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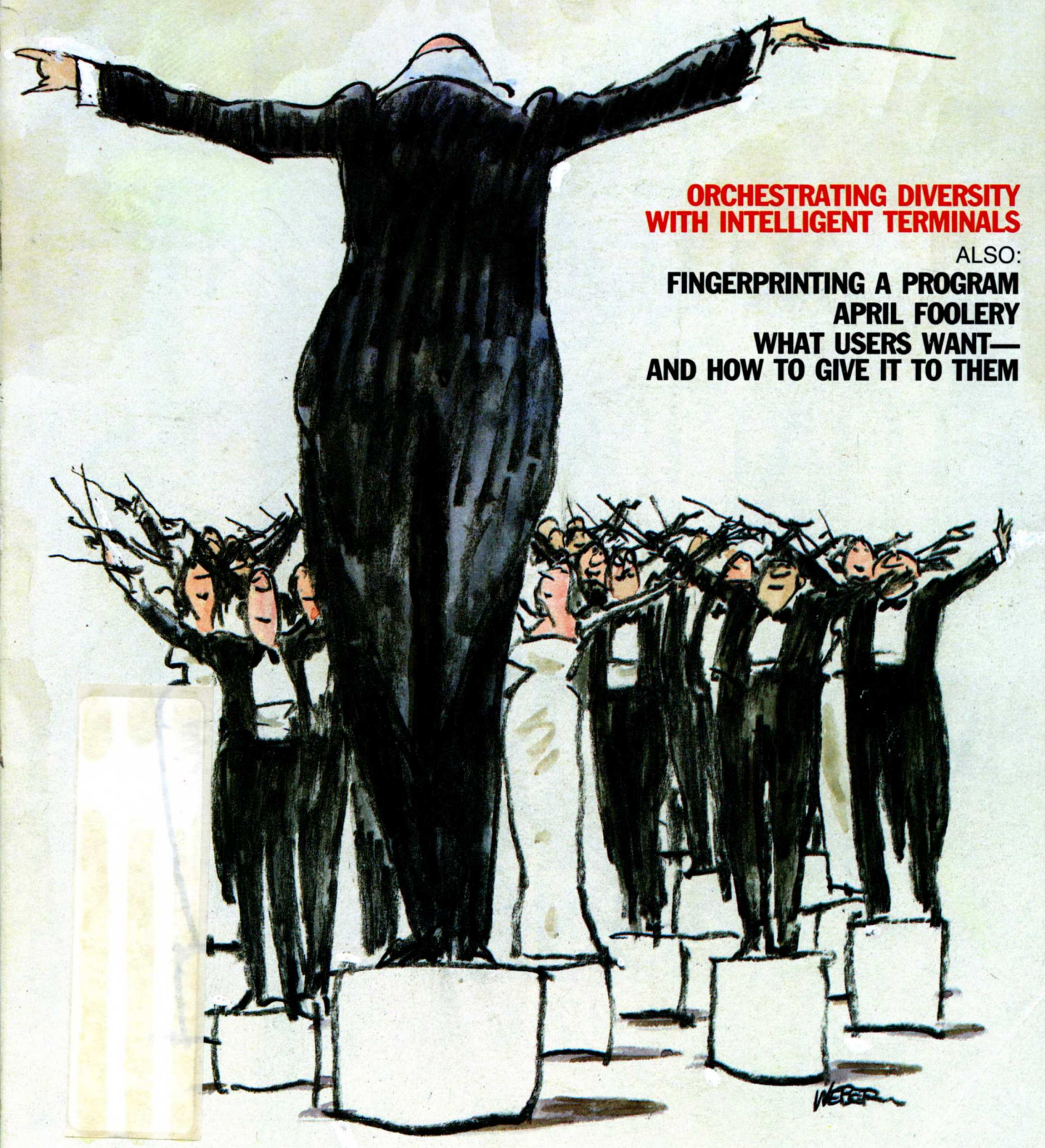

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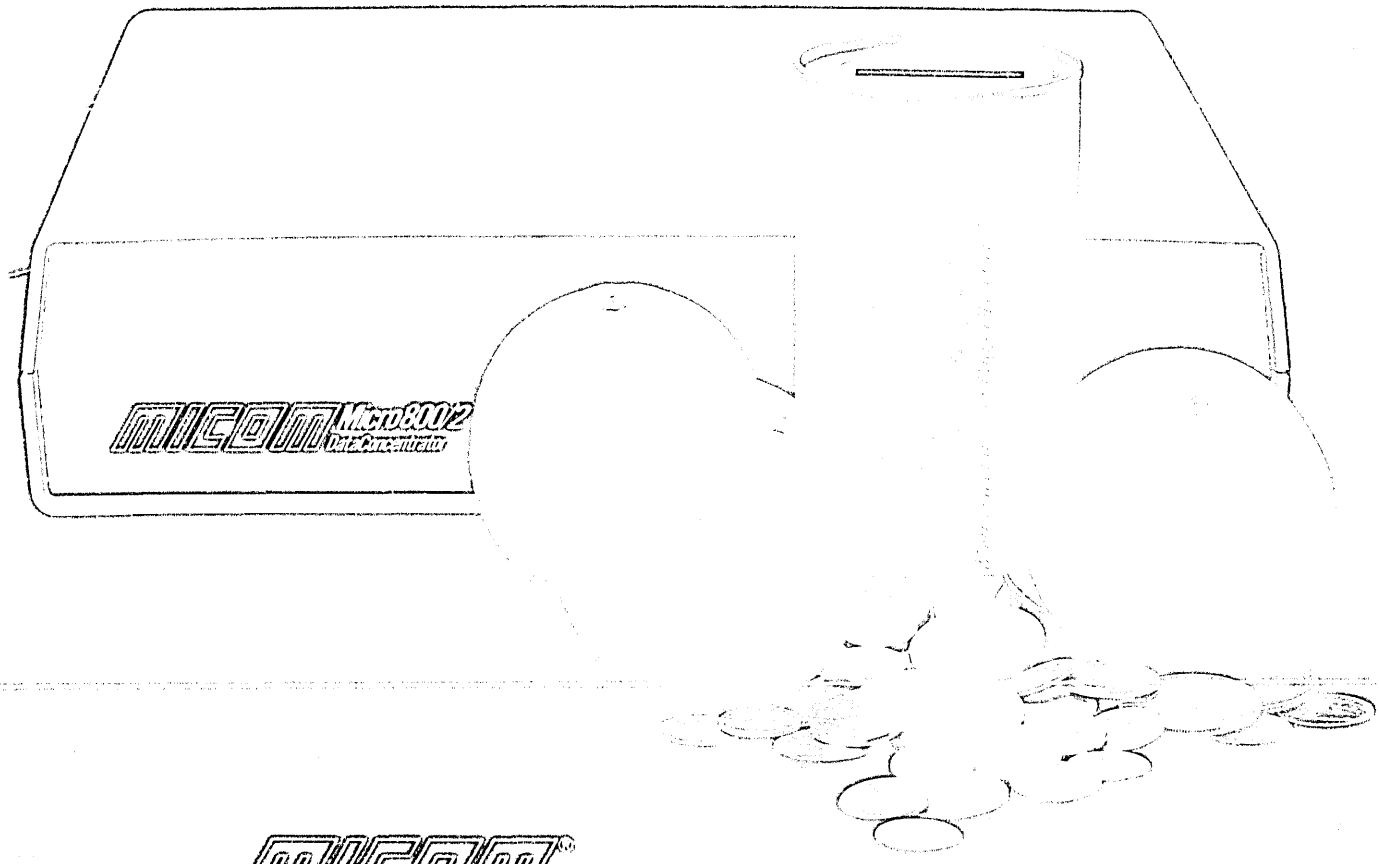

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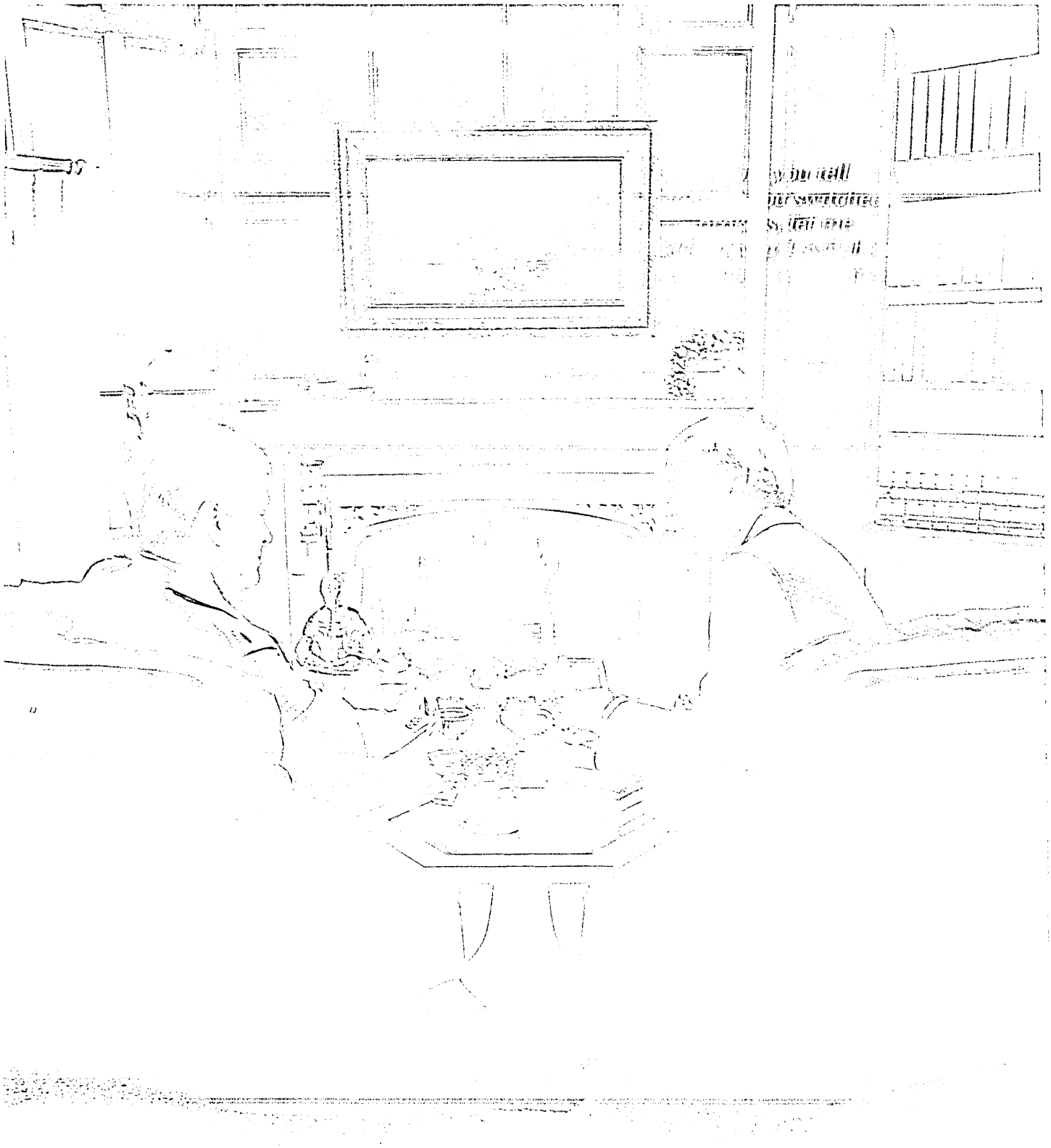

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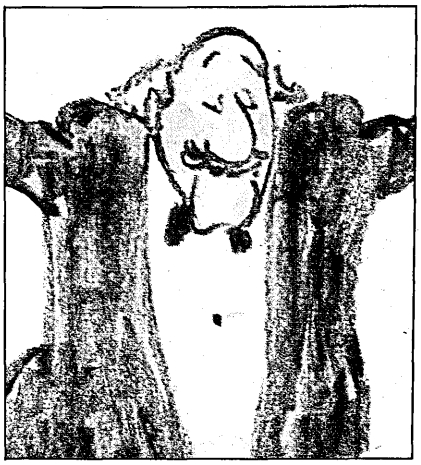

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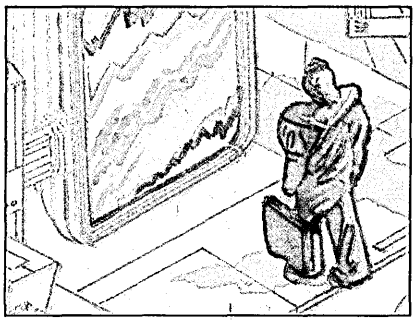

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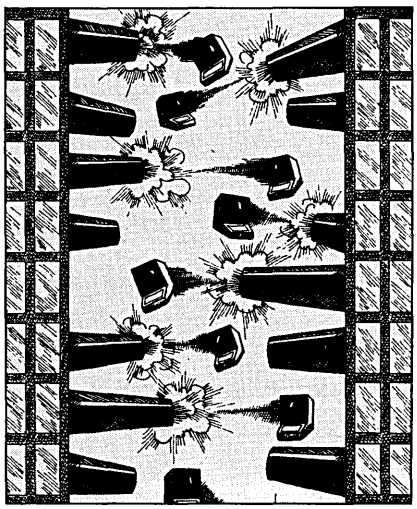

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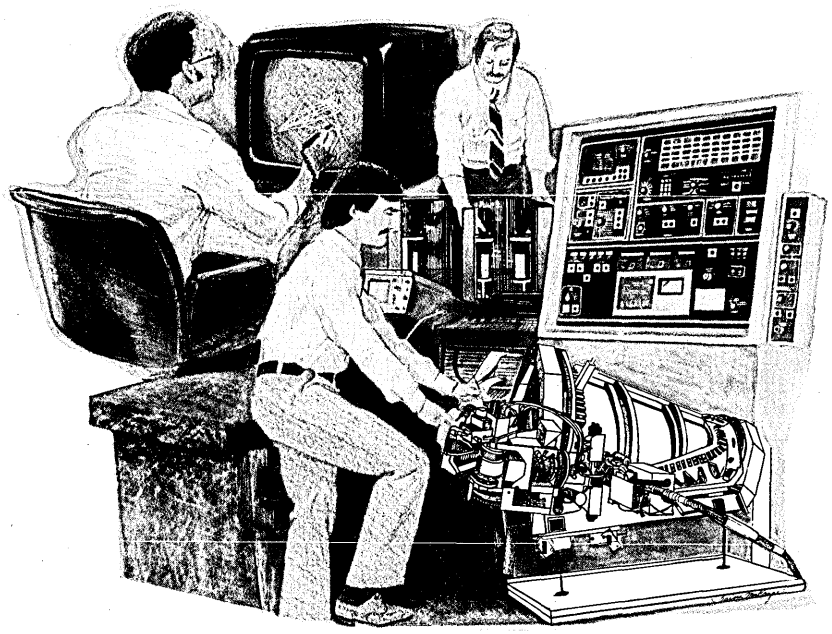

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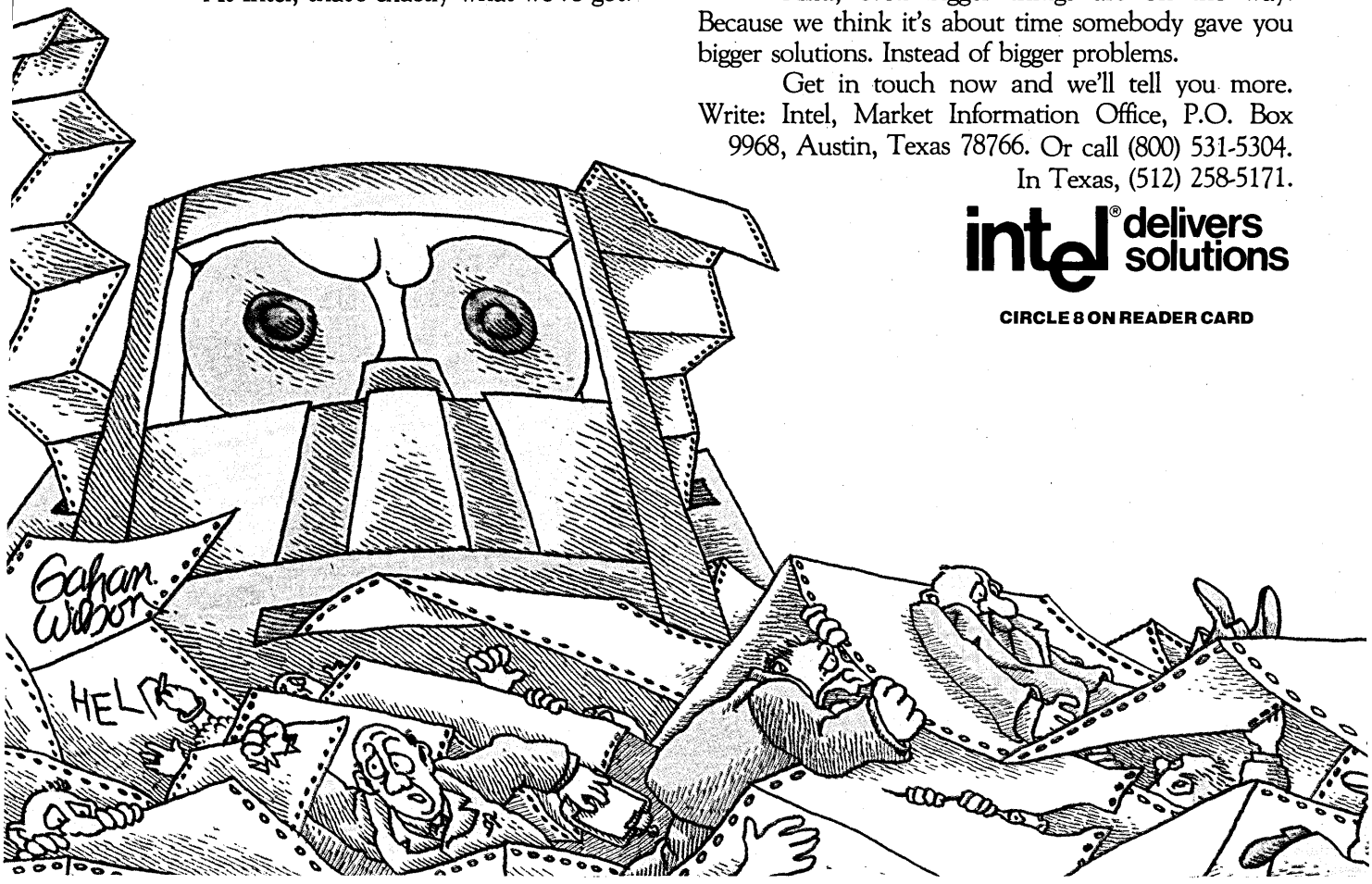

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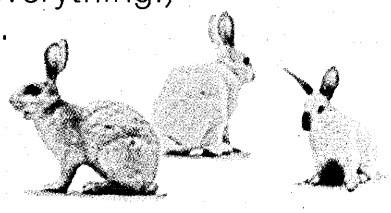

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LOOKING BACK

THE HORSE'S MOUTH

April 1962: More than 15 years had passed since J. Presper Eckert and John Mauchly invented ENIAC, the world's first general purpose, digital computer. In an interview, the two pioneers discussed the state of the industry they had helped to create.

DATAMATION first asked the pair to speculate as to when the digital computer might have been invented if a) there had been no World War II funds available, and b) there had been no Eckert and Mauchly. Eckert's reply was that computers would have appeared about the same time anyway, but what continued to puzzle him was that the components to build ENIAC had been around long before the computer was created. "The ENIAC could have been invented 10 or 15 years earlier, and the real question is why wasn't it done sooner?" Mauchly answered, "In part, the demand wasn't there. The demand, of course, is a curious thing. People may need something without knowing they need it."

Mauchly commented on why IBM, a relative latecomer to the computer industry, had been able to take the lead so quickly. "People feel IBM's sales force is a good one. There's also another factor which seems to me to have something to do with it. IBM's business, except for typewriters and now dictating machines, is almost entirely in the computer field. In almost every other company, computing is just a sideline or a division at most."

Eckert and Mauchly displayed some prescience when asked whether large or small machines would dominate:

Eckert: "Dollar volume is almost certainly on the smaller machines. I think that the companies selling larger machines will be dropping these entries and more small machines will be announced because the technology is going to make it possible to have a lot of small machines; maybe little digital machines which can sell for under $1,000."

Mauchly: "We will continue to learn how to make these things cheaper and cheaper, and we will continue to train more people who will naturally think in terms of computers just as we now naturally expect everybody to read and write."

According to Mauchly, the computer of the future would "fit in with the way of life of the common person."

COMPUTERITE PHILOSOPHY

April 1972: Climbing the corporate ladder has always been difficult, but in Computer City, the aspiring climber must deal with additional worries. In "The Insiders, Onward and Upward," the fourth part of a report on dp personnel trends, Milt Stone offered some advice for the success-hungry computerite.

Aspirants were first reminded to keep their expectations in line with reality. In 1972 data processing was most often regarded as a service, a fact that could hinder a dper's move into corporate management. Success seekers also had to remember that there are far more workers than queen bees in the corporate world. According to Stone's figures, only about 5% of dp professionals would ever head an information systems operation in a medium or large corporation.

To further enlighten the circa-1972 computerite, DATAMATION and the American Management Assn. cooperated in a study of executive attitudes. There were two groups: executives who depended on systems, and the information systems executives who designed them. One-fourth of the executives queried indicated that solid prior experience in line operations was a "prerequisite to becoming a top information processing honcho."

The executives also agreed that the top honcho of tomorrow would need less technical knowledge. More importance would be placed on effective communication, professional managerial skills, and keen business sense. The successful computerite of the future would have to become a modern Renaissance person, someone with "many broad interests who has the opportunity to indulge in them so as to acquire a knowledge of each that is more than superficial."

—Deborah Sojka

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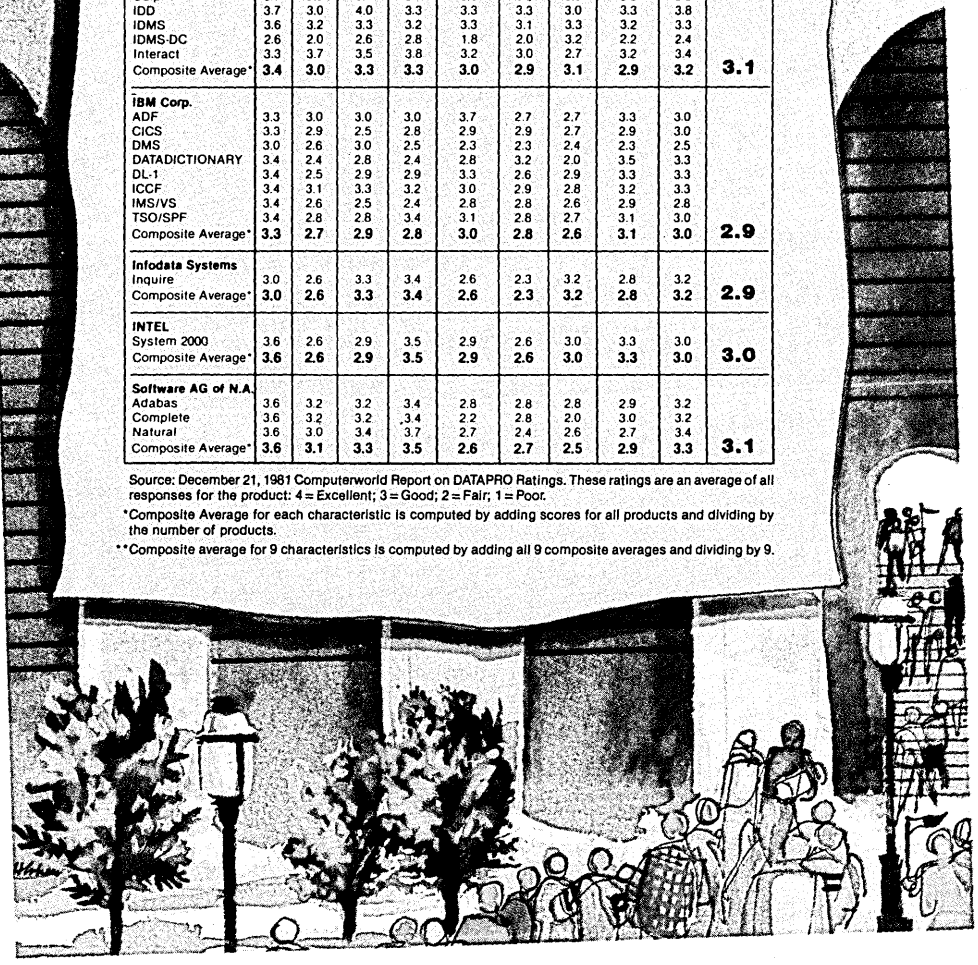
Applied Data Research, Inc.										
DATACOM/DB	3.1	3.4	3.0	3.3	3.1	2.6	2.6	2.9	3.0	
DATACOM/DC	3.2	3.4	2.0	3.6	2.0	2.4	2.2	2.4	3.2	
LIBRARIAN	3.7	3.4	3.3	3.4	3.0	3.1	3.0	3.2	3.4	
LOOK	4.0	3.5	3.5	4.0	3.7	3.0	2.5	3.3	3.5	
MetaCobol	3.3	3.0	3.0	2.7	2.5	3.0	2.7	3.3	3.0	
ROSCOE	3.6	3.5	3.1	3.4	2.9	2.9	2.7	3.1	3.3	
VOLLIE	3.8	3.5	3.5	3.8	3.1	3.3	3.1	3.3	3.6	
Composite Average*	**3.5**	**3.4**	**3.1**	**3.5**	**2.9**	**2.9**	**2.7**	**3.1**	**3.3**	**3.2**
Cincom Systems										
Environ/1	3.8	3.4	3.0	3.2	3.0	2.8	2.8	2.8	3.0	
Mantis	3.7	3.5	3.5	3.3	3.3	2.8	2.7	2.8	3.5	
Total	3.4	2.9	3.0	3.0	2.6	2.7	2.8	2.8	3.0	
Composite Average*	**3.6**	**3.3**	**3.2**	**3.2**	**3.0**	**2.8**	**2.8**	**2.8**	**3.2**	**3.1**
Computer Corp. of America										
Model 204	3.2	3.6	3.3	3.4	2.2	2.6	2.6	2.6	2.8	
Composite Average*	**3.2**	**3.6**	**3.3**	**3.4**	**2.2**	**2.6**	**2.6**	**2.6**	**2.8**	**2.9**
Cullinane Corp.										
Cars	3.2	2.6	2.8	3.2	3.2	2.6	3.0	2.5	3.0	
Culprit	3.7	3.3	3.7	3.7	3.0	3.3	3.3	3.0	3.3	
IDD	3.7	3.0	4.0	3.3	3.3	3.3	3.0	3.3	3.8	
IDMS	3.6	3.2	3.3	3.2	3.3	3.1	3.3	3.2	3.3	
IDMS-DC	2.6	2.0	2.6	2.8	1.8	2.0	3.2	2.2	2.4	
Interact	3.3	3.7	3.5	3.8	3.2	3.0	2.7	3.2	3.4	
Composite Average*	**3.4**	**3.0**	**3.3**	**3.3**	**3.0**	**2.9**	**3.1**	**2.9**	**3.2**	**3.1**
IBM Corp.										
ADF	3.3	3.0	3.0	3.0	3.7	2.7	2.7	3.3	3.0	
CICS	3.3	2.9	2.5	2.8	2.9	2.9	2.7	2.9	3.0	
DMS	3.0	2.6	3.0	2.5	2.3	2.3	2.4	2.3	2.5	
DATADICTIONARY	3.4	2.4	2.8	2.4	2.8	3.2	2.0	3.5	3.3	
DL-1	3.4	2.5	2.9	2.9	3.3	2.6	2.9	3.3	3.3	
ICCF	3.4	3.1	3.3	3.2	3.0	2.9	2.8	3.2	3.3	
IMS/VS	3.4	2.6	2.5	2.4	2.8	2.8	2.6	2.9	2.8	
TSO/SPF	3.4	2.8	2.8	3.4	3.1	2.8	2.7	3.1	3.0	
Composite Average*	**3.3**	**2.7**	**2.9**	**2.8**	**3.0**	**2.8**	**2.6**	**3.1**	**3.0**	**2.9**
Infodata Systems										
Inquire	3.0	2.6	3.3	3.4	2.6	2.3	3.2	2.8	3.2	
Composite Average*	**3.0**	**2.6**	**3.3**	**3.4**	**2.6**	**2.3**	**3.2**	**2.8**	**3.2**	**2.9**
INTEL										
System 2000	3.6	2.6	2.9	3.5	2.9	2.6	3.0	3.3	3.0	
Composite Average*	**3.6**	**2.6**	**2.9**	**3.5**	**2.9**	**2.6**	**3.0**	**3.3**	**3.0**	**3.0**
Software AG of N.A.										
Adabas	3.6	3.2	3.2	3.4	2.8	2.8	2.8	2.9	3.2	
Complete	3.6	3.2	3.2	3.4	2.2	2.8	2.0	3.0	3.2	
Natural	3.6	3.0	3.4	3.7	2.7	2.4	2.6	2.7	3.4	
Composite Average*	**3.6**	**3.1**	**3.3**	**3.5**	**2.6**	**2.7**	**2.5**	**2.9**	**3.3**	**3.1**

Source: December 21, 1981 Computerworld Report on DATAPRO Ratings. These ratings are an average of all responses for the product: 4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor.

*Composite Average for each characteristic is computed by adding scores for all products and dividing by the number of products.

**Composite average for 9 characteristics is computed by adding all 9 composite averages and dividing by 9.



ADR beats DB/DC rivals in 1981 Datapro ratings.

From 1973 to 1979 ADR software products received 18 Datapro awards — more than any other software or hardware vendor for IBM mainframe computers. In 1980 ADR achieved higher ratings than any of its DB/DC competitors. And in 1981 ADR's integrated products again received higher *composite ratings* than its DB/DC competitors. ADR continues to beat the competition because:

1. **The ADR/Datacom System provides an easy-to-use and efficient Relational Information Management Environment.**
2. **ADR's products are fully integrated using fourth-generation engineering technology.**
3. **ADR services, supports, and actively enhances its products.**

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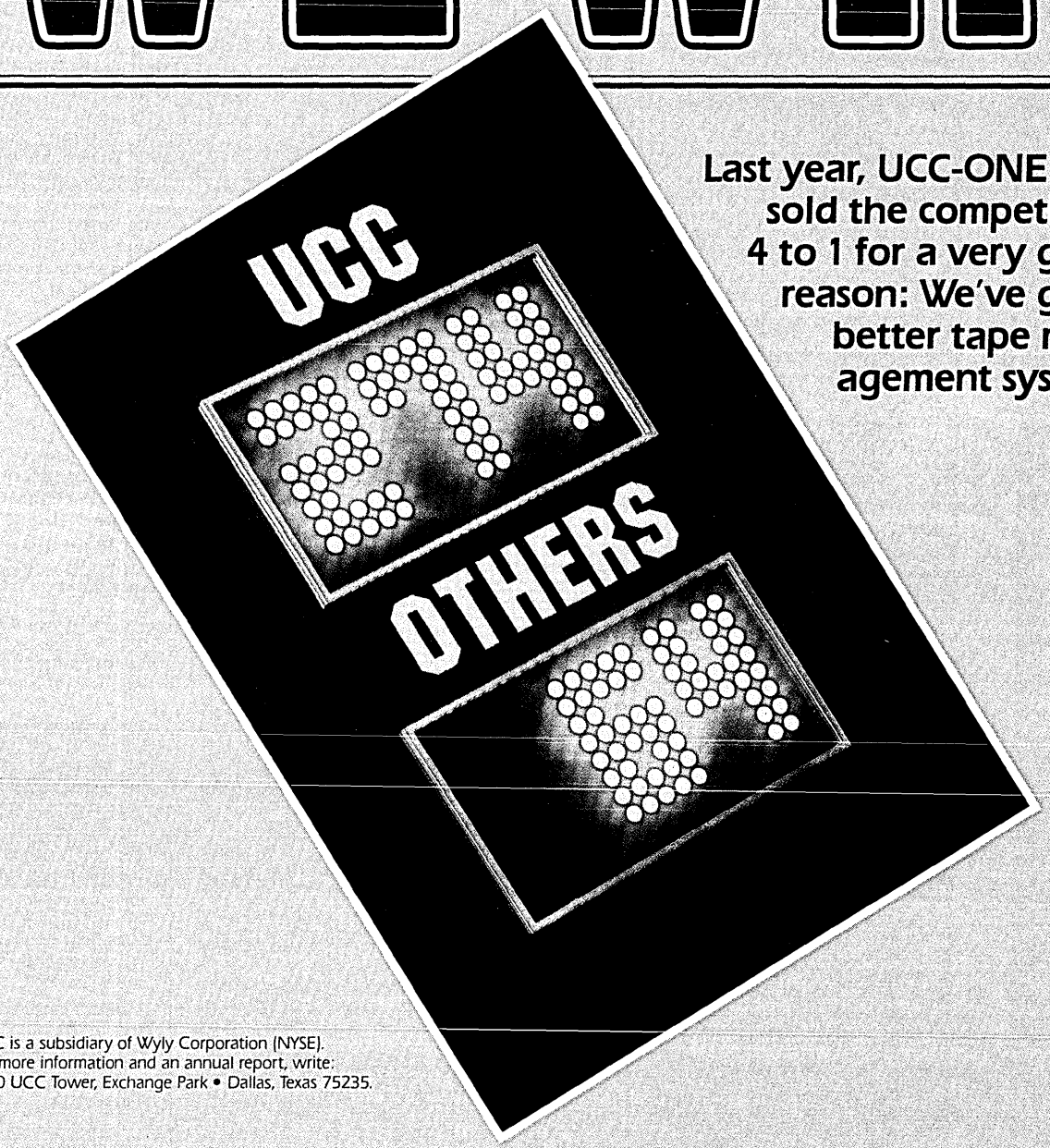
CIRCLE 11 ON READER CARD

THE UCC-ONE TAPE MANAGEMENT SYSTEM

WE WIN



Last year, UCC-ONE outsold the competition 4 to 1 for a very good reason: We've got a better tape management system.

UCC is a subsidiary of Wyly Corporation (NYSE).
For more information and an annual report, write:
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The UCC-ONE Tape Management System. The industry leader in tape management... for years. And the industry leader again in 1981. Because it's the industry leader in performance.

Now, almost two thousand OS shops are getting assured protection for their tapes. Plus the kind of support and confidence that only UCC can provide.

