't forced into a row-by-row or column-by-column evaluation.

While FPL does not require a trained programmer, it obviously does require the user to have some understanding of programming. Most users should be able to pick this up as they go along, developing ever more sophisticated models. Model builders also can set up question and answer dialogs so clerical users can enter data and produce reports from predefined models. The system itself is controlled through the use of menus.

UNIVERSAL BUSINESS FORMS
Pro-Forma Income Statement
1st Quarter, 1981

JANUARY 17, 1981

	JANUARY	FEBRUARY	MARCH	TOTAL FIRST QUARTER
GROSS SALES	235,840	228,563	233,134	697,537
RETURNS & DISCOUNTS	7,075	6,857	6,994	20,926
NET SALES	228,765	221,706	226,140	676,611
COST OF GOODS	129,712	125,710	128,224	383,645
GROSS PROFIT	99,053	95,997	97,916	292,966
OPERATING EXPENSES				
SELLING	52,616	50,992	52,012	155,621
GENERAL	22,877	22,171	22,614	67,661
ADMINISTRATION	11,438	11,085	11,307	33,831
DEPRECIATION	820	826	830	2,476
	87,751	85,074	86,763	259,588
OPERATING INCOME	11,302	10,922	11,153	33,377
OTHER INCOME (EXPENSE)	8,050	-	23,425	31,475
NET INCOME	19,352	10,922	34,578	64,852

FPL EXAMPLE

```
1010  ROWS
1020  GROSSS GROSS SALES
1030  'RETURNS RETURNS & DISCOUNTS
1040  NETSALES   NET SALES
1050  COGS COST OF GOODS
1060  GROSSP   GROSS PROFIT
1070  SELLING OPERATING EXPENSES/  SELLING
1080  GENERAL   GENERAL
1090  ADMIN   ADMINISTRATION
1100  DEPREC   DEPRECIATION
1110  TOTOPEXP
1120  OPINC OPERATING INCOME
1130  OTHINC OTHER INCOME (EXPENSE)
1140  MIBT NET INCOME
1145  INCTAX INCOME TAX
1146  NETINC NET INCOME
1150  COLUMNS
1160  JAN JANUARY
1170  FEB FEBRUARY
1180  MAR MARCH
1190  Q1 TOTAL/FIRST/QUARTER
1200  DATA
1210  'GROSSS = 235840,228563,233134
1220  DEPREC=820,826,830
1230  'OTHINC=8050,0,23425
1240  RULES
1250  MATHROW
1260  RETURNS=.03*GROSSS
1270  NETSALES=GROSSS-RETURNS
1280  COGS=.55*GROSSS
1290  GROSSP=NETSALES-COGS
1300  SELLING=.23*NETSALES
1310  GENERAL=.1*NETSALES
1320  ADMIN=.05*NETSALES
1330  TOTOPEXP=SELLING+ADMIN+GENERAL+DEPREC
1340  OPINC=GROSSP-TOTOPEXP
1350  NIBT-OPINC+OTHINC
1360  INCTAX=.52*NIBT
1370  NETINC=NIBT-INCTAX
1380  MATHCOL
1390  Q1=JAN+FEB+MAR
```

FPL requires a 64KB microcomputer running under CP/M. Additional requirements are at least 120KB of disk storage, BASIC version 5.2, and a cursor-addressable crt. The package is being marketed by Lifeboat Associates for a fee of $695; the manual alone can be had for $30. LIFEBOAT ASSOCIATES, New York, N.Y.

FOR DATA CIRCLE 325 ON READER CARD

3270 EMULATION

New software from HP enables its HP 3000 Series 30, 33, and 44 computers to communicate with remote computers in several different ways. A 3270 emulation package is designed to connect HP machines to IBM mainframes interactively while a HASP package provides remote job entry facilities in a similar configuration. A third product, designed to connect terminals to the HP 3000 computer, reduces wiring requirements by enabling multipoint connections on a single wire. HP says all three packages make use of the HP intelligent network processor (INP) which is claimed to reduce by as much as 50% the data communications overhead on the host computer. The INP is a separate plug-in computer with its own memory and a number of LSI I/O devices. The 3270 package, designated Interactive Mainframe Link/3000, is priced at $4,200. The HASP emulation package carries a purchase tag of $2,400, while the Multipoint Terminal System/3000 is priced at $1,200. HEWLETT-PACKARD, Palo Alto, Calif.

FOR DATA CIRCLE 331 ON READER CARD

VS/1 Users
You could have timesharing right now...

if you've got the GUTS™ to do it.

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Unlike its forerunners which held the promise of improved programmer productivity and user satisfaction, but fell way short on delivery, GUTS has licked the problems with on-line text editing and timesharing systems.

GUTS takes a unique approach that enables it to combine the wealth of power, features and flexibility of the most sophisticated timesharing system, with a miserly use of core, CPU time, and disk space that is even lower than its most basic competitors require.

In no time at all, users will appreciate its flexibility, performance and lack of required operating system modifications...all of which ensure a smooth and satisfactory transition from current methods of operating. And best of all, it's fully TSO compatible.

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Give me the GUTS™ to tackle timesharing.

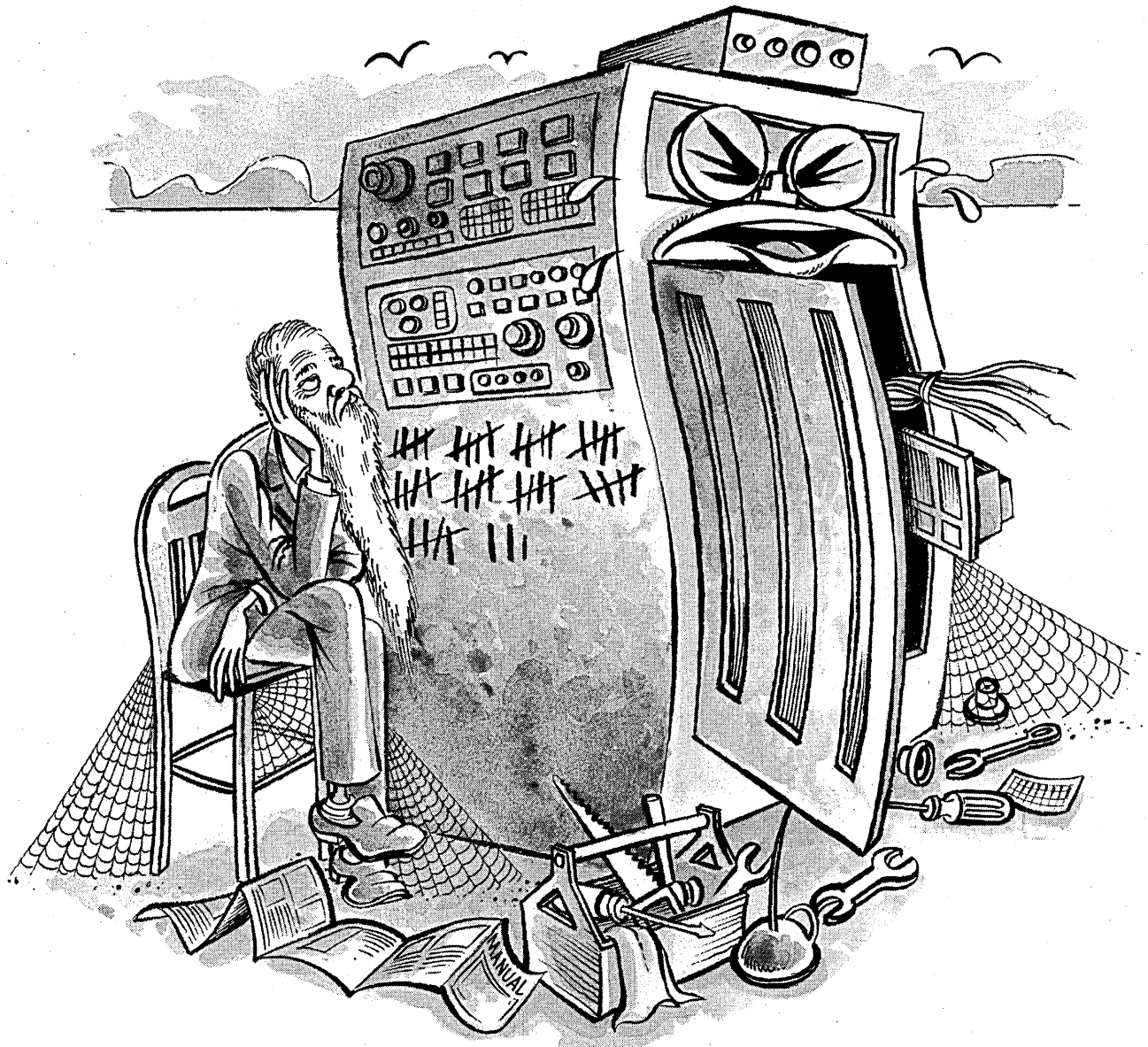
04

NAME ADDRESS

TITLE CITY STATE ZIP

COMPANY PHONE HARDWARE OPERATING SYSTEM

CIRCLE 183 ON READER CARD



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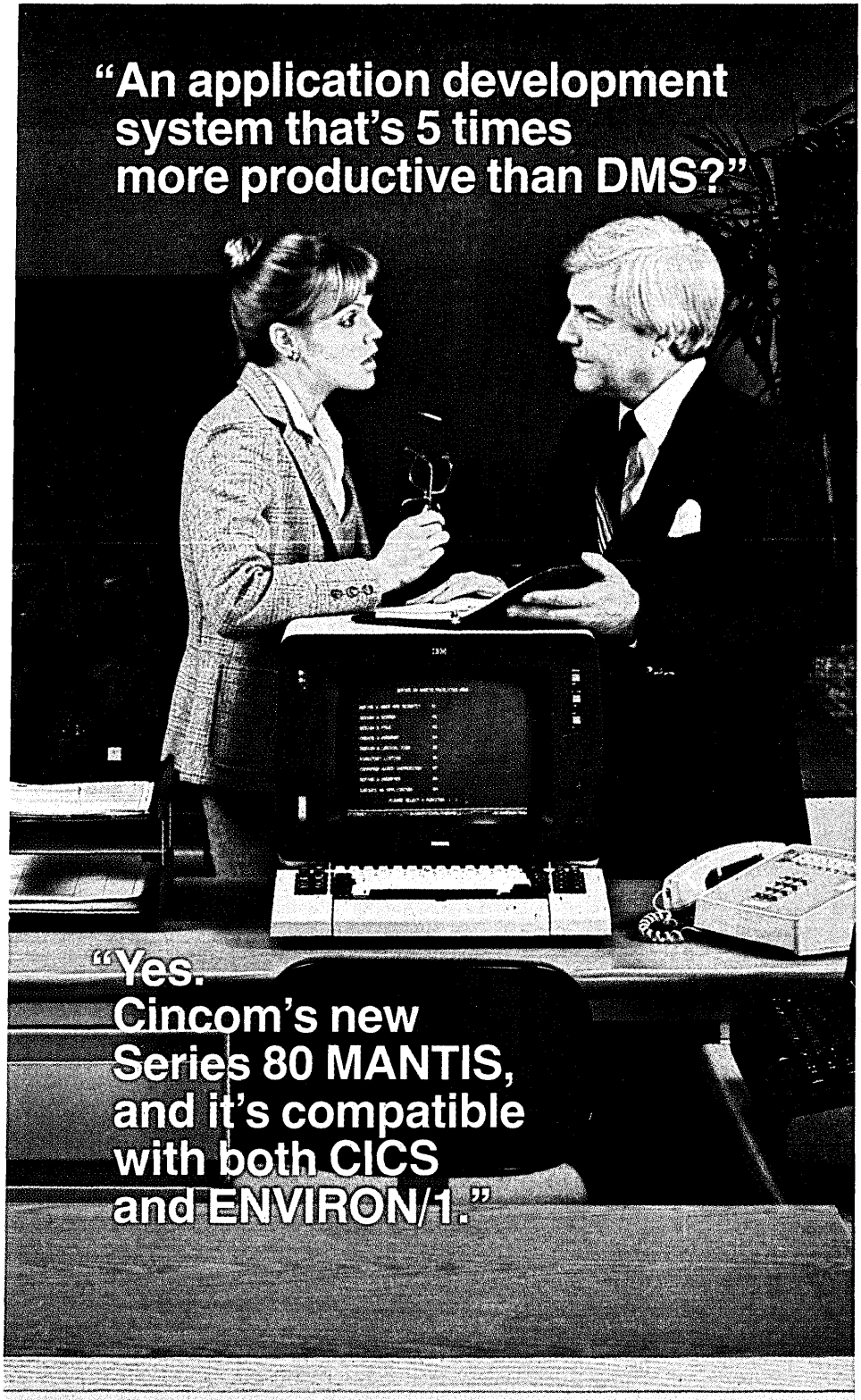
CIRCLE 186 ON READER CARD

FSC Corporation is a publicly owned, diversified enterprise actively engaged in manufacturing and distribution worldwide of equipment and chemical products for industry; refining crude oil for jet fuel, naphtha and fuel oils; selling and servicing cost effective electronic telephone systems for business and government; and management of over $750 million worth of assets with long term income-producing values including railroad freight cars, aircraft and high technology equipment.



Cincom introduces Series 80 MANTIS.

Series 80 MANTIS is the first application development system that dramatically increases programmer productivity by eliminating all batch steps in on-line systems implementation.

With MANTIS, the programmer uses an efficient high level command language to develop, test, document, and execute the entire application interactively—all in one sitting. As a result, programs typically requiring 80 hours in batch or 24 hours with DMS can be developed in only five hours using MANTIS.

Running under Series 80 ENVIRON/1® or CICS, Series 80 MANTIS reduces development time for both standard and data base applications. And its ease of use means programmer productivity will begin to increase within hours after installation. In addition, many applications can be developed directly by the end-user.

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Full DOS/OS Compatibility	✓	
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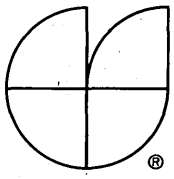
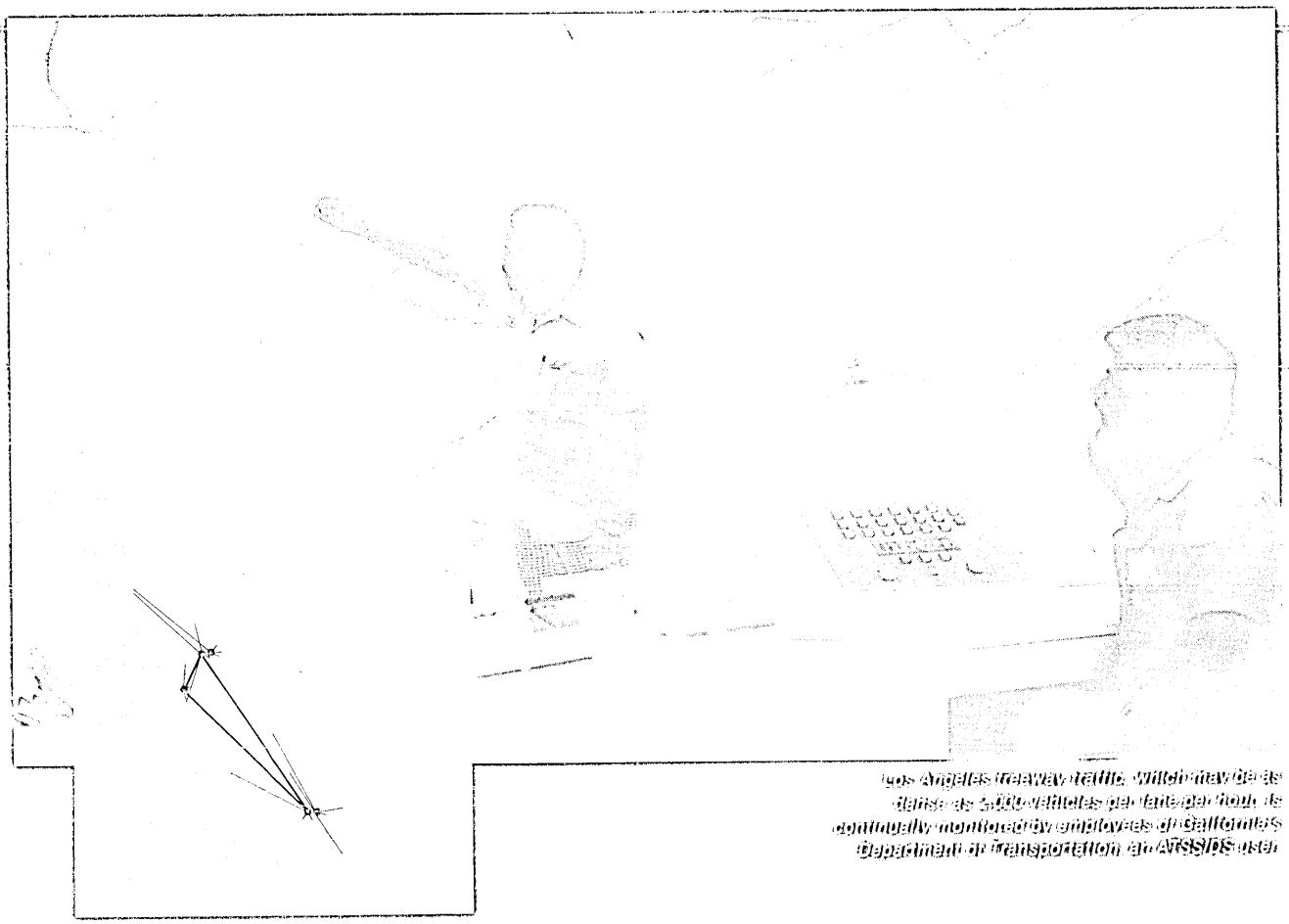
Conversational debugging	✓	
Runs under CICS or ENVIRON/1	✓	
Menu driven	✓	
Online documentation	✓	
Oriented to both DP *and* end users	✓	
Dynamic file generation	✓	
Logical view access to files	✓	



Cincom Systems, Inc.
2300 Montana Avenue
Cincinnati, Ohio 45211

CIRCLE 193 ON READER CARD

Pacific's ATSS/DS Network...