UCC-1: a vital first step in total dataset management capability. Call us today at 1/800-527-5012 (in Texas 214/353-7312) about UCC-1 or:

A DOS Under OS System that lets you run DOS programs and JCL without conversion (UCC-2+20). Circle 85

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The leading line of Banking Software packages. Circle 94

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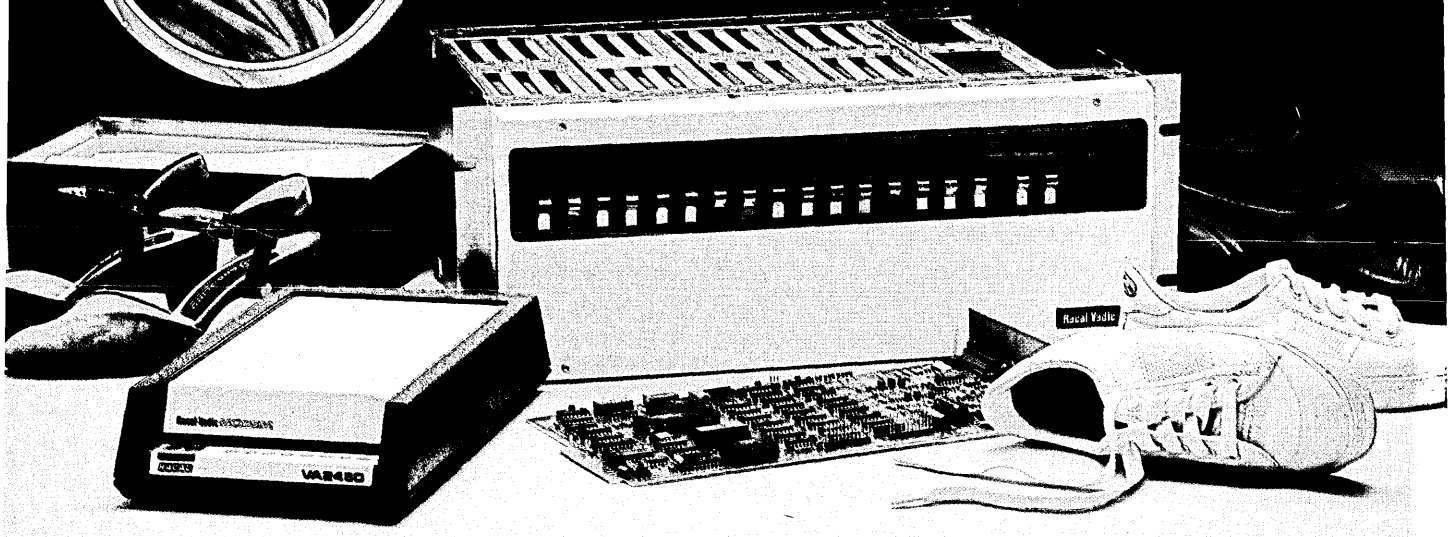
WE'RE #1 IN TAPE MANAGEMENT.

University Computing Company • Dallas • Toronto • London • Paris • Dusseldorf

Dear Ma:

For Point Of Sale applications, Racal-Vadic's 2400 bps modems are a real "shoe-in"!



Recently, three of the country's largest retail shoe chains selected Racal-Vadic modems for their Point Of Sale systems.

You see, Ma, many of the new P.O.S. terminals operate at 2400 bps; twice as fast as older 202-based systems. And, being synchronous, throughput is increased another 30% since start/stop bits aren't transmitted. This adds up to a big savings in line costs.

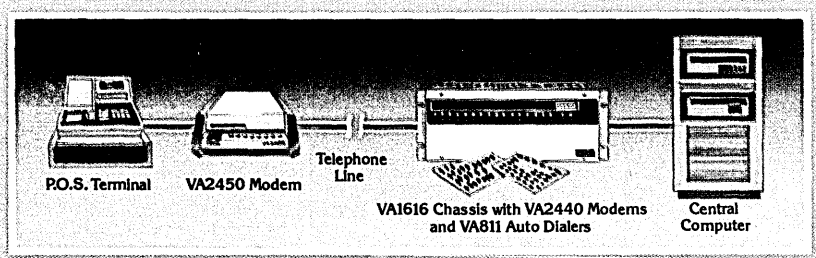
The retail stores install the VA2450 modems. They're compact, low profile and the telephone can sit on top, conserving space. An important feature of the VA2450 is the VOICE/DATA/MANUAL switch on the front panel which eliminates the need for a special telephone. During the day, the switch is positioned so the phone can be used for normal incoming and outgoing voice communication. At night, when rates are lower, the modem is engaged so the central computer site (using the VA2440 modem and VA811 dialer) can poll each retail store collecting sales, inventory and other data.

Up to eight VA2440 modems and VA811 auto dialers can be mounted in Racal-Vadic's 7-inch high rack chassis. The auto dialer(s) operate either in a singleline mode (one modem per dialer) or in Racal-Vadic's exclusive Multiline configuration where up to 60 modems can be accessed from a single RS366 or RS232C computer port. That's a tremendous savings in space and hardware.

When you sum it all up, Ma, Racal-Vadic modems are a real "shoe-in" when it comes to Point Of Sale systems for any business or industry.

Your independent thinking son,

Alexander Graham Jr.



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Sunnyvale, CA 94086
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CIRCLE 13 ON READER CARD

LOOK AHEAD

WHAT'S IN A NAME?

Finishing touches are being put on DEC's 16-bit CT-300 personal computer for its May launching. The machine will use a new LSI chip set to provide PDP-11 software compatibility and will be sold with the not-so-personal RSX-11M operating system (although Unix and other systems for the PDP-11 should be available elsewhere). The sales force has seen the machine and been pepped up with a tale suggesting DEC chief Kenneth Olson has more than purely business interests in its success. It seems Olson approached Apple a couple of years back with the idea of buying out the startup company. He was given the brush by the young Cupertino fruitarians, who told the man from Maynard that DEC would be too late to the personal computer market to ever amount to much. Angered, Olson is said to have code named the upcoming machine KO, after his initials and as a signal of his intentions towards his competition.

WARLOCK IS JUST THAT

As we revealed last month, one enticing factor in IBM's Information Network is the chance to use a low-cost 3101 terminal as if it were a full-duplex 3270. This will be made possible through a program written at Yale which runs on the Series/1 controller. Apparently one IBM internal project, known as Warlock, has applied the same logic to the giant's upcoming local ring net debut. The key selling point of the new ring net will be the chance to use a 3101 as if it were a 3270 -- though sources claim that only block mode will be offered initially through new IBM software. The logic seems to be to lock the customer base firmly into the Series/1 and 3705 front-ends (as well as the imminent 3705 replacement) and hence deeper into IBM through commitment to local networks.

NEW MAINFRAMES DUE OUT OF CDC

First Honeywell unveiled its DPS strategy, then Univac its OS/1100 strategy. Now it's CDC's turn. The message from the Minneapolis Three is clear: don't give that user base a reason to escape. The strategy: don't put a user through a major conversion to get to new product families. By the end of this month, CDC plans to announce a conversion-free migration path for its mainframe users. A new family, based on the NOS operating system, will offer faster throughput, bigger memory, and four or five models, a CDC source revealed. In another sensible but

LOOK AHEAD

long overdue move, CDC will soon offer Plato computer-based education courses to its Cyber series users. Instead of buying Plato courses via CDC's computer service, users can buy the software and run it on their own cpus.

DATAPOINT DOWN IN THE DUMPS?

Loaded down with the TRW-Europe distributor acquisition, a broad range of new products to support, and an "aging backlog," Datapoint faces a very difficult year, Wall Street forecasts. Is Datapoint too early to market with its integrated office offerings, wonder analysts. "Indeed, we wonder if Datapoint is doing all that is needed to ensure that its bread and butter ddp business is being well supported on an ongoing basis," said Sy Kaufman, a general partner with Hambrecht & Quist. As for new products, plans are to introduce a low-end 8-bit system in the $15,000 range, rounding out the bottom end of the product line, and evaluations continue on an optical disk storage unit.

MORE ON LOCAL NETWORKING

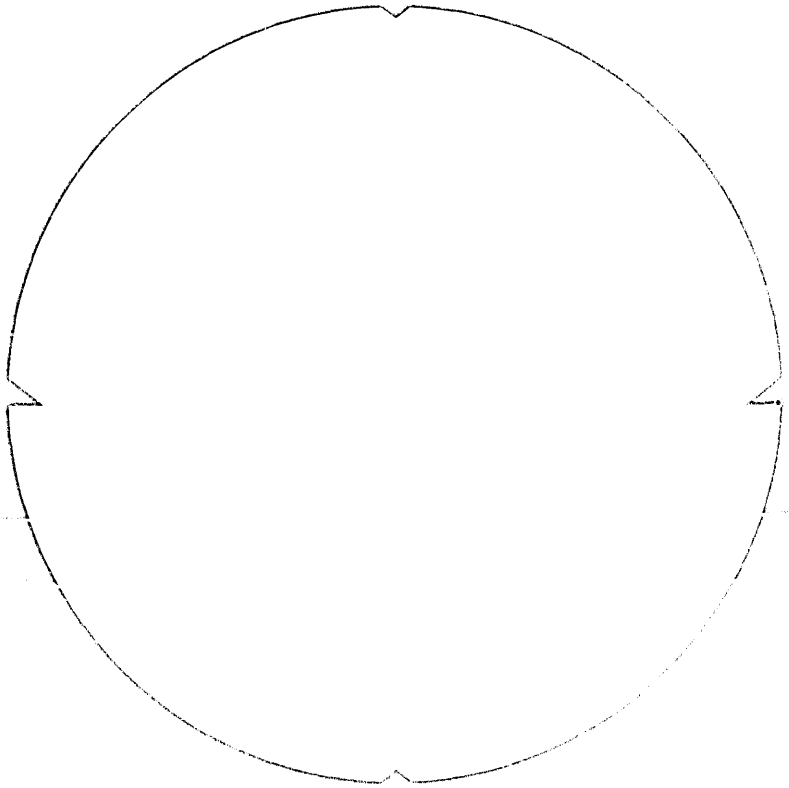
Wang Labs is said to be losing some of its best broadband networking engineers to neighboring companies including none other than Ethernet-backer DEC. It seems they find it hard to work under Dr. An Wang. DEC, we hear, is perhaps not as solidly behind the baseband Ethernet thrust as its partner Xerox would have the world believe. We also hear DEC has been talking broadband with a West Coast local networking firm and has approached AMD for broadband modem chips.

BABY BELL COURTS CBEMA

The first test of whether the world is big enough for AT&T and IBM won't come in the marketplace. It will occur in the new Capitol Hill HQ of CBEMA. The deregulated portion of AT&T is sure to join the trade group, in which IBM is a long-standing and powerful member, by the end of this month. AT&T was burning its wires with calls between Bell's James Olson and CBEMA's Vico Henriques early in the year. Events moved swiftly, culminating with an appearance by AT&T vp Archie McGill at CBEMA's spring meeting last month.

RUMORS AND RAW RANDOM DATA

Don't look for Univac's office automation offering to surface until June or later, say Univac insiders. The hardware is said to be on the mark, but there are software bugs....Bell Labs is said to have a supercharged version of the popular Unix operating system running on an IBM 3081 cpu....Teleram, which makes portable editing terminals for newspaper reporters, is soon to introduce a personal computer using bubble memories.



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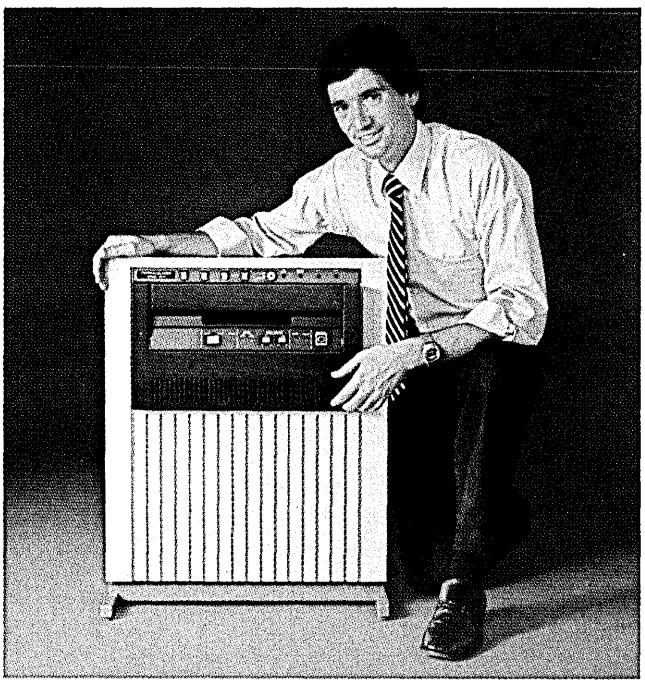
CIRCLE 4 ON READER CARD

There are two leaders in 32-bit minicomputers.

Perkin-Elmer is the one with the most affordable system ever. Announcing the new 3210.



The new 3210—a complete 32-bit minicomputer system for $49,900.

Perkin-Elmer, the company with the second largest installed base of 32-bit minicomputers, has just set a new pricing standard in the 32-bit marketplace—introducing the new 3210 at $49,900 (U.S. only). Our 3210 competes effectively with 16-bit top-of-the-line systems and offers much more performance.

Just 30 inches high, the 3210 is a complete computing system. Its integrated cartridge disc drive, with both fixed and removable storage, offers complete capability for software distribution, on-line file flexibility, data transfer and system backup. And the 3210 can support up to 32 terminals, with provision for field expansion.

You get as much as 4MB of directly addressable memory. And the 3210 runs all our system software including such high-level languages as FORTRAN, COBOL, Pascal, Basic II and RPG II. Application and software development packages, such as UNIX* and RELIANCE, as well as hundreds of third-party application packages can save you time and money.

And Perkin-Elmer offers the high-level service and support you'd expect from a $1 billion, multinational, Fortune 500 company.

There may be two leaders in 32-bit minicomputers. But Perkin-Elmer is the one that gives you the most. In performance. In software. In overall value. Call or write for details.

Perkin-Elmer, Oceanport, NJ 07757.
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We're the one.

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PERKIN-ELMER

CIRCLE 15 ON READER CARD

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Help users help themselves. That's the idea behind IBM's Information Center, where the data processing department will provide and maintain tools to allow users to retrieve, analyze, manipulate and present data (including textual material) more effectively.

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CIRCLE 16 ON READER CARD

CALENDAR

APRIL

International Symposium on Local Computer Networks, April 19-21, Florence, Italy.

Sponsored by IFIP. Conference topics are operating systems, performance evaluation, architecture, protocols, integrated voice and data, VLSI technology, and applications. The program includes a product exhibition. For openers, there will be a welcoming party in the Palazzo Vecchio. Contact Terry Parsons, Olteco-Olivetti Telecommunications, 10062 Miller Ave., #204, Cupertino, CA 95014. (408) 996-8128.

Hanover Fair '82, April 21-28, Hanover, West Germany.

Over 5,600 companies from 50 different nations will be exhibiting at this year's fair, which features an energy theme. Contact Hanover Fairs Information Center, P.O. Box 338, Salem Industrial Park, Whitehouse, NJ 08888, (800) 526-5978.

Info/Manufacturing '82, April 27-29, Chicago.

Called the "Information Management Exposition and Conference for Manufacturing," this show is billed as the only event devoted exclusively to manufacturing corporations. Contact Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017, (212) 661-8410.

MAY

ASM Annual Conference, May 2-5, Kansas City.

The program offers a "solid mix of current dp and systems topics," plus two special seminar series on systems planning and principles of productivity. Contact the Association for Systems Management, 24587 Bagley Rd., Cleveland, OH 44138, (216) 243-6900.

Computer Aided Quality, May 11-14, Baltimore.

This conference and expo is dedicated to the application of mini, micro, and mainframe computers as well as microprocessors and programmable controllers to improved manufacturing quality. Contact Robert Waterbury, CAM-I Inc., 611 Ryan Plaza Dr., Suite 1007, Arlington, TX 76011, (817) 265-5328.

Graphics Interface '82, May 17-21, Toronto, Ontario.

The National Computer Graphics Association and the Canadian Man-Computer Communications Society cosponsor this conference and exhibition. Contact Rich MacKay, DataPlotting Services, Inc., 160 Duncan Mills Rd., Don Mills, Ontario, Canada M3B 1Z5, (416) 447-8518.

Europe Software '82, May 25-27, Utrecht, The Netherlands.

The show is limited to software and services, with hardware only permitted to demonstrate the software. Again this year there will be a separate U.S. exhibition. Contact John Ferchak, U.S. Department of Commerce, International Trade Administration, Foreign Commercial Service, American Embassy, Lange Voorhout 102, 2514 EJ, The Hague, Netherlands.

Trends and Applications 1982: Advances in Information Technology, May 27, Gaithersburg, Maryland.

This one-day symposium will be held at the National Bureau of Standards in Maryland, and will be cosponsored by the Institute of Computer Sciences and Technology, NBS, and two branches of the IEEE. Contact the IEEE Computer Society, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

JUNE

NCC, June 7-10, Houston.

More than 600 exhibiting firms and 80 technical sessions will be found this year at the Astrodomain. Pioneer Day will honor the developers of FORTRAN. Contact AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3610.

World Computing Services Congress III, June 20-23, Copenhagen, Denmark.

Computer service firm reps from around the world will gather to discuss issues relating to the computer services industry and participate in workshops on international trade, management, and technical issues. Contact Thomas Farewell, ADAPSO, 1300 N. 17th St., Arlington, VA 22209, (703) 522-5055.

Syntopican X, June 21-24, Kansas City.

For Syntopican's 10th anniversary, the conference will focus on the key role of the new information manager. Contact IWPA, Conference Services Dept., 1015 N. York Rd., Willow Grove, PA 19090, (215) 657-6300.

COMDEX/Spring '82, June 28-30, Atlantic City.

This annual event is especially geared toward the needs of small system vendors and their ISOs (independent sales organizations). Contact the Interface Group, P.O. Box 927, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

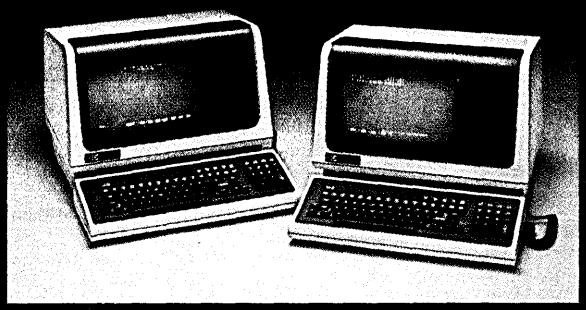
Videotex '82, June 28-30, New York City.

The conference will examine the several areas deemed most important for videotex expansion. Special emphasis will be placed on meeting the challenge of marketing videotex in the U.S. Contact E. R. Dawe, On-Line Conferences, Ltd., Argyle House, Joel St., Northwood Hills, Middlesex, England, 011-44-9274-28211.

JULY

ACM SIGGRAPH '82, July 26-30, Boston.

The first two days of SIGGRAPH will feature courses on computer graphics from introductory to advanced levels, while the last three days will concentrate on technical sessions. Contact Elaine Sonderegger, P.O. Box 353, Derby, CT 06418, (203) 735-9980.



Now you don't have to wait for the video terminal you want. C. Itoh's growing family of high-performance video terminals won't leave you waiting for delivery. Or wanting for features.

Our CIT 101, for example, is available right now and not only emulates DEC's VT 100, but gives you far more flexibility and reliability – all for less money! You get 20% faster throughput. Standard 80/132 column performance (24 lines either way). Standard Advanced Video for VAX Edit word processing. And standard expansion card cage for maximum versatility. You also get dozens of other useful features DEC® doesn't offer.

If you need an entry level 80-column terminal, we have that too. No waiting, of course. Our CIT 80 has all the important features of DEC's VT® 101, costs less and includes a long list of most-wanted extras the VT 101 doesn't have. Things like tutorial soft setup, 19.2K baud communications, true half-duplex operation and much more. For increased versatility, there are power supply options and CRT phosphor options.

Both terminals feature modular construction and standard off-the-shelf components (no custom, hard-to-find LSIs are used). And unlike DEC, each is ergonomically designed to reduce operator fatigue.

You get all this performance and flexibility, plus one other important extra: C. Itoh reliability. You see, C. Itoh's quality standards are the highest in the industry. That's because every C. Itoh terminal must pass a variety of tough tests. Including board tests, power supply tests, sub-assembly tests and a punishing series of temperature, vibration and noise tests that weed out any marginal performers. That's why we're not surprised when field failure rates come in at under 1% – far below the industry average.

So get what you want when you want it with the CIT 101 and CIT 80.

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CIRCLE 17 ON READER CARD

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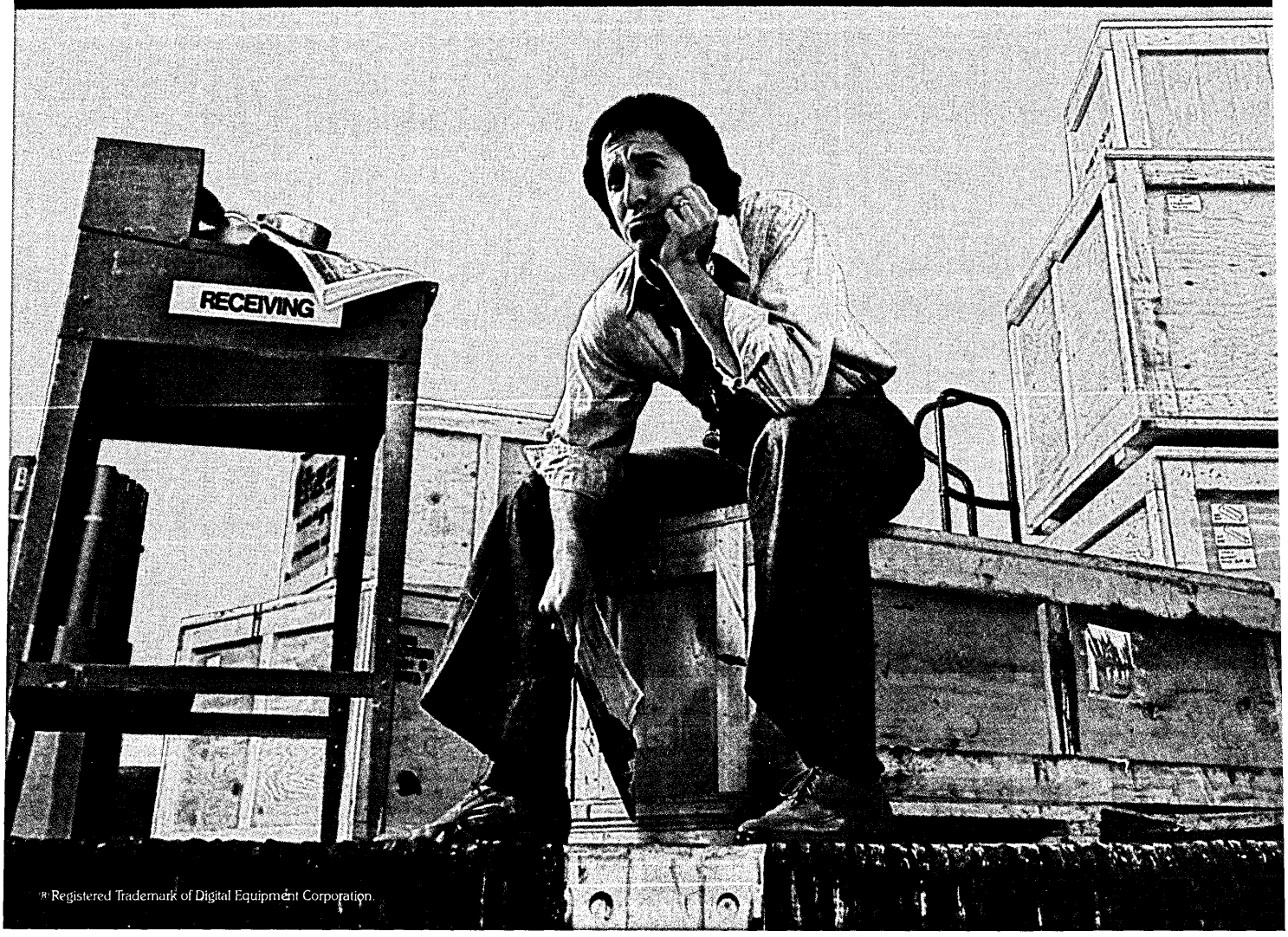

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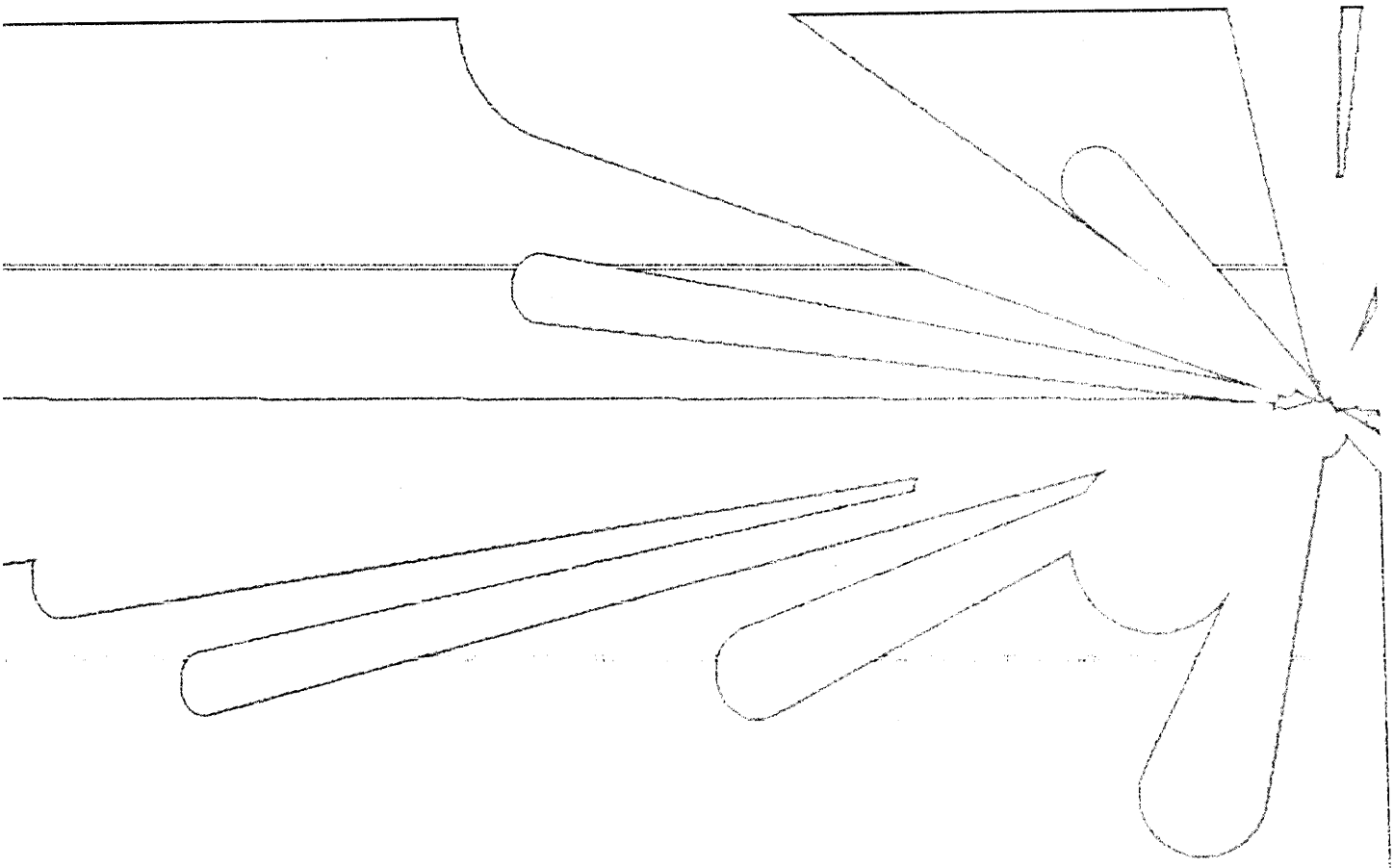
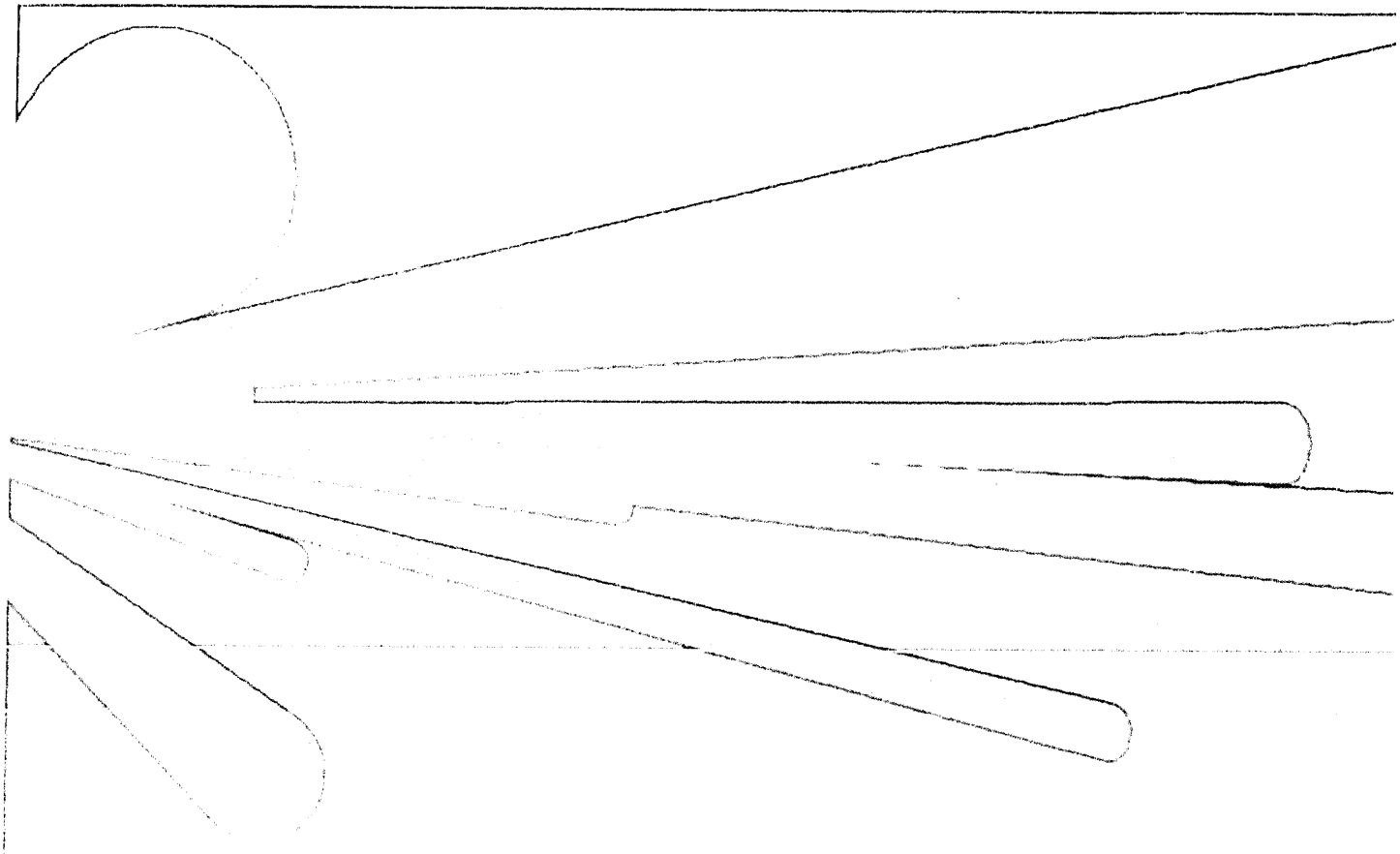


The cluster you can shape to the moment.

Change has become a universal constant in business. How quickly your company adapts to it can determine productivity and profits.

The Bell System recognizes this need for flexibility in an area particularly sensitive to change—the terminal systems you use to manage information.



Our Dataspeed® 4540 terminal system fits into your current operating procedures and adapts readily to future changes.

The system is 3270-compatible, installs easily, is fully modular. Its cluster controller interconnects as many as 32 terminals (8 can be printers). Displays may be located up to a mile away, printers up to 2,000 feet.

The general-purpose display stations are human-engineered for high productivity and low operator fatigue. Screens tilt. Keyboards come in five arrangements and are interchangeable. Display characters are crisp upper and lower case. A variety of printers is available to meet the exact needs of your system.

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We're ready to discuss a step-by-step program for fitting our terminal system to your needs. To arrange an exploratory meeting with your key people and a hands-on demonstration, call your Bell System Account Executive.

The knowledge business

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PRIME
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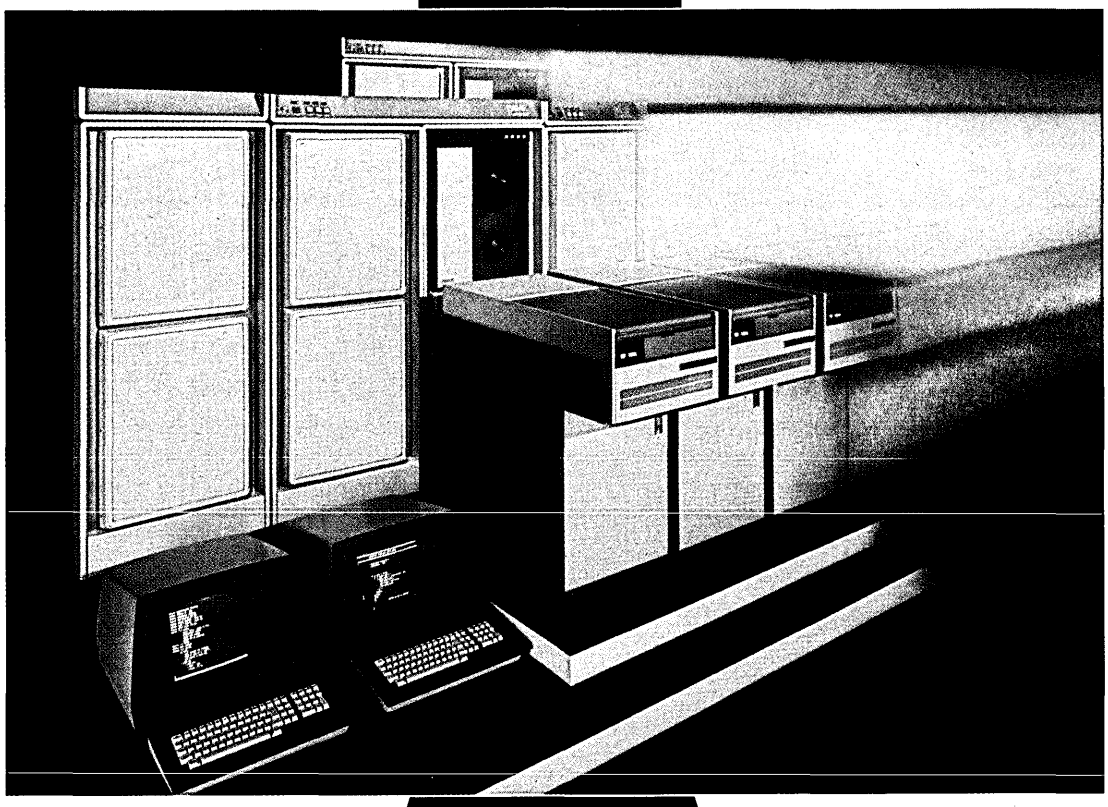


CIRCLE 19 ON READER CARD

LETTERS

AN ERROR OF OMISSION

In your recent survey of computer software ("Users Judge Systems Software," December), you failed to include National CSS Inc.'s operating system offering, VP/CSS. It is available as a licensed in-house timesharing system as well as on National CSS's commercial timesharing network.

VP/CSS is currently being licensed by five major U. S corporations, running on up to six mainframes at each company. Over 8,000 users now utilize this operating system as an in-house service. It is on-line at five commercial timesharing installations, 10 in-house, licensed sites, and on 40 minicomputers.

JOHN W. NELSON
Branch Technical Manager
Western Systems
National CSS
San Francisco, California

NOSTALGIA

Many thanks for the article on the IBM Stretch Computer at Brigham Young University (In Focus, January). I received my BSCS from BYU and, while there, spent one pleasant summer working as a computer operator for the Stretch. I consider that experience an important part of my education for two reasons. First, it gave me a tremendous appreciation for just how far and how fast our computer technology has advanced; I still tell my friends about the room-long cpu and the 1 MB disk platters that were 3 ft. in diameter. Second, and perhaps more important, it taught me that "newer" does not always mean "necessary" or even "better." After all, how many computers today can be programmed to spell out TILT using that marvelous 3000-light maintenance panel?

BRUCE F. WEBSTER
Principal Programmer/Analyst
Monitor Labs, Inc.
San Diego, California

INCREASING THE STAKE IN MIS

The semantics of MIS (management information systems), as used in "The Changing Role of the Data Processing Manager" (January), has always bothered me, in that it smacks of a special elitists' system, unavailable to help the Great Unwashed. If "It will take more than the same old song and dance to move MIS execs out of the chorus and into the limelight," then I'd suggest you use a ploy (first laid on me by Dave Methvin, president, Computer Automation) based on the notion that the key to good results is an accurate and up-to-date database. If the system were called an "Information Management System," and if it were designed to help the "taskworker" (a buzzword used by human resource types to mean the person "turning the crank," whether it's a vice president allocating a budget or a janitor filing a report) get the task done more easily, then it is highly likely that "all the little taskworkers out there" would bring a little happiness to the manager using the system by having (surprise) a stake in an up-to-date database.

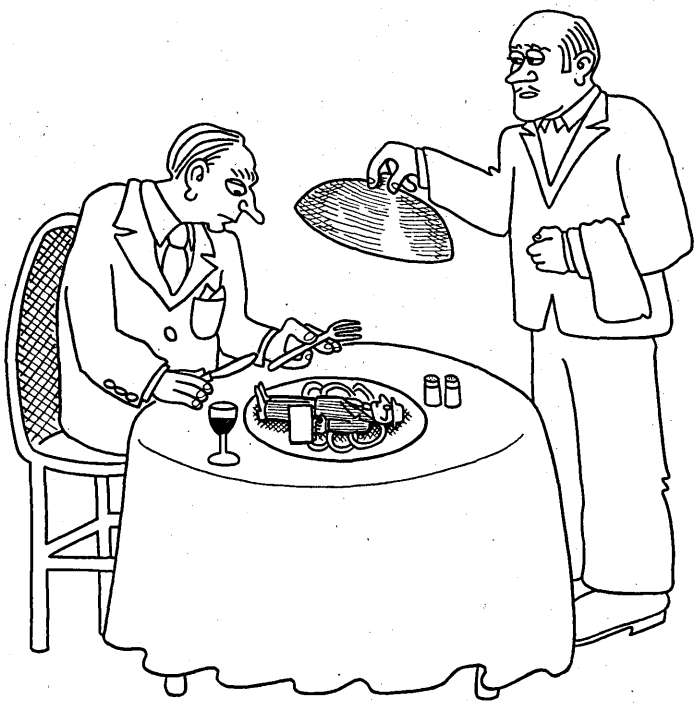
Needless to say, we number crunchers here have an "Information Management System"; you're welcome, byte shufflers.

C. N. WINNINGSTAD
Chairman
Floating Point Systems, Inc.
Portland, Oregon

I am dismayed to find myself characterized as one who ". . .complains that experienced end users are now competing within his organization for computing resources, and as a result, he no longer has the same authority." This is an irresponsible distortion of my views and reflects exactly the kind of parochial attitude which enlightened managers should be trying to overcome.

My comments to the interviewer went approximately as follows:

Many data centers encounter very heavy production volumes and tight schedule deadlines. In these situations there is con-



"Here you are, sir, the Executive Special."

CARTOON BY T.O. SYLVESTER

© DATAMATION

siderable risk in having experienced end users on-line, especially where users must have access to production data. Such users can impose heavy unexpected demands on the equipment, and production schedules can be threatened as a result. One of the challenges for the dp executive in this situation is to develop architectures (both hardware and software) which facilitate end-user access to production data while assuring that production schedules can be maintained.

I am unable to comprehend how this concern was garbled into a concern for "authority."

RALPH D. LOFTIN
Vice President, Data Processing
Blue Cross Blue Shield
Boston, Massachusetts

POWERING UP

As president of the actual selling entity for two of the three sites mentioned in News in Perspective ("Don't Get Burned By Brownout," December), I would appreciate the opportunity to clarify concerns about power problems in general and the Airmotive and Westlands Bank installations in particular.

The only way to tell if you have a power problem is to conduct a grounding/wiring and power quality survey. Without properly connected instrumentation there is no way to "see" a transient, sag, surge, or a frequency deviation in the course of normal daily operations. The only directly observable power problem is a power interruption (blackout).

We counsel our clients that the first thing to do, before spending money to purchase power protection equipment to solve an (unspecified) power-type problem, is *determine what the problem is*. Evaluations need to be made of both the computer wiring/grounding system and the power service quality. Hardware alone cannot solve computer power problems. Standalone power line analysis will not define wiring and grounding problems. Safe system grounding and wiring systems are critical to reliable operations.

Power problems are system problems. They can be defined and resolved using analytical, troubleshooting methods. Power problems are solved by addressing two separate, equally important and closely related areas: safety/code, grounding, wiring problems, and power quality problems.

The bottom line is this: power problems are complex. All power conditioning devices and installations are not the same. Throwing hardware at an (unknown) problem may or may not fix it. Plugging "it" in, walking away, and expecting instant resolution of grounding and power quality problems is not realistic. Properly installing power conditioning equipment to provide a guaranteed solution can be just as big a task as problem definition.

ED MUXO
President
Computer Power Solutions, Inc.
Placentia, California

THE FIFTH GENERATION: A BLEAK OUTLOOK

In "Tokyo Looks to the '90s" (January), once again the proposed solution to the computing problems of the 1990s is a massive development effort during the 1980s to design a huge machine based on AI and VLSI. It does not seem from the (admittedly brief) description given that this innovative computer will really address the social needs of the '90s touched on by Hajime Karatsu.

Many futurists foresee a world in which the mass society that Japan so epitomizes, with its needs for centralization and bigness, will wither away due to scarce and expensive energy, dwindling natural resources, and aging industry. Where, in such a world, is the place for the fifth generation machine described?

To what purpose will continuing education be put in a society where large segments of the educated as well as the uneducated population remain unemployed for years on end? How are computers in schools to lower the dropout rate? Here in

THERE'S ALWAYS ROOM FOR ANOTHER VIEWPOINT

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CIRCLE 20 ON READER CARD

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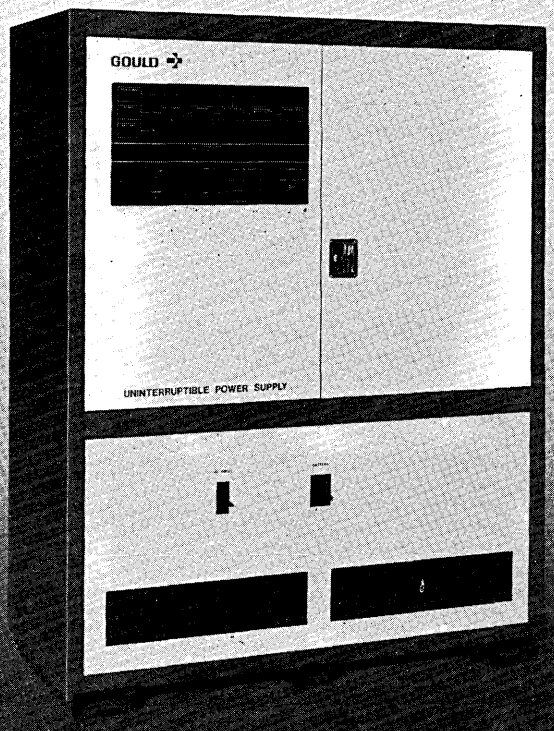

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CIRCLE 21 ON READER CARD

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THE DATAMATION INSTITUTE

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May 3-4, **Strategic Planning for Information Systems,** Chicago, Sheraton Plaza
May 3-4, **Computer Graphics,** Seattle, The Seattle Hilton
May 3-4, **Local Area Networks,** Cambridge, MA, Faculty Club
May 4, **Business Graphics,** New York City, The Harvard Club
May 6-7, **The CAD/CAM Revolution,** Seattle, The Seattle Hilton
May 6-7, **Systems Design in a Data Base Environment,** New York City, Vista International
May 7, **Financial Management's Use of Computer Graphics,** New York City, The Harvard Club
May 10-11, **Data Base Management, New York City,** The Harvard Club
May 10-11, **Systems Analysis,** Cambridge, MA, Faculty Club
May 11, **Management's Use of Computer Graphics,** Atlanta, Southern Conference Center
May 11-12, **Data Dictionary/Directory Systems** (DD/DS), New York City, Vista International
May 12-13, **Systems Design,** Cambridge, MA, Faculty Club
May 13-14, **Management Skills for First-Line DP Supervisors,** Washington, D.C., L'Enfant Plaza
May 13-14, **Measuring and Improving Programmer Productivity,** Washington, D.C., L'Enfant Plaza
May 13-14, **Integrating Word Processing and Data Processing,** Washington, D.C., Sheraton Washington
May 17, **Decision Support Systems,** Boston, The Harvard Club Downtown
May 17-18, **Demonstrating DP Department Performance to Non-DP Management,** New York City, Halloran House
May 17-18, **Applications Software Packages,** New York City, Vista International
May 17-18, **Data Communications: Concepts/Management Overview,** New York City, The Harvard Club
May 17-18, **Data Communications: Analysis, Networks, Designs,** Atlanta, The Southern Conference Center
May 17-18, **Improving Your Leadership and Management Skills,** Dallas, The Fairmont Hotel
May 17-19, **Network Design,** New York City, Vista International
May 19-20, **Distributed Systems: Concepts/Management Overview,** Washington, D.C., The Washington Hilton
May 20-21, **Data Base Management Systems: Comparative Evaluation,** Cambridge, MA, Faculty Club
May 24, **Slashing Telecommunications Costs and Improving Service,** San Francisco, Pacific Plaza
May 27-28, **DP Project Management,** New York City, Vista International

JUNE

June 1-2, **Writing Skills for DP Professionals,** New York City, The Harvard Club
June 7-8, **Management of Software Engineering,** The Southern Conference Center
June 7-8, **Project Management,** Washington, D.C., The Shoreham
June 7-8, **Integrating WP and DP,** New York City, The Harvard Club
June 12-22, **Data Communications: Analysis Networks, Design,** Cambridge, Faculty Club
June 14-15, **Local Area Networks,** Washington, D.C., Sheraton Washington
June 14-15, **Data Base Management Systems,** Atlanta, The Southern Conference Center

To receive further information, please contact Jill Kemp at the Datamation Institute Seminar Center at 850 Boylston Street, Suite 415, Chestnut Hill, MA 02167, or call (617) 738-5020.

LETTERS

the United Kingdom severe cuts in education spending coupled with already high unemployment are already creating a generation of chronically unemployed graduates and at the same time eliminating upper secondary and university places for otherwise qualified and deserving potential students, who are, in any case, unable to find regular employment. Where are the opportunities in a fifth generation machine, such as the one described, for individuals or small groups to find useful employment (paid or otherwise), conduct small local businesses or projects, and otherwise protect their dignity from the stigma of social uselessness?

As for creating a system which will "allow us to make proper use of nonnumeric information. . ." so that ". . .we can use qualitative value judgments in our decision-making," isn't that what managers, elected and appointed officials, and bureaucrats are chosen for and paid to do? If qualitative judgments are not a part of current decision-making, we must ask why, and ask whether, if we cannot do this for ourselves, we should leave it for even the most intelligent machine to decide.

LAURIE S. KELLER
Lecturer in Computer Science
The Open University
Milton Keynes, England

FOR WHOM THE MACHINE TOLLS

In Tim McGinnis's Readers' Forum article, "The Toll of a New Machine" (January), he leaves the impression that I retired permanently to Mexico after designing the all-important heating element of the Parakeet toaster. In fact, I left Toasta General to become principal designer of SkilletVision's new Advanced Toasting System, or ATS, also a 32-slice toaster.

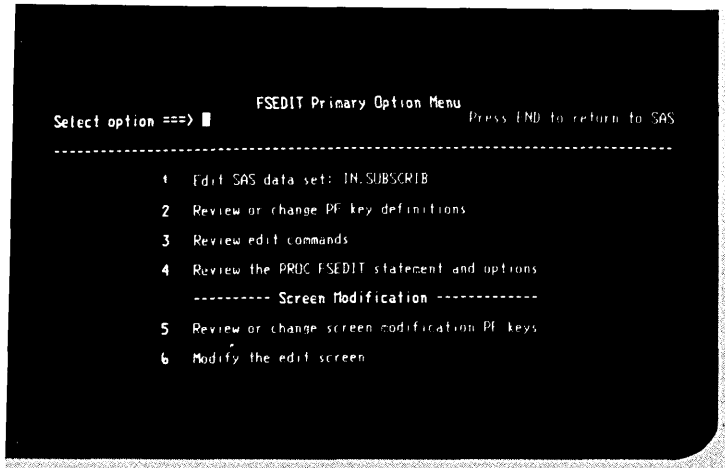
At Toasta General I had a considerable amount of friction with both Buzz North and Ed Mazola over my state-of-the-art toasting concepts. At SkilletVision I was able to put these ideas into effect in the new ATS. The ATS uses magnetically controlled plasmas to obtain temperatures of over 5 million degrees. As a result the ATS can toast 32 slices of bread in a mere 225 nanoseconds for a aggregate throughput rate of 142.2 million slices per second, nearly 20% faster than the Parakeet.

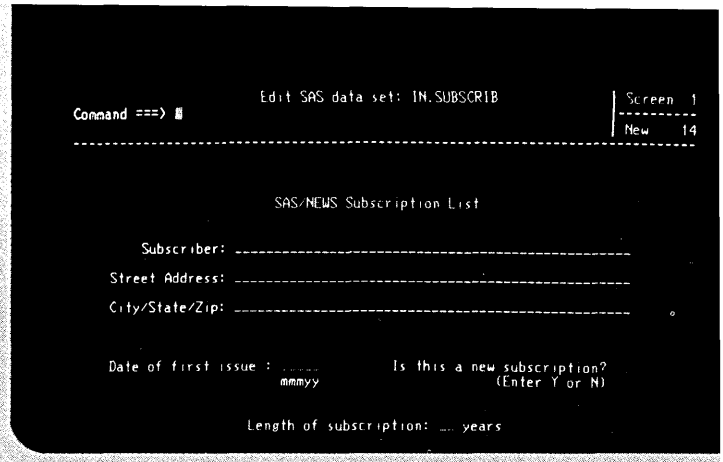
SkilletVision is now at work on a toaster oven which will obtain temperatures of over 10 million degrees and be able to cook a nine-pound roast in under a microsecond; we believe that this product will bring about a kitchen revolution no less important than the variable speed blender.

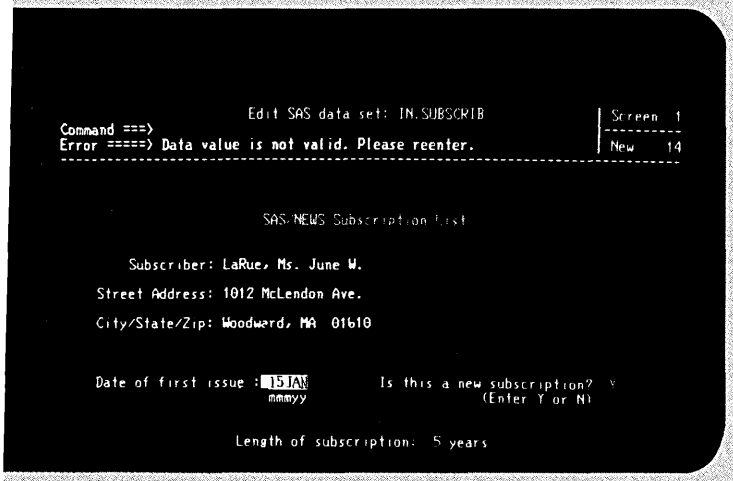
DARYL WEBSTER
Manager of Toaster Development
SkilletVision Corp.

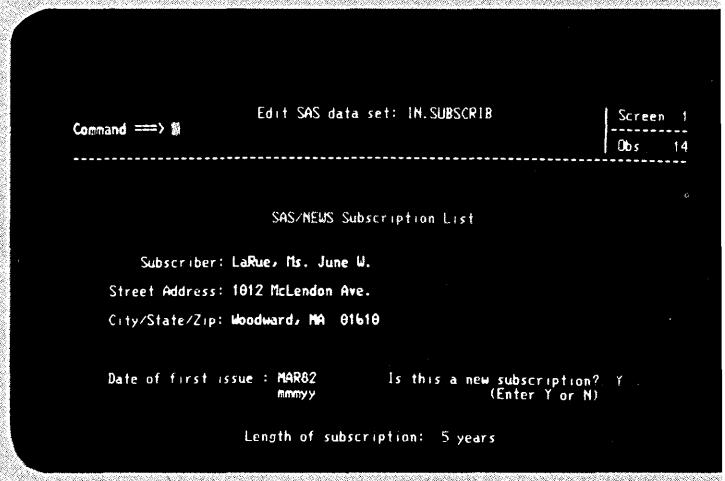
Daryl Webster can be contacted through Joshua Rosen (former Hardy Boy), Manager of Processor Development, Computervision Corp., Bedford, Mass.—Ed.

CIRCLE 22 ON READER CARD









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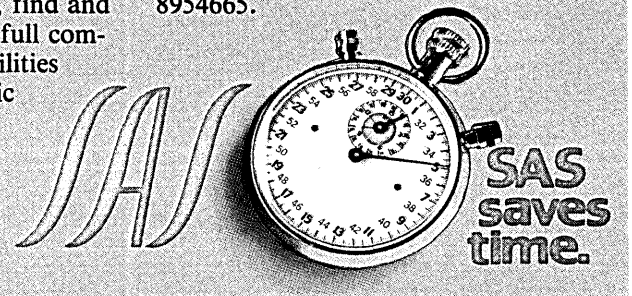
SAS products run on IBM 360/370/30xx/4300 and compatible machines, in batch under OS and OS/VS, and interactively under VM/CMS and TSO. Coming soon: SAS products under DOS/VSE.



CIRCLE 23 ON READER CARD

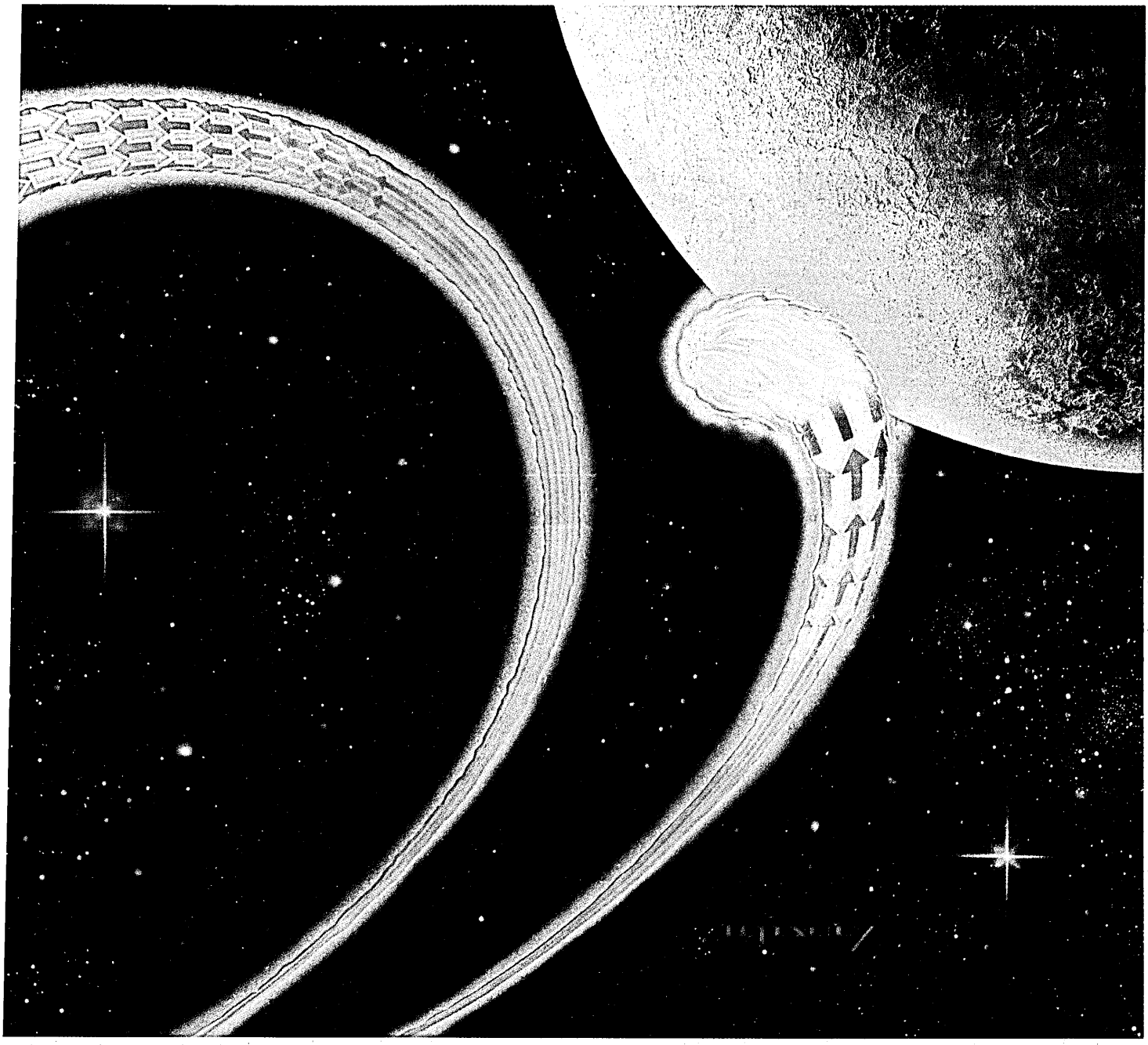
We're launching a new beginning in MIS systems...

A new direction and bright future for the industry's top professionals.

Beginnings. Nowhere is today's excitement and tomorrow's challenge more clearly reflected than in the new beginnings of MIS at National Semiconductor.

The excitement: a competitive edge through state-of-the-art information processing. When our new worldwide MVS network goes on-line, MIS at National will become more available, more efficient, more streamlined than ever.

The challenge: to support National's industry leadership position with the most effective worldwide MIS systems, communications and data services in the industry.



Our proposed network is already taking shape—worldwide MVS and program product support; SNA; CICS/IDMS for communications and database management; Information Centers for user-friendly products; and AS/9000 and 7000 class systems for total computing support.

To sustain our momentum, we need more tomorrow-minded professionals—MIS pro's with the desire to join a fast-track team.

We need more ideas. And we've found that the best ideas are conceived in an environment conducive to creative freedom and open participation. When you have something to say, we'll listen.

If you're a talented MIS professional, discover the challenge and excitement of new beginnings in MIS at National. Explore exceptional career opportunities for managers, project leaders, database administrators, MVS and SNA systems programmers, programmer/analysts, systems analysts and operations professionals.

Send your résumé in confidence to C. J. Liang, Professional Staffing, National Semiconductor, P.O. Box 60879, Sunnyvale, CA 94088. We're an equal opportunity affirmative action employer.

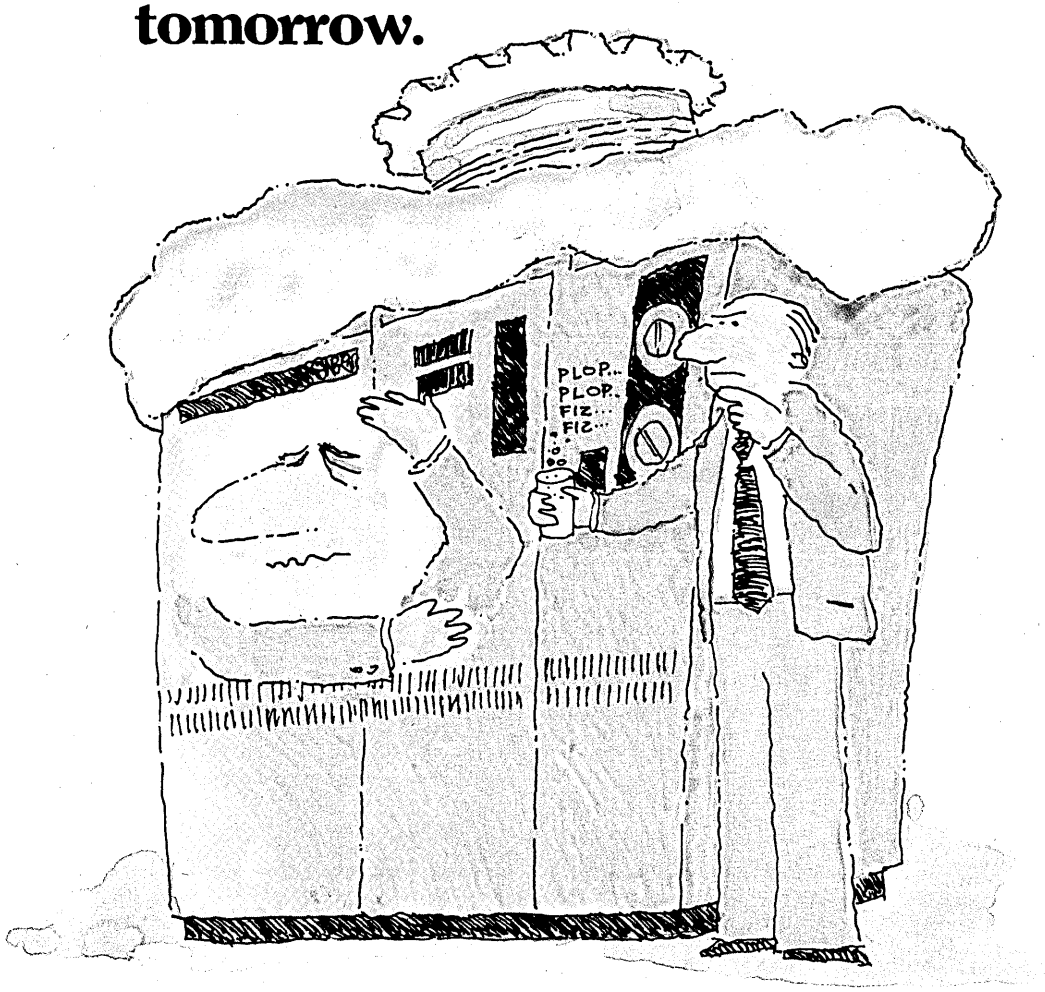
National Semiconductor

Beginnings with National MIS

CIRCLE 24 ON READER CARD

Some data base management systems are like cheap wines.

Unpleasant today and a headache tomorrow.



To avoid such disappointment, consider ADABAS from Software AG. It's the DBMS you can count on to live up to your expectations—now, and in the years to come.

ADABAS can be enjoyed immediately. There's no installation delay because there's no need to predefine all the rules for data usage or to preestablish all possible data relationships. ADABAS' inverted list architecture lets you access data directly and immediately. You can install the system and begin to load your data in just one day.

The more you use ADABAS, the better it gets. The way ADABAS stores data takes the headache out of dealing with change. By completely separating the data and index structures, ADABAS lets you change the way to view data without changing the way the data is stored.

ADABAS can be used for any occasion. It contains DBMS access tools for virtually all corporate information needs. Included are: ADASCRIPT+, an online inquiry language; ADACOM, a batch report writer; ADAMINT, a host language interface; and an integrated, online data dictionary. For instant application development, you can add NATURAL, our program development language, and cut development time up to 90%.

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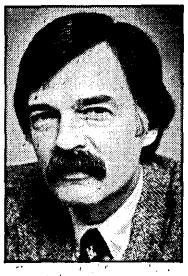
CIRCLE 25 ON READER CARD

John L. Kirkley, Editor

EDITOR'S READOUT



BIG BLUE VERSUS MA BELL

Will it be the clash of the titans or the waltz of the toreadors?

Will it be a mammoth slug-fest between giants or a series of territorial maneuvers as formal and as bloodless as a minuet?

Will the much-heralded struggle between IBM and AT&T be as big a bash as the press has indicated?

The answer is, of course, yes and no. Events surrounding organizations of this size and complexity are never clearcut. But that doesn't stop our penchant for speculation, and April, the traditional month for foolishness, is a good time to indulge that inclination.

First, we would comment that all of you who are waiting for a battle royal will have to wait a little longer—perhaps three to five years. AT&T is, after all, much like a small nation, with a well-entrenched cultural heritage as a regulated utility, not as an aggressive, marketing-driven competitor. The remaking of Ma Bell's corporate ethos is not going to happen overnight.

But that doesn't mean there aren't going to be skirmishes along the front lines.

For example, as a glance at the back covers of DATAMATION over the years will testify, AT&T has been competing with IBM in the terminal market through Teletype for a long, long time. And it's in terminals, or in Bellanese, "customer premise equipment," that the first major battle will take shape. Voice and data are coming together, and when the crt and the telephone are really combined into one functional, digitized unit, the face-off will be in earnest.

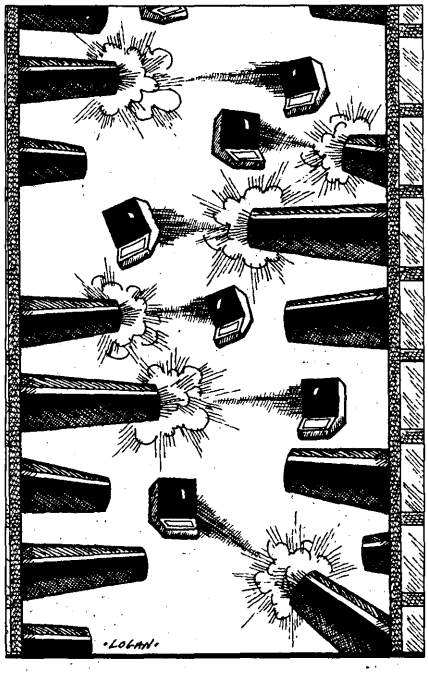


ILLUSTRATION BY RON LOGAN

Another major bone of contention will be the as-yet-untapped office systems market. Surely both giants are working on a highly evolved PABX, an electronic Computerized Branch Exchange (CBX) that will turn the office automation hype into reality.

Then there's the succulent services business. IBM has already stuck a toe back into the water with that vanilla offering out of Tampa. AT&T is trying to get permission to sell yellow pages on-line, clearly a services offering. But AT&T also has all those long distance lines in place; what a deliciously simple way to get into the service bureau or timesharing biz in a big way and rake in massive amounts of money.

Now try on this bit of speculation for size. With those dollars AT&T steps up the tempo at Bell Labs. One of the Labs' biggest assets is Unix, a unique and widely accepted operating system around which AT&T and Bell can develop myriads of applications packages and proffer them over the services network. They then lock the users into Unix instead of VM or MVS. Having built a huge applications base, they take the next logical step—they develop Unix-based micros, minis, or perhaps even big expensive mainframes for corporate database work, and sell them to all those users.

Whether or not this scenario comes to pass, AT&T's entry into the information processing marketplace will impact many people and organizations.

For example, a whole rash of new pcms may spring up around AT&T in much the same way that they gather around IBM. And surely the entire marketplace will open up even further as both public and corporate consciousness are raised concerning information processing.

One of the winners in this contest is you, the information systems professional. More products, more competition, more alternatives, more solutions. Maybe your applications backlog will get down to months instead of years.

Perhaps this battle will be like the more civilized conflicts of yesteryear when the soldiers shot at each other during the day and drank together at night. But whatever the scenario, it will not be dull. *

DATA SECURITY

The first in a series of messages on advanced technologies from Honeywell Information Systems.

Preventing unauthorized access to data stored in computers is no longer an esoteric, back-room problem. The data is so valuable an asset that to have its integrity destroyed, altered or in some other way violated unintentionally or by artful programming can cause irreparable—even fatal—harm to an organization.

With any large, general-purpose timesharing system, the easy sharing of both programs and data would seem incompatible with security. Yet the three-dimensional data security mechanism in the Honeywell Multics system not only makes controlled sharing possible and convenient, but has earned Multics a reputation as the most secure, general-purpose system on the market.

The Standard Defense

Data security usually is provided by specialized (i.e. incremental to the basic system) operating software that controls the sharing of computer resources, programs and data. To prevent unauthorized access to data or programs, this operating software can use a set of tables listing the authorized users along with their access rights—such as read, write, execute. The operating system scans this table on each reference to a block of data. In theory, it's an unbreachable defense.

In practice, it's vulnerable, largely because operating systems—composed of many complex programs with frequent modifications and patches—contain errors. The more complex the system, the more patches and alterations it has and the more susceptible it is to exploitation.

Honeywell's Approach

Honeywell has reduced the complexities of the final software system. Multics was designed and developed so that its security mechanisms could grow without reorganization. Assuming at the outset that it was impossible to foresee all problems at the design stage, the Multics software was written to be easily redesigned (rather than patched) should problems crop up upon implementation.

Functions were added as subsystems, rather than modifications. As a result of these and many other design decisions, exploitable design flaws in Multics, for all practical purposes, are nonexistent—even though the current operating system has matured over many iterations.

Discretionary Access

As the first defense, Multics provides a discretionary access control mechanism consisting of a table that lists the names of those authorized (and denied) access to each and every file. This table, called the Access Control List (ACL), also lists the access modes—read, write, execute—allowed each user.

All authorized users also have a unique personal identification (ID) plus a project identification. The personal ID is authenticated by an encrypted password stored in the system. The encryption algorithm, however, is a one-way algorithm so there is no algorithm for recovering the encrypted password in clear form. When at log-in, the system requests the user's password, his terminal print mechanism or screen is automatically turned off

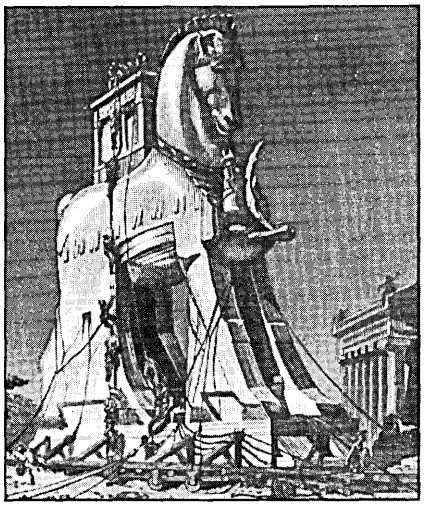
The call bracket defined by the ring numbers associated with each program is used to restrict the sequences in which programs can execute. In this example, the user operating in ring 6, references in turn programs A, B, C, and D, with ring numbers (6,6,6), (4,4,6), (2,5,6), and (0,0,4). When program A calls program B, the user's ring changes to 4, the highest and only ring number in program B's execute bracket. When B calls program C, the user's ring number remains the same. When B calls C and C calls D, the ring number changes temporarily to 0. The ring numbers of these programs prevent program A from calling directly to program D. The user must pass through program B, called a gate, to reach program D. The ACL and AIM settings on gates can be used to control access to inner ring programs and data, making it much easier to protect them from misuse. The bottom line is that the user is secure in the knowledge that the hardware and software mechanisms of Multics protect his programs and data from unauthorized access.

or masked, so that the password is never displayed. Passwords are controlled and can be changed by each user. Software tools can force users to change their personal passwords within a given time.

Non-discretionary Access

To prevent inadvertent (or intentional) release of data, the system also provides an extended access control system called Access Isolation Mechanism (AIM).

AIM protects against unauthorized release of data by assigning levels of classification to data files and levels of clearance to the user. It then matches clearances and classifications. For "read" and "execute" access modes, the user's clearance must be higher or equal to the classification of the data block. For "write" access, the clearance must match the classification.