Los Angeles freeway traffic, which moves at speeds of 2,000 vehicles per lane per hour, is continually monitored by employees of California's Department of Transportation on ATSS/DS lines.

...is also a Tran Network.

When a California state official near the Mexican border wants to check license plate files in Sacramento, his local terminal immediately connects him with computers in the state's capital. When an engineer in Los Angeles needs data from Sacramento, her inquiry is switched to computers in that city. When a researcher at an educational institution in San Francisco uses a program residing in a Los Angeles computer, on-line access is only a few keystrokes away.

Pacific Telephone's digital network makes it all possible. Called ATSS/DS, it is the first statewide switched digital network to be offered by a common carrier, the first packet switching network to be tariffed by a Bell System operating company, and the first to provide mixed packet and nonpacket services simultaneously.

Stretching from the Oregon border to San Diego, from San Bernardino in the east to San Luis Obispo in the west, ATSS/DS ties the entire state together through switching centers in San Francisco, Los Angeles and Sacramento. It provides permanent and switched circuits between more than 400 terminals, 35 network access concentrators, and 250 ports on seven computers (including DEC, IBM, Control Data and others).

Users access the network for inquiry/response, data collection, remote job entry, time-sharing and even point-to-point message switching — all without concern for how the network will accommodate them.

In spite of its widespread topology, Pacific's network is an integrated facility with centralized management, billing, diagnostics and status reporting. And in spite of its already large size, it continues to grow to meet customer demands. Nor will the state long remain the only one with such a network — California simply has a head start on the 1980s.

Tran has installed several such networks for telephone companies, and many more for educational and financial institutions, government agencies, and private industry in the United States and other nations. Simultaneously performing X.25-compatible packet, circuit, and Frame switching, Tran's networks are unmatched by any others in the world.

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SOURCE DATA

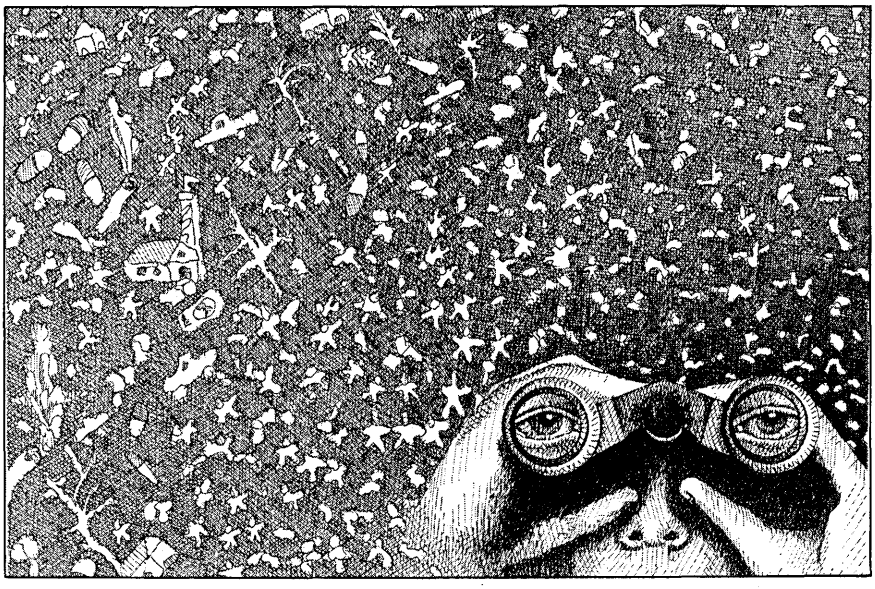
BOOKS

THE BOOK OF PREDICTIONS by Wallechinsky, Wallace, and Wallace

The Wallace family has struck again, this time with a *People's Almanac* of potentialities. The authors polled today's "leading minds" about the shape of tomorrow, and compiled their forecasts, hopes, fears, and premonitions into this volume. The book includes a wide range of subjects, from sociology to technology and abortion to zoapatle, and an assortment of predictors, from Nostradamus to Milton Friedman. *The Book of Predictions* is generally serious rather than sensational in its coverage of the future, but is light reading since a book so broad in scope can provide little detail.

What does the future hold? Take your pick. Part I asks the experts—respected scientists, professors, writers, and Jim Fixx—about outer space, war and disaster, home and family, health, income, science, transportation, and leisure. Each contributor projects a chronology of the future through 2030, providing one- to four-sentence forecasts of various aspects of each time period. Predictions concern the mundane as well as the momentous: one reads of the extinction of rutabagas due to lack of interest, then turns to the next predictor's anticipation of *in utero* genetic modification. These brief forecasts are supplemented by some short reports: nascent technologies like steam cars and biofeedback; the future pharmacy, complete with endorphins, aphrodisiacs, and confidence pills; a picture of nuclear attack reprinted from *The Progressive* ("The Day the Bomb Went Off—You Are There"). These sections are excellent, but they are too few. Don't expect much hard information from the book.

Energy, environment, and cancer are big issues, of course; in reflecting contemporary concerns and technology, this book says at least as much about today as about tomorrow. Nothing is as certain as uncertainty, as the book's experts acknowledge. They can only guess. Still, they know of what they write, and it seems likely that the future is contained somewhere within their nearly 300 pages.



Much of this is intriguing. Some of it is also boring, depending on the reader's particular interests (do you care about future immigration laws?). The predictors include optimists, pessimists, and people who maintain we'll continue to muddle along as we do today, and their predictions often contradict one another. These brief forecasts give a reader little factual or theoretical basis on which to evaluate their validity. The ideas do stimulate thought, however, and readers interested in the future will flesh out or discard the forecasts using their own knowledge and imagination.

The future games become a bit silly in Part II, "The Seers." First, we learn what some psychics think the fates have planned for Iran and Jacqueline Onassis. Then, the authors summarize the scenarios of writers like George Orwell, Ray Bradbury, Gene Roddenberry, and Patrick McGoohan. The suggestions from science fiction seem redundant and trite after the more serious forecasts, and most of the artists featured were far more concerned with allegory than with the feasibility of their mythical or futuristic societies. This part closes with some straight predictions from popular science fiction authors who should have had their say in Part I.

Part III, "Looking Backward—And Forward," discusses historic and contemporary predictions, predictors, psychics, and prophets, and their various methods. There is magic as well as science, beginning with the Great Pyramid of Cheops and proceeding to various ways scientists expect the world to end—nuclear holocaust to the collapse of the universe. Along the way are the fume-crazed goat, shepherds, and priestesses of Delphi; the rise and fall of some doomsaying religious cults; profiles of some well-known psychics; and future headlines as projected by major journalists. There's something in this section to interest any generalist.

Why is this book? To learn what we may be, according to the authors, forewarning us so that we may choose the best of possible futures. To stimulate dialog about important issues and record contemporary expectations for posterity, according to one

ILLUSTRATION BY LINDA M. BENSON

of their contributors. But the only reason for reading this book is pure and simple curiosity, and it fails unless it raises more questions than it answers. From this grocery list of possibilities, readers are left to concoct their own visions of the future. It can be fun. William Morrow and Co., Inc., New York (1980, 513 pp., $12.95).

—Margaret Graham

THE HUMAN SIDE OF INFORMATION PROCESSING edited by Niels Born-Andersen

In the social and cultural climate of the '80s, information processing is becoming far too important to be left to its specialists, high priests, and handmaidens. The impact of the fast evolving microelectronics technology has broken out of the constrained spaces of the early years. Today, only some 30 years after the first marginally usable commercial computer, the equipment and the systems that surround it are having a direct and immediate impact on the home, the work place, and the lives of millions.

Scandinavia has long been the birthplace of many of the more unique approaches for dealing with relationships between the workers, the work place, and the demands imposed by the society. Most of the ideas regarding industrial democracy and participative management first appear in the literature of Denmark, Sweden, and Norway. Consequently, it is no surprise to find the first major discussions of these matters as they relate to information processing being held at the 1978 Copenhagen Conference on Computer Impact sponsored by the Danish IAG. The Danish IAG, nominally a part of the IFIP hierarchy, has a long history of running conferences just a little ahead of public awareness that there is a problem brewing. This volume of proceedings includes 13 formal papers, excerpts from some of the more pertinent discussion of the papers, and an introductory essay by the editor.

While the papers are serious and the subject important, the tone of the volume has been lightened by Bjorn-Andersen's introducing each paper with a limerick. Picking a favorite is difficult, but when the next speaker will be the top man at the Danish Post and Telegraph Office, it's easy to lean toward:

> A Director-General from Copenhagen
> will make sure there is no mistake-n
> about technological prospectives
> and investment initiatives
> even though our Parliament will be
> shaken.

The papers come at the problems from several levels and deal both with administrative systems and decision-support systems. Under investigation is the role of information systems, the impact of systems on the individuals concerned, and the design of information systems, now and in the future.

Increasingly, the work force has grown sharply critical of the managerial habit of arbitrarily imposing systems. Indeed, such authoritarian practices are already illegal under the 1978 General Agreement between the Norwegian Federation of Trade Unions and the Norwegian Employers' Confederation. There are no "ifs" or "buts" in this document. Employees will be involved with the proposals, the designs, and the implementation of information systems. A reading of this brief document included with the Docherty paper should be required of all who think that these matters are purely theoretical.

Clearly, in the view of several papers, sharing in the design process is only a cosmetic move. The more critical questions deal with *why* a system is needed at all and *how* it will impact on the daily lives of employees *and* all others, shareholders and customers included, who must deal with it.

Of special note is Ackoff's closing paper dealing with information systems as only a part of the total management system. The point is that an information system cannot be isolated and disconnected from the surrounding larger systems.

North American information processing practice has been one of generally ignoring the social context surrounding the computer/communications complex. There is a romance with technology. In contrast, the Scandinavian view recognizes that the impact of the use of technology is more important than the awesome capabilities available. This slim volume poses enough problems to keep corporate information system planners busy for the next decade. In spite of the slightly uneven quality of the papers, the book is highly recommended to those wondering about the future role of information processing. North-Holland Publishing Co., Amsterdam (1980, 230 pp., $31.75). American distributors: Elsevier North Holland Publishing Co., New York.

—Philip H. Dorn

"I'm a man of few words, Willowsby, and I want to speak to you."

©DATAMATION

CARTOON BY STEVE ATTOE

REPORTS AND REFERENCES

NETWORK AND COMMUNICATIONS STUDY

International Resource Development, Inc., Norwalk, Conn., published a 124-page research report on the future of local networks and their current status. A user survey conducted by IRD in conjunction with this report supports the findings in seven sections: the executive summary, the introduction, a technical overview, the structure of the industry, highlights of active companies, market forecasts, and users. Each section takes an in-depth look at its topic—the industry structure section explores configuration philosophies (AT&T, IBM, PABX, coaxial cable systems, broadband and baseband), current standardization efforts in local networks (DEC, Intel, Xerox, IEEE, IFIPS, NBS), and fiber optics (ANSI, Motorola

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SOURCE DATA

and Amp). Local Networks and Short-Range Communications can be purchased for $985 by writing to IRD, 30 High St., Norwalk, CT 06851, or by calling them at (203) 866-6914, Ask for report No. 158.

PURDUE RESUME BOOK

The 1980/1981 volume of the Purdue chapter of Eta Kappa Nu, the Electrical Engineering honorary society, contains over 200 single page resumes of electrical engineering students at Purdue. This is the fourth edition of the book, open to all Purdue EE students. It contains resumes of both graduate and undergraduate students looking for permanent and summer work. Proceeds from book sales are used to support the chapter's service projects. The price is $20, prepaid by mail to Resume Book, Eta Kappa Nu, Box 109, Electrical Engineering Building, Purdue Univ., W. Lafayette, IN 47907, or call (317) 493-1581.

SOFTWARE TOOLS DIRECTORY

This directory contains detailed information on over 400 software tools—it describes the tools, the systems in which they operate, the languages, and the costs. A unique aspect of the directory: it lists over a hundred public domain tool packages available free or at a nominal fee. Some of the tools listed are definition, development, maintenance, management, and tool systems. There is also a section on tool taxonomies, where the classification system used by the directory is explained at length. Reifer Consultants, Inc., offers the directory for $195. Their mailing address is 2733 Pacific Coast Highway, Suite 203, Torrance, CA 90505, or call (213) 530-2274.

SEMINAR

DECISION SUPPORT SYSTEMS

The New York University Symposium on Decision Support Systems, May 21-22, will feature experts from both industry and academia who specialize in the design and implementation of decision support systems. Symposium topics include an overview of the field, behavioral considerations, outstanding examples of systems, human-aided optimization, and applications of artificial intelligence. Contact CAIS Dept., New York Univ., Graduate School of Business Administration, 90 Trinity Pl., New York, NY 10006, (212) 285-6120.

VENDOR LITERATURE

KEYBOARDS

Four-color brochures are available on a full line of inductric keyboards. The brochures describe concept, adjustable touch control, reliability, options, noise immunity, keytops, cost, and specifications for each of the products. MECHANICAL ENTERPRISES, INC., Sterling, Va.

FOR DATA CIRCLE 350 ON READER CARD

MORE KEYBOARDS

This vendor offers a 24-page catalog of standard keyboards, including data on the company's models 753, 756, and 771 keyboards, plus a variety of new models ranging from 10 to 98 keys. There are versions listed as suitable for education or hobby, as well as ruggedized versions for industrial and military applications. GEORGE RISK INDUSTRIES, INC., Kimball, Nebr.

FOR DATA CIRCLE 351 ON READER CARD

ANSWERS TO SOFTWARE QUESTIONS

For Datapoint system users, this six-page brochure answers three commonly asked questions about software: "Why isn't there a faster way to code and debug our programs?"; "Why can't I use my creativity?"; and "Why can't I print what I see on my crt screen?" The brochure is distributed by the software firm THE INNOVATORS, INC., Greensboro, N.C.

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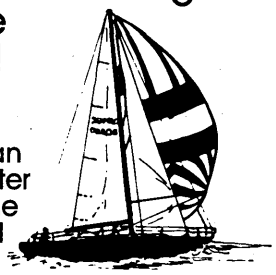

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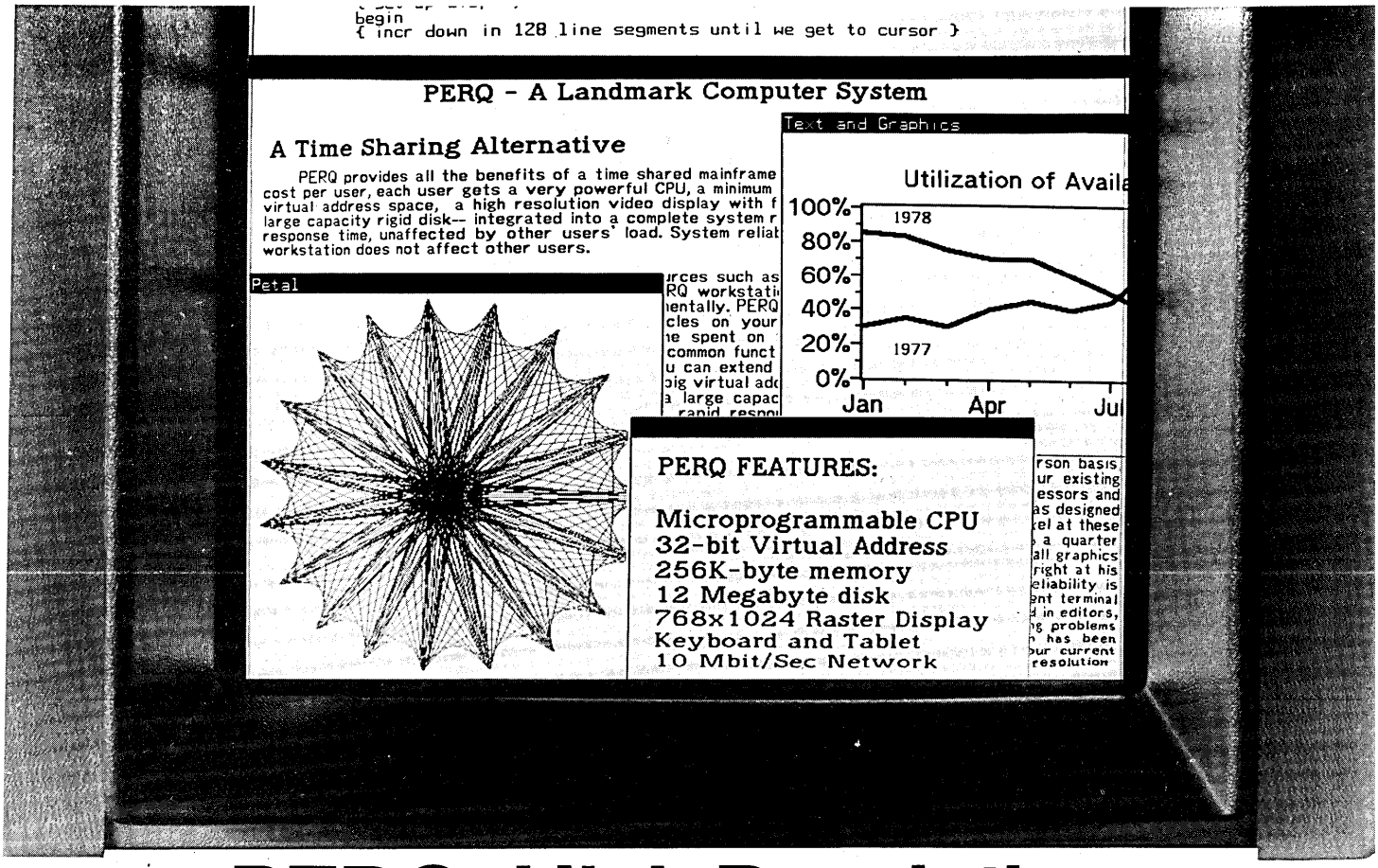

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This product from two co-vendors is the end result of a worldwide survey conducted on data dictionary usage and its development as a tool for information resource management. The findings appear in a five-page booklet and range from the "typical installation with an interest in data dictionaries" to the "level of acceptance the various methodologies have achieved." PERFORMANCE DEVELOPMENT CORP. and MSP, INC., Lexington, Mass.

FOR DATA CIRCLE 357 ON READER CARD

DATACOM CATALOG I

Revised general catalog is 28 pages long and includes pictures and descriptions of the entire data communications equipment line produced by RIXON, INC., Silver Spring, Md.

FOR DATA CIRCLE 353 ON READER CARD

DATACOM CATALOG II

A short form catalog and price list which describes the full line of data communications products, and addresses the fundamental problem areas of line costs, transmission errors, and computer port utilization. MICOM SYSTEMS, INC., Chatsworth, Calif.

FOR DATA CIRCLE 354 ON READER CARD

DATACOM CATALOG III

The "1981 Black Box Catalog of Data Communication Devices" is 44 pages long and contains 107 products in 167 models. Pricing, features, and specifications are listed for each product of the EXPANDOR, INC., line. Pittsburgh, Pa.

FOR DATA CIRCLE 355 ON READER CARD

EVALUATE TELEPROCESSING MONITORS

Produced by a software and services company, this 68-page manual is "designed to establish a well-defined set of requirements for the selection of teleprocessing monitors." Subjects covered in the manual include the selection process, the charter, collecting users' names, evaluating list for ideal monitor, communications, and file/database management. SDA, New York, N.Y.

FOR DATA CIRCLE 356 ON READER CARD

FUJITSU IN TOUCH

This 12-page color booklet is not a catalog or price list, but an interesting set of five separate "stories," illustrated with excellent photography, color charts, and drawings. The subject matter is varied; "The Good News For Japanese Newspapers," for example, goes into the historical background of Japanese newspapers including the development of the NELSON system (New Editing and Layout System of Newspapers), in modern times. There is some product mention in the "Fiber-Optic Communications Systems" story, and a bit of company PR in the "Facilities" section, but the booklet is nicely done, light and interesting reading, and noncomputer related. FUJITSU LIMITED, Japan.

FOR DATA CIRCLE 358 ON READER CARD

HMS BROCHURE

The Honeywell Manufacturing System is summarized in this 94-page brochure. Using photos, flowcharts, and computer printout samples, the brochure illustrates the systems features, including product structure control, process structure control, inventory control, order release, and performance measurement. HONEYWELL, Waltham, Mass.

FOR DATA CIRCLE 359 ON READER CARD

TELECOM FACT SHEET

Over 70 telecommunications products are listed in this four-page fact sheet. Product categories are amplifiers, attenuators, bridges, equalizers and networks, power supplies, terminating sets, transformers, mounting arrangements, accessories, and custom assembly capabilities. ITI ELECTRONICS, INC., Clifton, N.J.

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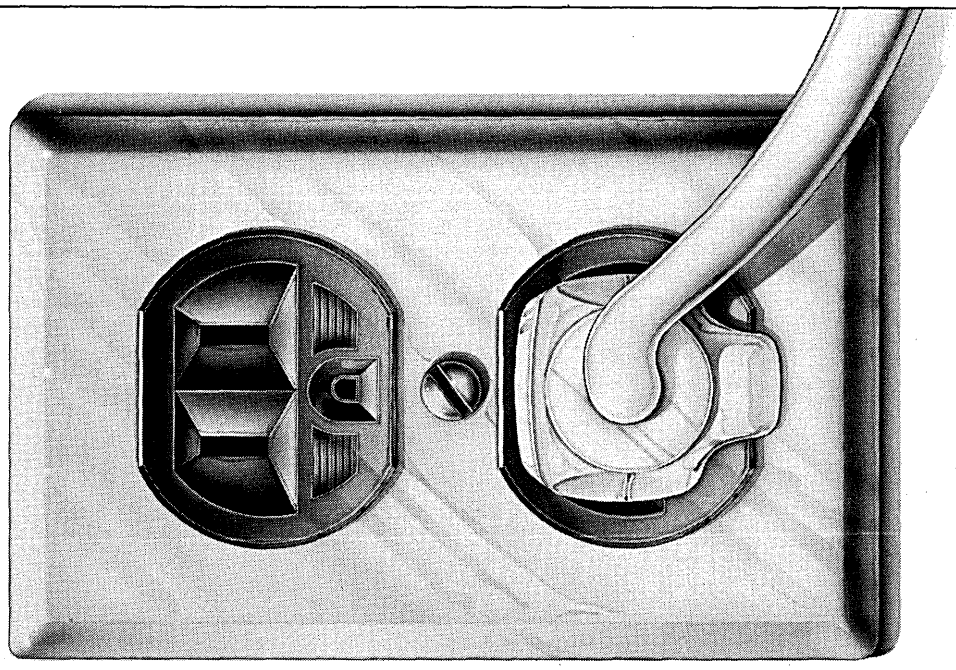

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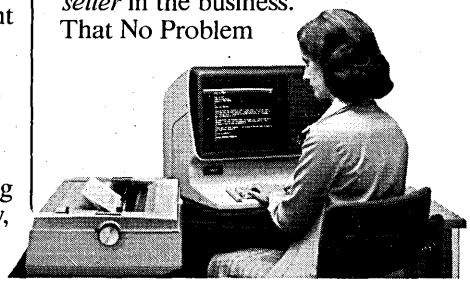

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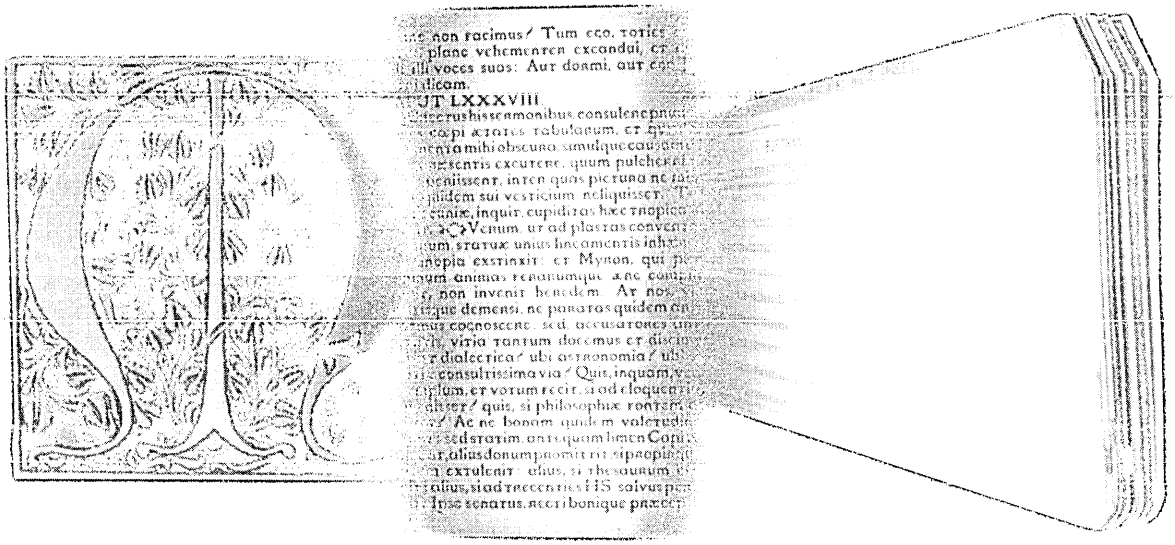

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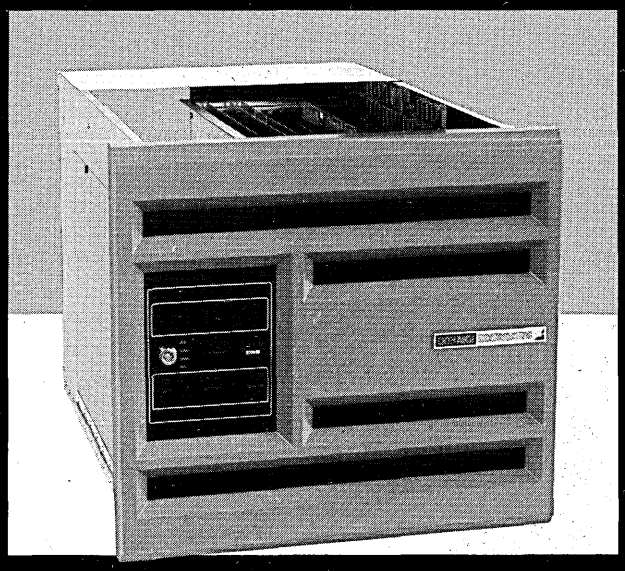

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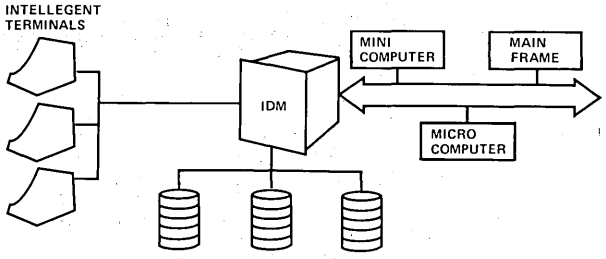

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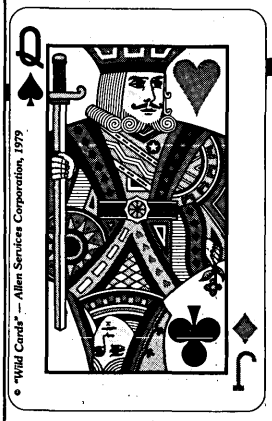

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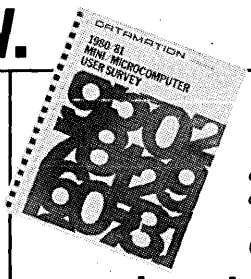

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DATAMATION® *magazine*

SCIENCE/SCOPE

An antenna built to extremely close tolerances is a key element of a military weather satellite that will use a microwave sensor to gather vital data about clouds, rain, wind speed, soil moisture, and sea ice. The dish, cast in a mold that was machined to an accuracy of 0.4 mils from a single 1500-pound block of steel, consists of 20 layers of high-performance graphite fabric and an epoxy resin. Coating it is a vacuum-deposited layer of aluminum 0.0002 inch thick. The antenna is designed to an accuracy of less than 1 mil and will operate over temperatures ranging from -120°F to 180°F. It will detect radiation in four frequency bands: 19, 22, 37, and 85 GHz. Hughes built the antenna for the Defense Meteorological Satellite Program under a U.S. Air Force contract.

Tactical cruise missiles can be guided to a target, despite electronic jamming, using signals from navigation satellites. Flight tests over nine months demonstrated extremely accurate midcourse guidance of a Navstar Global Positioning System (GPS) missile guidance system, which was mounted in a pod beneath an F-4 fighter. The system even flew over a simulated high-power jammer without breaking its tracking lock. Tests were conducted by Hughes for the U.S. Air Force.

An optical chip the size of a stick of chewing gum can do the job of conventional electronics equipment the size of a two-drawer file cabinet in analyzing and identifying microwave frequencies. The chip is called an optical planar waveguide and is part of a larger device known as an integrated optical spectrum analyzer (IOSA). The IOSA uses a beam from a tiny semiconductor laser to separate a broadband microwave signal into as many as 100 individual frequencies. A key feature of the planar waveguide is two concave lenses ground into the chip's surface. The first lens collimates the laser light so it travels correctly through the microwave acoustic signal, which bends the beam. The second lens focuses the bent beam into one or more of 100 charge-coupled detectors. Hughes developed the IOSA for the U.S. Air Force for microwave signal processing.

Hughes is seeking engineers to develop advanced systems and components for such weather and communications satellites as GOES E and F, Anik C, Anik D, GMS II, SBS, Westar IV/V, Palapa B, and Telstar III, plus the Galileo Jupiter Probe. Immediate openings exist in advanced communications, scientific and engineering programming, systems test and evaluation, microwave and RF design, power system design, spacecraft alignment, reliability, and quality assurance. Please send your resume to Tom W. Royston, Dept. SE, Hughes Space & Communications Group, P.O. Box 92919, Los Angeles, CA 90009. Equal opportunity employer.