AIM defeats the "Trojan Horse" ploy whereby a programmer hides within a legitimate, often-used program some additional code completely unrelated to the documented function of that program. That code, for instance, might search the storage system for data to which the programmer has no access.

Hardware Rings

The two security mechanisms are protected and further enforced by specialized hardware, called the Ring Mechanism, which makes Multics a uniquely secure repository.

Files dwell within rings, numbered from 0 to 7. The lower the number, the more privilege is conferred on the executing program and its associated files. A special hardware register keeps track of the ring number in which each user's application is executing. The ring number increases or decreases within the access mode limits set for each user as the application references different files. The limits set for each user are implemented in ring brackets: the read, write, and execute/call brackets.

User access to files is determined by all three mechanisms: ACL, AIM, and the ring brackets. The user can process a file only if he is permitted the kind of access authorized by the security mechanisms.

The ring mechanism also protects itself from attack. Ring numbers of files can be changed only by authorized users. The operating system checks every attempt to modify ring numbers to assure that the attempt is legitimate. The rings also protect the users' subsystems.

User Control

When an authorized user changes the protection modes on a file, these changes are reflected to all users of that file immediately. That is, access permissions and denials are dynamic and are re-calculated by the hardware with no loss in system performance during the execution of every computer instruction.

More on Data Security

For an in-depth paper on Multics Data Security call our toll free number 800-343-6294 (in Massachusetts call 617-552-2264) or write Honeywell, 200 Smith Street (MS 487), Waltham, Massachusetts 02154.

CIRCLE 26 ON READER CARD

IN FOCUS

NEW WAYS TO WRITE WRITS

Attorneys want a preponderance of evidence to prove that computers can help close the case.

Farewell to those 8½ × 14 lined pads. Au revoir to the stacks of research tomes written in indecipherable legalese. No more hours, days, or weeks spent buried in the library catacombs. Just push the button and see everything you wanted to know and no longer have to ask.

On the left side of the terminal screen, your client's file. On the right, the subject of his immediate presence. While he's talking, you're drafting. After an hour, voilà! A revised Exhibit A.

"That will be the ultimate in lawyers using computers," says Peter Guiliani, principal in charge of Arthur Young's consulting practice for New York law firms. For sure. What lawyer wouldn't want instantaneous research and writing at his fingertips?

For those who do, nirvana is more than a terminal or two away. But based on the remarkable progress law firms are making to join the 20th century, it is not inconceivable that a decade hence split screens will be the order of the day.

"Lawyers are extremely reluctant to jump on the computer bandwagon," contends J. T. Westermier, a Washington, D.C., attorney and leading consultant in the use of computers by his colleagues. "The profession is generally reluctant to deal with change. They don't deal well with matching up-front costs against long-term gains. And lawyers are not good at strategic business planning, much less strategic information planning.

"Most lawyers view their profit-making resources as the people in the firm. If it's a choice of installing a litigation support system [LSS] or putting 1,500 paralegals on the job, they'll go with the paralegals. By doing things primitively, they can make more money—as long as the client is willing to pay for the method."

"The innate conservatism of lawyers has been a serious problem in automating their practices," says Carl Liggio, general counsel of Arthur Young, the accounting firm that is one of the leaders in helping lawyers computerize their businesses. Liggio's department in his employer's New York headquarters is well automated, "but not nearly as much as I'd like or as it ought to be," he says.

"Lawyers are extra cautious and extra slow," Liggio maintains. "The hardest thing is getting them off their duffs to make a decision."

Until the late 1960s, the profession sat on that collective portion of its anatomy. While other businesses—and it is beyond a reasonable doubt that the practice of law is clearly a business—leaped into the 21st century, law firms rested in the 18th. Only in very special cases late in the decade did firms risk computerizing any piece of their practice. Then the deed was done through service bureaus, which converted manual input to computer reports. Of course, vendors weren't selling equipment for today's nickels and dimes.

By the early '70s firms began to scan their ledgers and found they did not like what they saw. Spiraling costs of discovering, deposing, and documenting were making manual systems of billing and filing losers rather than winners. As business grew more complex, so did practicing law. The trappings, entanglements, and accompanying costs of litigation increased geometrically. Some practitioners saw it was time for a change.

To help with the shift, along came minis and micros. These machines placed within economic reach of small and medium-sized firms that which had previously been restricted to large firms with deep pockets and ready assets. Foresighted attorneys could see the future, and it was hardware and software.

"If it's a choice of installing a litigation support system or putting 1,500 paralegals on the job, [attorneys] will go with the paralegals."

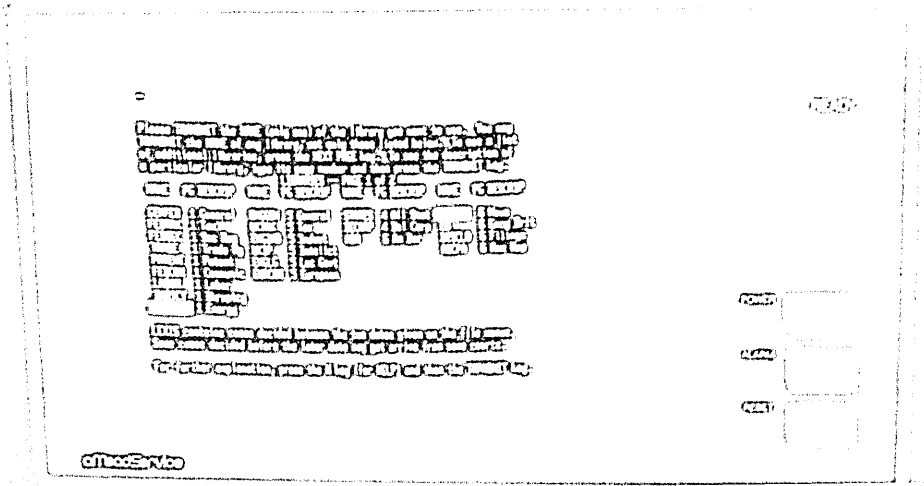
But their vision was clouded by dollar bills—not the ones they didn't have, but the ones they didn't want to spend. A partner drowning in paper will not necessarily see a mini or micro as a life raft. Better he should submerge under endless 35-page memos than surrender a penny of his surplus to Univac or Honeywell.

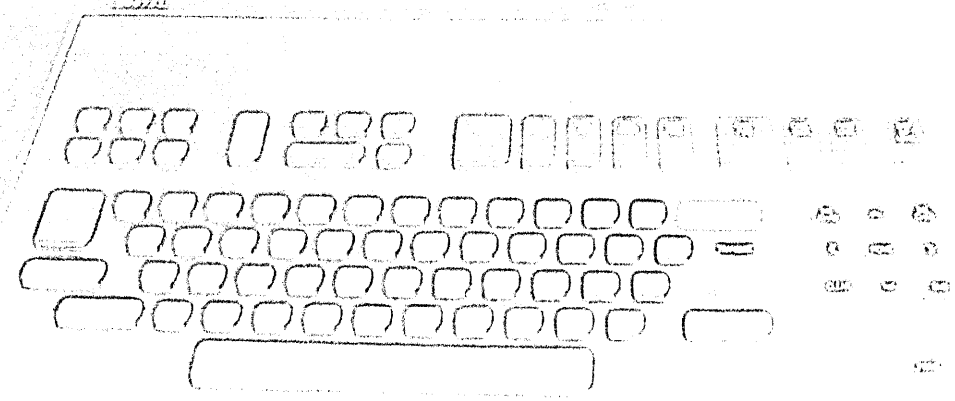
There were, however, some pioneers. Fran Musselman prodded New York's prestigious Milbank, Tweed, Hadley & McCloy to become the first on any block with a computerized data bank. Washington's Wald, Harkrader & Ross started thinking about taking the plunge in late 1975, the comparative dawn of legal computerization.

"We didn't have a choice," says director of administration Bob Schack. "The more information you have, the more your needs grow geometrically. There was no other way for us to handle it."

After thoroughly investigating the alternatives, the firm chose a Honeywell level 62 computer. It arrived in 1977, ready to cope with the demands of 35 lawyers and

PHOTOGRAPH BY PETER ANGELO SIMON





their support staff.

Now, with two tape drives, two 300-megabyte disk drives and three 80-megabyte disk drives, two programmers, and two keypunchers, the system supports 95 attorneys and 140 support staff. All programs—time and disbursements, general ledger, billable hours, production analysis, and an enormous LSS are among the more than 200 available—were developed in-house. Most firms, even those with resources as vast as Wald, Harkrader's, receive some outside programming help.

"There were no packages with the flexibility or programming capability we needed," Schack explains. "It was cheaper than going to a professional. But the person doing it damn well better know hardware.

"The firm took a supportive, wait-and-see attitude. They offered no resistance. They just wanted to be convinced that it would work. We sold them on the basis that we could do what we said and have it ready on time. We wanted a modest configuration that would allow us to upgrade and grow. We tried to design the system so we would not have to replace the mainframe between lease expirations."

Schack will have to replace the level 62 when its lease on life expires in 1984. He is planning to bring in a DPS-6. He will also have a more sophisticated database management system than the rudimentary DBMS currently used. By then Schack will also have some type of virtual or duplicate memory, traits conspicuously lacking in the present system. Does every lawyer have a terminal on his desk? "Definitely not," Schack says. "But they can get them whenever necessary. You're automating the business, not the profession. For the guts of the work, you don't need on-line automation for every attorney. You might someday. In the meantime, this system meets our needs very nicely."

There are similar positive vibes a few blocks away. There, Howrey & Simon, which represented Litton Industries in its successful antitrust case against AT&T, installed two years ago a Wang VS-100 system to provide an LSS and other financial services. Even Ma Bell recognizes the trend. A year ago the Washington office began using a computerized, in-house database that makes the company's legal research faster, easier, and less expensive.

Howrey & Simon uses its 16-terminal system for timekeeping and billing functions; it also has a sophisticated LSS.

"The database is highly useful in our particularized or specialized area of law, which is principally regulatory work," AT&T general attorney Donald King says. The birth of the database means the death of a 500,000-card, 68-year-old manual file that documents the company's legal history. Bet the house, dog, and kids that everything anyone ever wanted to know about rate increases is in there.

"It also eliminates the possibility of missing an issue," King says. "A brief may cover 10 subjects and you can only make five index cards." The database contains about 16,000 pages. The AT&T group plans to increase the file by 10,000 pages per year, and is putting on-line 14 terminals in addition to the 26 previously installed in Bell subsidiary offices. It also plans to computerize the drafting of standard legal forms and record the results of labor arbitrations.

Howrey & Simon uses its 16-terminal system for timekeeping and billing functions, now de rigueur for most medium and large firms, and recently implemented inventory control and records of recruiting activities. But that's not all, folks.

"On the client side," as partner Robert Ruyak, the method behind his firm's madness, delicately puts it, the LSS is child's play. The system allows in-house economists to perform regression analysis and other boring but vital statistical research functions, thus saving the considerable expense of retaining outside experts to provide nonlegal information. A "work product retrieval system" permits the firm to identify research already performed on a specific issue or client problem. Howrey & Simon also is developing a conflict-of-interest package that will eliminate their cross-referencing and quizzing of people about former clients and exhaustively perusing past billings.

"We committed to computerization two years ago because the big watchword of American industry is productivity, or cost-efficiency," Ruyak says. "You can't continue to up the fees just to keep pace with inflation. You've got to be as efficient and productive as possible.

"We honestly believe that corporations will start to hire law firms on that basis. We've got to be crazy to think they don't want production and efficiency from us. We want to have clients confident that we are playing the same [productivity] games they are. But law firms are very conservative in this area because it involves a substantial monetary commitment by the partners."

Sometimes only the party of either the first or second part keeps its commitment. For every Howrey & Simon or Wald, Harkrader, there may be a Pohoryles, Goldberg, Foster, Staton & Harris.

The firm was seeking to computerize its time and billing in 1979, when it had eight lawyers. A certified public accountant acquaintance told Lou Pohoryles about a fantastic package he had just purchased from someone who had chucked accounting for a consulting business. The lawyer couldn't wait to see his putative savior.

"He came in with a completely bound package of printouts for a hypothetical law firm," recalls Pohoryles, who now has 13 attorneys on his letterhead. "It was everything you wanted for time and billing and a bunch of other functions. I said, 'The

LET THE RECORD REFLECT

That any terminal screen appears in any law office is weighty testimony to the literal and figurative powers of the computer. Since the barons told King John they'd appreciate his being a little less regal and a lot more common, the law and its practitioners have suffered the slings and arrows of serious character assassination, particularly from the creator of some of the loveliest prose in English.

Let the record reflect the following from one William Shakespeare: "But in these nice sharp quillets of the law" (*King Henry VI*, Part I, Act II); "The first thing we do, let's kill all the lawyers" (Ibid., Part II, Act III). Two and a half centuries later, the law's lot had improved not a whit. "If the law supposes that, the law is an ass, an idiot" (*Oliver Twist*). Charles Dickens thus rested his case.

There have been rare occasions when the law was not castigated and maligned. Consider: "The law, which is perfection of reason" (Sir Edward Coke); "It is not uncommon to hear the expression, 'The law is a jealous mistress.' It is true that this profession, like all others, demands of those who would succeed in it an earnest and entire devotion" (George Sharswood, *Memoirs of William Blackstone, Blackstone's Commentaries*). Even then, no soul has ever confused the profession with innovation and daring. Lawyers do not want you to give them liberty or death. They want you to give them precedent.

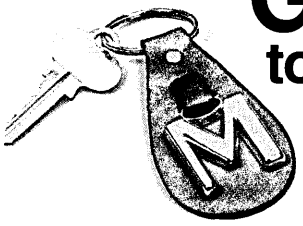
That does not mean last year's or last decade's precedent. It usually implies the last three centuries' precedent. The longer a principle's trail of history, the more formidable it becomes. "Common law," the generic name for the immense body of rules and regulations bequeathed to America by England, is the justification for almost all legal theory and principle in this country. When in doubt, cite the common law. If one law was common in 1615 and another in 1516, guess which one prevails?

This reverence for precedent is not unique to the courtroom. It also envelops the management of a law firm. If the founding partners did it, it must be the truth, the light, and the way. The legal profession may be one of the few where "handcrafted" does not denote something special. "Computerization" conjures visions of evil incarnate unleashed upon an innocent profession.

Besides, there's little precedent for computerizing the law office.

—W.S.

THE INFORMATION GRAPHICS KEY
to better communications



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Media that dull color reproduction cause loss of impact. The Color Graphic film recorder reproduces your terminal images on slides, transparencies and instant prints in brilliant full color. And our raster suppression functions and built-in, high-line rate monitors mean the recorded image quality is better than the terminal image quality, with no film artifacts.

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Systems that record only slides or small prints may not fill all your communications needs. The Color Graphic film recorder offers a choice of modular film backs that allow you to record 35mm slides, 8″ x 10″ overhead transparencies, Polaroid® 8″ x 10″, 4″ x 5″ or SX-70 instant prints, even motion picture film. And its fully field-upgradeable; additional film backs can be added later.

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If you are photographing slides and hard copies directly from the terminal screen, or are using any other technique, we can show you a better way to get high-quality film copies from any raster scan color terminal — under full RS-232C host control if you prefer. Write for more information to Matrix Instruments, 230 Pegasus Avenue, Northvale, N.J. 07647. Or call us toll-free, for a free demonstration on your terminal, at (800) 526-0274. In New Jersey call (201) 767-1750. Telex: 135131.

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CIRCLE 27 ON READER CARD

MATRIX

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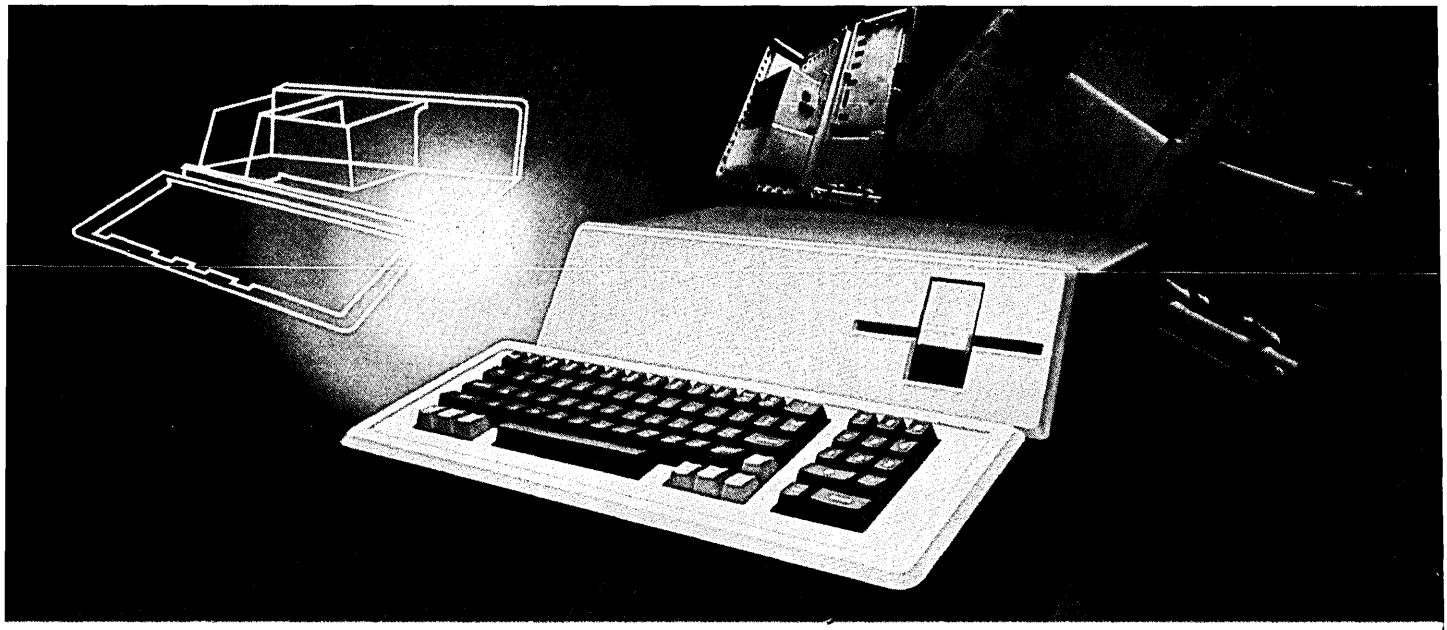
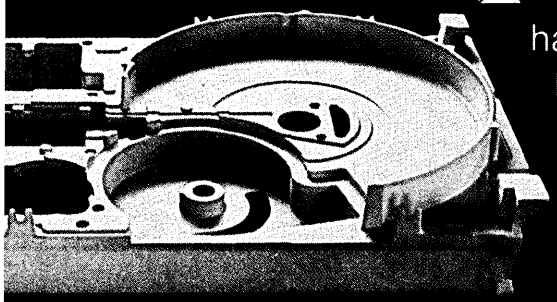
1140 Brussels, Belgium
(02) 241 44 50



Doehler-Jarviservice & Datachievements

1 A specialty of Doehler-Jarvis is die casting achievements. Specifically, for the data processing industry.

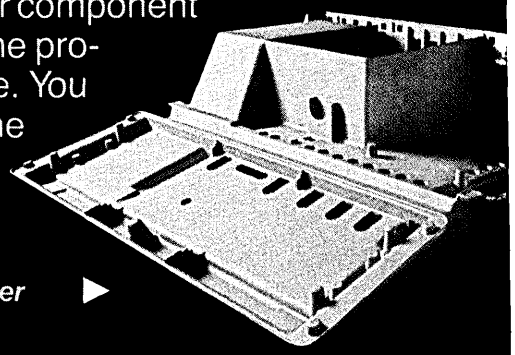
Disk Drive Base ▼



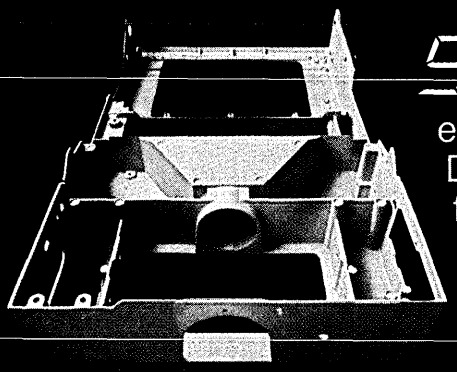
2 Doehler-Jarvis has been a part of the information processing industry for a long, long time. Hundreds of thousands of parts, in fact. From huge single piece disk drive bases, weighing up to 26 pounds and replacing six other components. To intricately cast and cored business machine top frames, supplied to our customer machined and painted, with over 160 holes in place and all component parts assembled.

3 Add to these achievements Doehler-Jarvis services. Product development. Design and engineering assistance. CAD – Computer Aided Design. All of which aided in the creation of the industry's first one piece minicomputer chassis, cast in lightweight aluminum with integral heat dissipating fins, and providing radio frequency shielding.

4 We also offer CNC – Computer Numerical Control – machining, complete assembly and a wide variety of finishing. Which means we are able to deliver your component ready for the production line. You then add the electronic expertise.



Mini-Computer Chassis ▶



▲ *Business Machine Top Frame*

5 Write or call the engineers at Doehler-Jarvis for something you can't get from any other die caster. Doehler-Jarviservice and Datachievements.

Doehler-Jarvis Castings

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CIRCLE 28 ON READER CARD

computer produces all that?'; he said, 'Sure.' "

A man's word is his bond, right? Soon Pohoryles was in for a cpu, two terminals, and two printers. He never dealt with a vendor; the consultant "took care" of everything. The hardware was worth $24,000. Including a modem and memory, Pohoryles got it all for $30,000. It was installed and wired, and he hired a keypuncher to run it.

She was out of the job before she got in it. The system never ran, never walked, and barely crawled.

"There were no screens," Pohoryles says ruefully. "You couldn't call up anything. You couldn't collect information. Everything was hardcopy. I kept asking what was wrong, and he [the consultant] kept coming up with stories. I believed them. He said there was a problem with the hardware, memory board, and control board. There was electrical interference in the building. The temperature was wrong. You name it, he thought of it."

The estimated size of the LSS market is $60 million to $80 million per year.

Eventually Pohoryles saw several thousand gaps in the demurrals, but by then he was $25,000 in the hole. The deal called for $15,000 on delivery, the rest on delivery and performance of the software. When some parts of the software showed signs of functioning, one of Pohoryles' partners parted with $10,000 more.

"I blew my stack when I heard about it," Pohoryles says. "I wouldn't have given him a damn cent. I thought we were buying L'Automation [a financial services package], but we obviously weren't. The guy turned out to be a total scoundrel. He was a CPA who knew nothing about law firm needs. We would have gone after him, but he told us he was virtually judgment-proof [i.e., that he had no assets]. So he gave us his source codes and operations manuals. Then he disappeared into the wind."

The blameless Alpha-Micro computer disappeared as well, into a corner of the office. There it sits, begging for compatible software. It may have a long wait. The firm now uses a service bureau.

"I don't think we need to be computerized," Pohoryles contends. "I didn't want to be a pioneer, have any software named for me, or reinvent the wheel. We leaped into it, but we didn't know we'd been lied to. It pays to use a good service bureau for $10,000 to $12,000 a year rather than put on a full-time keypuncher."

The majority of his colleagues dissent. While there is disagreement on whether the legal automation market is expanding geometrically, arithmetically, or just gradually sloping upward, there is little dispute that it is growing. It is now the rule, rather than the exception, in cases involving more than 50,000 pages of evidentiary materials for both sides to rely on an LSS. Market figures are guarded more tightly than the CIA's budget, but independent consultant Larry Berul of Rockville, Md., estimates the LSS market at $60 million to $80 million per year, excluding paralegal labor charges by firms performing all or most of the function in-house. Full service vendors, who assume all or the major portion of the responsibility for a job, comprise an estimated $40 million to $50 million business per year. Limited service vendors' aggregate is reportedly between $20 million and $30 million per annum.

A potential customer may need a computer merely to keep track of the services offered. Full service vendors include Mead Data Central, which in 1973 began offering Lexis, a private file LSS that encouraged lawyers to do their own bibliographic coding and subjective analysis; Informatics; Aspen Systems Corp.; Control Data Corp.; Litton Mellonics, and American Legal Systems. Limited service vendors, generally divided between those online and those offering software packages emphasizing litigation support, have more intriguing names if less complete services. There's IBM's STAIRS; Infodata Corp.'s INQUIRE; Battelle Memorial Institute's BASIS; Cuadra Associates' STAR; Turnkey System's DOCUMASTER; Warner-Edison's INMAGIC; and Minicomputer Systems' FACTMATCHER. There promises to be many more where those come from.

Not everyone's automating, but more and more are. Some want the latest and greatest because their colleagues down the hall have it, or their adversaries just bought it and just may win the big case because of it.

"There's absolutely no question that firms can save money by computerizing," attorney and consultant Joan Countryman says. "But I think a lot of it has to do with keeping up with the Joneses. They acknowledge that they're behind the times if they don't have computers, but it still takes some shock techniques to make them realize it. Eventually they begin to feel embarrassed if they don't join in."

"People are beginning to realize that if they don't get more productive, they will gradually lose business to the firms that are automated and more productive or lose it to corporate legal departments," counters Arthur Young's Guiliani. "I don't think it's a question of keeping up with the other firm because it's 'the thing to do.'

"The reason to automate is to make the lawyer more productive. The greater volume a lawyer can handle, the more productive he is. And the only way to make a lawyer more productive is to change the method by which he produces."

"A law firm that automates its accounting and administrative practices can improve its services to its clients and remain competitive in the changing legal environment by increasing firm revenues, profitability, and cash flow," writes Harry Landsburg in *Planning for Computers: Evaluating Data Processing Needs for Medium and Large Law Firms*.

The 134-page guide for attorneys and office administrators is published by the Section of Economics of Law Practice of the American Bar Association, which is assuming an active role in assisting and advising on how to join the electronic age. The ABA also publishes *LOCATE*, a buyer's guide to hardware, software, and application packages.

"A properly supported automated system increases revenues and profitability by quickly converting reported time charges and expense information to the work in process detail used in billing clients," continues Landsburg, a CPA with Laventhol and Horwath in Philadelphia. "Automation also reduces clerical workload, increases the productivity of firm personnel, and provides management information to effectively administer the practice."

The deed is still easier said than done. Once the decision is made and the initial shock waves subside, automation proceeds in four stages. The first act is obtaining word processing and time and accounting billing, about which there are no qualms from even the most hidebound practitioners. Without those functions, either in-house or out, one might as well be disbarred.

Act two is either legal research and litigation, if the firm is a large one that owes its existence to an endless series of complex—not to mention lucrative—cases, or legal research alone. Legal research usually is handled on Lexis or its competitor, Westlaw. These are available only through the terminals of the proprietors—Mead Data Central and West Publishing Co. Mead Data is under severe pressure to offer Lexis on other terminals too, but so far it has remained steadfast. The services offer full text of statutes, regulations, and recent and older cases. They are libraries without books. Their stacks, in the form of databases, are becoming more specialized to meet increasing demand. More than 100,000 people have been trained on Lexis, which reportedly controls 90% of that market, and more than 25,000 searches are performed daily.

"There's a huge gap between the capability of the equipment and the lawyers who use it."

Any further computerization brings a firm to the leading edge. According to consultant Countryman, the third act consists of case tracking/docket control and

management reporting. General case tracking shows all cases the firm is currently handling, their status, who's in charge, and anything else the information seeker's heart desires. For a large case, detailed case tracking will probably maintain better control over the proceeding. Management reporting uses information from accounting and billing to predict future economic conditions for the firm. Countryman suggests that a minimum of one year's detail accounting and billing data be computerized before a firm tries this system.

For the brave and the bold, there is act four—calendar, conflicts, library, and substantive law systems. A calendar system tracks cases by attorney and date. State-of-the-art systems can organize schedules, track and coordinate attorney appointments, and provide input to the accounting system. A conflicts system attempts to avoid conflict of interest without having personnel pore over foot-high stacks of yellowing invoices. The system cannot determine whether a conflict actually exists, but it does make it simpler for the partners to decide if past cases and clients present a conflict in taking on the new client. A library system tracks books and periodicals owned by the firm and those on order. Simple, yet effective. Last, but far from least, substantive law systems use the computer to help attorneys actually do their work.

Rudimentary software packages in real estate, probate, estate tax, wills, and personal injury now exist. Other possible subjects, according to Countryman, include contracts, patent, copyright, and family law. Technology assures that in the near future any area of substantive law, with the exception of dynamic ones such as tax, will be ripe for programming. Need the latest word on property? Right there, at your fingertips.

Does this mean a terminal on every desk? Not on your habeus corpus. "Only when library services become available by automation and when there are good, quiet printers will lawyers have on-line capability," Wald, Harkrader's Schack contends. "No practicing lawyer spends so much time in a manner that justifies a tube on every desk."

A select few law firms have already achieved state of the art. In addition to Howrey & Simon, regarded as the most advanced in the country, Milbank, Tweed, Baker & Botts in Houston and Pillsbury, Madison in San Francisco have gone about as far as technology will carry them.

"It's easier for a firm like ours, because we're involved so much in federal court litigation," Howrey & Simon's Ruyak says. The firm's strategically located terminals support 130 lawyers, 80 paraprofessionals, and 300 support staff. Ruyak plans to upgrade the capacity of the system as necessary, but not to move up to the next level.

"Only when library services become available by automation and when there are good, quiet printers will lawyers have on-line capability."

"We're on the frontier of in-house LSS, but we could afford to be because we do so much of it," he admits. "For a large firm that's divided into six or seven areas, it's much harder to justify laying out the money. If you put in a massive system and only 10 or 20 people use it, then you have to wonder if you really need it."

The competitive forces may not give doubters much time for pause. The auto-train has arrived. Those not boarding can seek other means of running their businesses.

"The way attorneys handle information resources will determine the effectiveness and profitability of the law firm over the next 10 years," Westermier contends. "Management will have to understand automation if it's ever going to integrate it effectively into the firm."

Attorneys and office management personnel have never been on the best of terms. Most attorneys, understandably concerned with billable hours, clients' welfare, and profit-and-loss numbers, don't want to be bothered with the mundane chores of everyday office procedure. They do not want to, cannot, will not—or all of the above—be bothered with administration.

With a firm on manual, benign neglect may be acceptable. With computerization, it is a capital offense.

"Attorneys better stick to practicing law, which they're expert in," Landsburg says, "rather than trying to manage law firms, which they're not expert in. They must also realize they don't have time to truly understand automation and its impact on the firm.

"When I talk to law firms about in-house computerization, I guarantee that if I'm sitting with 10 attorneys, two are going to think it's great, six are going to accept it, and the other two don't even want to attend the meeting. Attorneys have to learn to grow comfortable with automation and learn how to interact with it in order to make it work effectively."

So who's going to teach them? Their secretaries and paralegals, for whom being on-line is akin to breathing, may try, but their bosses rarely deign to listen. Speak not to them of the wonders of litigation support and docket control. Just give them the damn brief. Asking other attorneys, most of whom are equally inept, disinterested, or downright hostile, would be negligence at best and malfeasance at worst.

Each graduating class offers some hope, however, if only by osmosis. Trained on terminals, or at least trained not to regard them as objects from another cosmos, the Clarence Darrows of tomorrow can pass the good word. As they replace those who went before, attitudes will change. Resistance will lessen, gradually at first, then precipitously. Computers are monthly becoming less imposing, frightening, and incomprehensible. But next week's or next year's user will still have to have some idea of what it's all about.

"The outlook is bright for computers, but not for the way lawyers use them," consultant Brad Hildebrandt says. "There's a huge gap between the capability of the equipment and the lawyers who use

"Go home! The world has enough stuff! We don't need any more!. . ."

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CIRCLE 29 ON READER CARD

JUSTICE FOR ALL

Justice may or may not have been done for the American public in the settlement of the AT&T case. Let the record reflect that the body politic can rest assured that it was well served by the plaintiff's computerized legal system.

"People from the AT&T support staff used to come to us for answers," says Terence Sweeney, chief of Justice's Information Systems Support Group (ISSG). "We were really disappointed the case wasn't carried to conclusion. We had gone far enough to develop some really good approaches and support systems."

The computerized bibliographic database that allowed Justice to hang in there with Ma Bell, despite being outspent $8 to $1 for support, knew every move the attorneys made. Once U.S. District Judge Harold Greene reduced the case to manageable size, Justice's Wang VS system took over.

The SOCAP (Statement of Contentious and Proofs) was broken down into episodes. The support staff knew to which episode a particular document and witness referred, simplifying monumentally an otherwise staggering research task. Justice also maintained an auxiliary database for witnesses, references, total exhibits, and other factors in the case. There were witness schedules available a week in advance, with witness boxes for each attorney handling a particular episode.

"I think we did some innovative things during the case," Sweeney says. He and his 26 employees will have additional chances when a prototype document support system for smaller cases becomes functional June 1.

"There's no question the private area has an advantage in resources," Sweeney admits. "But I think we've got our finger on that pulse. Some of our attorneys would look at us very skeptically, as if we'd invented dp.

"We didn't, of course. But we've got a good system that we're proud of. You've got to implant the knowledge in lawyers that they need to know what their opponents are doing. If you raise their level of consciousness, make them successful, and make them a model for others, you both can see what you can do for each other. It's not true that computers are used only by AT&T."

Just what was AT&T using for an estimated 25 million to 26 million pages of documents? The company developed a card for each document in the Justice case, as well as all pending private antitrust suits, and computerized it. An attorney with a need to know could then sidle up to a crt, call up the card, and determine if it was pertinent to his case. Once the determination had been made, the document could be found on microfilm or microfiche. Every page had its particular number, available courtesy of the film library.

That database, housed in Piscataway, N.J., remains active. For its in-house staff of about 850 lawyers, Ma Bell offers the Bell Legal Information System (BLIS). BLIS is now concentrating on legal research from what Bell attorney Margaret King describes as "a pretty meager base." The system, consisting of 30 terminals and climbing, is available to all attorneys within reach of one of the company's Dataspeed 40 terminals. It also has access to Mead Data's Lexis, the bible of computerized research systems, via a special Lexis keypad.

"We've really simplified Lexis," King says. "With a minimum of instruction any attorney can sit down and get into the world of information.

"But there's much educating to be done. There is an aversion to technology by almost all lawyers. A person has to sit at a terminal and think he will get an answer before he'll talk to it. Once they sit down and get what they want, they become attuned."

Justice's other former foe also has its own internal system. IBM's STAIRS, (Storage and Information Retrieval System), which the company markets aggressively to the rest of the legal community, is a general purpose information retrieval system. Able to run on a 4341, it comes in STAIRS/VS, STAIRS/DOS, and STAIRS/CMS. It has advanced text management capability, comprehensive text processing features, and full word indexing facility. It is as state of the art as software packages come. Queried on the number of lawyers IBM's in-house STAIRS supports and the type of hardware on which it runs, IBM said it was "proprietary information."

Control Data uses the PALLAS system both in-house and as a marketing tool. The software provides document indexing, full-text storage, abstract storage, and an interface to statistical analysis programs. Five optional modules allow users to retrieve almost anything they could possibly want.

The system is extremely versatile. It's available through CDC's Cyberkey network and can be licensed on CDC's 6000 and CYBER series, IBM's 360 and 370 series, DEC's PDP-10 and PDP-20, DEC's VAX series, and Univac's 1100 series. PALLAS tracks all activities associated with a particular case, large or small.