A new atomic clock being developed for navigation satellites will perform better than previous devices. The clock, which incorporates a hydrogen maser, will use a new microwave cavity design to provide a compact and lightweight package, and new electronic techniques to maintain long-term stability. The clock can provide precise navigation information to military forces because it is stable to one second in 3 million years. The differences in the time when signals from four satellites arrive at one location can be used to calculate that position to within a few yards. Hughes is developing the clock under a U.S. Navy contract.

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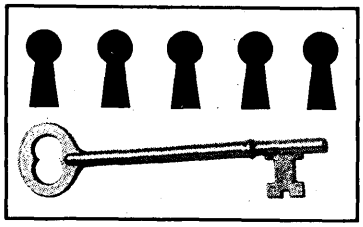

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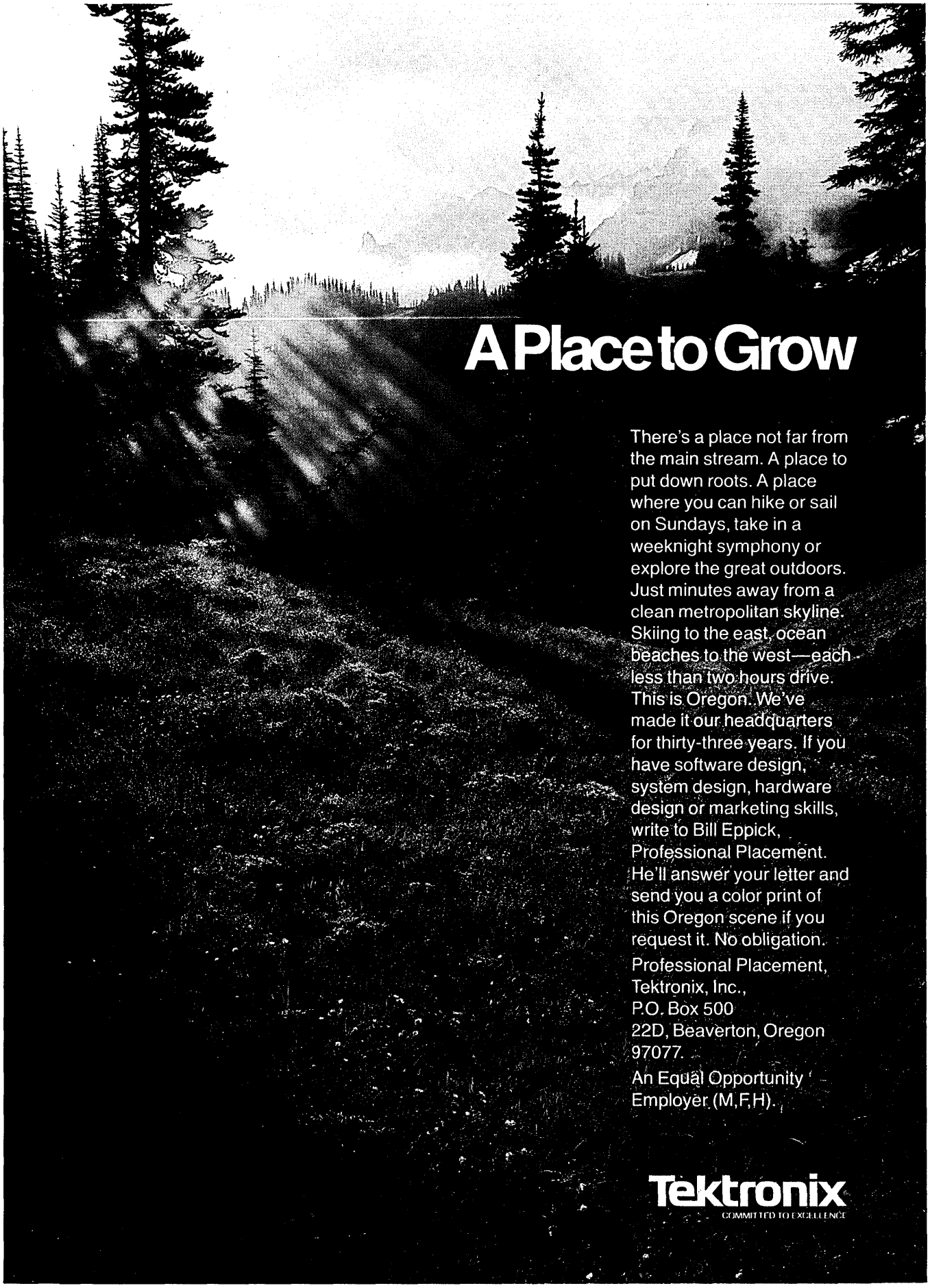

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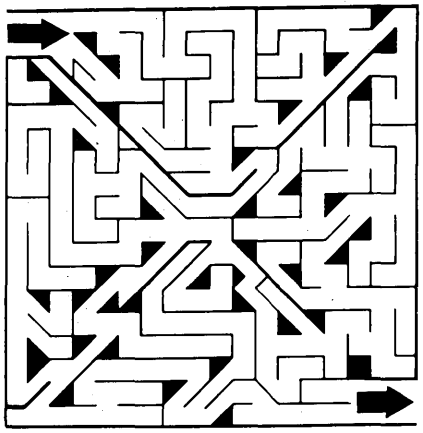

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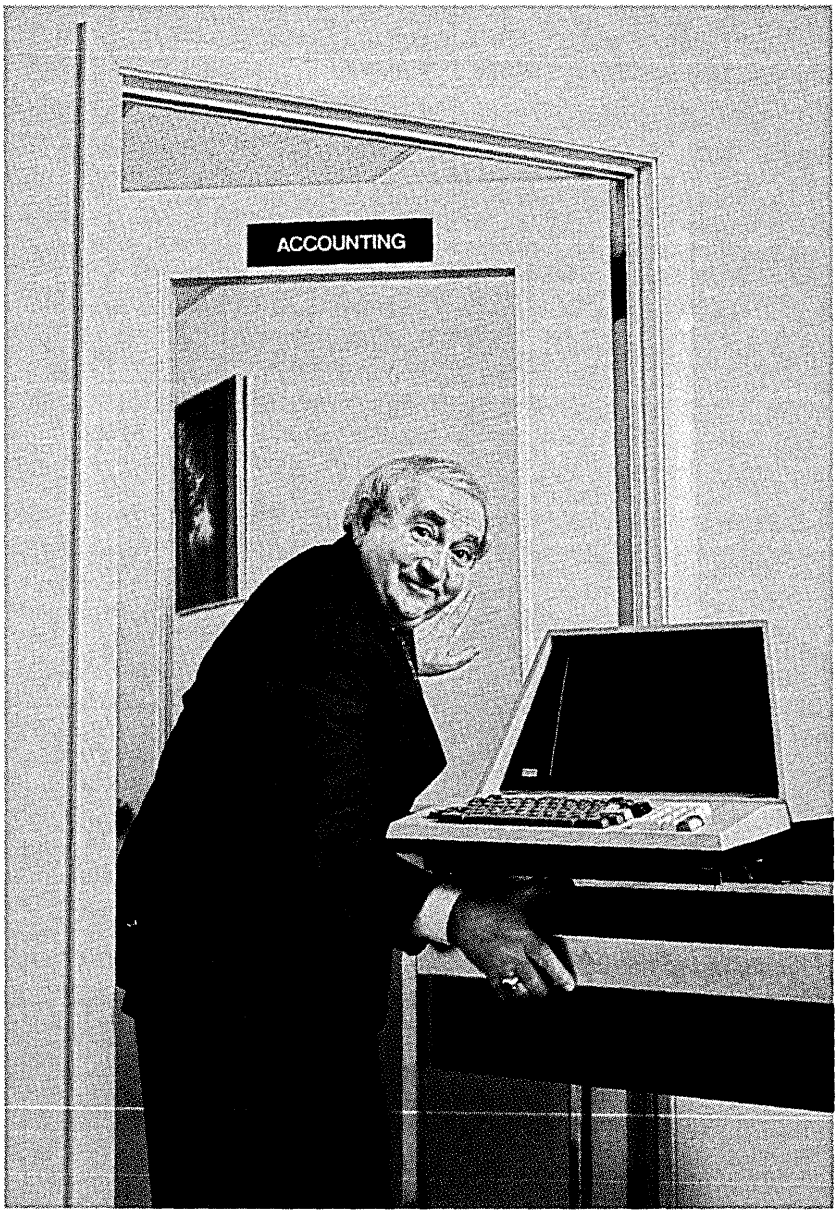

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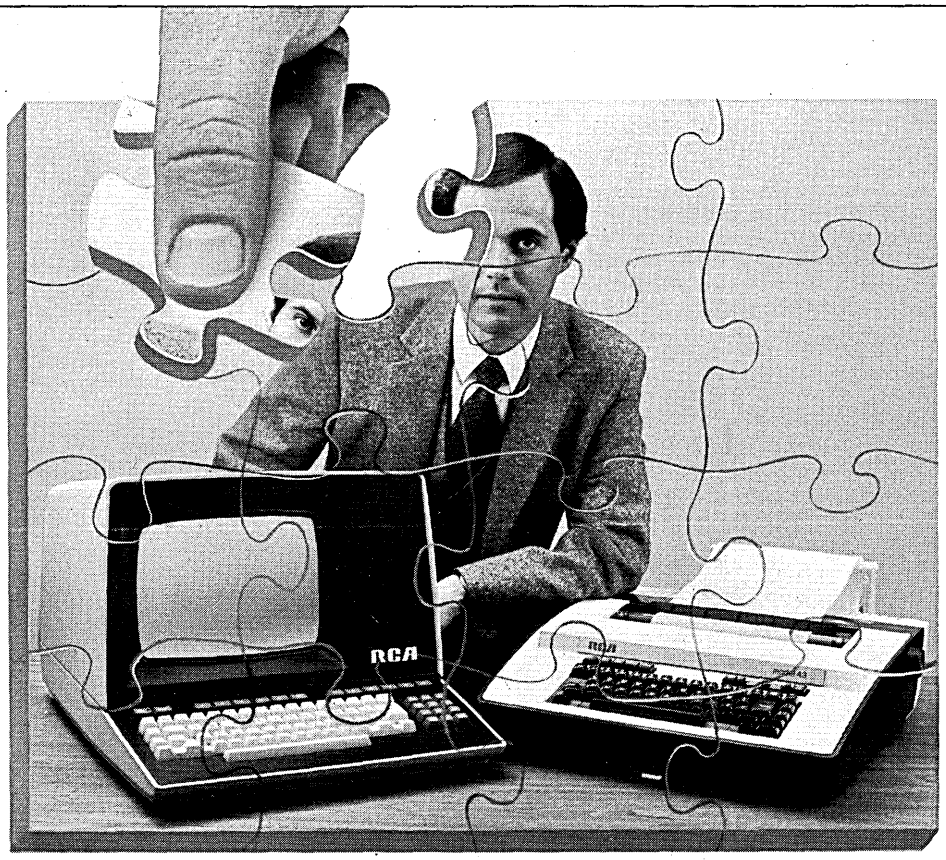

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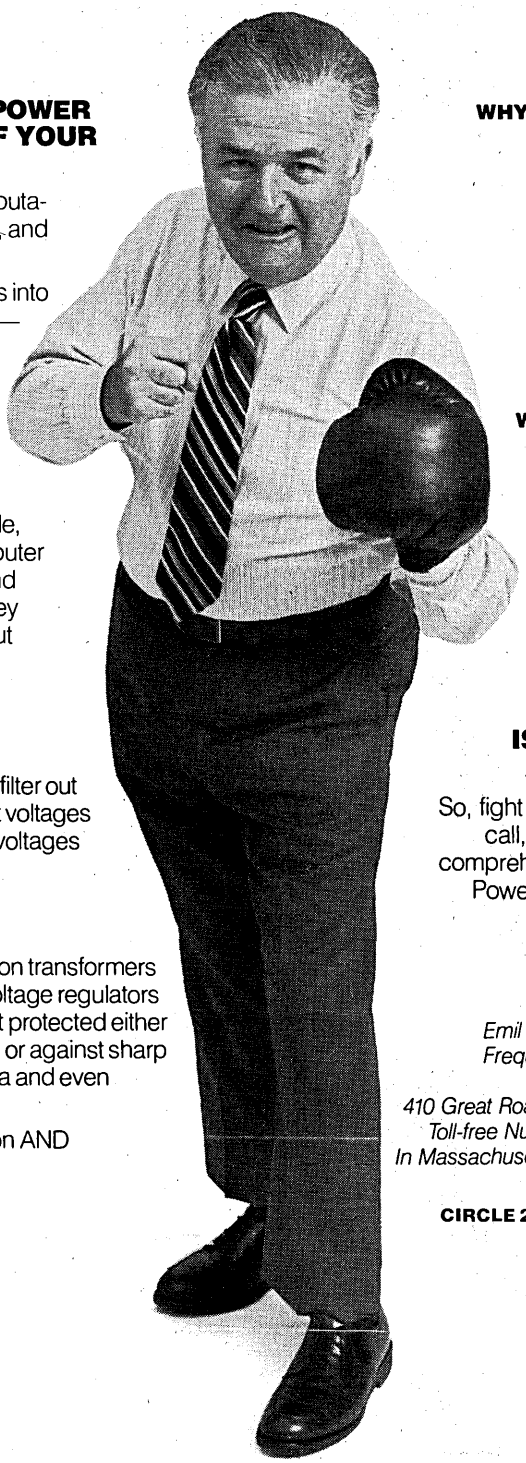
PUT AN END TO POWER-RELATED COMPUTER PROBLEMS"

Says Emil Rechsteiner, President of Frequency Technology, Inc.



UNSTABLE AND "NOISY" POWER CAN MAKE A SHAMBLE OF YOUR COMPUTER OPERATIONS!

Voltage Spikes can scramble computations, wipe out data, alter programs, and destroy circuits.

Brown-outs can turn computer runs into disasters, paralyze your equipment—perhaps even your business.

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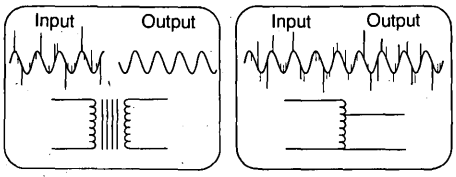
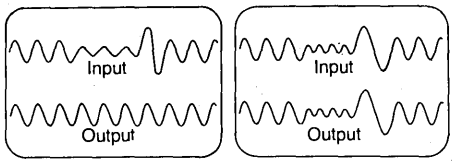


Line-to-load isolation shields computer from sharp, destructive voltage spikes.

Without isolation computer is exposed to spikes even when power is supplied by voltage regulator.

WHY REGULATE?



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Without regulation, voltages sag and surge even when power is supplied by isolation transformer.

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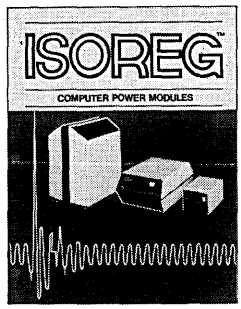

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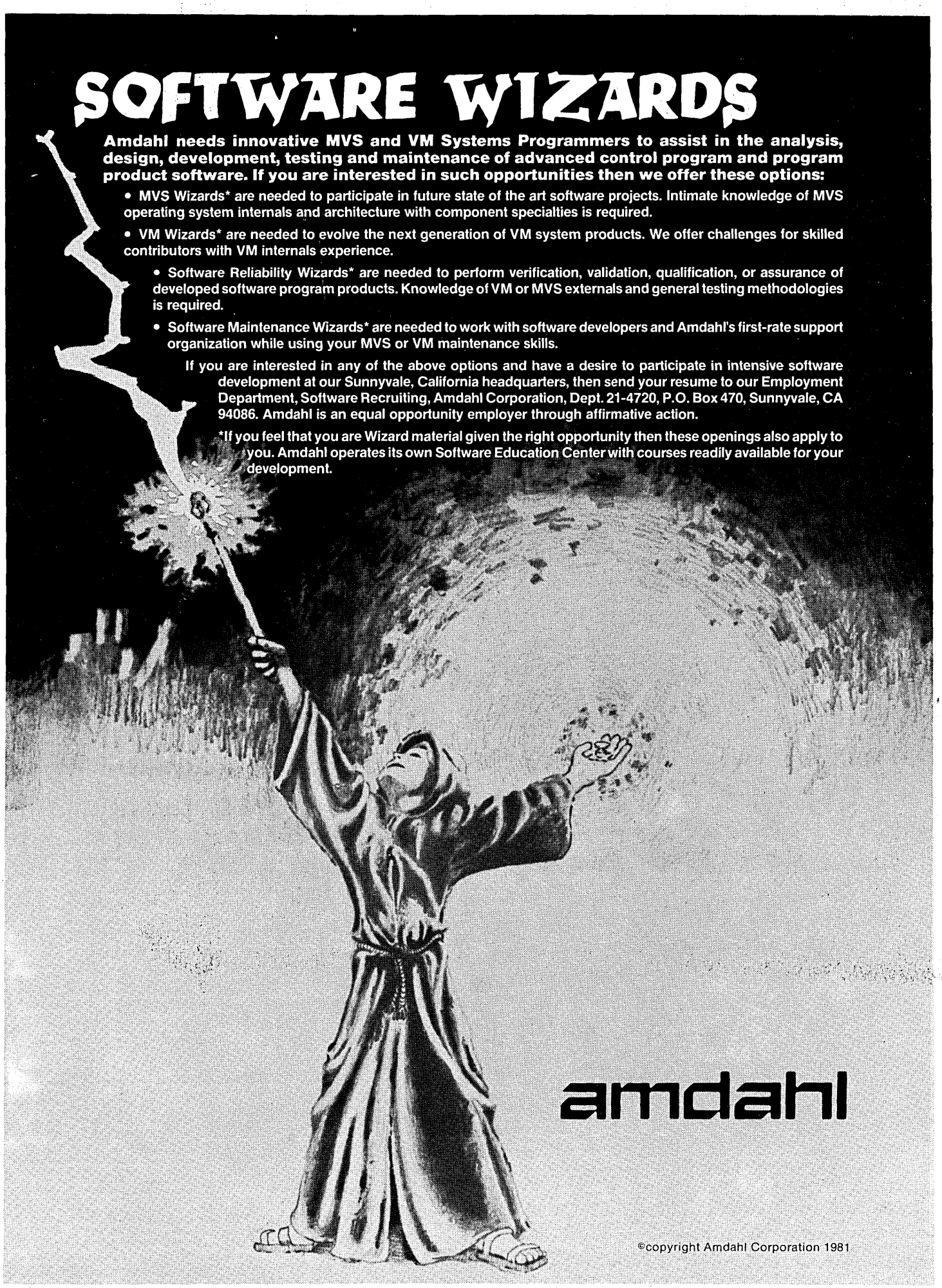

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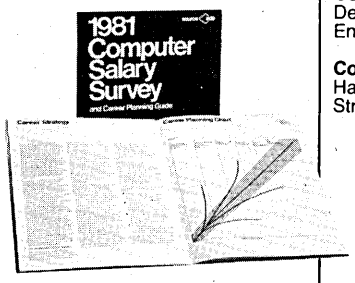

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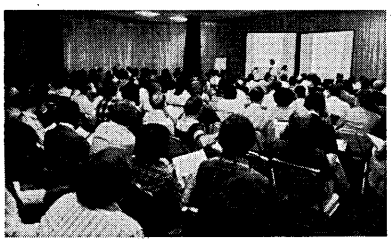

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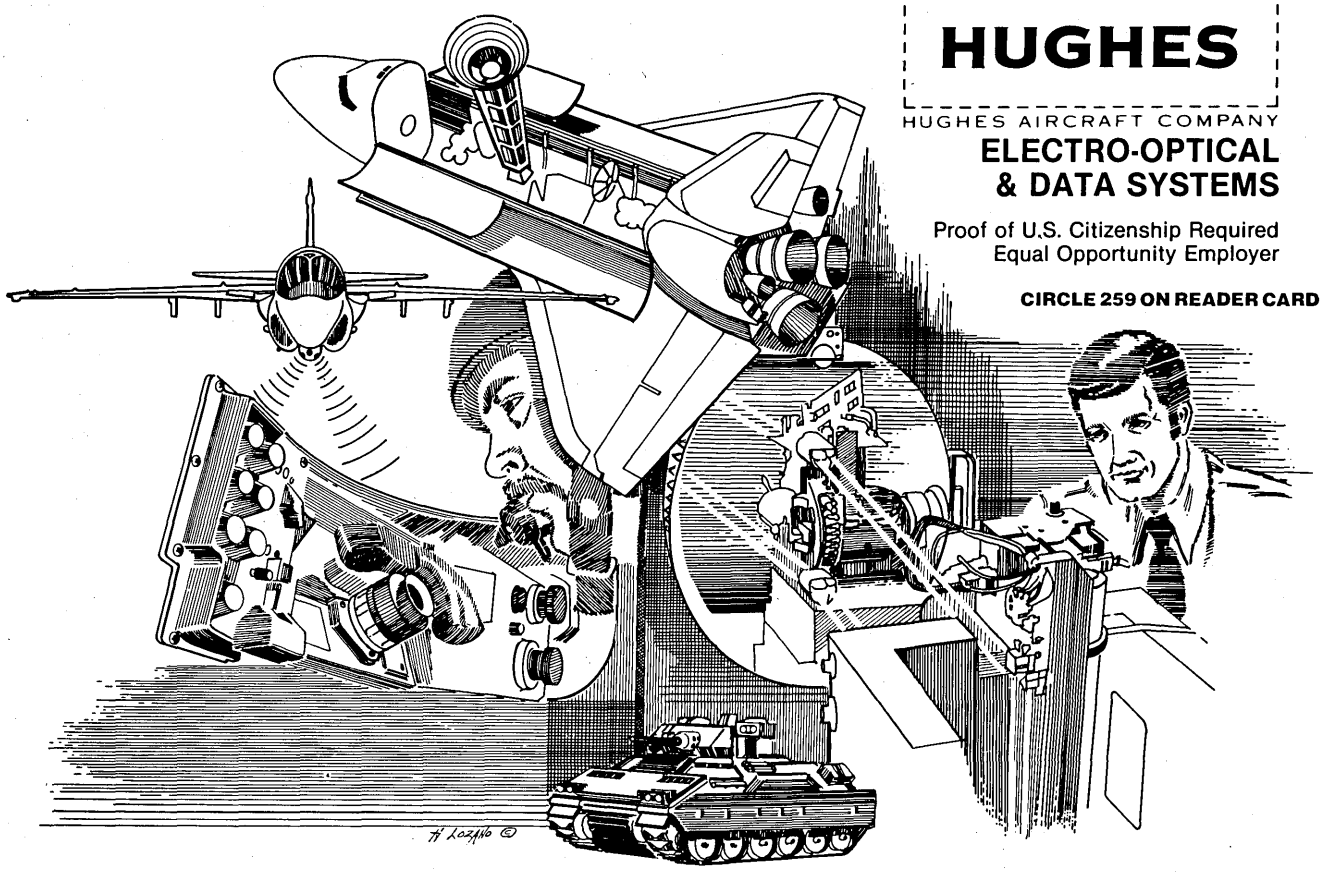

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FEATURE COMPARISON CHART

FEATURE	Visual 400	Lear Seigler ADM-42	Perkin Elmer 1251	ADDS Regent 60	Hazeltine Executive 80, Model 30	Beehive DM30
ANSI X3.64 Specified	STD	**NO**	**NO**	**NO**	STD	**NO**
Set-up Modes Eliminate External Switches	STD	**NO**	STD	**NO**	**NO**	**NO**
Typomatic Solid State Keyboard	STD	**NO**	**NO**	**NO**	STD	**NO**
Detached Keyboard	STD	STD	**OPT**	**NO**	STD	STD
CRT Saver	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Block or Underline Cursor	STD	**NO**	STD	STD	STD	**NO**
80 and 132 Columns	STD	**NO**	**NO**	**NO**	**OPT**	**NO**
Double Size Characters	STD	**NO**	**NO**	**NO**	**OPT**	**NO**
Smooth Scrolling	STD	**NO**	**NO**	**NO**	**OPT**	**NO**
Horizontal Split Screen	STD	**NO**	**NO**	**NO**	STD	**NO**
Video Attributes Require No Display Space	STD	**NO**	**NO**	**NO**	STD	STD
8 Area Qualifications	STD	**NO**	**NO**	**NO**	**NO**	**NO**
8 Resident Nat'l Char. Sets Including Line Drawing	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Programmable Non-volatile Function Keys	STD	**OPT**	STD	**NO**	**NO**	**NO**
Display of ALL Control Codes	STD	STD	STD	STD	**NO**	STD
Insert Delete Line with Push Up or Down	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Insert Delete Character with Push Right or Left	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Select Editing Extent to Field, Area, Line, Page	STD	**NO**	**NO**	**NO**	**NO**	**NO**
20 mA Current Loop	STD	STD	**OPT**	**OPT**	**OPT**	STD
Programmable Message Framing (non-volatile)	STD	**NO**	STD	**NO**	**NO**	**NO**
Programmable Answerback	STD	**NO**	STD	**NO**	**NO**	**NO**
Baud Rates to 19200 BPS	STD	**NO**	**NO**	**NO**	STD	STD
Independent Xmit/Receive Rates	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Printer Port Independent of Communication Interface	**OPT**	**OPT**	STD	STD	**OPT**	STD
Paging	**OPT**	STD	**NO**	**NO**	STD	STD

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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

TOWARD TOTAL DEREGULATION

The single most important consideration regarding the structure of tomorrow's telecommunications industry is *not* how to make that structure fair to AT&T and its competitors. Instead, it is how to make that structure serve the national interest.

Strange, isn't it, how such a statement is held to be a platitude by an American audience? In other countries that is not the case. In many nations, especially in those where government and industry play cooperative rather than adversative roles, the national interest is often the primary industrial guideline. I think it should be our primary guideline as well although our democratic system will cause the results of government and industry cooperation to be quite different.

If this industry holds a fraction of the promise we believe it can yield, then we should turn our attention to national problems and see how these might be affected or resolved by our present actions. I believe we shall find ourselves considering the questions of industry regulation (especially of AT&T regulation) from a broader perspective.

At least three national issues deserve our attention. First, for many years we have watched our prominence as a leader in national productivity slide. As a result, we are now actually beginning to feel a decline in our standard of living. If we continue to stand and watch, we will see that decline continue to accelerate.

Second, related to our decline in national productivity is another decline, that of our international competitive position. In addition to falling behind in our rate of construction of goods, we are also falling behind in our rate of innovation—our cherished technological lead in which we have felt most safe, and perhaps most proud, as an international competitor.

Third, as the standard of living falls in general, aggravated by a weakened competitive posture, the changes will most hurt those members of our population who can least afford them. This will open up a whole set of new social questions and almost certainly bring about increased social unrest.

These declines cannot be allowed to continue, and we in the telecommunications industry are in a privileged position to affect them. We are among those who must recognize the national need to stimulate innovation in order to make America more competitive. We must provide new kinds of telecommunications services which will aid in making the country more productive, and lead the way to a healthier economy which will provide more jobs.

Is this what the question of regulation is all about? It is if we really believe what we have been telling our customers: that communications can provide the key to efficiency, economy, and streamlining of business operations.

And yet, with the current uncertainty in the telecommunications industry, we have no hope of nudging productivity rates or stimulating innovation in other industries. The state of the telecommunications market is one of confusion, of players without uniforms on an unmarked field.

While the FCC's decision as a result of the Computer/Communications Inquiry II is remarkably perceptive, it is neither easily interpreted nor easily implemented. And that leads to the confusion.

As long as our marketplace lacks clearly defined ground rules, our potential customers certainly won't be willing to make great investments in telecommunications. Even within the industry, we cannot firmly go ahead with our own investments and product developments without better rules than we now have.

I suggest that we are wasting our time. Major advances in technology will always make new services possible. These will always require new regulations, and litigation, and so on. Just as the first Computer/Communications Inquiry failed to foresee the blending of data processing and data communications which has made its findings obsolete, so too will Inquiry II become outdated.

BREAKING THE CYCLE

We can choose to break out of this cycle, and we should. Part of that choice, in fact, has already been made for us.

A decade ago the exercise we are now engaged in could have been more fruitful. We had the opportunity then to divide the telecommunications marketplace into regulated monopoly and unregulated free market portions. We could have reserved a core "transport" service for monopoly, and opened as much of the rest of our business to competition as we chose.

With the 1969 FCC decision to allow MCI and all other comers to enter that core region of transport service, we chose instead to divide the market into regulated competition and unregulated competition, and now we can never go back to the monopoly/free market balance.

The problem with that early decision, as we're finding out, is that "regulated" and "competition" are incompatible terms. Regulated competition cannot work well in a dynamic market which is dominated by rapidly changing technology. It always leads to this cycle of reworking obsolete decisions, and it doesn't provide the benefits of a free market.

What's ahead for us now? Litigation. Appeals. More regulatory decisions leading to more litigation and more appeals. We can expect to spend five to seven years unscrambling our present situation.

We cannot afford to lose that time. Nor can we afford to spend more time debating what should happen at this stage of our industry's evolution. We are already committed to an increasing degree of deregulation. I believe that our best course of action, and possibly our only practical course, is to define our national telecom-

munications goal as one of *total deregulation* within a reasonably short time, and to push for the federal legislation and regulatory activity necessary to bring that about.

Is that frightening? It needn't be. Not if we believe in the free marketplace's effect on technical innovation, as we say we do. Granted, this wouldn't work and shouldn't be attempted in many other countries. In Canada, for example, one of the national priorities is to develop the now sparsely settled areas of the country. It may be totally impractical to expect that total deregulation could support that national priority in a relatively short period. In the U.S., however, where the goal of universal telephone service has largely been achieved, we can have confidence that total deregulation will be a successful choice, and that viable competitors will emerge to take on the areas of the telecommunications business now served by monopolies.

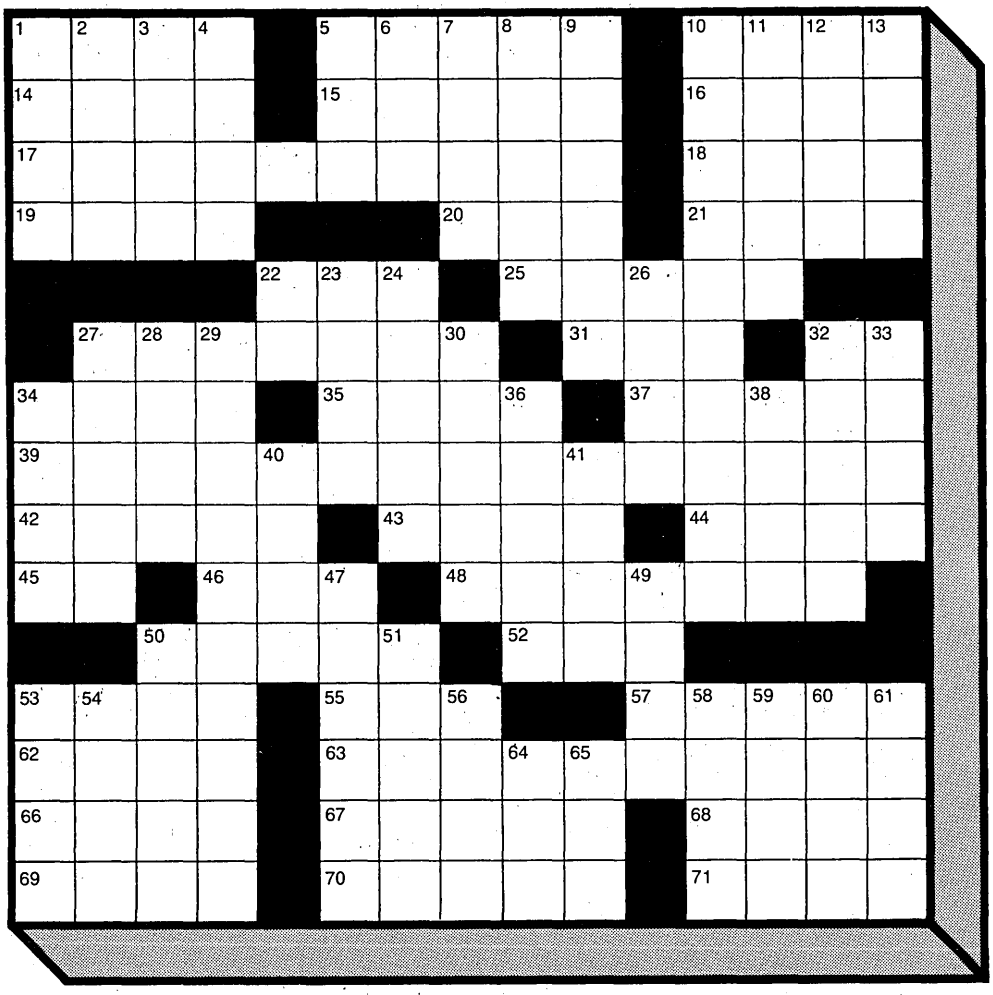
As an example of what free markets can do, consider what has happened in the data processing industry. Not long ago, the level of competition in the mainframe business began to drop off as IBM's competitors abandoned the field or were forced into smaller market niches. With lessened competition, technology still continued to reduce the cost of computing, but at what might be described as a leisurely pace.