"I would be confident that we have a better system than any law firm," says Bob Jackson, CDC's director of legal support systems. "I think PALLAS is the top litigation package in the country. It has more power than those found in law firms and has more features. It's also user friendly. I'd put it up against anything. I'm prejudiced, of course, but I've found that out through marketing and the word on the street."

Most law firms have yet to hear it.

—W.S.

it. We are not doing a good job educating lawyers.

"The system has to be practical. Firms have to ask themselves what they need and who can supply it. The need for an integrated system is the biggest myth ever perpetrated on the legal system. You have to use a system that lawyers trust, understand, and will use. The future is only going to be bright if you install a system intelligently and honestly and it is used."

"Attorneys must ask really hard questions of people who are implementing technology in firms," advises Robert McCormick, executive director of Weinberg and Green in Baltimore. " 'Will the system really be responsive to my needs? Is this wonderful set of computer reports really going to provide the information I need on a firm level, on a client level, or on an administrative level such as recruiting?' "

If the answer is yes, get in line. Business for vendors has been very good and is certain to get better. If the legal market isn't the fastest growing in the industry,

Attorneys who are reluctant, or who refuse to accept computer technology, could find themselves obsoleted.

it's in the top five. Landsburg predicts that with micro vendors marketing more and more to law firms, the automation of even small firms will take off in three to five years.

Vendors know a gold mine when they see one, and there's money in them thar offices. The industry has spawned a specialized publication, *Legal Automation News*, which began monthly publication in January and guarantees a controlled circulation of 35,000.

Full service, limited service, and those vendors in between are wooing firms with tenacity and persistance equivalent to the best—or worst—mainframe rivals. Even the United States Supreme Court recognizes the inevitable. Court clerk James Donovan told *Legal Automation News* editor Gil Merritt his place "didn't have a Xerox copying machine 12 years ago." Now the Court is fully automated.

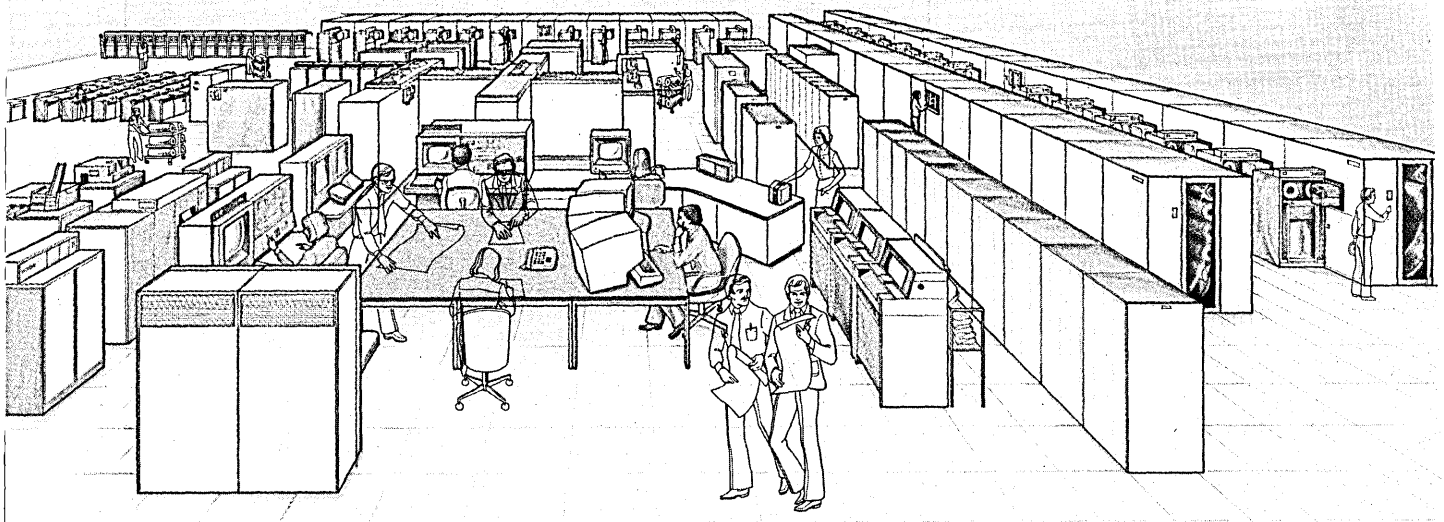
"Lawyers as well as secretaries will have to type," Arthur Young's Liggio contends. "There will be a dramatic and traumatic change for the profession. Attorneys must learn to feel at home with computers.

"There is a great chance those attorneys who are reluctant, or refuse to accept computer technology, could find themselves obsoleted," Westermier warns. "I foresee a good possibility of obsolescence within the professional ranks by virtue of attorneys sticking to the traditional ways of practicing in terms of researching cases and preparing documents."

Case closed.

—Willie Schatz

ROBOTICS...



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The BRAEGEN ATL will increase your computer room productivity while reducing the number of personnel, disk and tape drives required.

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The personnel and equipment shown in phantom in the illustration are no longer required with the installation of the ATL, since the tapes are now automatically *online*.

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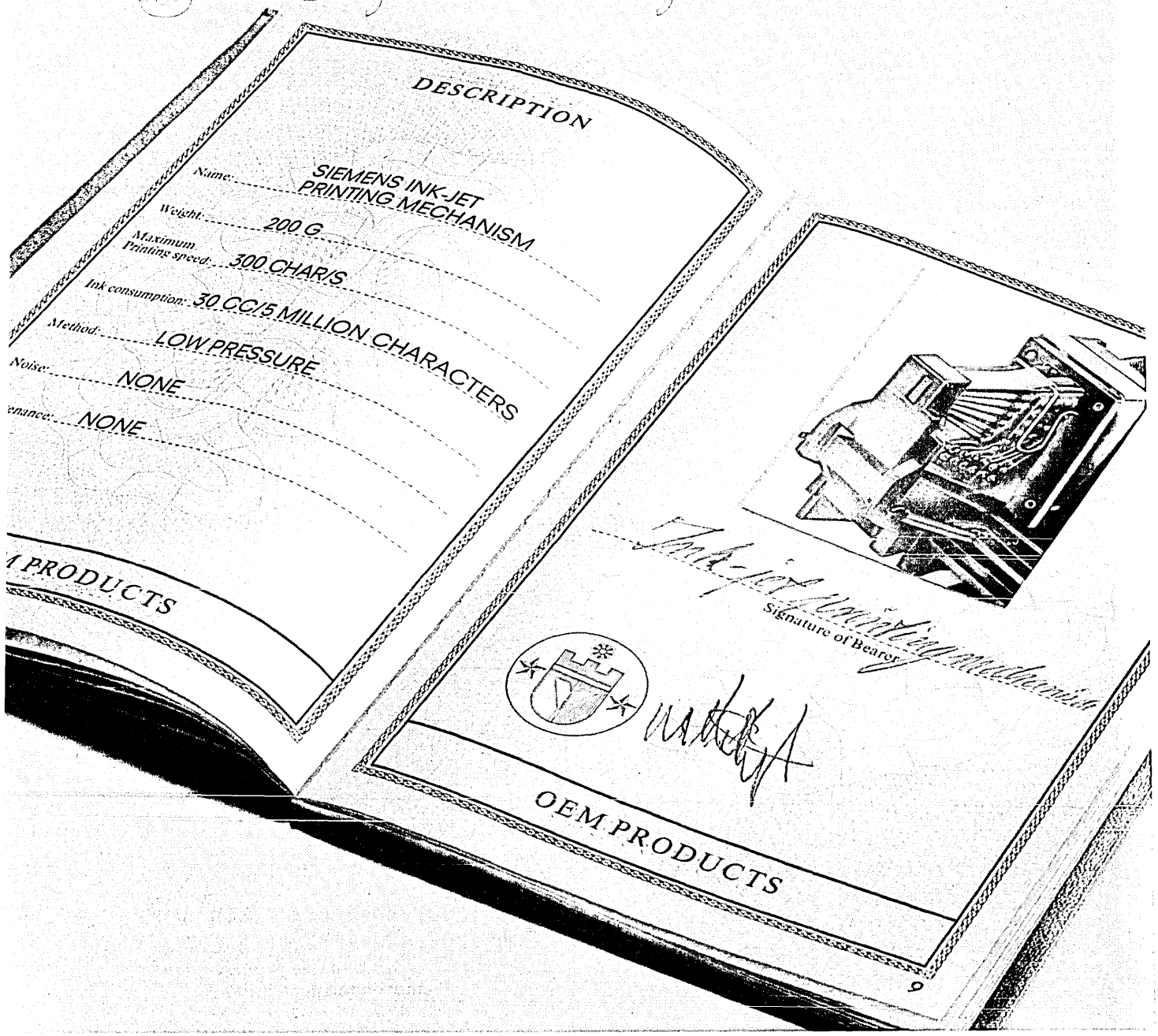

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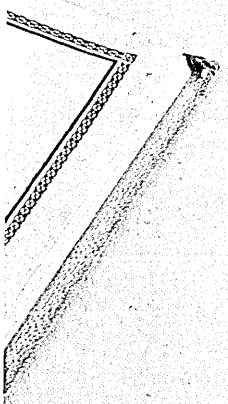

The printer's ink supply is held in easily replaceable plastic cartridges which can be sealed for transport and storage. Each cartridge is equipped with a special seal for quick replacement in the printer. Siemens' specially formulated ink is black, lightfast, indelible, waterproof and instant-drying, and applicable to plain paper.

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CIRCLE 162 ON READER CARD

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NEWS IN PERSPECTIVE

MAINFRAMERS

UNIVAC TALKS STRATEGY

Can a traditional mainframer find happiness in a modern world? Univac talks strategy.

Univac, like a tradition-bound aristocratic lord, has come upon hard times and a changing society. Money got exceptionally tight this year, the first year in nine years that the company didn't have an increase in profits. Executives attribute their hard times to the high cost of money, which hit the company particularly hard because it carries the paper on all its leased products. In need of a cash infusion, the company is said to have asked Citicorp and G.E. Credit to carry its lease contracts. In order to unload that financial burden, however, the company would have to sell the contracts at a loss, say industry analysts.

Foreign currency rates have also squeezed Univac's profit belt, but this year the company insists it stands to gain—something on the order of $100 million—instead of lose. The third blow is the recession. While those effects have not softened backlog, as corporate executives still maintain, the recession has begun to weaken the order rate. By the end of calendar year 1981, Univac's backlog stood at $1.998 billion, an increase of 6% over 1980's $1.886 billion.

Some bad product decisions have not helped the company's balance sheet. In its efforts to go modern—i.e, to get into the small systems business—Univac spent "huge amounts of money" on the Varian acquisition and the BC7 project, confirmed one former employee. The outcome, as several analysts put it, is that Univac botched these efforts because of its traditional mainframe orientation to marketing and to the marketplace. With a new management team in place, the company is on the verge of announcing yet another candidate for the office automation market, and the question remains: can an old, traditional mainframe house successfully market a small system? More about that later.

Meanwhile, many users of Univac's top-of-the-line mainframe, the 1100/80, have topped out, and a follow-on product has yet to surface. This comes at a tense time when profits are down and the company needs a strong cash mill. "Univac's main business is built on the high-end systems; that is where they make money," explains an industry analyst who asked not to be named. "The company is very late in its product cycle," and he questions whether it will announce something before the end of this year. "This is the first time that Univac is [overall] a couple of years behind IBM," another analyst added.

A follow-on to the 1100/80 is on the burner—on the front burner, in fact—and is code-named Cirrus. Several users think its debut may be sometime this fall. Univac executives would not confirm a specific month. While there is rumor that Cirrus has had trouble and its introduction has slipped, sources at Univac's Roseville, Minn., facility say that's not true. "If there has been any slippage, it's not because of technical problems. It must be some kind of marketing consideration." Morale and enthusiasm appear to be high among those working on the large scale systems, both in hardware and software development. One Roseville source was so positive about Univac's future that he was sorry he had had to sell off some of his Univac stock to cover unexpected family expenses.

Equally exciting to the Roseville gang is the supercomputer follow-on, code named Eagle, to Univac's 1100/80 Array Processing System. The first 1100/80 APS was shipped this past February to Shell Oil, Houston. Like Cirrus and its predecessor, the 1100/80, Eagle is slated to be bigger, better, and faster—particularly faster in terms of its scaler capabilities—than predecessor APS, as well as being compatible with all other OS/1100-based systems. "We learned from Burroughs," confides one source who also worked on Eagle but who is currently based at headquarters in Blue Bell, Pa. "They screwed up because they only improved the vector processor. Their scaler rate improved only by a factor of two." Univac was not specific, however, about its scaler speeds for Eagle.

"If there has been any slippage [on Cirrus] it's not because of technical problems."

In terms of cost/performance, a maximum Cirrus configuration would put the user somewhere in the 30 to 35 MIPS range and cost about $10 million, including mass storage, according to corporate figures. When the Eagle supercomputer attachment is added, performance kicks into the 50 MIPS range for another "order of magnitutde in price," says Glen Haney, Univac vice president of strategic planning and development. "Adding the supercomputer attachment to Cirrus puts us into a MFLOPS [millions of floating point operations per second] league that has traditionally been Cray's territory." Floating Point Systems' array processor is a much smaller system, and Univac does not perceive it as a direct competitor to its new superprocessor offering. Haney says Univac is ready to go with its new family, but don't expect any

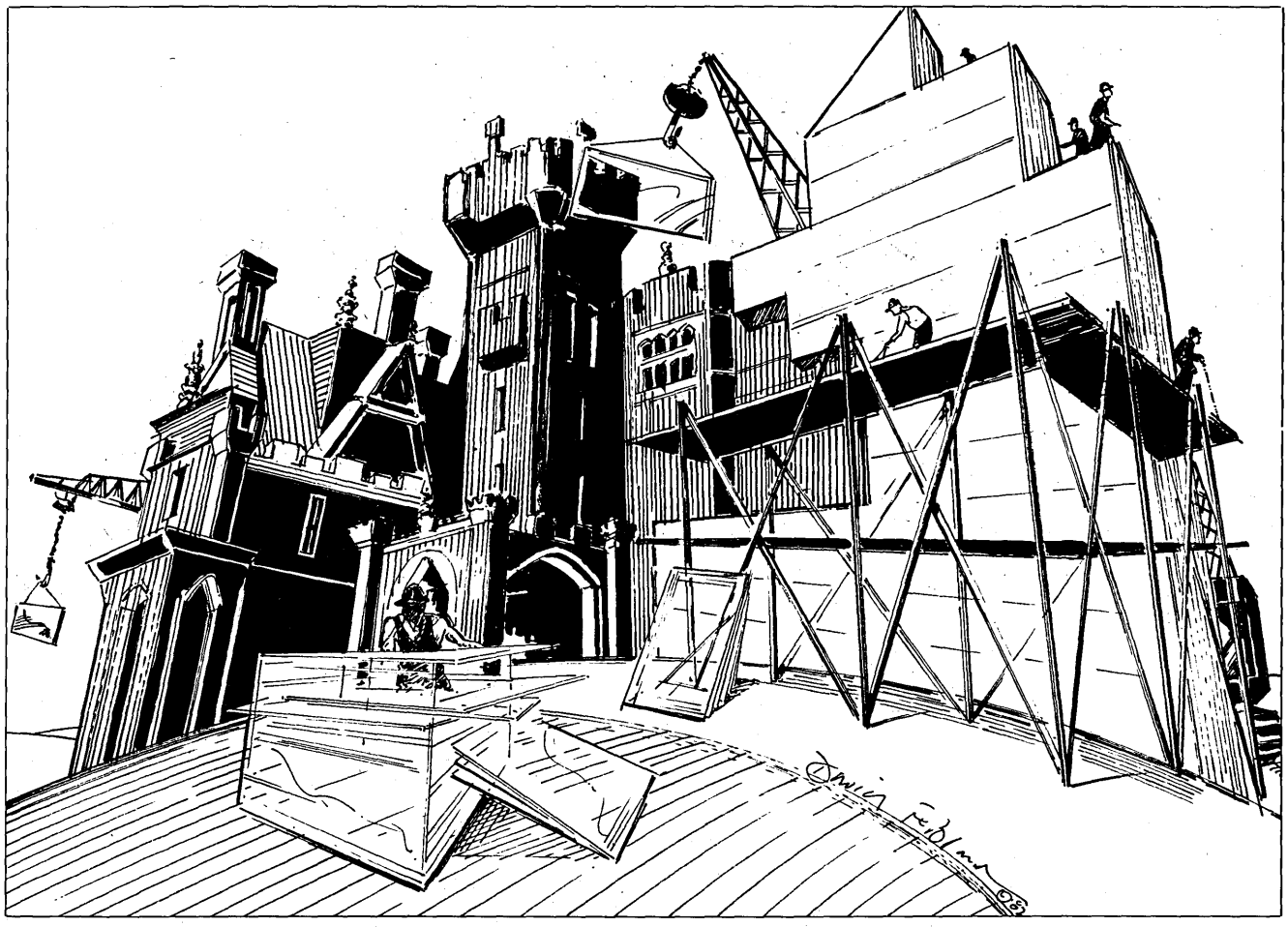

ILLUSTRATION BY DAVID FEBLAND

announcements before the end of second quarter. (Since Univac's fiscal year ends March 31, that means sometime after September.)

Although the machine specs sound credible and Univac does have a history of producing reliable hardware, its reputation in disk drives is not the best. So where is Univac going to get its disk drives? It's a critical consideration, say analysts, for without efficient, high-speed disk drives, the Eagle could very quickly become I/O-bound. There is talk that Univac has paid a visit to Storage Technology, which would not surprise most analysts, since many of them question whether Univac's peripheral arm is capable of producing high-speed drives.

"The underlying strategy at Univac is to be a total industry supplier to our industry segments," says Charles Williams, vice president and general manager, Americas Division. Williams sees Univac customers moving more and more toward bigger systems. "That's why we got into the multiprocessor architecture," explains James Fullam, vice president of worldwide communications.

Many Univac customers agree. "We are willing to take the risk of the building being damaged rather than deal with the problems that arise when you have your database in more than one place—all the problems of keeping them all current and maintained," says John Stevenson, MIS director for Valspar Corp., Minneapolis. Valspar recently moved up from a 90/30 and 90/40 to an 1100/60. That is not to say Univac doesn't see smaller processors distributed at various locations for such applications as CAD/CAM. It does, and the company plans to announce its new integrated, distributed CAD/CAM system this month at Hanover Fair in West Germany.

Without question, though, Univac's prime marketing strategy is structured around its traditional 1100 family. Almost all of Univac's offerings will in some way tie back to the 1100. At the high end, says Williams, "our concept was to develop a general purpose computer and give it tremendously added capacity for specialized functions." While the first ASP was designed as a specialized seismic processor for the energy market, a market where Univac claims a 16.7% share, Williams foresees such a machine functioning as a database processor or as a high-speed processor for almost any specialized application that requires substantial power. But for now, Williams wants to grow the energy market at about a 35% per year rate. He figures there are about 10 ASPs on back order as of February, when Shell took delivery.

Without question, Univac's prime marketing strategy is structured around its traditional 1100 family.

The supercomputer strategy is only a small segment of Univac's grand plan for the '80s. In addition to expanding the OS/1100 line up into the superspeed range, Univac is also expanding down, below the 1100/60 family. At the low end lies a product code named Chaparral, to be announced sometime after Cirrus's public unveiling. When Chaparral is in place, a Univac user will be able to buy into the product line for about $300,000 at a performance rating just below the half-MIPS level, and move all the way up into the Eagle performance range without changing operating systems, reveals Univac top strategy planner Haney.

Haney calls that rationalizing Univac's product line. VS/9 users call it war. For VS/9 and OS/3 users, Chaparral clearly indicates where the future of Univac lies, and it is not in the VS/9 and OS/3 operating systems. It is evident that Univac has chosen to support only one operating system, and it is OS/1100. Slowly but surely, all others, first VS/9 and later OS/3, will be presented with a migration path leading to the family fold. The indications can be seen in the amount of software support the company continues to give to OS/3 and VS/9 users, as well as in the policy statements

and product strategy. Users of VS/9 (which runs on the 90/60, 90/70, 90/80 products) are already feeling the affects, and are not very happy about it. Among the 400-strong VS/9 users, many are talking of a palace revolt if Univac follows its course of merging VS/9 users into the OS/1100-based product line. The palace plan for the merger centers around a machine called the AVP (attached virtual processor), which is basically a 90/80 hooked, for instance, to an 1100/60 processor. The idea is to provide VS/9 users with a leisurely migration path to OS/1100 equipment. Using an AVP, they can run their old programs while they make the conversion to OS/1100 at their own pace.

"Prior to the AVP announcement, 90 series users had a very restive attitude," comments Haney. The source of discontent, as Haney describes it, was the lack of an upward migration path. "With AVP, we expect to see a very dramatic shift in attitude. The progress of moving this base, this big user base, really looks very, very favorable. It took awhile for the large group to understand the implications, but since eight or 10 months ago the reaction has been very favorable. We see it as one of our better efforts to take a user base and gradually migrate them [the users] into what is essentially our mainframe, flagship base."

That's not the way users see it, though. At the last users meeting, reported one attendee, only two out of about 150 said they had ordered an AVP, and only a few raised their hands when asked if anyone was considering an AVP. Univac executives maintain that its "restive" VS/9 base has calmed down since the AVP was announced and "is ordering AVPs by the dozen."

"We couldn't tell which version of a product was compatible with what version of another product for the 1100/60."

What appears to gravel users most is that Univac is abandoning VS/9 for OS/1100, and, as a consequence, those users are left with two routes if they want to move up. Either move up or move out—out of Univac. For a company that advertises how much it "Listens," Univac certainly appears to be turning a deaf ear to the VS/9 group, retorted several users. "They are going to lose us, and I don't think they are going to recognize that until it's too late. They think we are bluffing," said a user in a shop running a 90/80. He was told about a year ago it would take approximately 30 man-years to convert this 90/80 operation over to an 1100/60.

"From an AVP point of view, our only choice is to go their route or dig our heels in and stay with VS/9 till the bitter end. I only hope some other route shows, but who knows," said another manager from a VS/9 shop.

TABLE I
WHERE UNIVAC's BUSINESS COMES FROM

MAJOR TARGET MARKETS	%OF TOTAL UNIVAC BUSINESS
Manufacturing	25
Energy	7
Distribution	10
Airlines	3
Banking and financial, outside U.S.	8
Federal government	10
State and local government	12
Communications	4
Other markets	21

TABLE II
MARKET SHARE IN TERMS OF INSTALLED BASE

MAJOR TARGET MARKETS	%MARKET SHARE
Manufacturing	6.9
Energy	16.7
Distribution	4.3
Airlines	26.4
Banking and financial, outside U.S.	8.0
Public sector	16.3

SOURCE: UNIVAC

Yet another criticism of the plan is that converting to OS/1100 requires additional support people. A disgruntled VS/9 user figured there was roughly a one-to-three relationship in terms of support people. Where it only takes one person to run VS/9, OS/1100 requires three. Performance is another thorny area, particularly if the shop has a 90/84 system. After reading an internal Univac newsletter on performance, one user figured an AVP and an 1100/60 fall in somewhere beneath the performance of a 90/84.

Further fanning the flames of discontent is the story about the University of Pennsylvania computer department that is currently in the process of converting from a 90/70 to an 1100/61. No AVP for this group; they jumped directly from a 90/70 to an 1100/60 and ran into trouble. The problem had a lot less to do with the conversion than with Univac's organization, related a university source involved with the changeover.

Poor documentation of 1100-level programs was cited as the main problem. "We couldn't tell which version of one product was compatible with which version of another product for the 1100/60," said the university source. "On the 90, when a new release is delivered it is an integrated release. The product versions run together, they talk to each other. Documentation on the 90 side ought to be duplicated on the 1100 side."

Another complaint raised by the university people was that Univac waited too long before bringing in experts who had the knowledge to solve the problem. Information necessary to solve the compatibility problem was not made available to the branch or to the customer, points out one source. "That information resides in the heads of the software people. It is not well documented. Univac would do itself, its branches, and ultimately its customers a service if they provided more high-level information on what version of each package goes with what."

Why weren't Univac experts called in sooner? A recent policy change appears to be the crux of this problem. According to several users, there seems to be a new policy within Univac that says anytime someone outside the local branch is brought in, that branch will be charged for the costs incurred. As the university source sees it, that is why the branch delayed in calling in outside help.

Meanwhile, the only VS/9 defector that could be detected so far is the McDonnell Douglas Corp. facility in Tulsa. A Univac 90/80 was replaced with IBM gear. But the decision was not entirely a technical/dp decision; it was political, confided a company source in Tulsa. After all, Tulsa was the only McDonnell Douglas site not on IBM. Univac, however, is opening itself up to a rash of defections by requiring a conversion, as does any vendor in a similar situation. Many VS/9 users say they will look at other vendors if Univac forces them to leave VS/9 and go through a conversion. Conversely, if any other vendor would come along and support the VS/9 operating systems, said one user, it could possibly get the support of about 200 to 300 Univac customers. "They are ripe and ready," he said.

But the overriding issue is that VS/9 users like their operating system. Some VS/9 loyalists have even talked about approaching Siemens of Germany, which did

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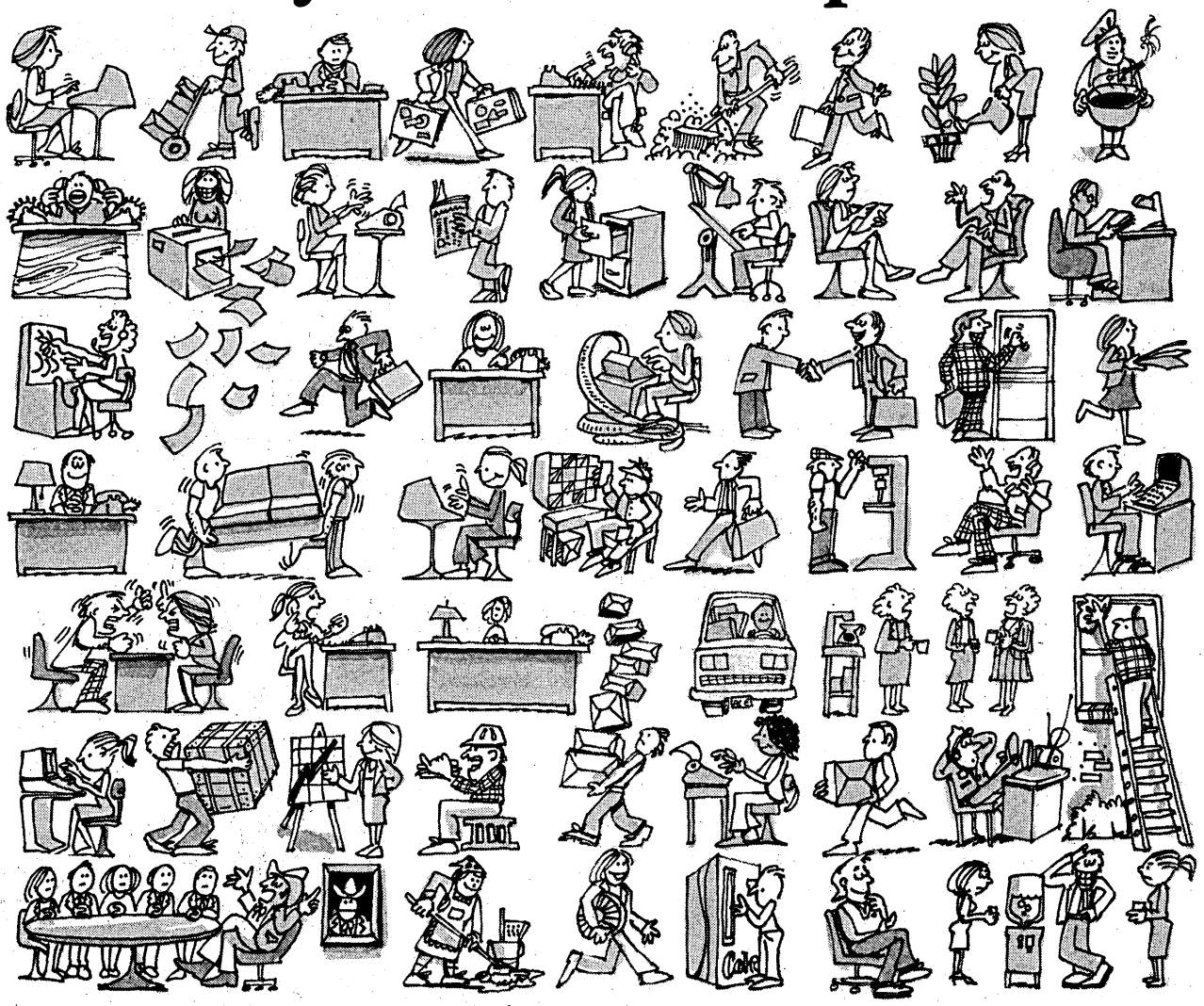

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some of the original development work on VS/9. "While Siemens is not selling its related product here in the U.S., if it did it could take potentially 200 to 300 customers away from Univac," estimates one user.

Dropping further down the Univac line, below the VS/9 Series 90 products, Univac's installed base and market penetration takes a nose dive. Small systems have for years been a mystery product to this traditional mainframe house. How do you market something this low-cost? How is it manufactured? Who buys, and what do those customers do with it? What kind of software does it need?

"Univac lost huge amounts of money on [the Varian acquisition and the BC7 venture]," recalls a former Univac insider who worked on small systems. "Univac wanted to get into low-cost systems, but it did not know how to market small systems," he said.

"Varian was bought quickly and it turned out to be a shell."

Nor did Univac know how to buy small systems. "Varian was bought quickly and it turned out to be a shell. All the problems that could possibly come up in a takeover did, and all the leadership was gone within 12 months." Univac was left holding the keys to a car it didn't know how to drive or repair, and it is well known that Varian was in need of repair. "Varian had weak software, the hardware was not that good, and there were no obvious follow-on products," recalled the former Univac manager. "Also, Varian's manufacturing was poor. Their strategy was a low-volume, high-cost item, while Univac wanted a low-cost, high-volume product. Univac poured a tremendous amount of capital into equipment, but it did not have the product to meet the market needs. Also, Univac went away from Varian's oem business."

The outcome of those ventures is history. Univac lost its shirt, and, as a result, Univac management became even more resistant to venturing into new territory or new markets, observed the Univac source. "They are scared of having another loser," is the concise analysis of the former Univac manager. But the company has not given up. Pushed by its user base for some kind of office information offerings, Univac is on the verge of trying it again.

The corporate story takes a different slant. Haney defends by saying: "I think the marketplace was misinformed about what our interests were. It was initially to accommodate our user community's interest in minicomputers. Univac is a systems house. What we sell is systems, we tie it all together. It wasn't that we were going to go off and face Data General. We were going to utilize minis in our systems business so our users can come to us instead of Wang for word processing or Tymshare for online services. It is our plan to supply workstations, word processing, communications, and our own mainframes." Haney does mention that the emergence of microprocessors, particularly the Motorola 68000, has affected the company's product design plans.

Microprocessor chips are "changing the implementation of our strategy," Haney continues. "What has happened is that our entry into the mini business was timed so that the microprocessor and microcomputer. . . ." He paused. "Their advent was so robust and sudden that we began to see it is not really the mini that is going to crush the future; it is the micro. Therefore, the press has sensed that we are pulling away from the tremendous commitments to more and more minis, and more and more software. And I would say there is something to that. We know that microprocessors are going to be critically important to our systems in the future. And therefore, it may even begin to eclipse the mini business. One thing we were going to do is use minis as controlling devices. If we were designing the system today, we'd have the option of using the V77 or the 68000."

Although Haney certainly indicates that Univac's strategy for hitting the office information market may be in for some serious changes, one of the early configurations for the systems, claims the ex-Univacer, was a unit that was an outgrowth of the BC7. The BC7 was to serve as the local processor and a modified UTS400 as the display screen, all of which could be attached to an 1100.

The weak link, however, in all of Univac's grand plans is its communication software, say users and analysts alike. Writing good communications packages is perhaps one of the weakest links in Univac's grand office systems plan or in its plans for distributed processing, soon to be offered in an integrated CAD/CAM system. A Chicago-based computer service center was going to buy a Univac front-end communications processor, but backed off once they looked into the product and the people developing the product. After visiting Univac's Salt Lake City operation, where communications development takes place, they were convinced the people were insulated from where the industry is heading.

"They build software like everyone is still going to be directly tied to the mainframe and never move the terminal. We use a van and parts come in from all over the country."

The target market for Univac's office system is that nebulous group called "managers." Univac claims it has spent the past two and a half years researching what managers do and how they might use a desktop computer. By the end of this month, Univac is expected to unveil a desktop box that will function as the kernel around which Univac will build an integrated office information system. The system will ultimately include networking capability (most likely provided by 3M), voice mail, facsimile, a PBX capability, graphics, and most important, the ability to communicate and share data and files with a mainframe.

Late to the market? No way, says Univac. "It is our contention that the potential for office information systems has not even begun to be exploited," said Haney. "What has been exploited is word processing, which is a minor but important part of the offering. The driving factor is that we plan to develop products that integrate the office as well as automate it, and our key thrust is toward managers. If we had wanted to come to market with a word processor, we would have been out two years ago."

The plan is to integrate personal computing with mainframes, says the company. The desktops can be linked to an OS/1100 database, and from the same terminal a user can also access files on the mainframe. "Nobody else has done that," said Haney. And as one customer pointed out, he won't believe Univac can deliver that capability either until he uses it.

—Jan Johnson

ROBOTICS

I(BM), ROBOT

The computer giant has stepped forcefully into the robotics market with a pair of machines, one built in Japan.

Ending months of speculation, IBM entered the industrial robotics market in late February with two products. It introduced a Japanese-made machine scheduled for delivery in the fourth quarter of this year, as well as its own more advanced robot, which it has begun test marketing on a limited basis.

Immediate reaction to IBM's entry into the infant robotics industry was quite positive. Analysts predicted that the firm's presence would both legitimatize the concept of robotics as well as heat up competition between U.S.-based suppliers and those from West Germany and Japan.

The market for robots in the U.S. stands at just over $150 million today, but it is expected to grow by leaps and bounds in the next few years as productivity-hungry industrial firms install the machines to cut costs, reduce labor, and increase output. General Motors, for instance, has plans to install as many as 14,000 robotics machines in the current decade to perform a wide range of tasks on its assembly lines.

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Product Specifics: The 2078 Display Station is built for flexibility, operating in bisynchronous as well as SNA/SDLC environments. It is built compactly to conserve space and even features a monitor that detaches for shelf placement. It is built to conserve energy, with efficiency features that allow the 2078 to operate on 58% less power while generating 41% less heat than its IBM equivalent. It weighs just 55 pounds, some 47% lighter than the IBM competition. And above all, the 2078 is built for people. The monitor is tiltable and the screen recessed. That screen, the keytops and all moldings are non-glare. The keyboard is movable for comfortable positioning.

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The 2076 Remote Cluster Controller is a lightweight 30-pound package that accommodates up to eight printers and/or terminals in a bisynchronous environment. It measures a streamlined 6.5″ high x 14″ wide x 26″ deep. While the 2076 can be located as far away as 4920 feet from its attachments, its dimensions allow for convenient placement just about anywhere, singly or stacked. Standard power-on, off-line and on-line diagnostics contribute to increased uptime.

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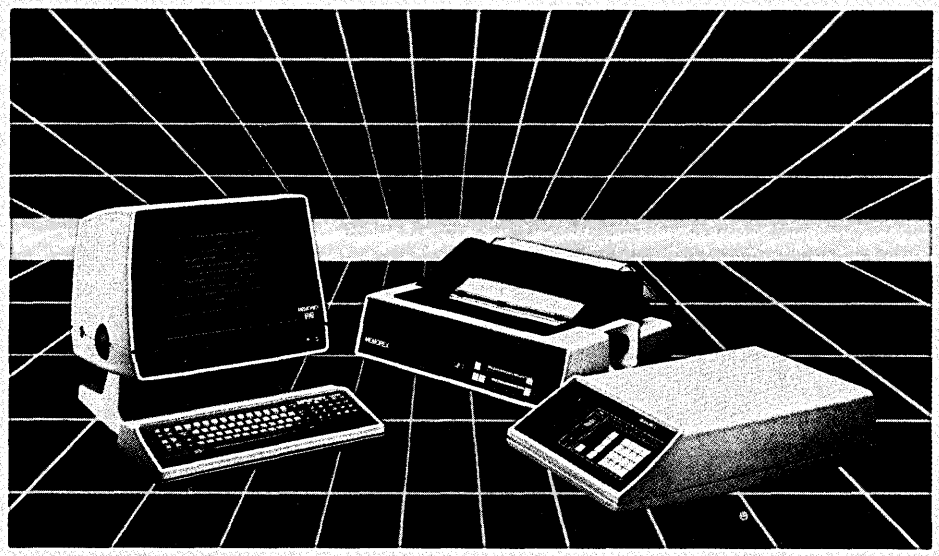

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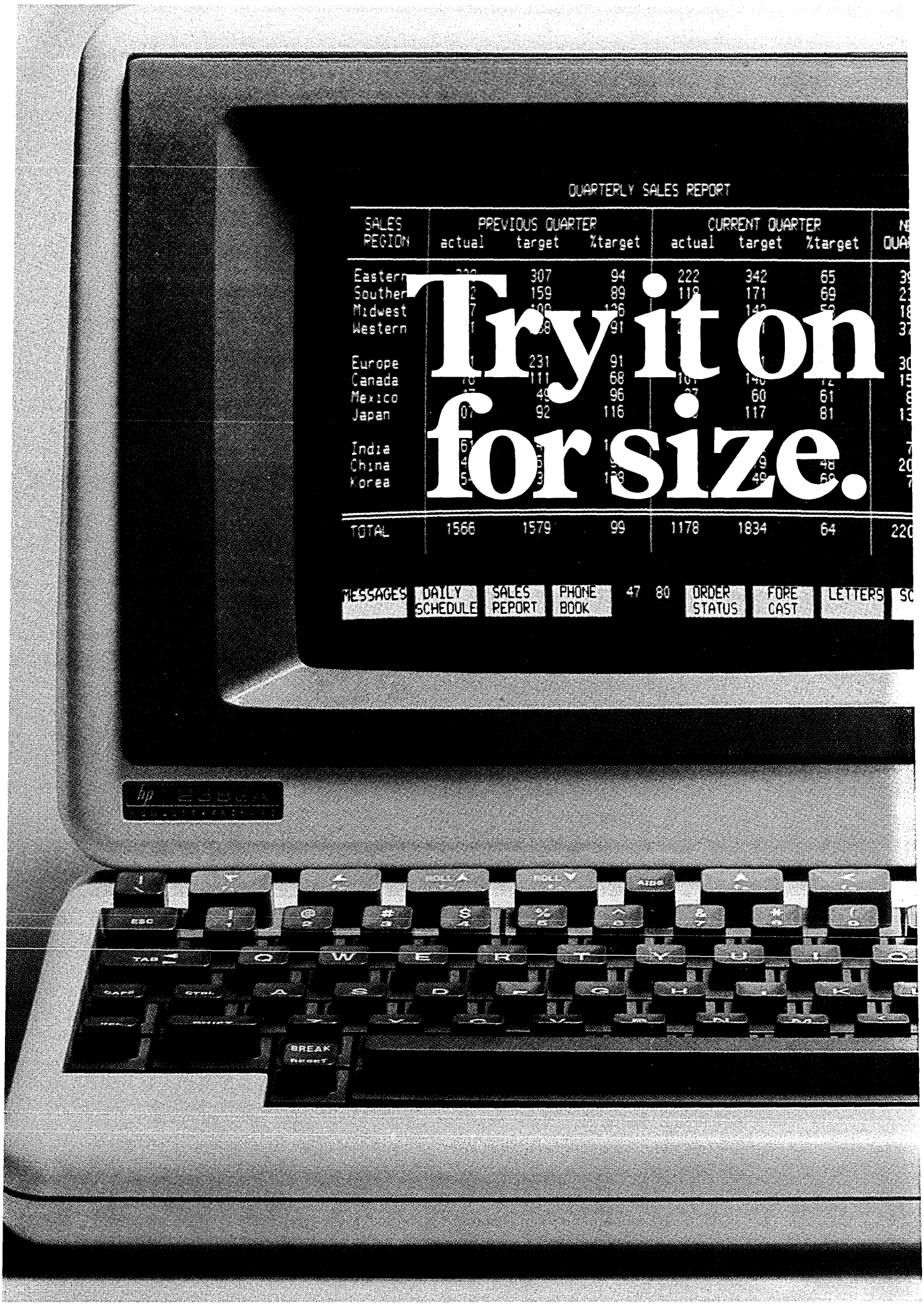
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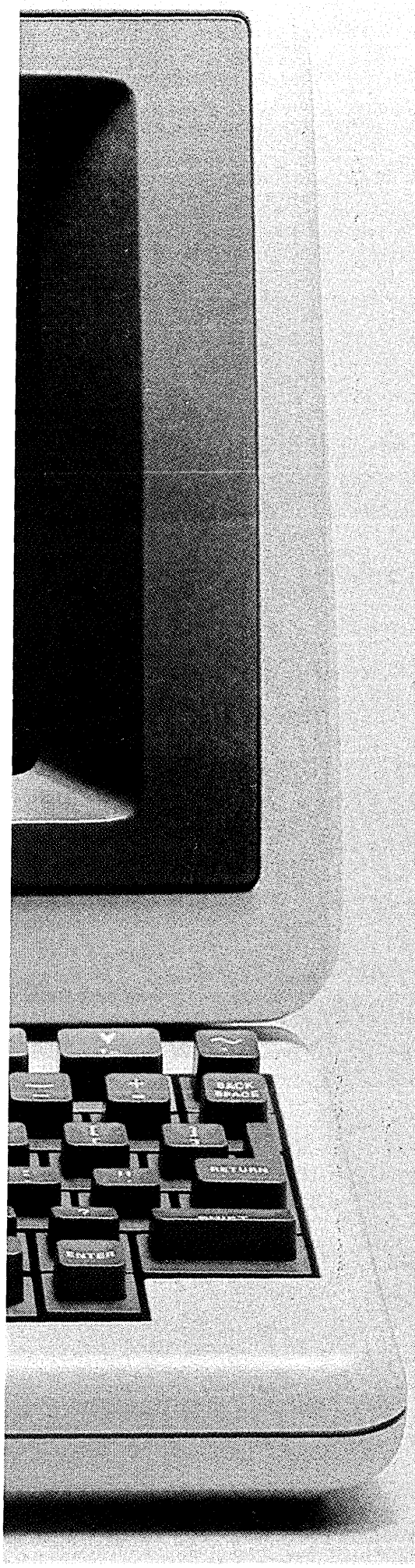

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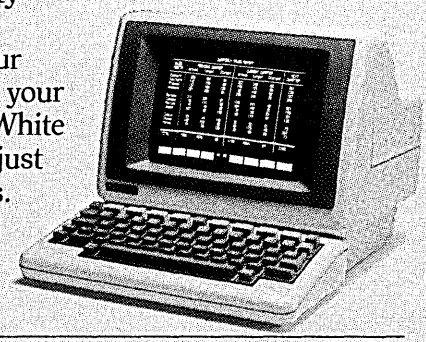

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NEWS IN PERSPECTIVE

As detailed in DATAMATION (January 1981, p. 84), some 50 manufacturers have entered the robotics race with systems ranging in price from about $10,000 to hundreds of thousands of dollars. In recent months the robotics market has seen still more action as competitors ranging in size from General Electric to startup United States Robots Inc. of Conshohocken, Pa., jockey for position.

IBM introduced its two robots a week before a large robotics show in Detroit, at which it was announced that GE and Volkswagenwerk A.G. of West Germany have signed a technology exchange agreement. GE has won the right to make and sell five VW robot models worldwide for five years. It is the third agreement on robotics that GE has signed with a foreign supplier, and the company is expected to follow up with a series of GE-developed machines next year. And AT&T is reportedly trying to enter the race as it works on the development of its own robots while also evaluating a dozen or more being offered by other manufacturers.

The RS 1, developed in-house, is said to adapt to its working environment through information gathered by optical and tactile sensors.

The two new products from IBM give the company a foothold in the emerging market, offering both a low-cost model and an advanced model with which the firm can impress competitors and potential customers. The model 7535 manufacturing system carries a price tag starting at $28,500, with quantity discounts available for volume orders. The IBM-built RS 1 has not yet been priced and no plans have been disclosed for a full marketing effort for the large machine. IBM did say the RS 1 is in use at some 15 customer locations and an additional 10 machines will be installed in coming months.

"IBM's introduction of a robot is not the tip of the iceberg, it's the tip of the ice cube," said Laura Conigliaro, an analyst with Bache, Halsey Stuart Shields, Inc., a Wall Street investment banker. "It's just a baby step for IBM, but obviously a very important one in its overall CAD/CAM plans." Conigliaro, who attended the packed Detroit trade show, said she was impressed by IBM's willingness "to listen to and assist its customers. They really seem to be caring about what their customers want in the way of robotics." That attitude, she said, was evident in the firm's dealings with its test customers for the RS 1, among whom are said to be United Telecommunications, Motorola, and International Harvester.

Industry sources have been claiming for about a year that IBM has robots working on its own production lines, building printers and other computer-related products. So it came as no surprise to them that the company would announce its entry into the robotics market. What did surprise these observers, however, was that the company is offering a non-IBM-built machine as its first robot, although it has done similarly in offering Minolta-built desktop copiers, Matsushita-built 3101 ASCII terminals, and, most recently, a primarily non-IBM personal computer. The 7535 was seen by some as a way for IBM to get into the robotics market quickly and with little R&D investment so that it can gain a strong foothold for future growth.

IBM's presence in the market is expected to legitimatize the robotics concept as well as heat up competition.

IBM described the 7535 as being useful in automatic assembly and insertion of automotive and electrical parts, multiple-point drilling and tapping, and high-precision work. The machine is said to position its single arm with a repeatable precision of 0.002 inch.

The 7535 is built to IBM specifications by Sankyo Seiki Manufacturing Co. Ltd., Tokyo, an IBM spokesman in Armonk

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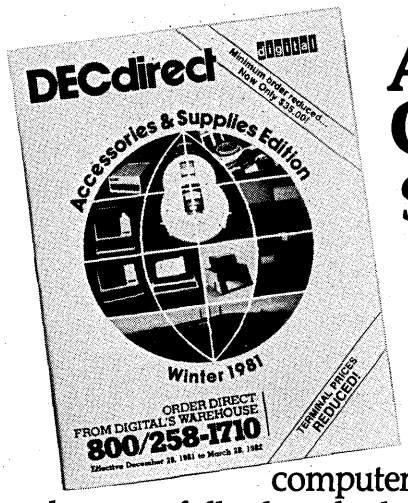

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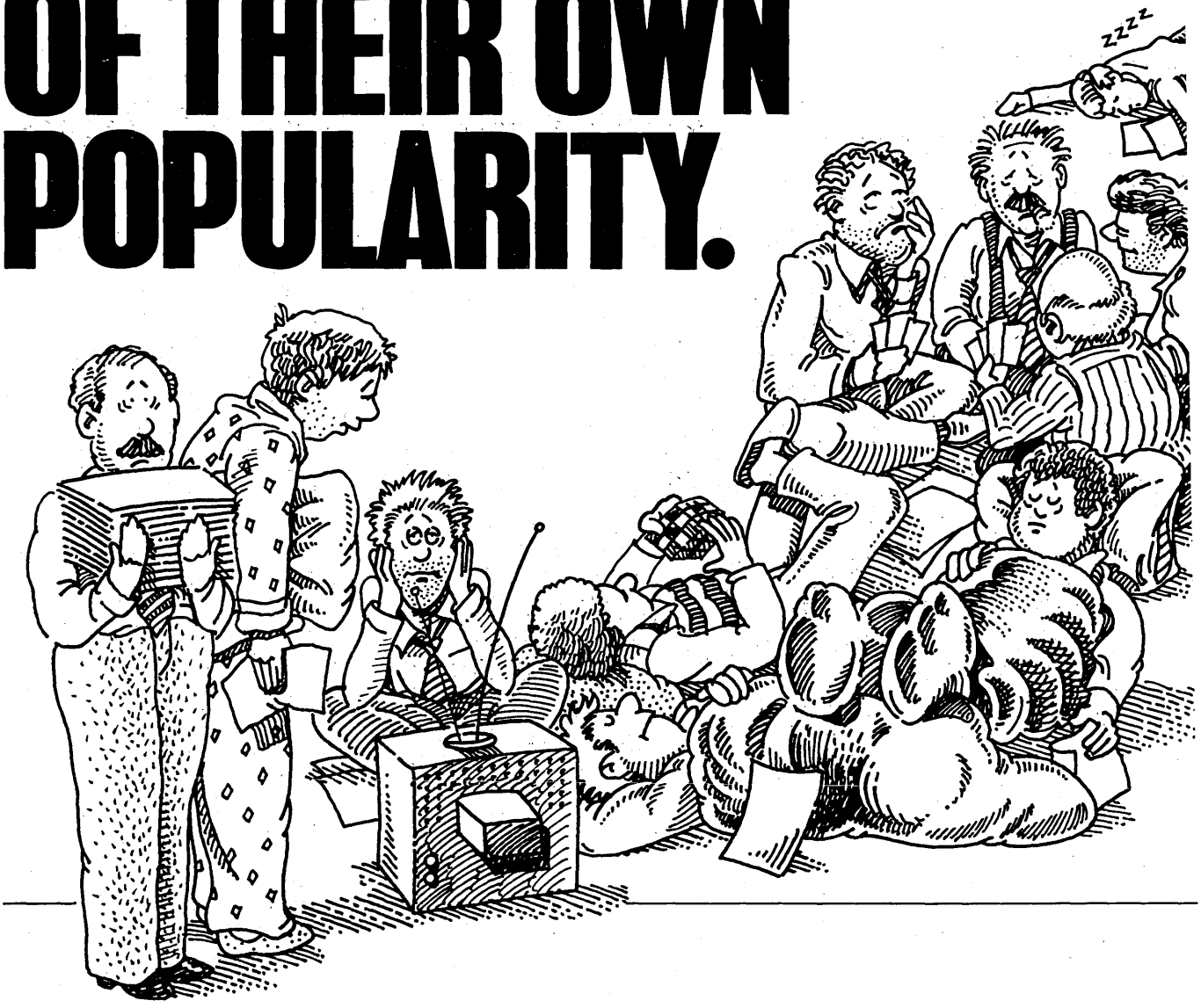

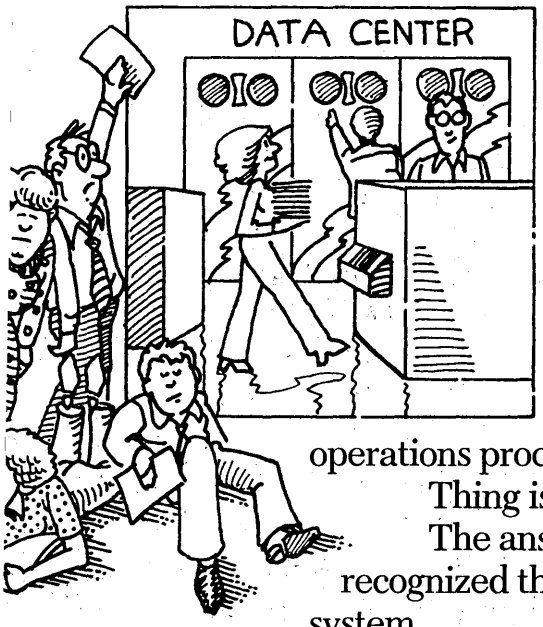

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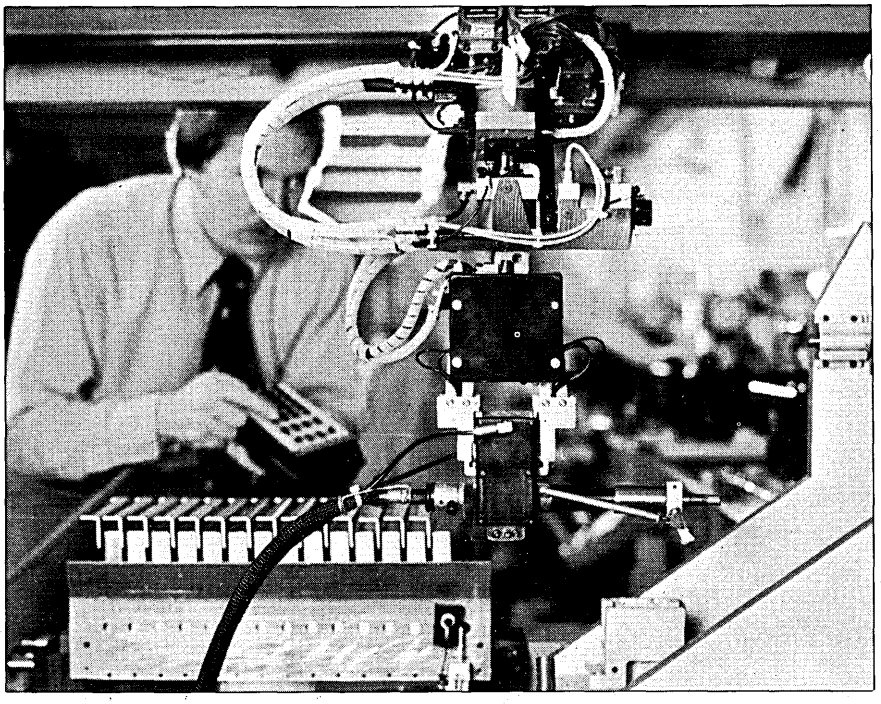

RS 1 ROBOT, IBM's advanced robotic manufacturing system, moves a power screwdriver toward a workstation. The arm can move in six directions and is controlled by an operator using a handheld device called a pendant. At the push of a button on the pendant, instructions are automatically set in RS 1's memory. The robot will then perform the required operation until instructed to stop or until programmed for another task.

said. It is programmed in an IBM-developed language called AML (A Manufacturing Language), which runs in a limited version on the IBM Personal Computer and in a full version on a Series/1 minicomputer for controlling the larger, more sophisticated RS 1 robot, the spokesman explained.

In a rare display of one-upmanship, IBM's Dr. David D. Grossman, manager of automation research at the Yorktown Heights, N.Y., research center, said, "We believe AML is the most advanced robotic control language in the world." An IBM spokesman said the language's ability to adapt to its working environment through various optical and tactile sensors was the basis for that claim. The sensors, available only on the RS 1, can detect faulty parts alignments or empty feeder boxes. For those lucky enough to get an RS 1, an application development program written in AML is available. It provides such commands as GRASP and TRANSPORT and is aimed at helping early users perform initial feasibility studies with the machine.

IBM said the RS 1 can move a payload of five pounds at up to 40 ips through six degrees of freedom. Its single arm ends in a two-fingered gripper that can be equipped with tactile and infrared optical sensors which monitor the device's operations. Thus, the arm's speed, motion, and gripping pressure can be maintained with accuracy.

The controller for the RS 1 consists of a modified Series/1 computer, which includes disk and diskette drives, a 120 cps printer, and keyboard display. In addition to system control, the computer also provides standard data processing functions such as record keeping, calculation, and report generation. Programmable and diagnostic safety features are under computer control, the spokesman said.

The smaller 7535 is capable of four degrees of freedom and is designed to handle loads of up to 2.2 pounds. Arm speeds range from 15 inches per second to 57 ips, depending on the load involved. The machine's controller can store up to five types of multipoint routines or programs with a maximum capacity of 6,000 characters of memory. Users can quickly and easily change the machine's programming using the AML language running on an IBM Personal Computer, the firm said, noting that more than one 7535 can be programmed by a single Personal Computer. The AML/entry language package for the Personal Computer is available for a license fee of $1,000.

It was not immediately clear when the RS 1 would be brought to market as a full-fledged IBM product. The company declined comment when asked. It is clear, however, that after several years of in-house use of robots, IBM has set its powerful sights on the robotics market and plans to be a strong competitor. It may try to establish standards for the industry, such as its AML language, as well as apply its own formidable manufacturing abilities to the production of robotics tools themselves.

—John W. Verity

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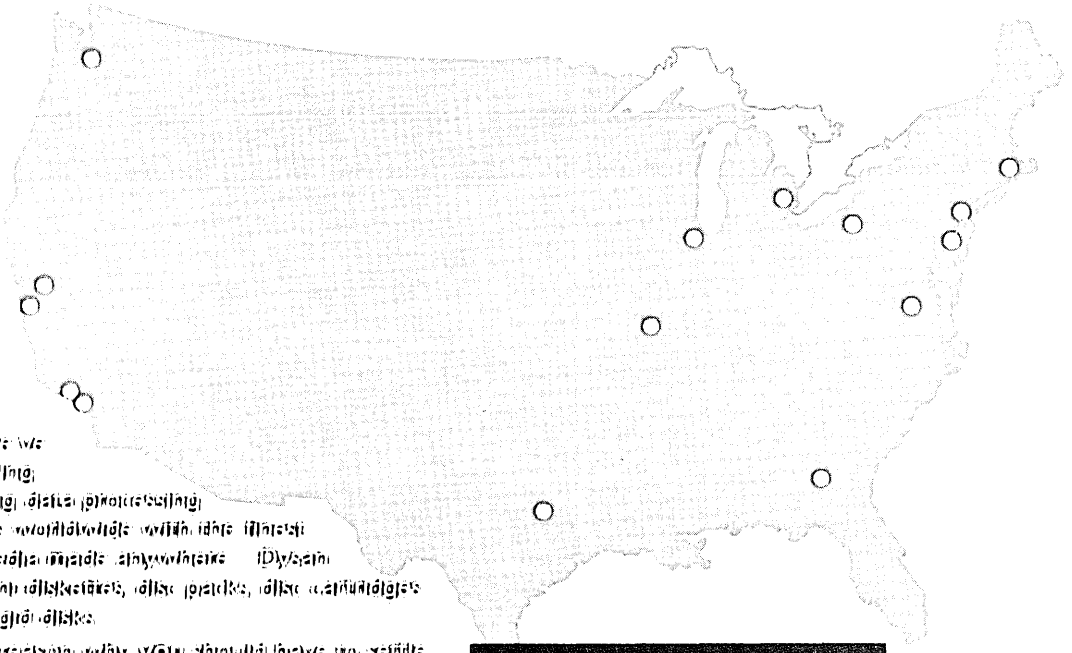

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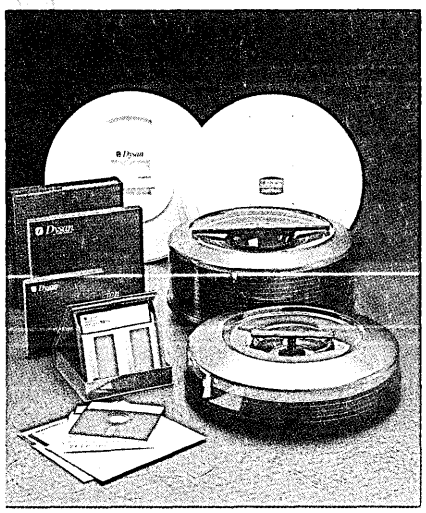

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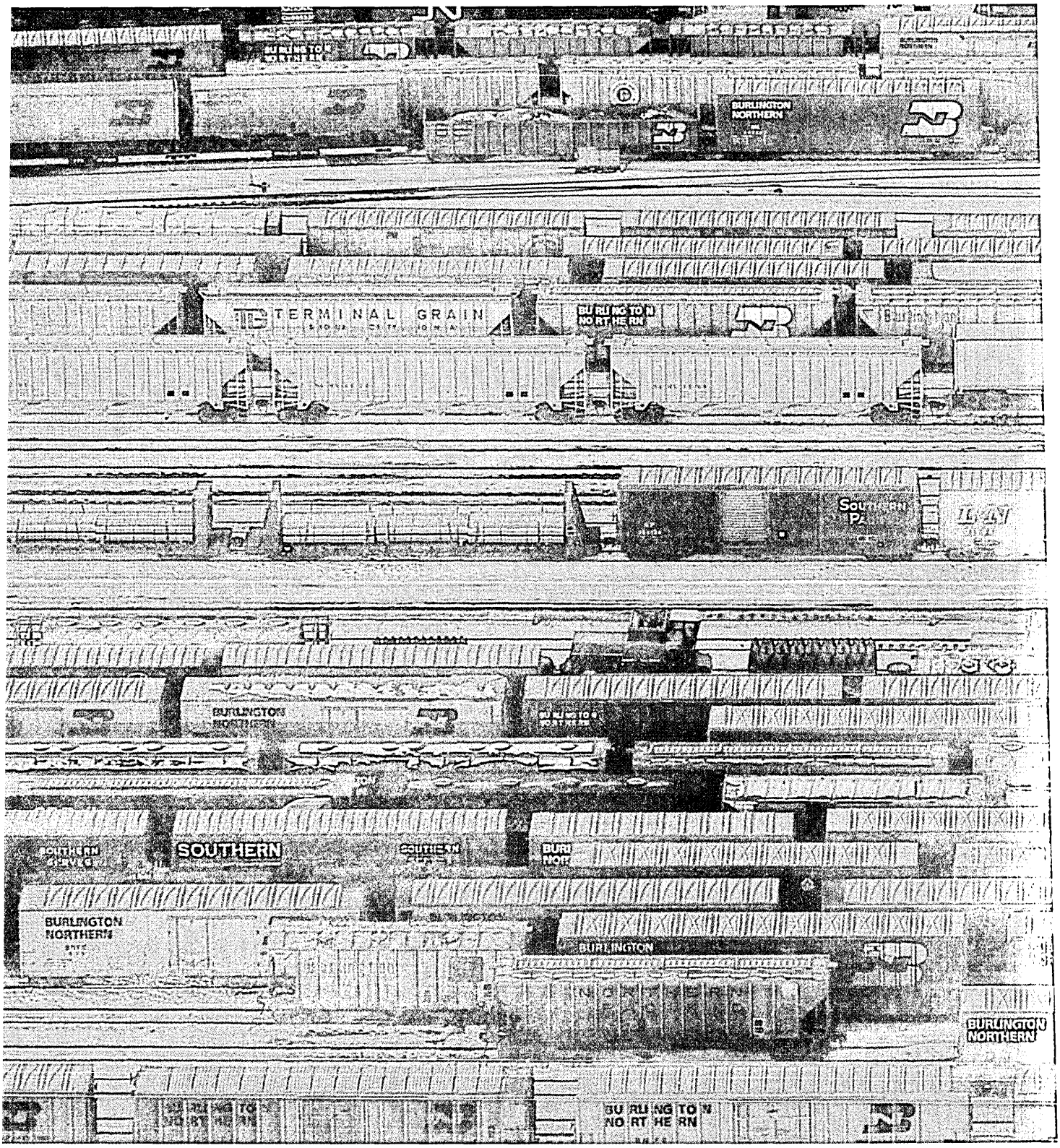
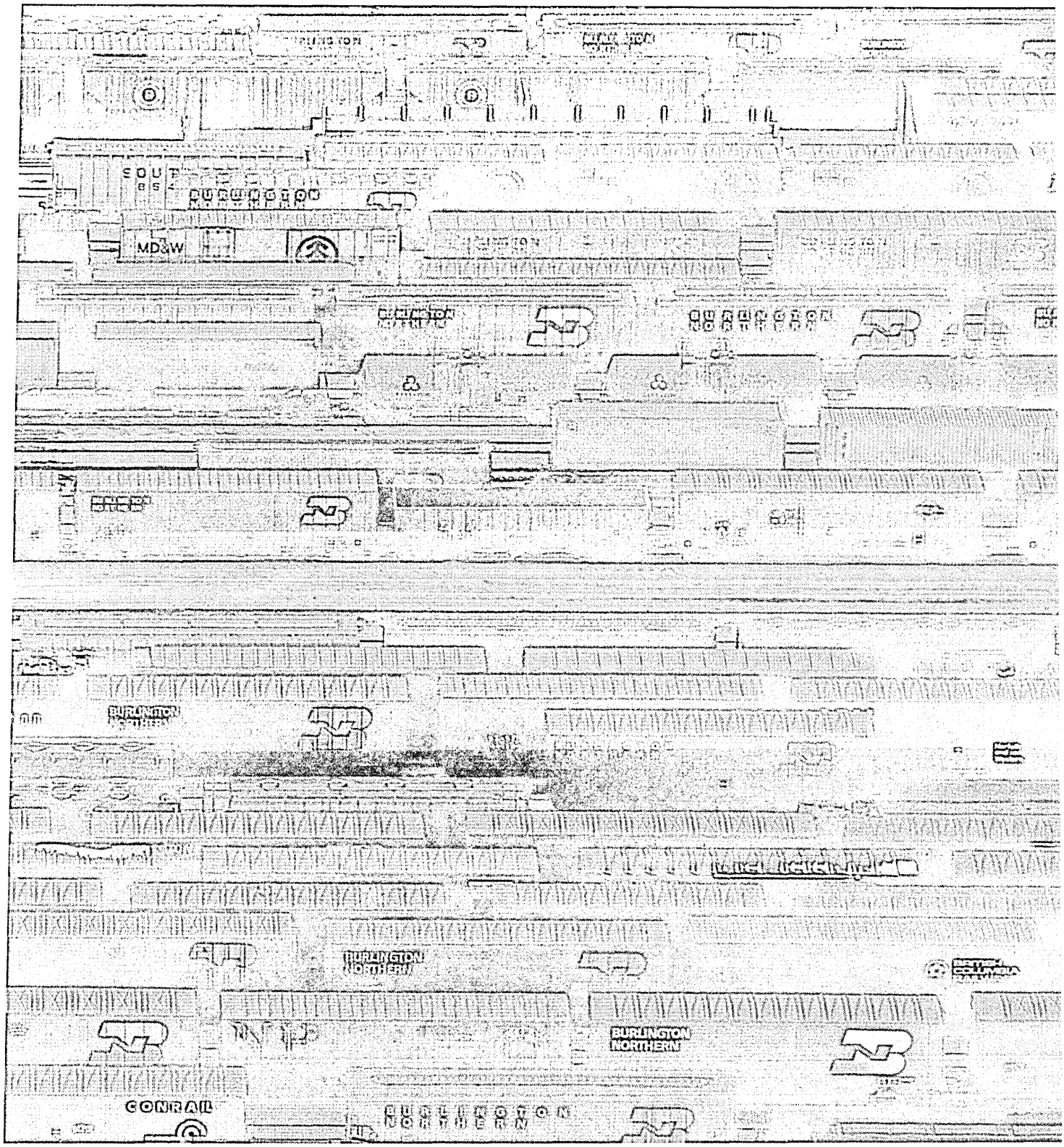


Can you spot the five cars headed for Wyoming?



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OFFICE AUTOMATION

DP, WP, & PBX ALL IN ONE

Prolink provides modular boxes that the user can unpack and hook together into a local area network.

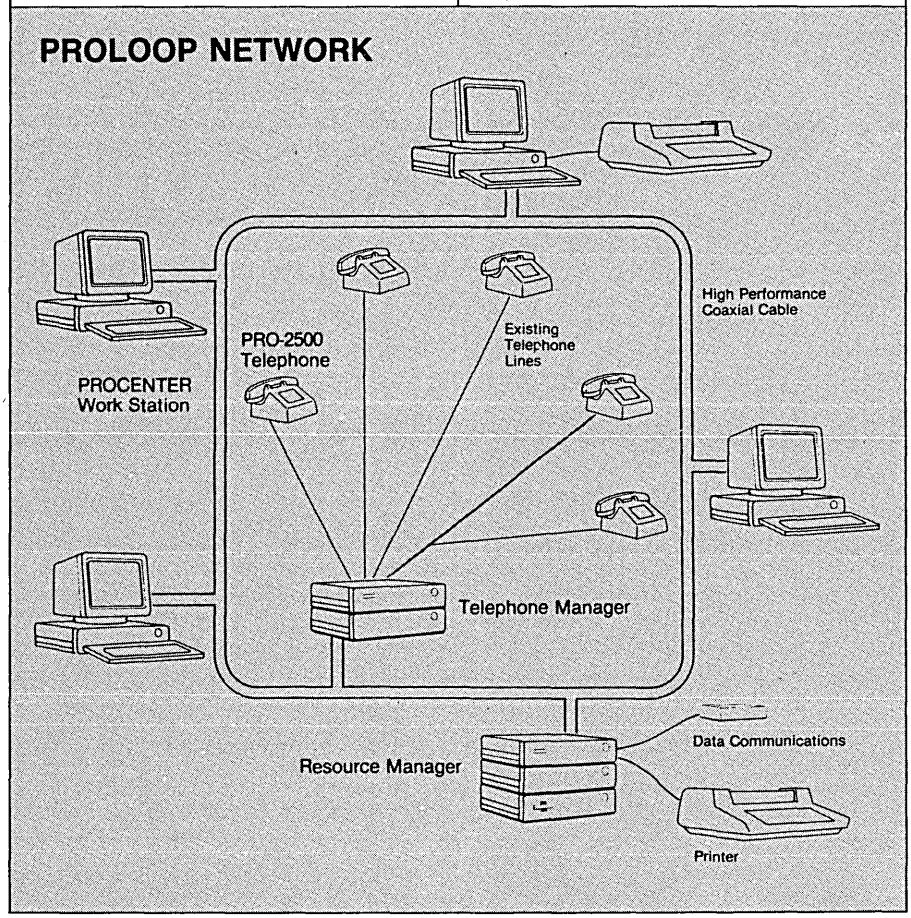
It took a while for users in the office environment to realize that their word processing systems could, with the mere addition of some software, also perform the data processing function. The device that moments earlier was being used to play out some letters and memos was, indeed, capable of also computing the payroll and handling accounts receivable. Thus it comes as no surprise that someone should design an integrated system that handles not only those two functions but telephone communications as well.

"The integration of functions can make higher performance available at lower cost, because you can share resources, share processing, and can simplify the human interface," says K. Dieter Heidrich, president of Prolink Corp., Boulder, Colo. His system makes it possible to use a single database for all office functions, he explains, and presents to the user a single interface to the system.

In this integrated approach to office information systems, Prolink provides modular boxes that the user can unpack and hook together into a local area network. One of the multifunction boxes, called a common control unit (CCU), has no personality until loaded with the proper software. Used in conjunction with a keyboard and display, it becomes known as a workstation. Used as a switching unit, it becomes a PBX. But when it drives a disk file, it's called a resource manager, the equivalent of what Xerox calls a file server. The CCU is based on an Intel 8086 microprocessor and can be configured with up to 450K bytes of RAM. Linked by coaxial cable, these boxes become part of a 10 Mbps baseband modulated system, the cable carrying both digitized voice and textual traffic.

The market being targeted is the office with more than 10 but fewer than 100 phones.