Then, the level of competition changed. In the mid-1970s, as PCM manufacturers began to deliver significant numbers of IBM-compatible mainframes, the cost of computing very quickly became much less.

Further, the market for IBM-compatible computers was increased beyond existing projections, not simply reapportioned. Although it is always difficult to prove cause and effect relationships, by the end of 1980 we estimate that there were 2,350 IBM-

DATAMATION CROSSWORD

RANDOM WALK
by Brian Burke



Across

1. Dep.
5. 1978 Nobel Laureate
10. Chirp
14. Fla. GSD Mfg. loc.
15. Omit, in pronunciation
16. Rage
17. Tokyo tunneler
18. Recovered from
19. Volume
20. In ____: legal term for against the property
21. Fellow
22. They, in Bordeaux
25. Loved ones
27. Striking
31. Prefix with gram or meter
32. Pronoun
34. Parisian potations
35. West et al.
37. Funt request
39. Higher animous batch
42. Child, e.g.
43. Genu
44. Summers, to Sartre
45. To wit: abbr.
46. Hoover is one
48. Emulated Attila
50. Word with wind or system
52. Time
53. Mil ____
55. Modern: prefix
57. Pithy
62. Fuss
63. Mork's interval
66. Rumanian city
67. Duck
68. Choke
69. Nota ____
70. Ms. Richards
71. River flowing to North Sea

DOWN

1. Facilitate
2. Mediocre
3. Three-card monte is one
4. Word with fire or double
5. But, to Brutus
6. Three-time champ
7. Haute couture designer
8. Part of V.A.D.
9. Abounded
10. Code turkey
11. Overhang
12. Square
13. ____ chart
22. Information Processing (abbr.)
23. South American capital
24. Dieter's bane
26. Suffix with Holland
27. Wash
28. Formicary residents
29. Bal averts eyes
30. "I can't ____ ____ . . ."
32. Ancient: poetic
33. Charges
34. Eight, to Ovid
36. Doesn't hold water
38. Whit
40. Kind of estate
41. Curve
47. Way
49. Grade
50. ____ chair
51. Rob
53. Attempt
54. Study carefully
56. Biblical figure with a sin named after him
58. ____ homo
59. Rob: slang
60. Eastern intellectual, to Agnew
61. Advantage
64. Poem
65. Holy ____

Solution on page 288

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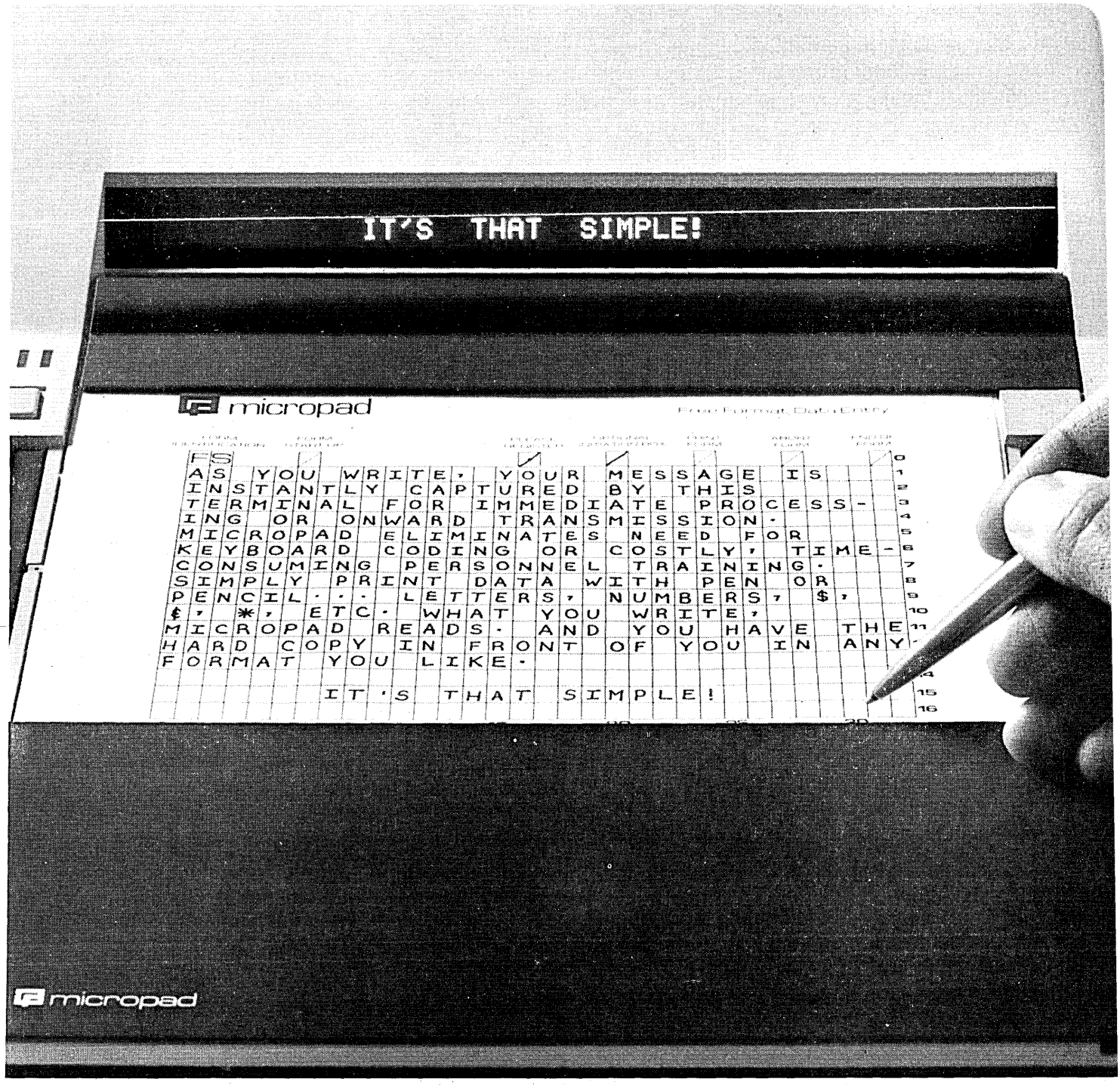

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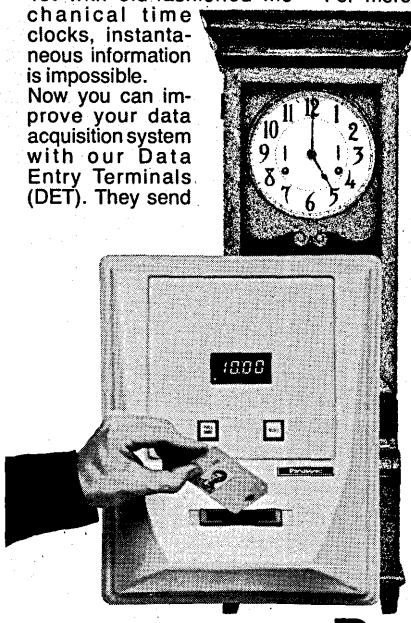

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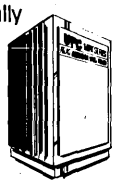

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READERS' FORUM

compatible computers of 370/168 power or greater installed. At the end of 1971, there had been only 90. Shipments increased from approximately $400 million in 1975 to approximately $2.5 billion in 1980, while the installed base increased in value from approximately $1.5 billion to $4.8 billion in the same period. That expansion is beyond what the most optimistic industry projections would have forecast.

This is contrary to what happened in the MCI case, where truly free market forces have not been allowed to function. Here the market was simply fractionated without major expansion.

Nor need we look to other fields for good examples of healthy competition acting to expand markets and reduce costs. The stimulation of the telecommunications industry after the Carterfone Decision took effect in 1969 is a perfect case in point. It is no accident that so many communications firms were founded that year.

WHY FEAR A FREE MARKET?

We have seen in these and other cases what a free market can accomplish in terms of productivity and international competitive position. Why should we fear it? Further, the economic arguments which once demanded monopoly and its attendant regulation in America—and which still demand them in most other nations—are becoming invalid. This is true even for many of those rural communities that monopoly is supposed to serve and frequently doesn't.

This portion of the argument still requires an act of faith in technology on our part, since long distance toll revenues still support local service in small rural communities and probably will continue to do so until technologies like small scale satellite service are more fully developed.

I believe that we can not only commit to total deregulation of AT&T and the industry, but that we also can establish a schedule for it. Although deregulation will cause massive changes in government and industry, even that schedule will not be as difficult to establish as one might imagine, for there too our options are limited. If we take the step too soon, we bring about even greater disruption and confusion. If we take it too late, we risk whatever technological advantage this country still enjoys.

For the sake of argument, I say the timetable for deregulation ought to end by the year 1995, and that we now should be considering how to refine that estimate rather than how to keep regulated competition alive.

I propose that we choose a scheduled, controlled migration to complete deregulation of an industry which has grown strong enough to dispense with monopoly.

—Ray W. Sanders
Marina del Rey, California

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A customer called me some time ago with an interesting comment. "You know," he said, "whenever something goes wrong with our network, those of us at the remote sites are usually the first to discover it."

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"It's easy," he responded, "whenever things go sour, the work we expect to see doesn't turn up and when we call central control to find out what's happening, they always say everything's fine. Then, after a while, one of the multitudes that support the network will telephone us and tell us that the framis failed, or that the gizmo was down, or whatever. It gets pretty obvious after a while what's going on."

"You got a point there."

"So what are you going to do about it?" my customer-who-is-always-right asked.

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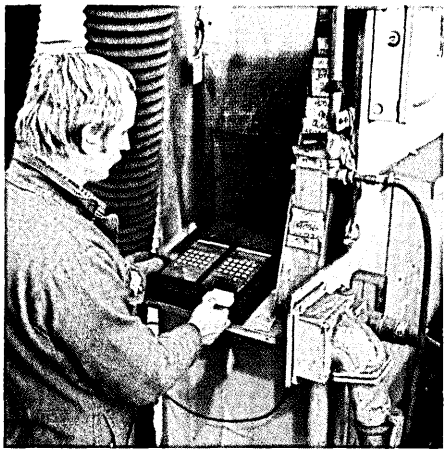

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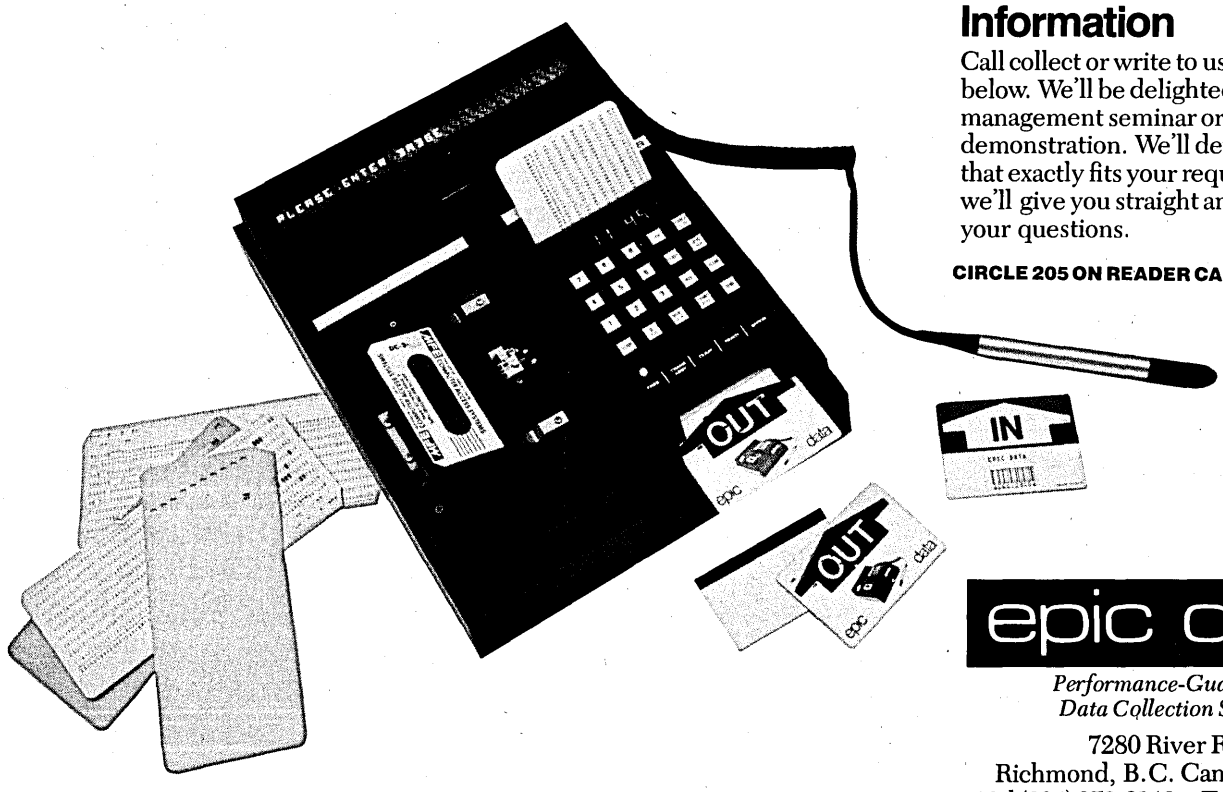

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	TI785 Portable KSR, 120 CPS	2,395	230	128	86
	TI787 Portable KSR, 120 CPS	2,845	273	152	102
	TI810 RO Printer	1,895	182	102	69
	TI820 KSR Printer	2,195	211	117	80
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	DT80/5 APL CRT	2,095	200	112	75
	DT80/5L APL 15" CRT	2,295	220	122	83
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	ADM31CRT Terminal	1,450	139	78	53
	ADM42 CRT Terminal	2,195	211	117	79
HAZELTINE	1420 CRT Terminal	945	91	51	34
	1500 CRT Terminal	1,095	105	58	40
	1552 CRT Terminal	1,295	125	70	48
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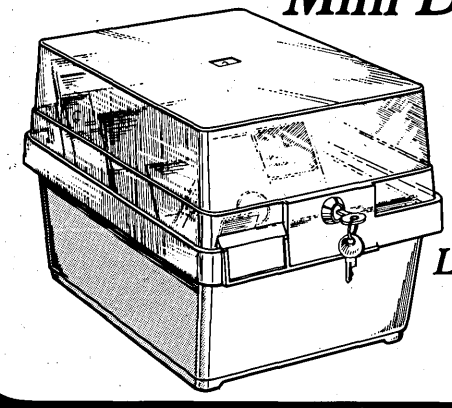

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READERS' FORUM

tion is to assume everything is fine until the telephones start ringing off the hook with complaints.

In the case of our network, this was almost surely the case. At last count, we were interconnecting four major computer centers (two IBM and two CDC) along with over 300 remote mini/micro computers, some of which are themselves interconnected in their own local nets. A significant amount of the information exchanged among all of these computers is done via special network interface processors which had been developed by an independent organization not associated in any way with the major computer centers or remote sites. While I could conceive that the major computer centers would routinely test their basic hardware, it was pretty clear that no routine diagnosis of overall network health was being performed.

Some interesting discussions with personnel from the major computer centers, remote sites, and telecommunications groups ensued. The dismal results of these discussions: each division felt that as long as their piece of the net was doing fine, it was not their duty to find out what was going on in another piece. Even the network interface processor organization was not interested in routinely testing the network; they were too busy adding the new features everyone had requested.

Well, a bunch of us in central control decided the job needed doing and if nobody else would pick up the marbles, we would. In a series of round table sessions, we determined that a series of network assurance tests would be developed and executed on a routine basis. These tests would be short, run at the highest priorities we could get and/or afford, and, above all, be self-checking. Self-checking was considered critical since there would eventually be

"I can afford scepticism—I have a scepter."

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CARTOON BY DALE J. JENNINGS

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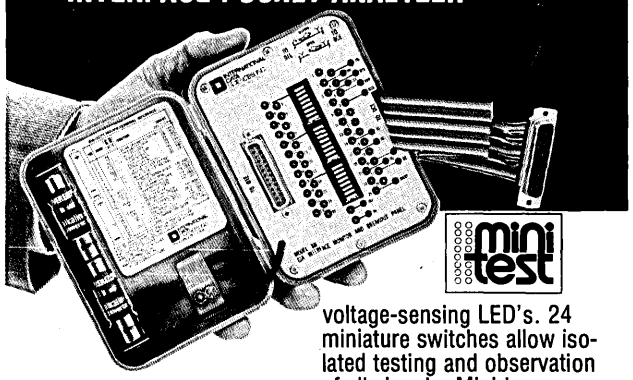

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READERS' FORUM

dozens of tests coursing through the network and anything beyond cursory analysis to determine correct network processing would rapidly push costs out of bounds.

In addition, we also determined that, initially, at least three levels of testing were feasible: pure communications (circuits), computer-to-computer link-ups, and network interface processor flows. A review of customer complaints to central control indicated that the bulk of calls received were due to problems in the computer-to-computer aspects of our network—most specifically in data transfers between major computer centers. The same review also showed that a test frequency of once every two hours would be sufficient to locate and correct such link-up failures without severe impact to customer activities.

It is now one year since the basic computer-to-computer assurance tests were initiated. In that year, an average of 14 failures a month have been detected by the link-up tests between each of the major computer centers. Also, in that year, telephone calls to central control complaining of transmission difficulties between major computer centers have dropped to virtually zero.

To make this tale even better, two unanticipated byproducts have resulted from this effort. The first involves diagnosis of apparent network interprocessor failures. Before a programmer/analyst is contacted by central control, an appropriate computer-to-computer assurance test is executed. If the test fails, major computer center and computer operations personnel are contacted. If the customer-reported failure still persists after they have taken corrective action, then the programmer/analyst is contacted and informed that the problem is not due to difficulties in the computer-to-computer link-ups. In those cases where the assurance test passes, the programmer/analyst can be contacted immediately and given the same information.

The second byproduct comes into being whenever changes to a major computer center operating system or equipment configuration occur. Prior to allowing network customers onto the changed environment, all of the assurance tests are executed. Once each of the tests has passed, the confidence that network performance will not severely impact production activities is greatly enhanced. All in all, I owe that original customer-who-is-always-right a debt. Even the few tests that are currently being exercised have markedly improved network reliability. As more tests at different levels come online, the projection is for ever increasing performance reliability coupled with enhanced early warning of difficulties which could impact network production.

It sure beats a lot of telephone calls.

—David A. Feinberg
Seattle, Washington

A COMPUTER'S LAMENT

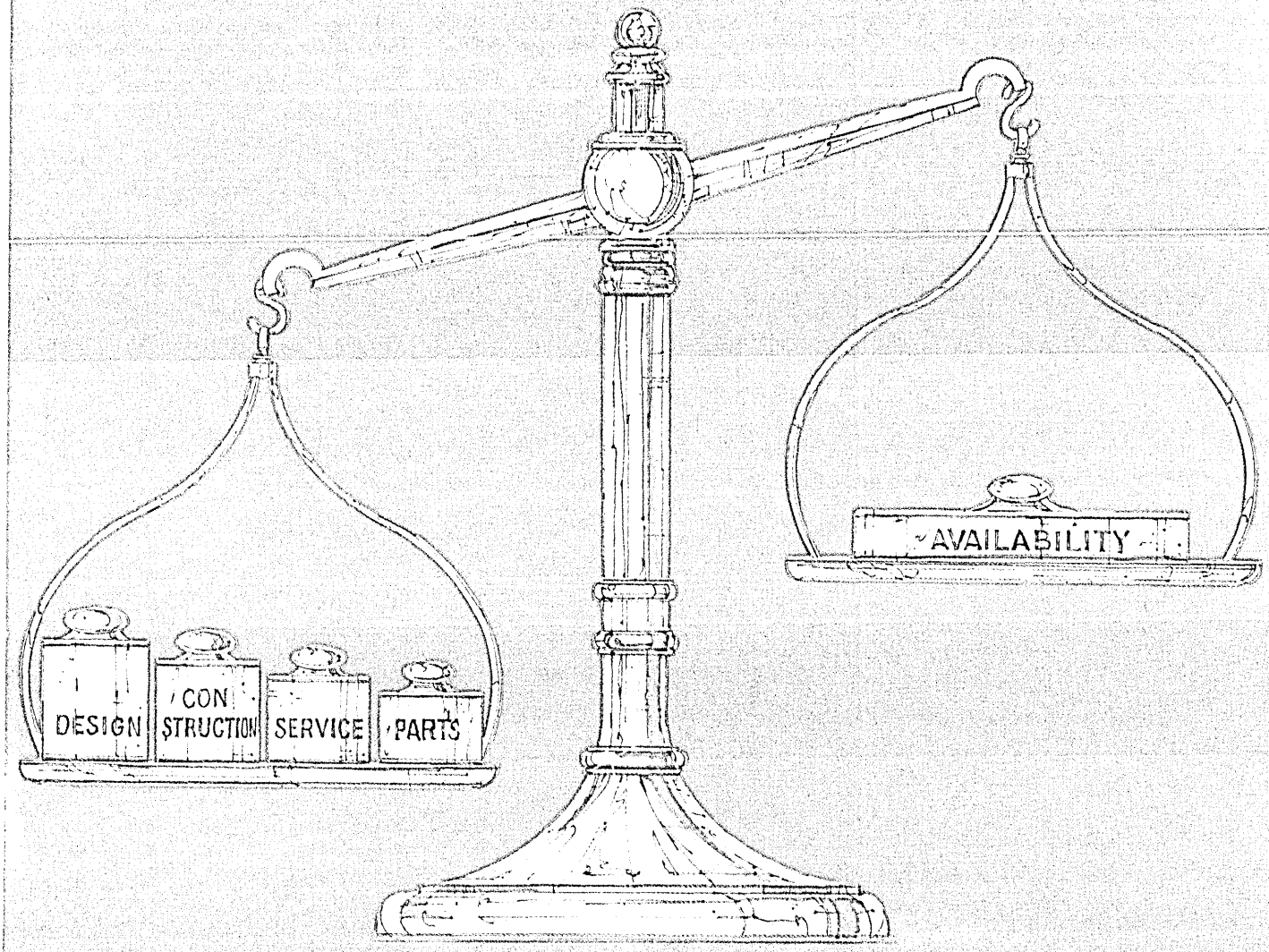
A computer's life is no vacation
(That's right—turn an ear, you'll learn my story)
Nanoseconds of quiet desperation,
A binary search for love and glory:

I do what I'm told, but it's not enough.
"Do this! Do that! No, cancel that job!"
I don't read minds, I've got it rough;
I'm still not wired to weep or sob . . .

Once I had rooms to stretch 'n relax,
Today, a mere desktop, and that's no joke.
Hypocritical rules scream, "Here, No Snacks!"
Yet my chips o'erflow with cookies 'n coke.

—Stephen H. Levy
New York, New York

ON LINE, ALL THE TIME.



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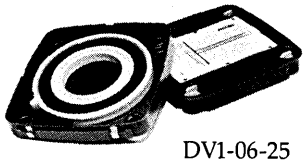

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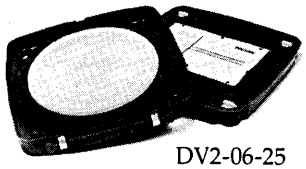
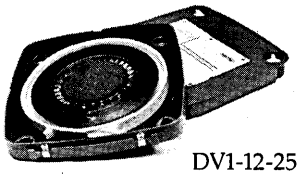
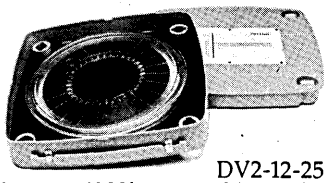
Ships one 600' tape reel in tape seal



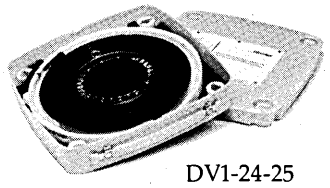
DV2-06-25
Ships one 600' tape reel in canister



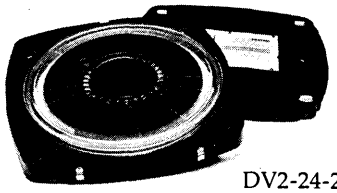
DV1-12-25
Ships one 1200' tape reel in tape seal



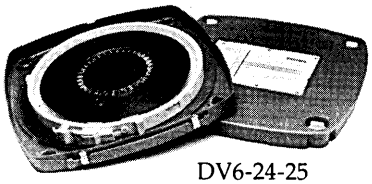
DV2-12-25
Ships one 1200' tape reel in canister



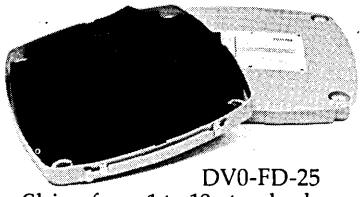
DV1-24-25
Ships one 2400' tape reel in tape seal



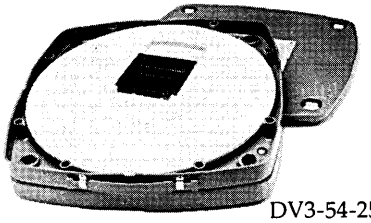
DV2-24-25
Ships one 2400' tape reel in canister



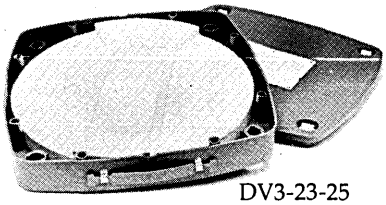
DV6-24-25
Ships one 2400' tape reel in Easy Load II seals



DV0-FD-25
Ships from 1 to 10 standard or mini floppy discs



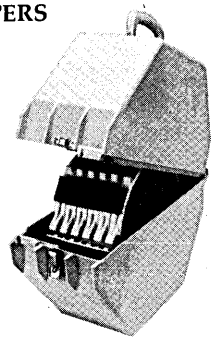
DV3-54-25
Holds one top-loading disc cartridge (IBM type 5440)



DV3-23-25
Holds one front-loading disc cartridge (IBM type 2315)

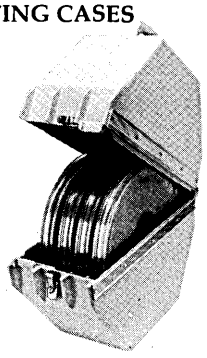
MULTIPLE SHIPPERS

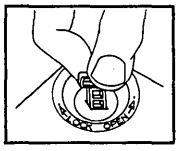
Ship four reels in canisters or Easy Load tape seals, and six in tape seals.
DV4-06-01...
600' reels
DV4-12-01...
1200' reels
DV4-24-01...
2400' reels



MULTIPLE CARRYING CASES

Hold four reels in canisters or Easy Load tape seals, and six in tape seals.
DV5-06-01...
600' reels
DV5-12-01...
1200' reels
DV5-24-01...
2400' reels





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READERS' FORUM

CODING THE SUPERIOR PROGRAM

What makes one computer program superior to another?

Superiority may be expressed in different terms—program design, program execution time, program maintainability, etc. It is possible to measure coding quality in each category and to come up with conflicting results. A single program may be an excellent cpu performer and yet be difficult to maintain.

In fact, many programmer/analysts are guilty of creating such programs. The common fault is poor (or nonexistent) internal documentation, stemming from the programmer's tendency to concentrate on program testing and design. Immediate results are stressed in both academic and industrial environments, at the expense of internal documentation.

But the value of internal program documentation comes, of course, when enhancement or modification is required. Even if the modification is made by the same programmer (which is unlikely in many installations because of personnel turnover or organizational structure), the logic that seemed straightforward at development time has to be absorbed from source code. This lengthy and tedious chore can be minimized with some well-placed comments.

The following list of assembler program coding conventions is intended to provide guidelines for internal program documentation. These guidelines are often overlooked in formal education and are usually independently developed by experienced programmers after much anguish. With some minor modifications, they may be applied to other languages. Assembler has been chosen since it is most vulnerable to the lack of internal documentation.

Assuming that a program is well thought out in terms of design and efficiency, adherence to these guidelines or some variation thereof will make that program a superior product. The cost of adhering to them is minimal in the total development effort.

To ensure easily readable and maintainable code, the following coding conventions should be followed:

1. Title each csect.
2. Preface each csect with introductory comments on:
   a. purpose of module
   b. input parameters expected
   c. narrative of processing
   d. output produced
   e. register usage
   f. modification descriptions
3. Precede each major section, which should consist of about two pages of code, with comments in the following format:
   a. purpose of section
   b. input registers
   c. a line of pseudocode for each logical subsection
   d. output produced
4. Precede each subsection with the identifying line of pseudocode.
5. Comment each line of code.
6. Align comments so that they appear orderly starting in column 36.
7. Eject after every major section and large subsection (more than 10 lines of code).
8. Use meaningful registers whenever possible (e.g., dynamic area 6 should be addressed by R6). All registers should be referred using the R0 thru R15 notation.
9. Use of literals should be minimized.

—John Hamersky
Lake Ronkonkoma, New York

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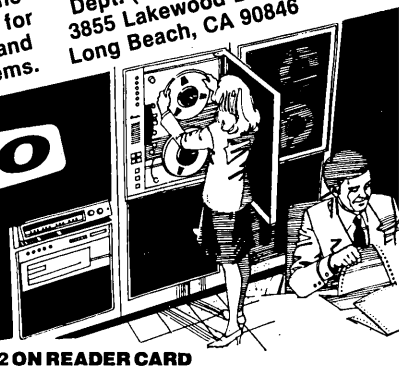

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CIRCLE 215 ON READER CARD

READERS' FORUM

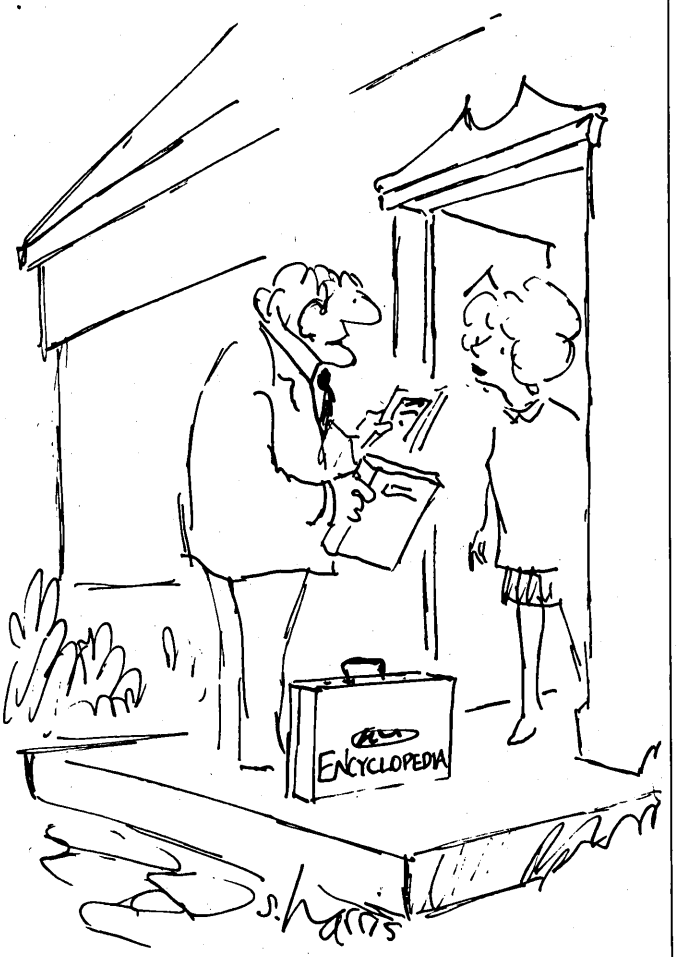
EATING YOUR BUZZWORDS

The dp industry has been severely castigated over the years for its heavy use of buzzwords and acronyms. Many people have felt it was an attempt by dp practitioners to set themselves apart.