The market being targeted is the office with more than 10 but fewer than 100 phones. Accordingly, the company this month is scheduled to begin shipments to large corporations having branch and sales offices, manufacturing facilities, and warehousing and distribution points. Through



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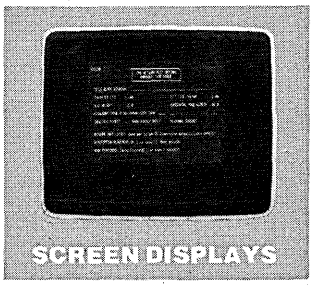

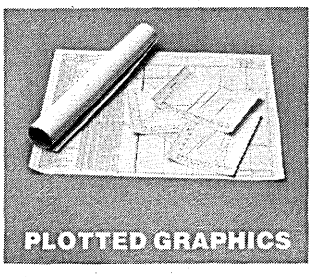

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CIRCLE 45 ON READER CARD

independent sales organizations, the company is also going after the million or so small businesses that employ fewer than a hundred in the office.

A minimal system with a computer-

Prolink is also going after firms employing under 100.

ized PBX for 16 phones, word processor, and about 1 MB of disk capacity, is priced at some $25,000. Add to this capacity and capabilities and a system goes to about $150,000. Heidrich explains that a small office typically cannot afford a PBX, which can cost upwards of $1,000 to $1,200 per phone line. But Prolink's 30-line system is priced at between $600 and $700 per line.

The two-year-old company, co-founded by people formerly with Northern Telecom, spent its first year developing its prototype models. It did not officially announce the product until last October, shipped its first units a month later, and this month is slated to have 10 systems evaluated. The company twice has passed muster with investors, its two private placements resulting in investments totaling $7.9 million.

—Edward K. Yasaki

NEW WP SHOW ON THE ROAD

Aiming a new standalone word processor at the small business market is Wordtronix, a startup in Minneapolis.

Can a small group of marketeers and engineers in Minneapolis hope to crack the booming word processing market at this late date? After all, the market would seem to be controlled by a number of heavyweights like CPT, IBM, and Lanier who have managed to dominate the standalone system segment ever since it was born. Well, Wordtronix, a startup founded by former CPT and Data 100 employees, is having a go at it.

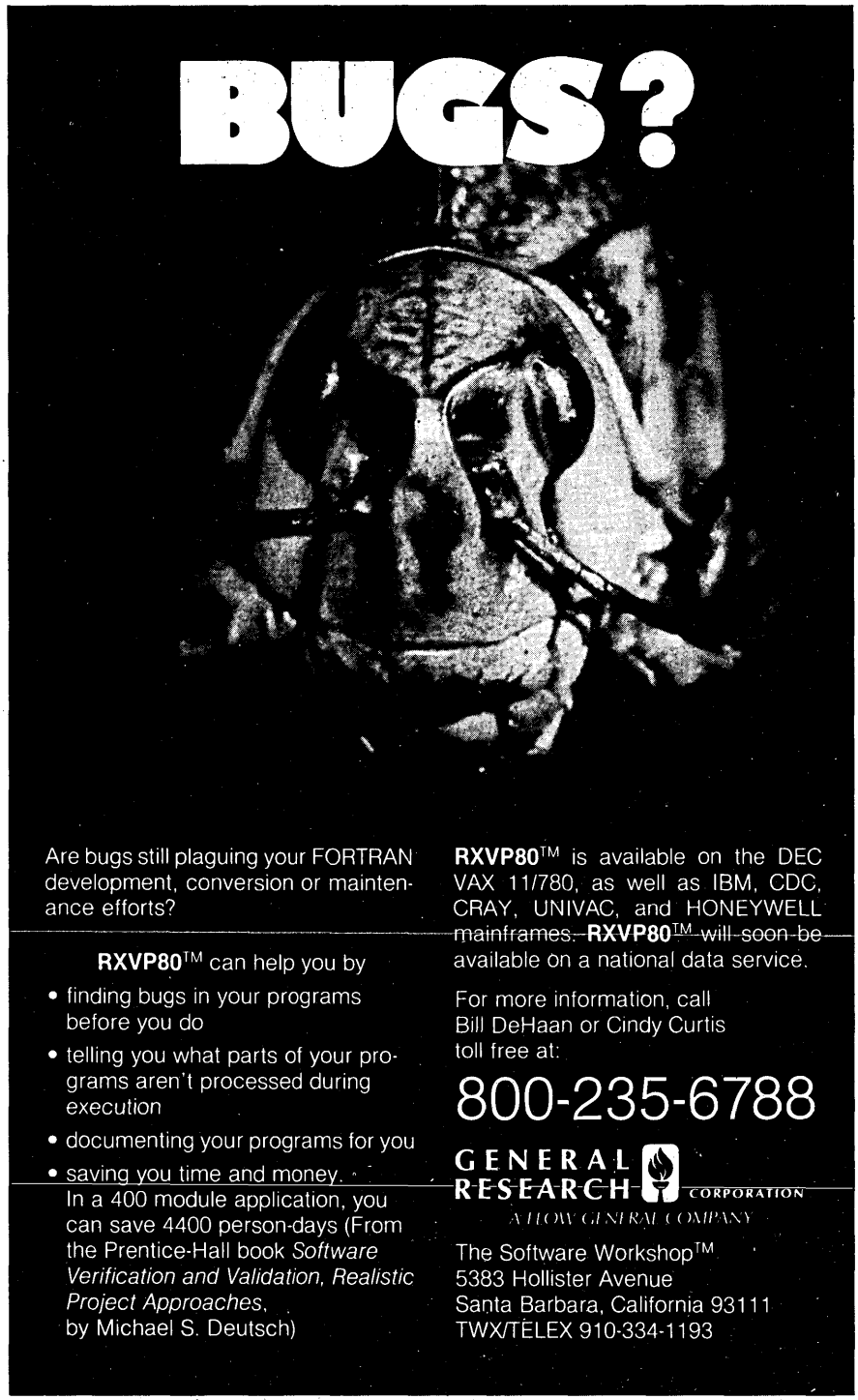
The firm has introduced a standalone machine, which it calls Serif, designed to replace memory typewriters and standard electrics used by thousands of small businesses and secretaries in big businesses who don't need the power of costly standalone systems but who could benefit from some electronics. According to Fred

The Serif machine is designed to be usable by anyone with no more than half an hour's training.

Zimmerman, executive vice president for the company, "There's been a void in the market for machines designed strictly for the clerical worker. Most people in the industry have aimed their products at the word processing and data processing operators." He emphasizes the word "operators" and points out that Wordtronix products are designed for use by secretaries who can't be bothered with training to become operators. "They just want to get their typing done," Zimmerman says. "They don't want to do the payroll as well."

Backed by $1.4 million in public financing, Wordtronix has entered the word processing fray quietly but deliberately, having spent a full year searching its market and designing its machine from the ground up. Its management team, headed by former CPT marketing vice president V.A. Kluesner, is counting on its experience at CPT, Data 100, and Storage Technology to guide it into a niche that has apparently been overlooked by the industry giants.

However late it is to the market, Wordtronix is counting on its machine's design and an ambitious dealer program to bring it success. The two Serif systems, differing only in disk capacity, have been



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—*John Imlay, Chairman MSA*

John Imlay and MSA Customer Support Team specialists Betty Feezor, Larry Smart, and Pat Tinley.

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The team behind the team

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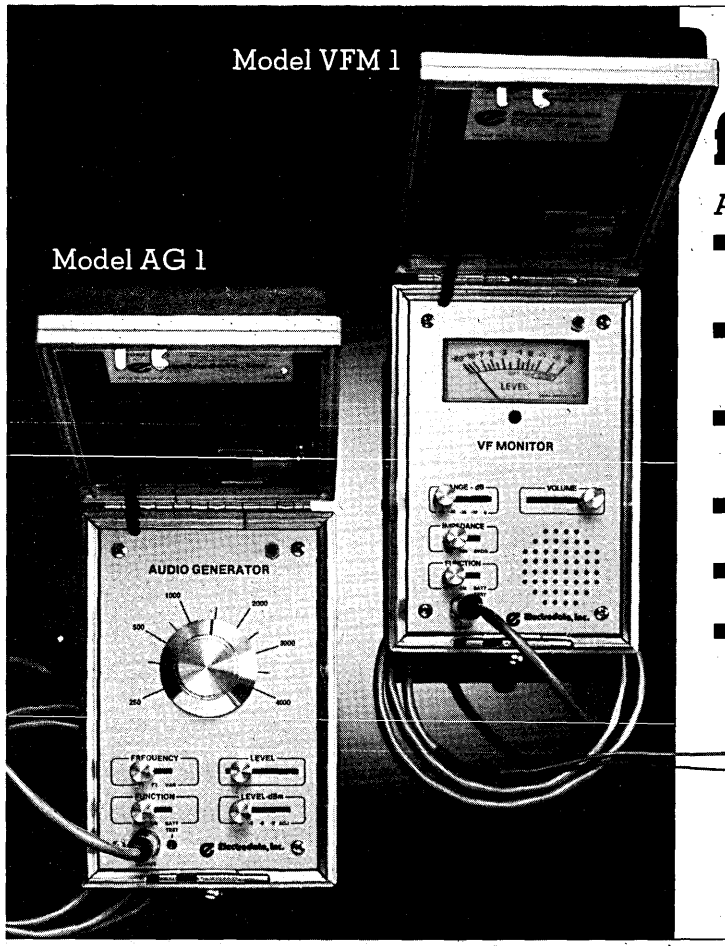
SERIF SANS COMPLEXITY: Wordtronix's Serif machines, priced from $7,600, were designed from the ground up as highly efficient typewriter systems that are simple, reliable, and affordable word processors.

designed to be as close as possible to standard typewriters—primarily the IBM Selectric—in ease of use and keyboard layout. Says Kluesner, formerly vice president of marketing at nearby CPT Corp., "It's our belief that the mass market of users can't, won't, or shouldn't have to learn new skills or make fundamental changes to enjoy modern word processing advantages."

To that end, Wordtronix has incorporated into Serif a full-page, 15-inch crt display that shows black type on a white background. The display mimics a typewriter by scrolling the white "paper" upwards as text is entered. The unit's keyboard layout and "feel" have been designed to be similar to the Selectric, and there is a minimum of function keys for the operator to have to learn about. A Help key is included, however, as is an "Oops" key which undoes the function previously executed. Text can be windowed so that inserts can be performed while keeping track of previously entered text, according to company literature. Finally, much of the machine's operation is controlled through a series of operator-prompting menus.

It is these ease-of-use features that Kluesner hopes will make his machine attractive to the 4 million small businesses he sees in the U.S. These companies are best reached, Wordtronix has determined, through a network of dealers that have traditionally supplied typewriters, office furniture, and other office equipment. The Serif machines' simplicity, it is hoped, will make it easy for such dealers to sell the machines without extensive training, investment, or hand-holding to novice customers. Wordtronix hopes to have signed up some 225 dealers by the end of 1984, supporting them with advertising, sales, and training programs; contractual policies regarding the number of dealers in a metropolitan area and sales to "national account" clients; and discount schedules that exceed 40% for large-volume dealers.

Kluesner is quick to point out that the word processors will be marketed exclu-



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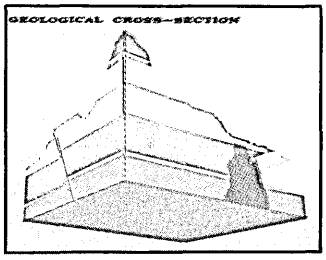
Precision Visuals' software tools currently run on 15 different computer systems, driving 26 different graphics display devices. They take full advantage of today's—and tomorrow's—most sophisticated graphics hardware, and are upward compatible with emerging hardware technologies.



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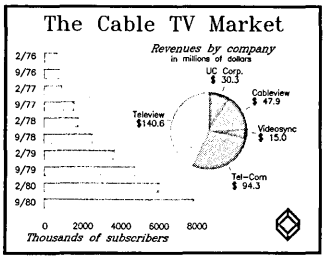

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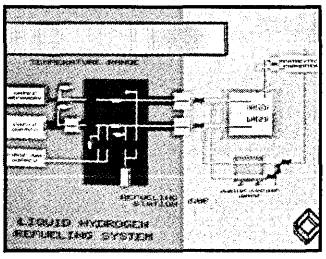

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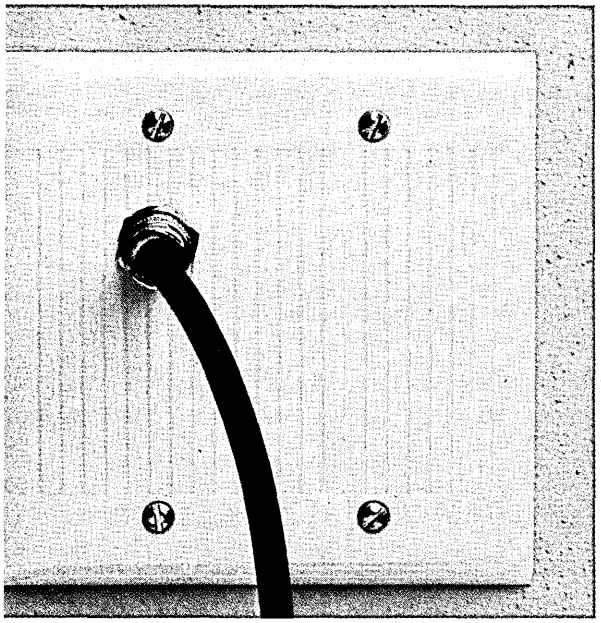

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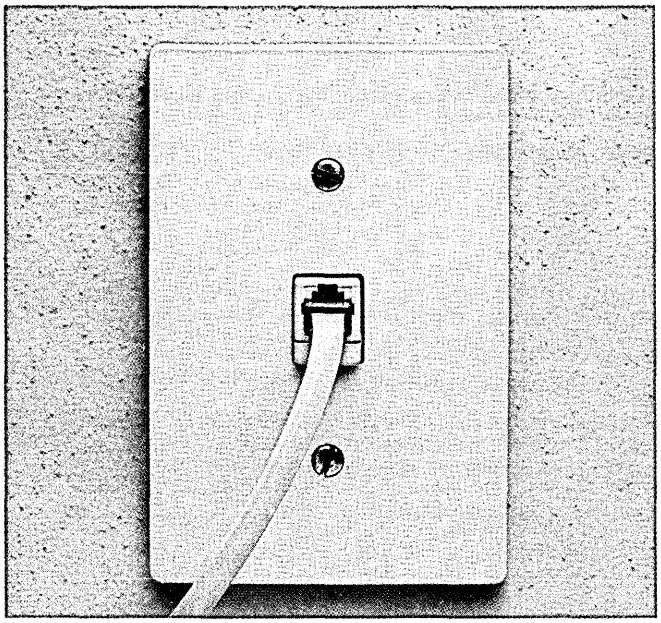

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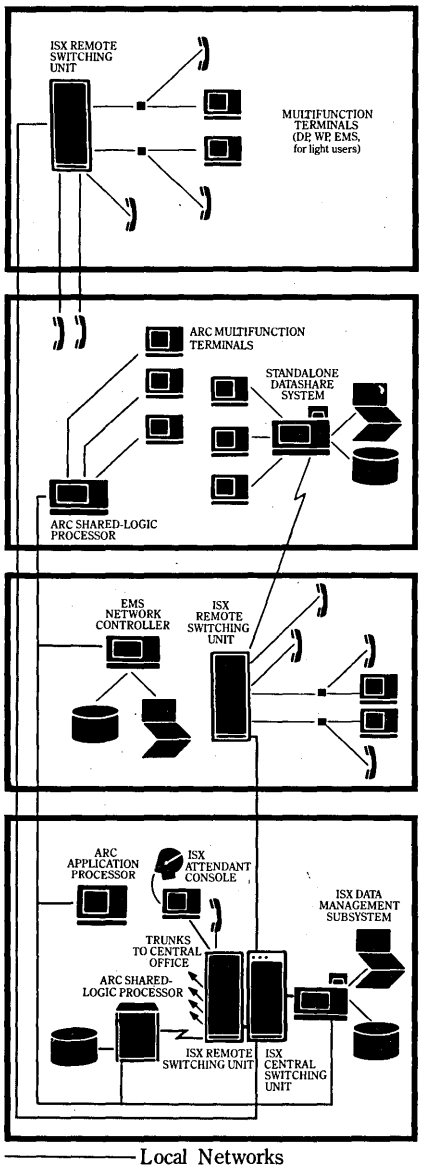

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"In recent months, for example, we've had two systems from other manufacturers go down, and both times Halcyon's response has been 'extraordinary.' In one case, Halcyon delivered, tested and installed a new 4200 in only 23 hours. No other manufacturer would do that for me.

"But then Halcyon has *always* bent over backwards for Apple. One call to their nearest regional service center . . . and they can have someone over in less than an hour. Now that's unheard-of!

"On top of that, the 4200 is a lot easier to use than other MUX's, and gives us everything we need . . . including line cost savings, flexibility, performance monitoring, network control, diagnostics, growth capability and more.

"In fact, I plan to purchase additional 4200's for our expanding remote sites. Halcyon's proven that they're committed to providing the best service around. And that means a lot to a 'back-up oriented' company like Apple."

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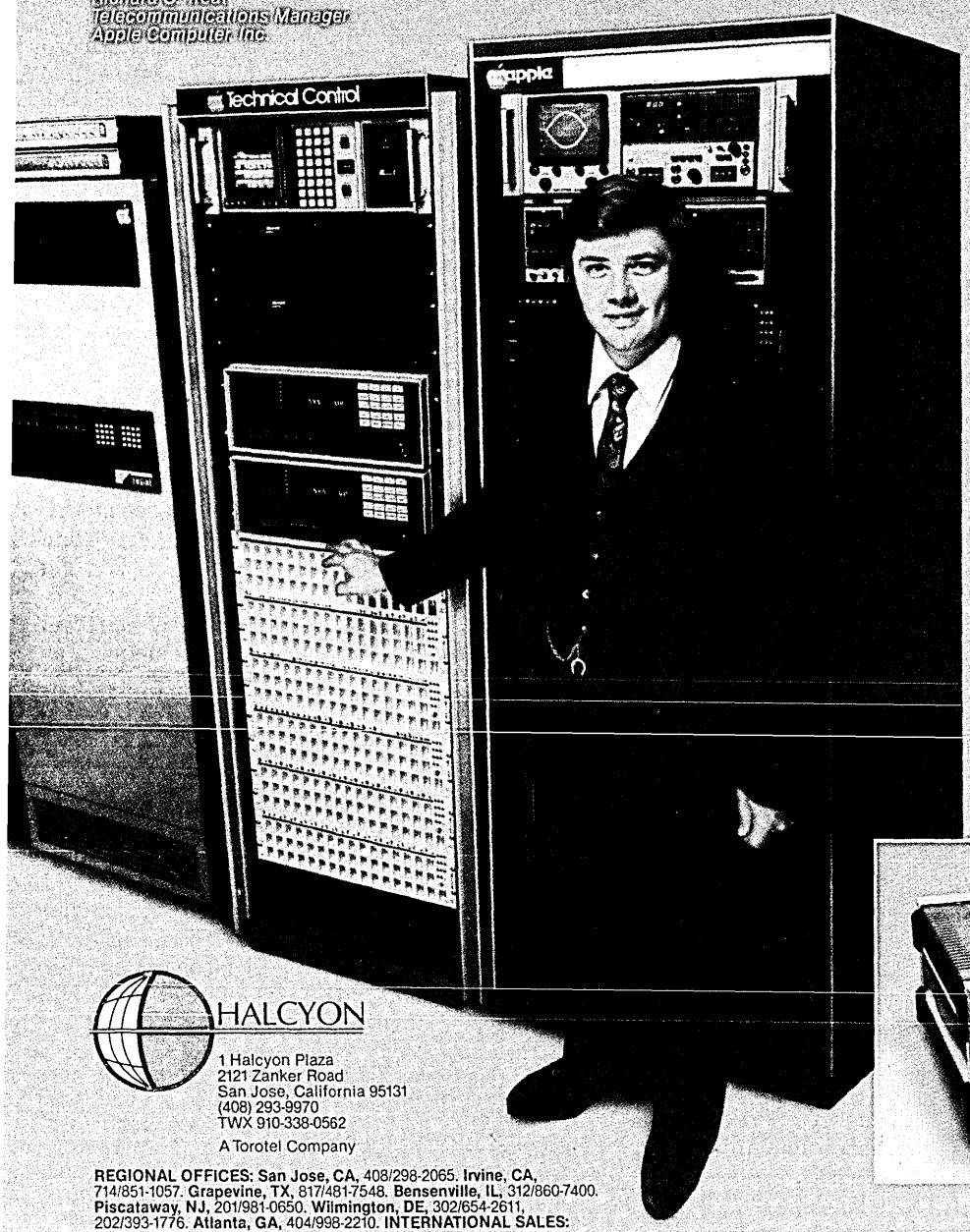

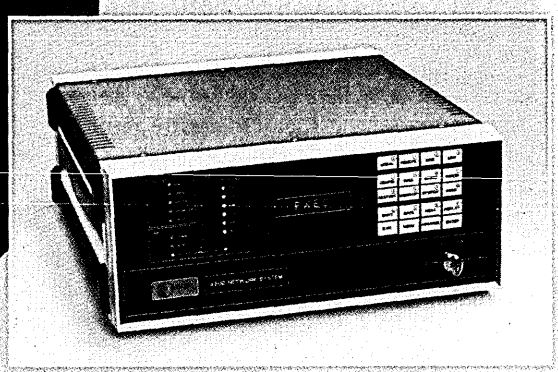

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CIRCLE 117 ON READER CARD

sively through those dealers and not through computer stores or distributors. This is expected to keep dealers happy enough to handle the machines on an exclusive basis and guarantee them the volumes they need to keep margins up.

Industry analysts contend that Wordtronix certainly has its work cut out for it, considering the well-established competitors it faces. IBM's Displaywriter, introduced in 1980, has gone far in setting new price standards for standalone systems and has been followed by a large number of similarly featured and priced systems. The new Minneapolis firm thinks its price is right.

The Serif-1 system has a single-sided, double-density minidiskette drive, full-page display, keyboard, and daisy-wheel printer. With entry-level software, the system has a suggested list price of $7,600. The Serif-2, with double drives, carries a list price of $8,400. An extended word processing software package carries a one-time fee of $700. These prices are competitive with IBM's machine, which starts in the $8,000 neighborhood. But it is not only price that Wordtronix hopes will attract small users to its hardware. Service and availability through a known, local dealer are key factors, according to Kluesner.

"My impression is that there's room for additional entrants [in the word processing market]," said Tom Niemiec, computer technology analyst at Piper, Jaffrey & Hopwood in Minneapolis. "The market is sufficiently large that if you offer a decent piece of equipment, you can make a living." He pointed out that a firm like Wordtronix would have to move quickly to sign on dealers and establish a "critical mass" to be successful in the long run.

Executive vice president Zimmerman stated at press time that Wordtronix was close to signing "half a dozen" dealers to sell the Serif machine, and that the firm expects to ship about 500 systems during 1982.

As for service, the machine has been designed with modules that local dealers can swap out just as they would on a copier, Zimmerman added. He noted, too, that communications will be added as a feature later in the machine's product cycle. The machine's cost has been held down through the use of an 8-bit microprocessor, a Z80, which is combined with programmable logic arrays to provide all the processing power required for word processing.

One distinguishing characteristic Wordtronix is counting on to gain a competitive edge is that its machine will be sold only as a word processor. Data processing software could be added easily, but the firm's market research has shown little "natural integration" of those two functions. "People who deal most naturally with words will continue to deal with words. People who deal with numbers will deal with numbers. Just as we don't ask the microprocessor in a microwave oven to balance out checkbooks, we don't ask the Serif's microprocessor to be a business computer," notes Kluesner. He says the firm is trying to "redefine" ease of use in word processing.

—John W. Verity

STANDARDS

I/O STANDARD ISN'T

How well is the federal I/O interface standard working?

In this corner, the federal government, waving the banner of increased competition and decreased costs. In the other corner, four powerful computer manufacturers, forecasting terrible consequences for themselves, the government, and the Republic itself. The object of their tête-à-tête? Federal I/O standards.

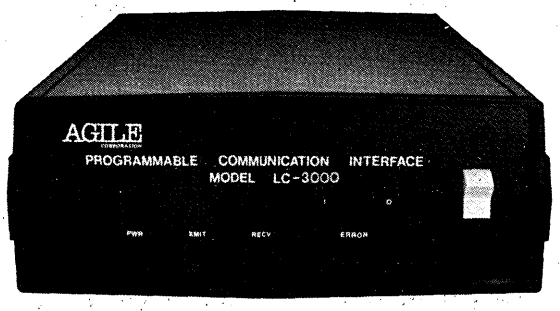
Two years and one lawsuit later, the government scored a knockout. Sperry Univac, Honeywell, Burroughs, and Control Data failed to convince federal district and appellate courts and the Supreme Court of the rightness of their cause. The plaintiffs were forced six months ago to rest their case. The ensuing time period has not quieted their souls.

"We've made a concerted effort to comply," says Joe Corini, Univac's director of marketing for federal systems. "But it's a bureaucratic nightmare. Procurements take longer. The equipment gives lower performance for higher cost. The number of competitors is down. We could easily give lower price and higher performance if we weren't following FIPS [Federal Information Processing Standards].

"We had to change our channels to comply. That cost the government a couple of hundred thousand dollars. I don't like to go around crying that we've been damaged. We've lost some business and we've won some. But where we've won, the government has paid more for less."

"The standards affect us most in the procurement process," says Control Data's director of standards, Keith Lucke. "It costs us more to respond to the procurements we have to respond to. We have to submit two configurations, one with the standards and one without. There's confusion on both sides, added costs to the gov-

Hewlett-Packard MTS 3000 users



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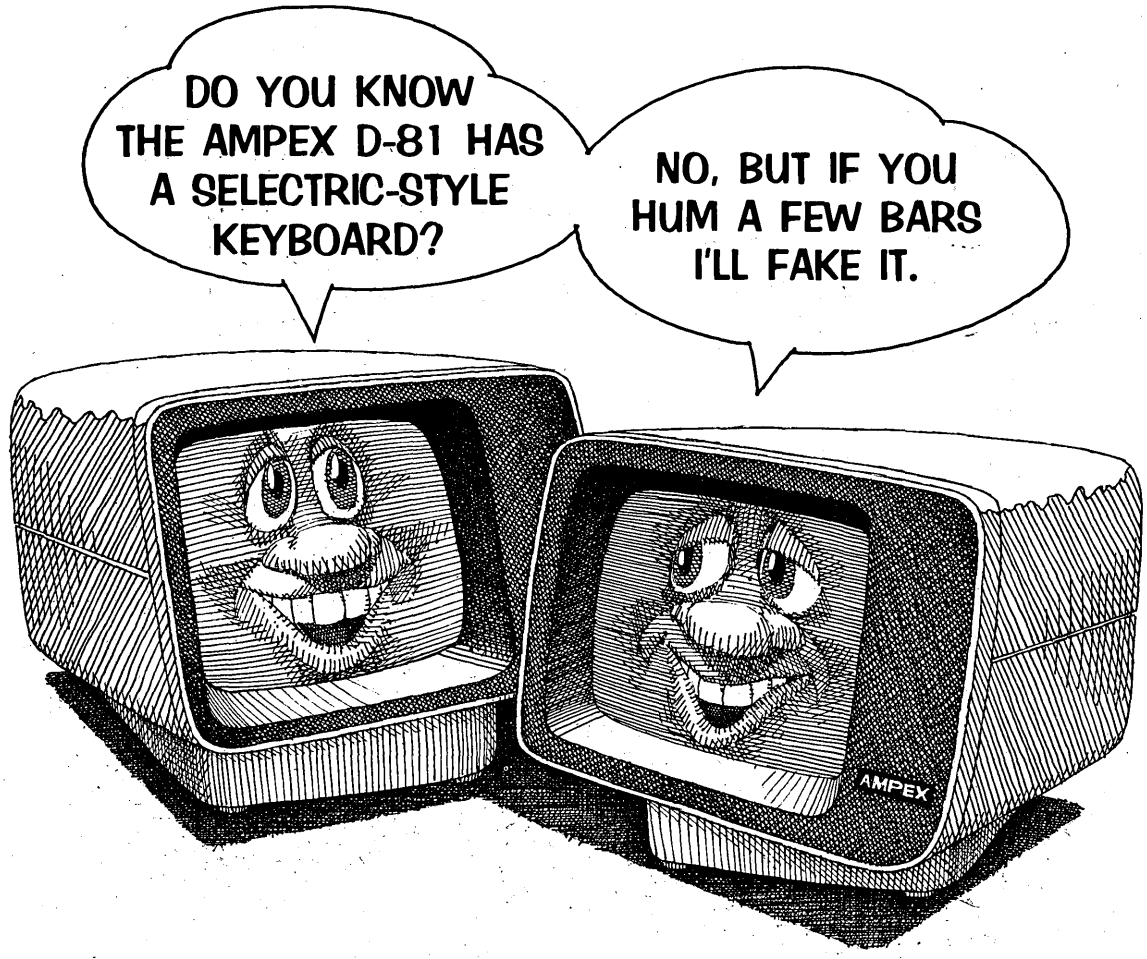

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ernment, and added costs to us. I believe it has been everything we feared it would be."

What the two mainframers and co-plaintiffs, Burroughs and Honeywell, feared varied in form but not substance. When they sought surcease in federal district court in October 1979, all warned of dire straits for the parties of the first and second parts.

Sperry wrote of a "drastically adverse effect on competition in the marketing of computer systems to the federal government"; manufacturers such as itself being foreclosed from selling or leasing additional equipment to the government, and "being compelled" to spend substantial time on research and development at a substantial cost. Honeywell claimed "immediate, serious, and detrimental impact" on its business. Control Data said it would "suffer immediate and irreparable injury by the immediate loss of opportunities to bid on

Vendors seeking federal largesse may have their equipment verified through one of four methods.

and obtain federal agency contracts for adp systems." It estimated expenses of $2 million for research and development, $200,000 per system to obtain the necessary hardware, and $200,000 for dual software systems. Burroughs joined the band with worries of "immediate, serious, and detrimental impact on plaintiff and other adp systems manufacturers."

Spared from the alleged holocaust was IBM, on whose 360 system architecture the standards admittedly were based. IBM argued against the implementation of the standards, claiming they were too dated. It lost during the administrative process, one step and several thousands of dollars prior to its rivals.

Almost two years after implementation of the I/O interface standards (AKA I/O Channel Interface, Channel Level Power Control Interface, Operational Specifications for Magnetic Tape Subsystems, and Operational Specifications for Rotating Mass Storage Subsystems), the implementer sees sunshine and blue skies. The implementees see dark clouds. The actual atmosphere depends upon the forecaster.

"All the complainants are meeting the standards to various degrees," contends John Rigonetti, chief of the systems components division of the Institute for Computer Science and Technology (ICST) of the National Bureau of Standards. "We've got a cooperative relationship now rather than an adversarial one."

"That's bull——," Corini retorts. "They want to pretend everything's going fine. But it's not."

While the Department of Commerce, NBS' parent, promulgates the standards, the dirty work of enforcement is left to the offspring.

Vendors seeking federal largesse may have their equipment verified through one of four methods. About 45% use the verification by document review, which entails a detailed description of the product and an exhaustive NBS checklist. Another 45% opt for the document by operation theory, in which a piece of equipment is used with another piece already on the verification list. The vendor lists customers and sites for the tests, and NBS performs follow-up contact to make sure there are no abuses. The document by demonstration method involves a demonstration test for performance, which may be, but does not have to be, witnessed by NBS. In the equivalency method, a second vendor certifies that his product is the same as an originally approved piece.

It is possible to obtain the cherished approval without NBS ever laying eyes on the equipment. "There is a sneak path in principle," Rigonetti admits, "but it hasn't been used."

It has allegedly remained virgin because those who would be tempted would lose business and quite possibly be forever banned. The standards apply to the procurement of equipment by all federal agencies. An RFP (Request for Proposal) must reference the standards. If an agency can't meet its operational requirements or if it would cost it too much to procure conforming equipment, it may petition the Secretary of Commerce for a waiver. That exalted status will be granted if "a major adverse economic or operational impact would occur through conformance with this standard."

"In 18 months I don't think there have been more than two dozen waiver requests," Rigonetti says. Only the agencies can request waivers. If vendors had that

Honeywell and Univac are complying through their own adaptors.

luxury, there wouldn't be enough trees in the country to supply the necessary paper. The fortunate few looking for a small sale (i.e., less than $400,000) and certain updates to existing systems are exempt altogether.

"The mainframers contend the standards are obsolescent," says Computer & Communications Industry Association (CCIA) executive vice president Jack Biddle, whose charges have a vested interest in free-flowing peripherals business. "They contend they've had to make major investments in hardware and software. While saying they can't do it, they're going ahead and doing it."

Some, such as Honeywell and Uni-

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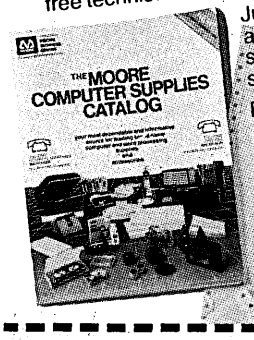

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vac, are doing it through their own adaptors. Burroughs was fortunate to marry Dynamic Sciences Corp., a small California outfit that developed a translator method for Burroughs to interface with FIPS requirements. Originally Dynamic Sciences got no Burroughs assistance; now Goliath has signed a contract with David and eased some of its worries. Control Data has no internal peripherals and must seek help from contractors.

"It's pure public relations propaganda," Biddle contends. "They get Commerce to be very lenient in granting waivers and try to kill the standards that way. In five years I've never seen anything other than allegations about harm done."

All the mainframers contend they have lost business, but none will quantify their claims. "The Univac marketplace is the only one in which I've heard any complaints other than from the four plaintiffs," ICST's Rigonetti says.

Amperif Corp., one of the complainants and a Univac disk drive competitor, alleges that Univac's 8450 disk drive has 35% more capacity without FIPS compliance. The company says it requires four FIPS-compliant drives to equal the capacity of three non-FIPS-compliant drives. Other disadvantages include the need for more floor space, greater cooling capacity and power, and more frequent maintenance.

"It's cost us a lot of money to do what they want," complains Amperif vice president Van Ramich. "We're doing a lot of things that we otherwise wouldn't. It really muddies the water. NBS has a real problem clarifying what each rule requires. There's confusion over the verification list. They verify things on schematic only. And the agencies seem to be confused about the performance of computers and what peripherals they need."

Even when the agencies know what they want, they often get less than what they need. The Census Bureau recently discovered what the private sector has alleged all along.

Amperif says it requires four FIPS-compliant disk drives to equal the capacity of three non-FIPS-compliant disk drives.

The bureau obtained a Univac 1182. It wanted 8470 disk drives, which have 600 megabytes. But those are too fast for the current standard and not FIPS-compliant. So the agency was forced to turn to the 8450, with 300 megabytes. By the time the changes were made to make it compliant, it actually produced 226 megabytes. In lieu of twenty-seven 8470s, Census took in sixty-six 8450s. Cost to the American taxpayer? Over $1 million. Add an additional $23,000 for extra space, $73,000 to air-condition the system, and $92,000 for more power, and the Treasury is more than $1.2 million poorer.

"It makes the procurement process much more protracted and expensive," says Norm Larson, head of the performance assurance staff at Census. "The only one really compliant is IBM. You wind up buying products that are already obsolete. By the time you replace them two years later, they're just terrible. There's no way NBS can keep up with the vendors' technological advances in order to certify good equipment.

"I can't imagine they won't come up with a standard identical to the IBM 3380. They're going to be a rubber stamp for what IBM develops. I'm not sure who profits by it. I can't see what we've done. I question whether it makes sense."

A procurer for a leading computer firm under contract to a federal agency doesn't question whether it makes sense.