It is the contention of the authors that a close look at many of these acronyms and buzzwords will actually reveal what would really motivate any person employed in data processing: food. It's not a new concept but a primary need existing in motivational research since the beginning of time.

Perhaps the first to give true meaning and importance to this need was Abraham Maslow in his discussion of the hierarchy of needs. Maslow contended that in the absence of any need satisfaction, a state of nonhomeostasis, organisms will first seek to satisfy their basic (physiological) needs. Furthermore, their every action will be dictated by this desire to obtain food. In elaborating on this concept and in developing his two-factor theory of motivation, Frederick Herzberg maintained that these basic needs could be classified hygiene factors, and that motivation would not occur until the organism was centered on the higher-order needs.

In light of the foregoing, it is not surprising that motivation theorists have not centered on dp people to test their suppositions. To study motivation, one would probably choose people who were



"They're all good, but my favorites are, 'calcium to cucumber' and 'Stravinsky to tiara.'"

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capable of being motivated: employees who were at least on the border between the lower- and higher-order needs. From the job hopping that dp people do and their preoccupation with the hunger need, it is obvious that they are still in the lowest order. The obsession with food is obvious: their vocabulary is riddled with culinary delights.

It is very easy to describe a full meal as we sit at the table. Breakfast consists of your choice of *serial*, *LIOCS* and bagels, or a *stack* of pancakes and sausage *links*. *Buffered* toast with either *card jam* or *paper jam* is always served with every meal. The drink available with your breakfast is *APL* JUICE.

A much more extensive menu is available for both lunch and dinner with all items on *DISPLAY*. For all meals served, there is no waiting in line because *DIRECT ACCESS* is always available and the service is *KWIC* and *friendly*.

For lunch, one might begin with *nested loop* soup and then choose from such delicacies as *microfiche* under glass or *shared segments* of beef. Punch is a speciality of the *host*, and choices include *card punch*, *numeric punch*, *zone punch*, *double punch*, *gang punch*, and *digit punch*. Desserts may be chosen from a *corner cut* of cake, apple (without the *core*), *joy stick* and *multidrop line* cookies.

All foods are prepared on a *control range*, which is obviously operated from a *control unit*. For ease of retrieval, all the recipes used are kept in an *indexed file*. It is no wonder, with all this food around, that we have to worry about *debugs*. The health department should never shut us down though, since everything is washed down in a hot *data stream* after each use.

For the *LIFO* us, we can't understand why no one has realized before that food is the way to motivate dp employees. You can bet your *bpi* that someone will do a follow-up study on this; if so, we hope they can give us some *feedback*.

—Charles Bilbrey
Donald Musselman
Marc Singer
Harrisonburg, Virginia

APL IS MORE THAN A LANGUAGE

A sound language provides effective ways of symbolizing both real and abstract events, storing the symbolic forms, and then manipulating the stored symbols. APL may be only part of the way there, but in comparison with other programming languages it comes off very well. This is because APL is far more than a programming language.

Unlike most other high-level languages, APL was conceived independently of any given machine. In its original form it was used to improve communication between humans, rather than between humans and machines. Some time later, when it was first implemented on a computer, this machine independence was retained, though implementation will vary slightly.

Similarities in ease of learning APL and natural language (e.g., English) are immediately apparent. APL syntax is uniform and extremely simple. It can therefore be learned in "building block" mode, just as a child learns to talk. A small subset of syntax rules, system commands, and language functions can be learned within an hour or two; a larger subset of the language is learned progressively as the user masters each step. The new APL user soon discovers that with relatively little effort he can perform complex tasks, and this stimulates him to learn more of the language.

People learn APL by using it; it's rather like learning to build

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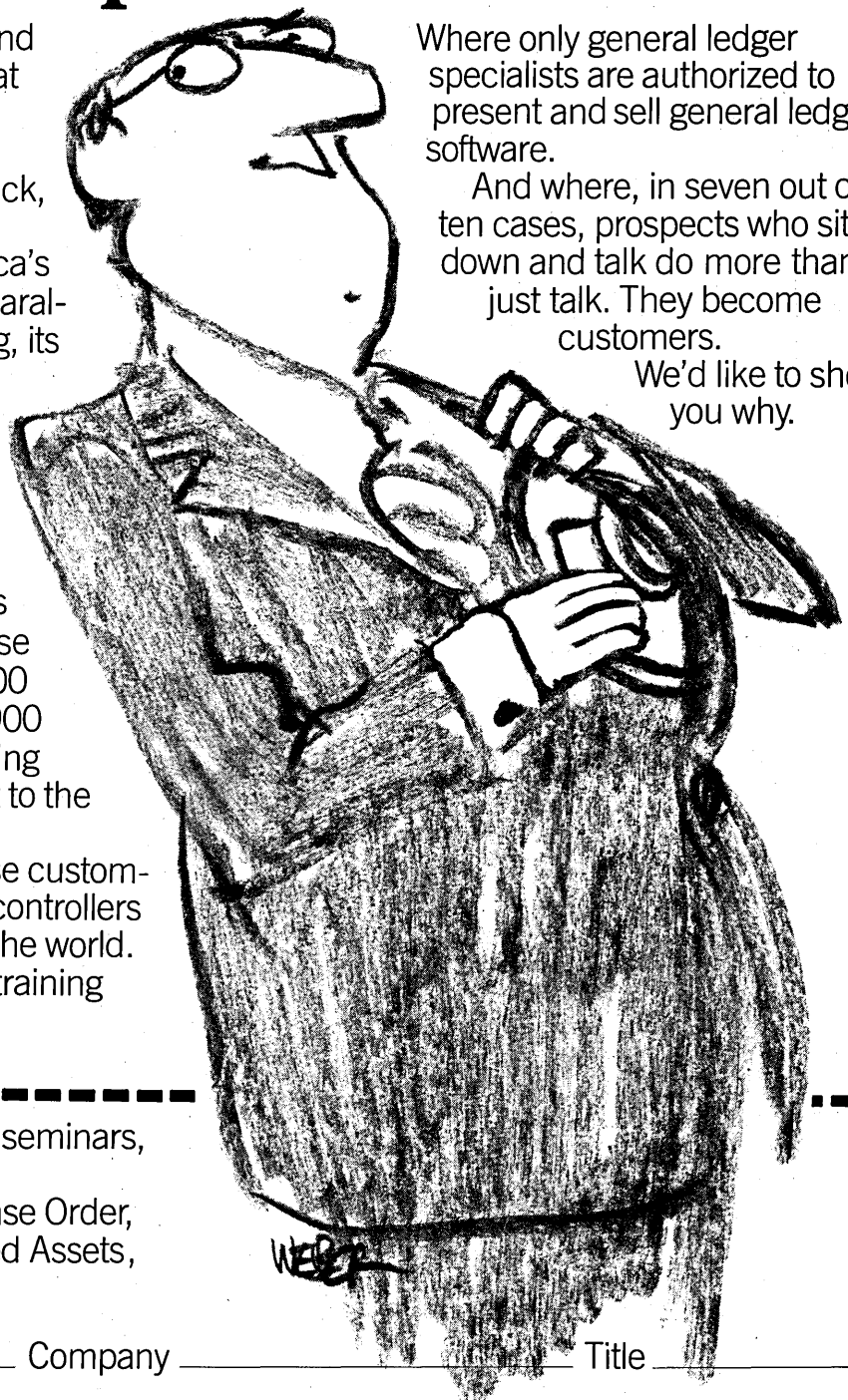

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with LEGO. APL shows the user logic by example, and enables him to fit different modules together in his own way, which may be quite different from the way originally intended. It could be that APL is the first true open-ended programming language.

APL is a system, a philosophy. It provides a bridge between creative lateral thinking (like Edward de Bono's) and effective vertical thinking (like Thomas Alva Edison's). APL has stripped away the mystique from the computer and helped to break down the language barrier that will remain however far prices tumble.

APL is a user language, not a computer language. It is likely to have more effect on business processes than the microchip has, because it is applied directly to the logic of the problem rather than to the logic of the computer. The user often finds that the statement of his problem in APL is the direct cue for the computer to solve it. He takes the verbs associated with his problem and translates them into APL functions, which then use the nouns as data to solve the problem. This means that the machine is left to do the task it does best—calculating—allowing the user to concentrate on what he does best—making decisions. And this user need not be a professional programmer; the language is a tool for anyone with a problem to solve.

Natural language is not precise enough for good data manipulation. The fallacy that programming language should be like human language has misdirected programming development for many years. English must surely be the lowest-level language used in programming, since it can take 10 times as many words to specify program functions as it takes lines of assembler to code them. Manipulating English is not a trivial operation. If it were, it would be easy to write an "English" high-level language. But, as those who have tried this have discovered, English is far too imprecise and inconsistent to form an appropriate interface between human and machine. Subsets of English applied to programming so far have been more effective in debasing the language from which they were borrowed than in allowing the computer to be used more easily.

Imagine the benefits of a consistent, general-purpose system of mathematical notation that could be taught in elementary schools, as is music. Children would grow up with the ability to program as naturally as they sing, proving how easy it is to learn APL, and thus, how easy it is to use the power of the computer.

—Alon Caplin
Croydon, Surrey, England

Answer to puzzle on page 274

A	S	S	T	■	S	A	D	A	T	■	P	E	E	P
B	O	C	A	■	E	L	I	D	E	■	R	A	V	E
E	S	A	K	I	D	I	O	D	E	■	O	V	E	R
T	O	M	E	■	■	■	R	E	M	■	G	E	N	T
■	■	■	■	I	L	S	■	D	E	A	R	S	■	■
■	R	A	P	P	I	N	G	■	D	I	A	■	O	F
V	I	N	S	■	M	A	E	S	■	S	M	I	L	E
I	N	T	E	R	A	C	T	I	V	E	M	O	D	E
I	S	S	U	E	■	K	N	E	E	■	E	T	E	S
I	E	■	D	A	M	■	O	V	E	R	R	A	N	■
■	■	S	O	L	A	R	■	E	R	A	■	■	■	■
S	P	E	C	■	N	E	O	■	■	T	E	R	S	E
T	O	D	O	■	N	A	N	O	S	E	C	O	N	D
A	R	A	D	■	E	V	A	D	E	■	C	L	O	G
B	E	N	E	■	R	E	N	E	E	■	E	L	B	E

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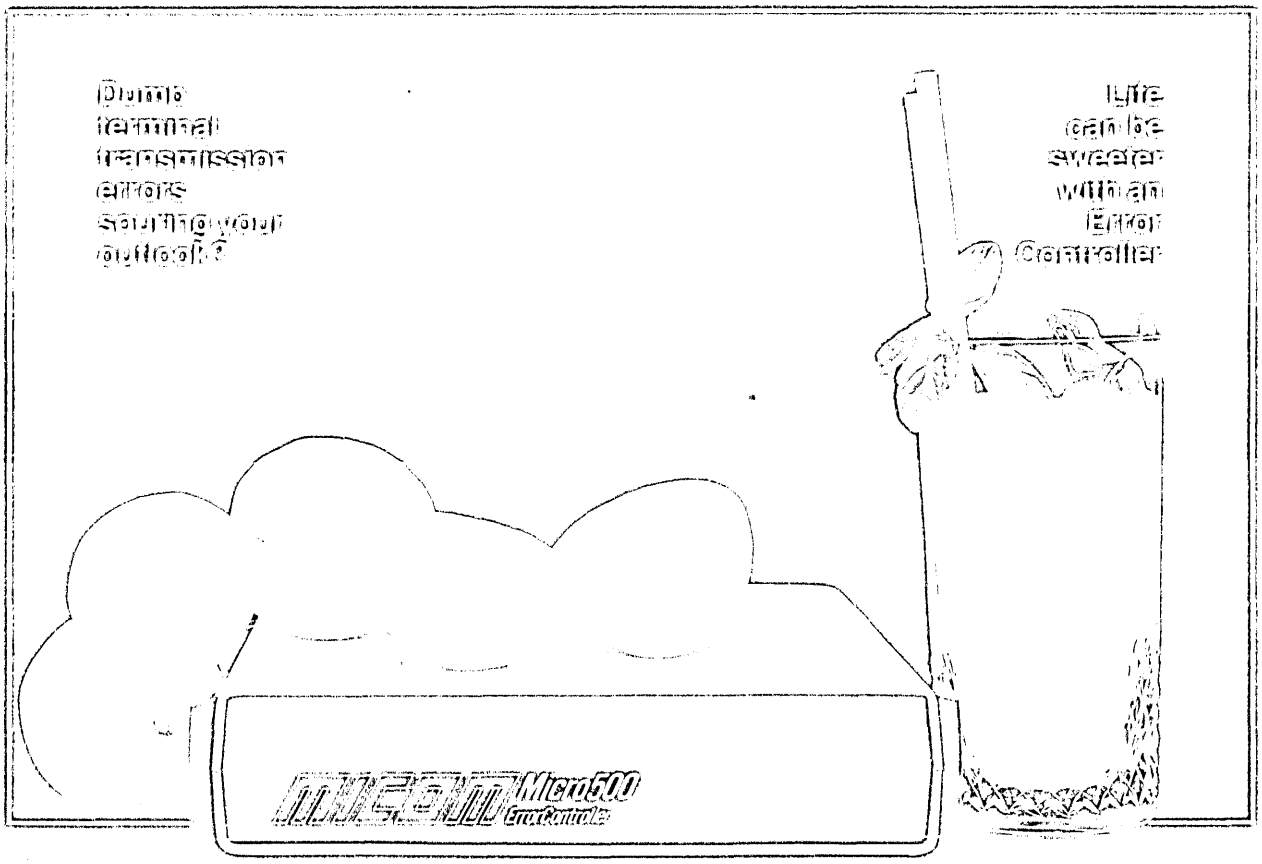

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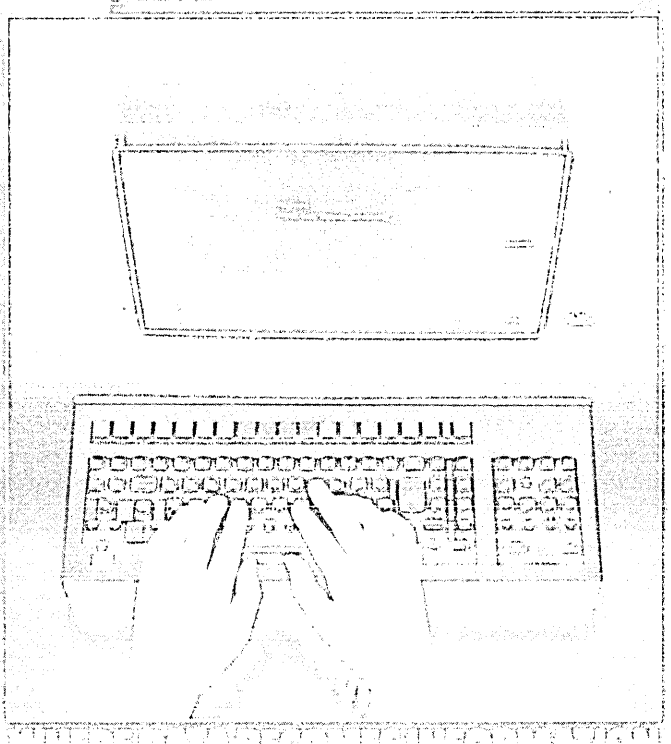

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