"FIPS is an abortion. They grabbed an IBM design and slapped an NBS cover on it," the source contends. "The intent is good, but the implementation stinks. We're forced by government bureaucrats strangling on their own spit to go sole source by definition. Their definition of field-proven hardware is ludicrous. The whole thing stifles technological innovation.

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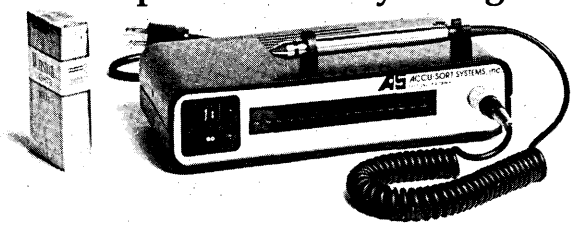

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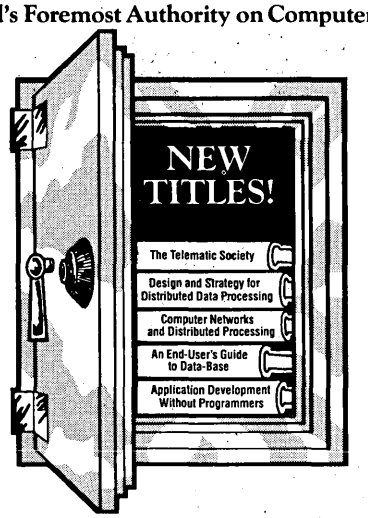

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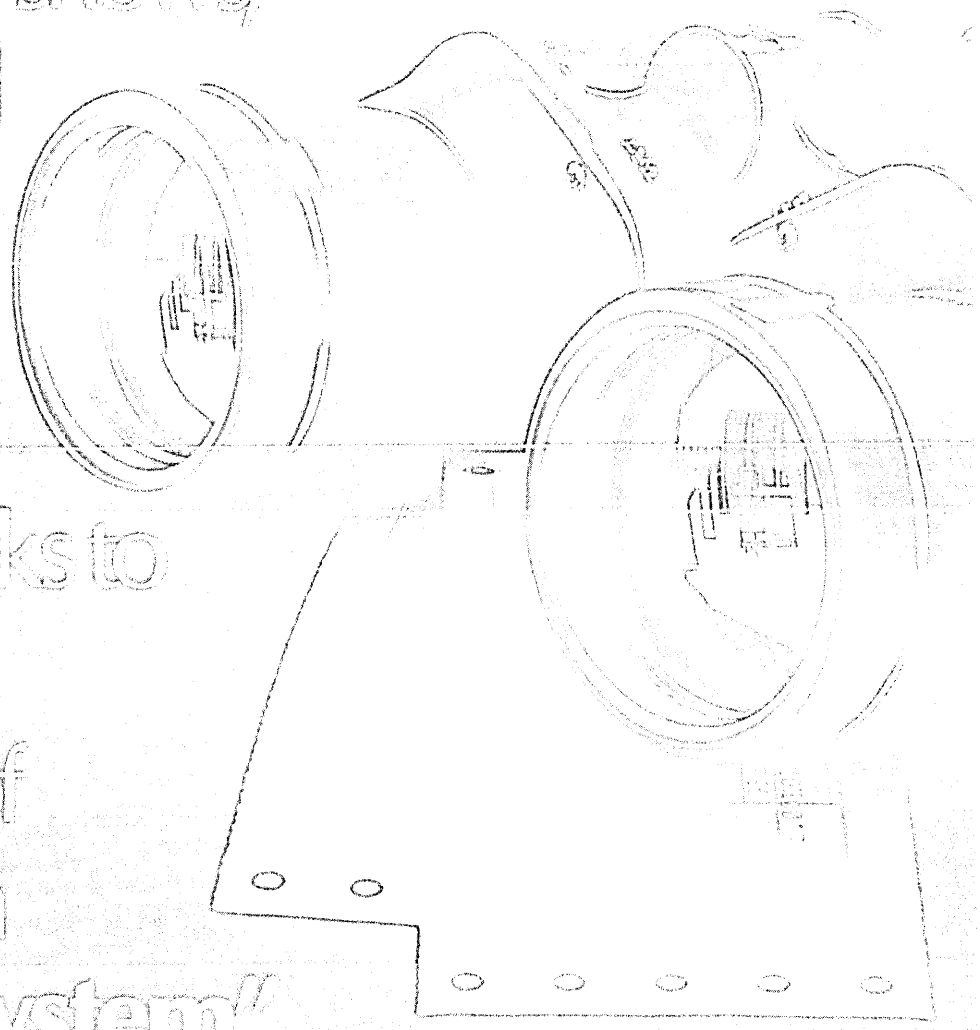

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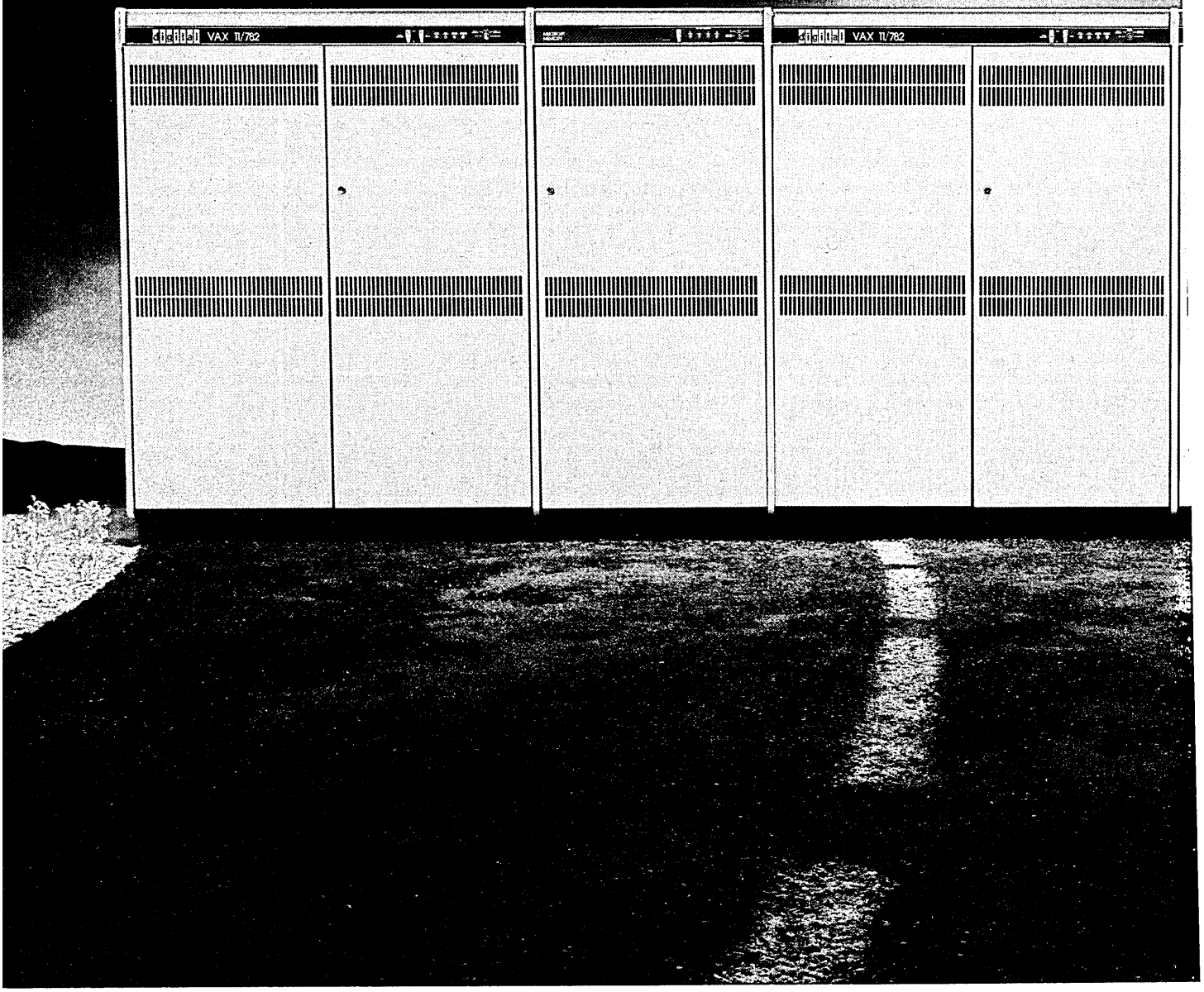

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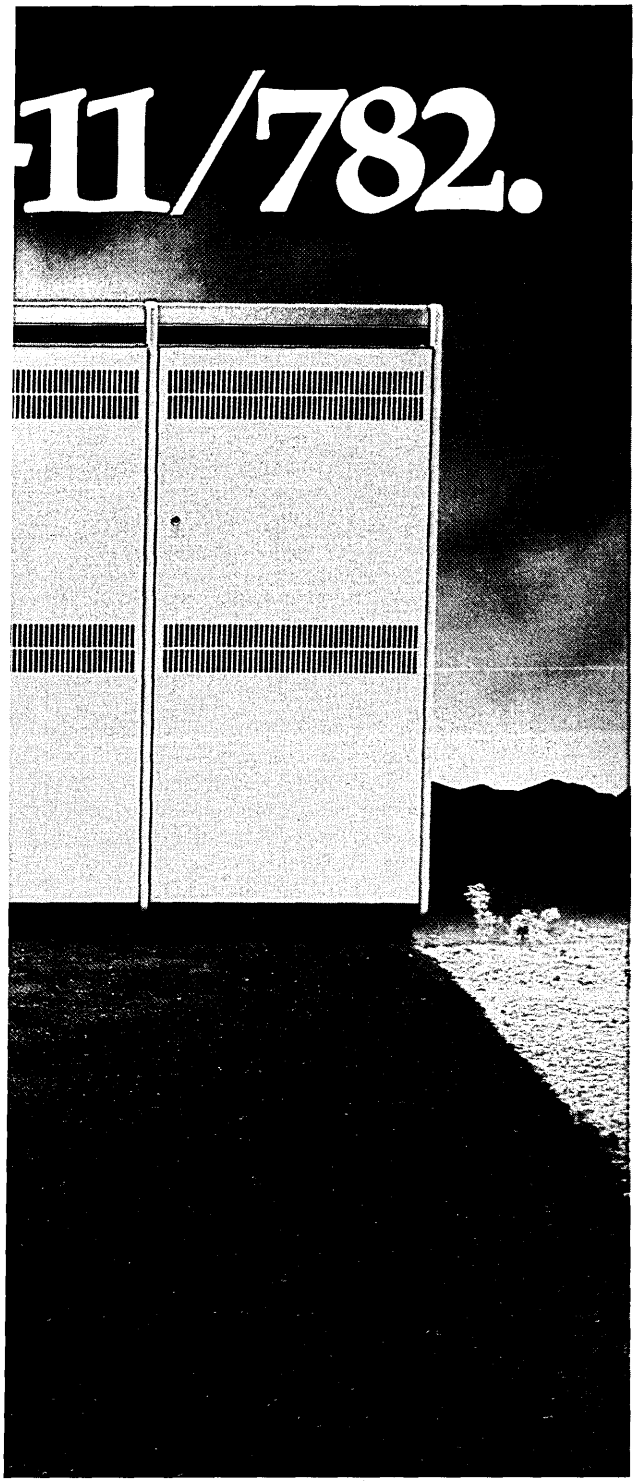

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"What they should do is format a standard and let the hardware manufacturers worry about the interface. If a decent hardware contractor can't figure out how to interface he doesn't belong in the business. FIPS is a misuse of government authority entirely. It's costing the taxpayers and the government money and not doing a damn thing technically. It's absolutely unjust."

The judges who heard the lawsuit didn't think so. So the beat goes on. Perhaps it would have been stopped had the original procurement plan been feasible—the General Services Administration (GSA) would have bought large quantities and then had each agency shop for what it needed. But it was all theory and no practice.

"That wouldn't have worked," CDC's Lucke admits ruefully. "People don't know how to procure that way. It's too complicated because you can't justify the components adequately. But when nobody knows their office location or job description, what do you expect?"

What to expect from NBS is the same old song. The next item on its agenda is the 600 megabyte disk drive, to be followed shortly by the storage module drive. Rigonetti believes these should create little controversy, since large groups do not exist in the field. He is working with industry groups to develop the high-speed interface with all deliberate speed. But the private-public animosity dies hard.

"They've been talking about that interface for a year and they haven't done a thing," says Univac's Corini.

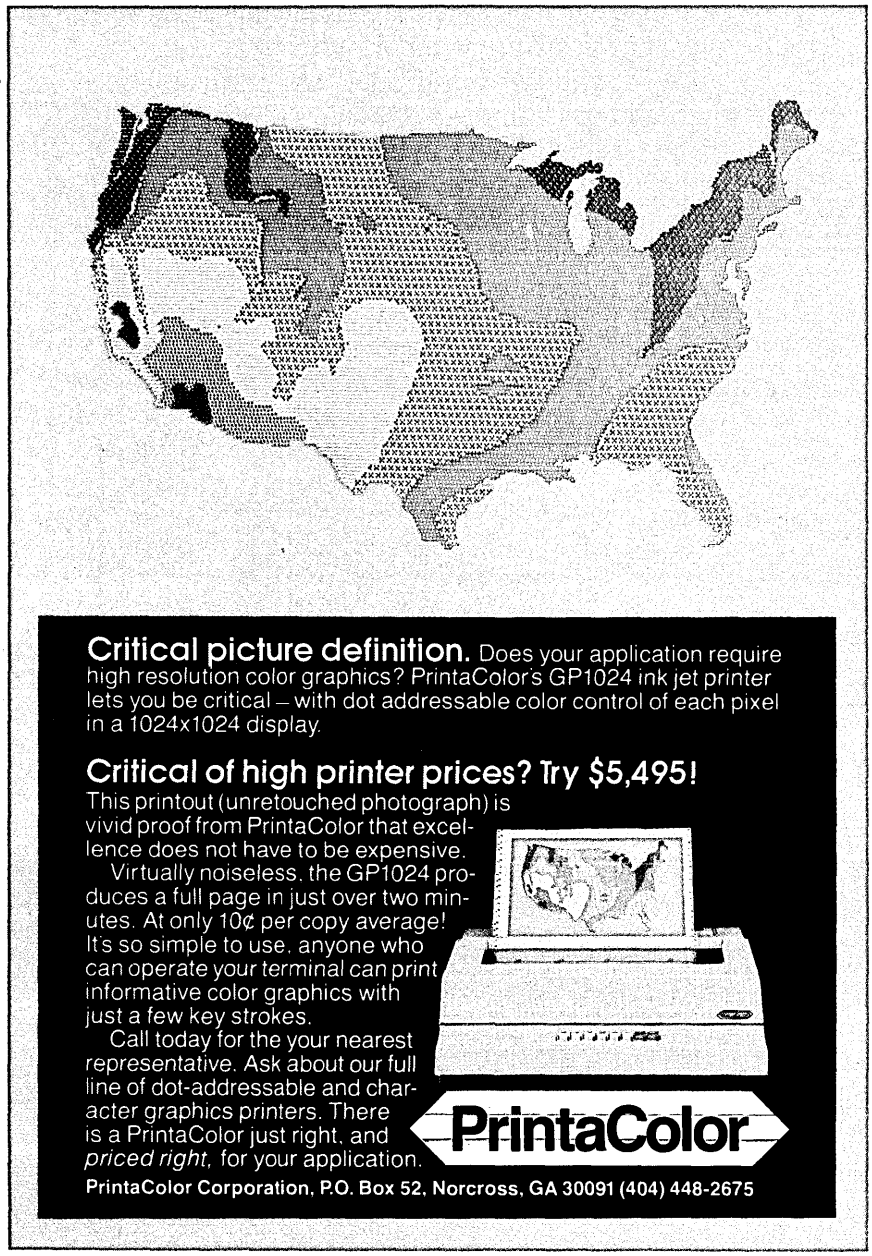
"It's a major problem for us in trying to comply," Honeywell's Tom McNamara admits. "We have put forth a tremendous effort in trying to continue to do business with the government. Right at this time we have several things up in the air. Anything we said now might be changed in the next few months."

"Left to our own devices we obviously would not have done this," says Roy Beers, Burroughs' vice president of engineering. "We haven't lost business, nor have we chosen not to bid because of the standards. But we were helped tremendously by Dynamic Sciences and our acquisition of Memorex. They knew the interface better than anyone at Burroughs.

"But there's no question it's costing us money. We would not have had to engineer mechanisms for the peripherals. It's been a significant investment in dollars as well as time. Some of that cost will be passed on to the government."

There's no doubt to whom the government will subsequently pass it.

—Willie Schatz



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SERVICES

ADAPSO BALKS AT IBM NET

The services organization is debating whether to attempt to bring IBM back into the antitrust arena.

There exists a strong possibility that the U.S. association of computer services companies, ADAPSO, will take legal action later this month to try to force a separation of IBM's infant service bureau from the main body of the parent.

ADAPSO is currently researching the legal aspects and sounding out various congressional committees. Its board of directors will meet in New York April 14 to 16 to vote on whether legal measures should follow the findings.

The services organization is expected to push for a meeting with IBM shortly to try to convince the computer giant to voluntarily separate out its new Information Net-

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MYTH #2

80% of programming resources are taken up by maintenance work and there's no way to reduce this figure.

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MYTH #3

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work from the mainstream of IBM. An earlier meeting with IBM following the announcement of the network in February resulted in a deadlock, say ADAPSO officials. Said one: "IBM made it clear that it had no intention of running the Information Network as a separate subsidiary and competing the same way as everybody else."

ADAPSO's unrelenting position was made clear last September, shortly after DATAMATION revealed IBM's reentry plans: "We'll accept nothing short of separation," said an ADAPSO spokesman. "For us," said one ADAPSO attorney, "the bundling of data, computing, and communications where the bundler monopolizes one of the areas is unfair competition. The real issue in our Citibank suit, for example, is the bundling of credit and debit data with computing and communications. In IBM's case the issue would concern how it bundles services around its computer dominance."

ADAPSO's only legal basis for complaint is that by reentering the services business as anything other than a separate subsidiary, IBM has violated a long-standing consent decree between itself and the Justice Department that settled an earlier antitrust suit. That agreement was signed back in 1956.

Though it is not generally known, this decree called upon IBM to operate any future bureau business as a separate subsidiary. Section 8 of this decree mandated that IBM "from here on" run any service bureau as a structurally separate entity, with separate accounting procedures and without using the parent's name.

So far, the IBM Information Network has done neither of these things. But then, IBM is not calling its offering a "service bureau" either.

In broad terms, ADAPSO's chief concern is that the whole computer services industry could become "rebundled," giving only the "giants" a fighting chance. "In the long term, such a move would kill the industry as we now know it," claimed an ADAPSO attorney.

Some contend that what IBM has announced and what it intends to offer are worlds apart.

Several industry observers have speculated that the industry is set for a move towards large-scale bundled and facilities managment (FM) solutions and a boom in leasing. "Against this background," said one ADAPSO source, "IBM has an overwhelming advantage. For one thing, it can use its hardware dominance for leverage and for clever pricing of a bundled package. Under cover of bundling, the customer will often pay for, and get, more than he needs—including the best *and* the worst of IBM. Many times, if he just wants a piece of applications software, he'll have to take a whole package."

Says another ADAPSO member: "With the bureau bundled into the parent, it will be able to share an immense amount of customer information as well as sales offices across the whole of IBM's massive customer base."

Not all sectors of ADAPSO's membership are equally militant about the need to take on IBM in the courts. Many breathed a sigh of relief when the Information Network was announced. For one, it ended over two years of waiting and wondering what IBM would announce. And two, what has been announced so far is so "mild" that it was instantly described by some members as a "vanilla offering." Others countend, however, that what IBM has announced and what it intends to offer are worlds apart.

ADAPSO's dilemma is that court action now would center on an "emasculated" bureau offering which undoubtedly will become extremely potent in the years to come. On the other hand, if ADAPSO waits and lets IBM build up its investment and commit itself to its users, a "separation" demand would have much less force.

Though ADAPSO did not wish to discuss its legal position, it is clear that, as one official put it, the "tenor of the times is not conducive to antitrust complaints."

Nonetheless, it's possible that ADAPSO will file a complaint this month with the court that has jurisdiction over the 1956 Consent Decree—the court of Judge David Edelstein, who presided over the Justice Department's recently aborted antitrust case against IBM.

IBM's immediate reaction would certainly be a "motion to dismiss," one insider notes. "The 1956 Consent Decree is really a contract signed betwen IBM and the Justice Department, and only the Justice Department can bring forward a complaint."

"It's true," says one legal source, "that ADAPSO does not have standing as a party to this agreement. But on the other hand it can rightfully claim that the contract was signed for its [ADAPSO's] benefit and for the protection of the industry."

Added the source: "Using a legal maneuver known as the third party beneficiary clause, ADAPSO could claim that IBM's reentry in bundled from will cause injury to both itself and the services industry."

Though this is a provision of consent decrees, observers are quick to point out that the maneuver has not been tested in the courts.

"There are grave dangers in not bringing such burning issues before the public," said an ADAPSO attorney. "I'd hate for people to wake up at the end of the decade to the feeling that they've just been violated by a few monopolists."

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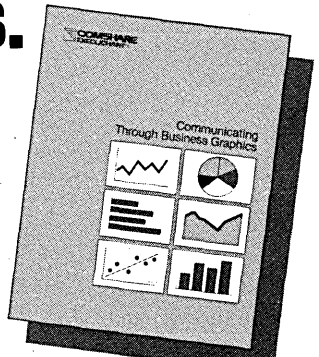

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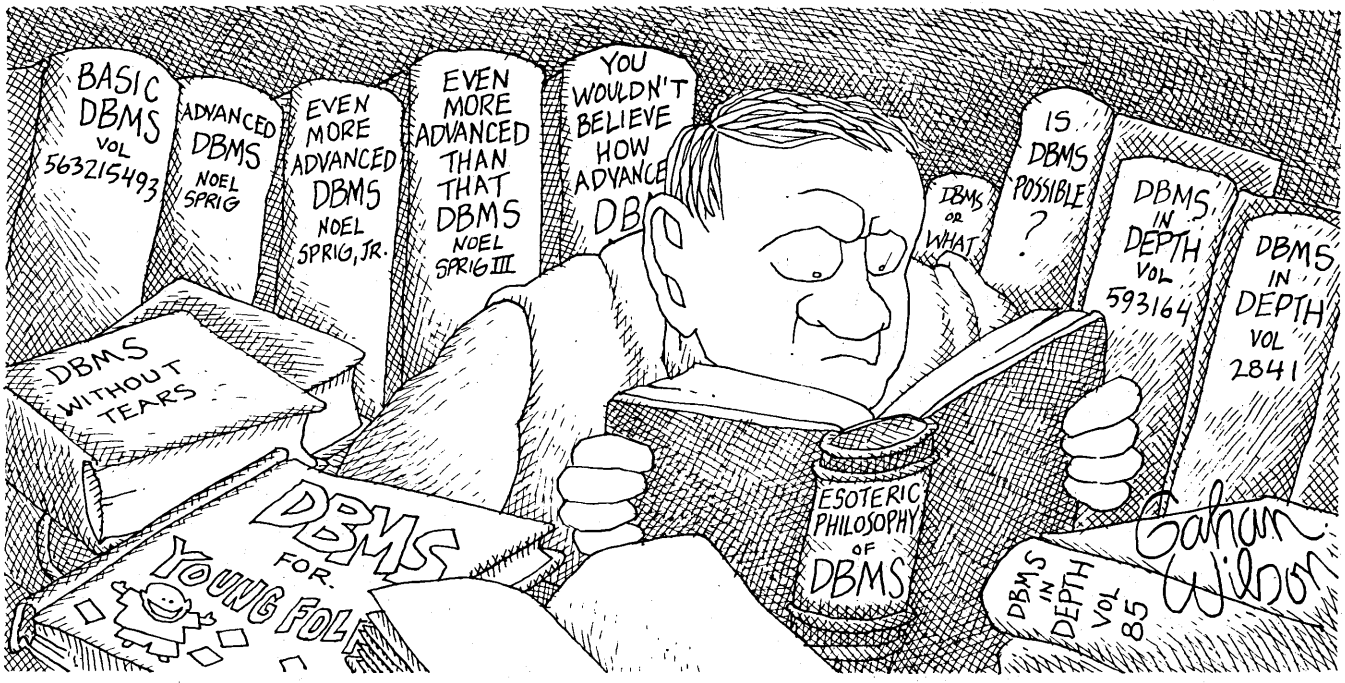

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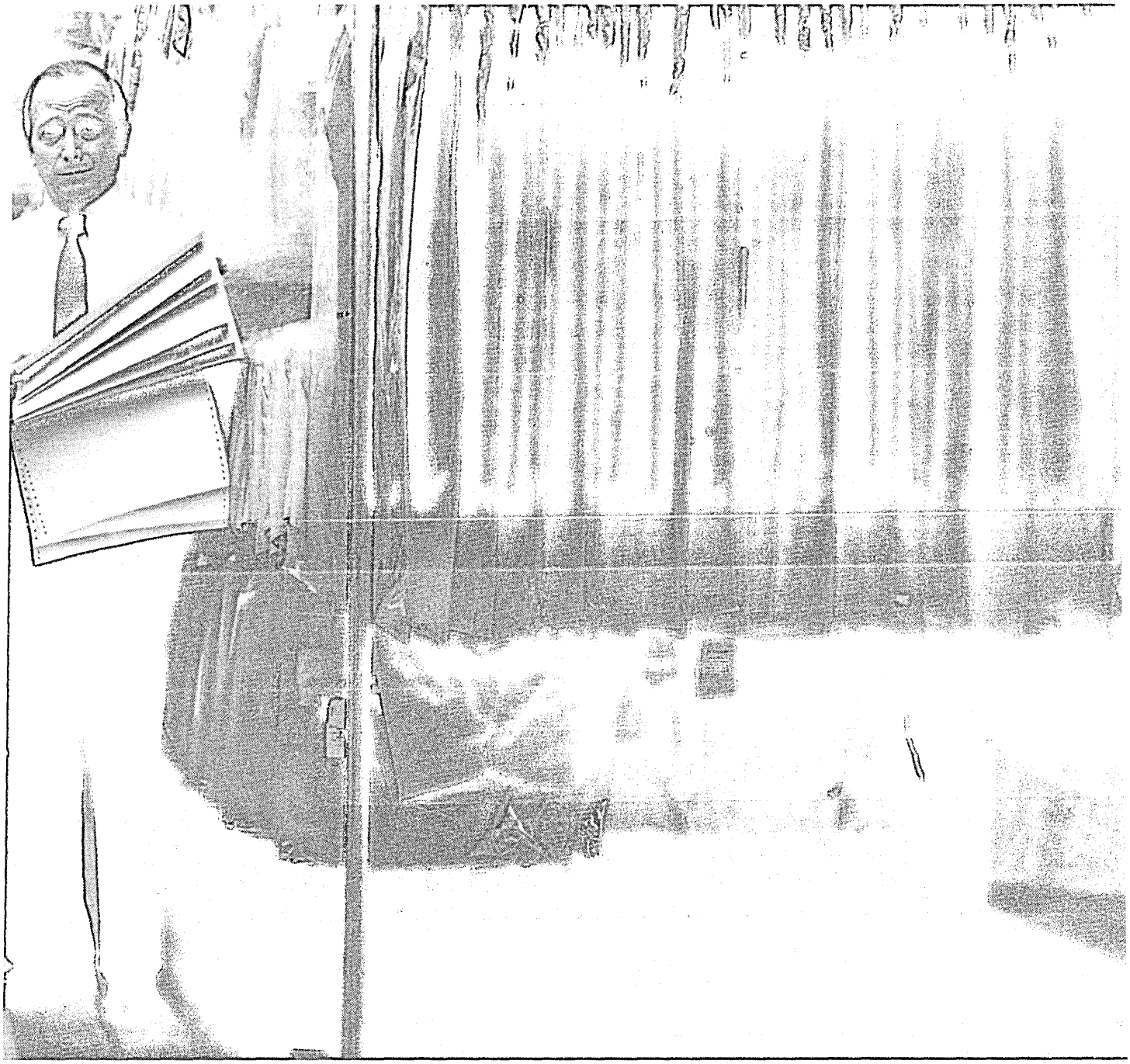

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NEWS IN PERSPECTIVE

Only last month ADAPSO received indirect support for this view from an unexpected quarter—Judge Edelstein himself. The federal judge accused the head of the Justice Department's antitrust division of failing to reveal former business ties with IBM.

The official in question, William Baxter, recently dropped the long-running antitrust case against IBM, saying that it had "no merit."

Edelstein said that the Justice Department "may not have acted in the best interests of the public." Such comments could lead to a raging public debate and add an ongoing public focus to the whole antitrust question.

The 1956 Consent Decree said IBM could not reenter the service bureau business except through a separate subsidiary.

But, apart from the possibility of having to conduct its business under a more stringent public focus, there is no immediate threat to the IBM bureau plan, experts say. As sources have revealed (September 1981, p. 46), IBM will attempt to bundle the fruits of its centralized thinking over the years into a vast FM package—all tied into the expanding, and nurturing bosom of the "mother" bureau in the center.

Said one IBM expert: "There's probably a million and one reasons IBM could give for being in the bureau business right now—not the least of which is a three-year programming backlog that IBM's users want it to chip away at."

Others have pointed out that the entry of IBM into the information network business is bound to create new opportunities for the software companies, because IBM is such an enormous applications generator.

According to ADAPSO, this view—which can equally be applied to AT&T's impending push into the computer business—is deceptive. "IBM will determine the pace of the new technology. New services (and new opportunities) will be introduced at a pace that suits IBM, not the customer," one source said. "The danger is that the user will lose an interface that is sensitive to his immediate needs and mirrors them at all times," he added.

IBM, of course, is yet to have its say. So far its long-range intentions for the bureau have been carefully guarded. But one industry consultant stressed, "You should not go around assuming that IBM has *any* deep underlying motives or master plans. My experience is that the company is bumbling along from day to day, and is often as confused as the rest of us."

—Ralph Emmett

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Breaking through the software bottleneck is the name of the game in the computer industry these days, and the number of players is big.

Most game plans seem to include development of a new approach, a new way of thinking about software. Such is the case with Pro, a software concept developed by Data Technical Analysts Inc., Honolulu, Hawaii (April 1981, p. 64), and being brought to market by six California companies under licensing agreements.

The licensees are Microdata Corp., CIE Systems Inc., General Automation, Capro Inc., Pro IV Inc., and Pro Computer Sciences. All but General Automation hold

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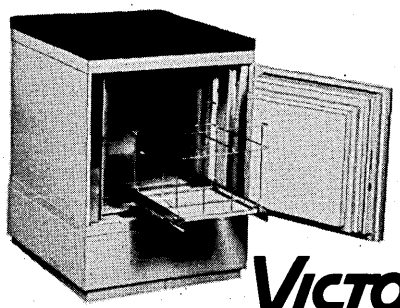

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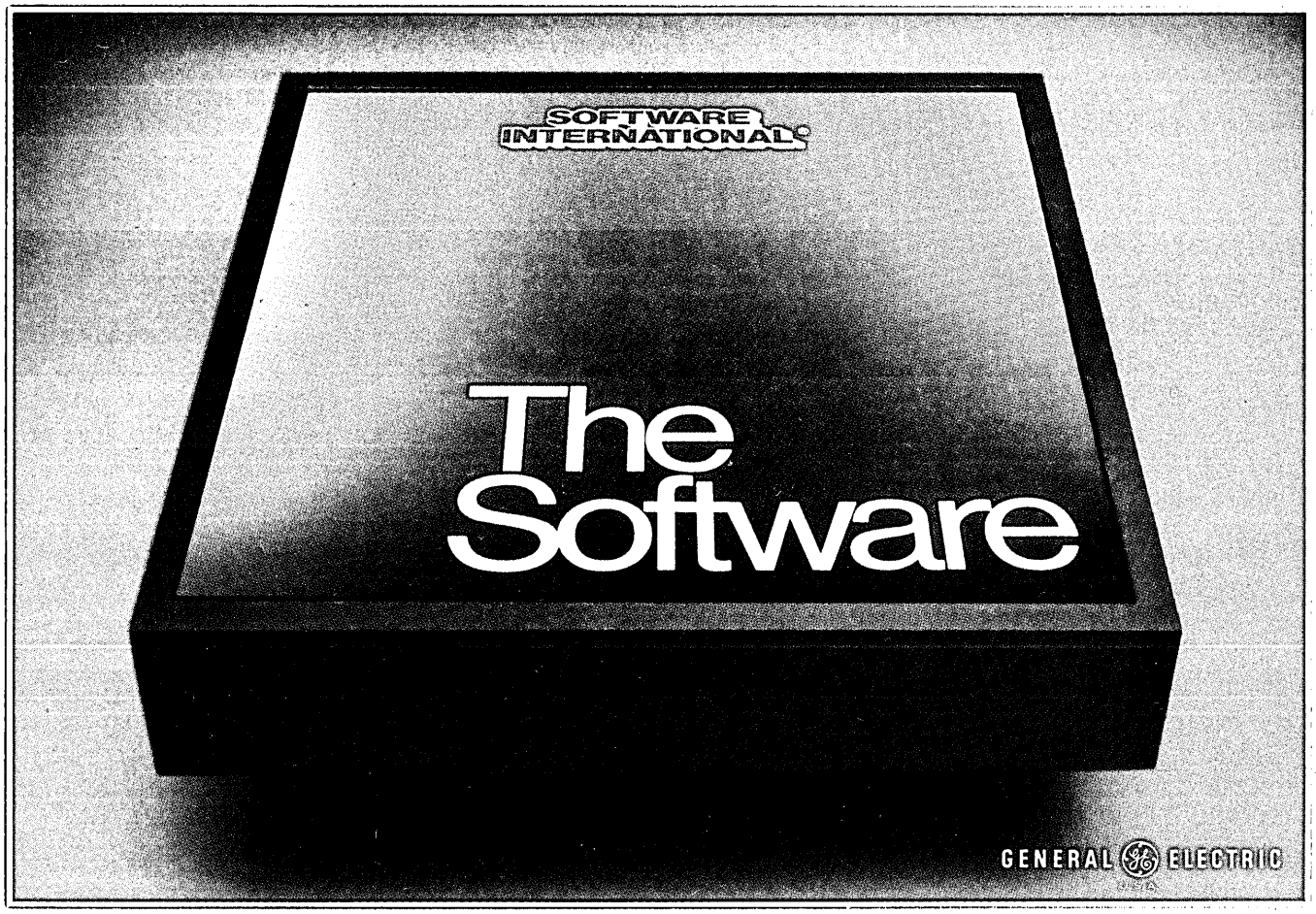

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exclusive licenses from DTA to offer Pro on a specified machine. General Automation, on whose hardware Pro was originally developed, exercised an option to obtain a license for Pro use on its equipment. It later assigned that license to Pro IV Inc., and now is a sub-licensee of Pro IV.

A Pro system is driven by a single, all-purpose, multiapplication program that resides in 32KB of main memory. The program is made up of a group of precoded assembly language functions that will execute every known business application. A user does not have to spend time translating codes or symbols because the system communicates in nontechnical terms.

Implementing an application involves only filling in blanks. To execute a function, a user fills out a series of specially designed input specification forms. Five or six of these forms cover most applications.

Microdata has exclusive rights to offer Pro on Reality and Reality-like equipment, CIE Systems on the Motorola 68000, Pro-IV on the General Automation 220/440, Capro on the Intel 8086, and Pro Computer Sciences on the IBM 370.

Another small California firm, Systems Group, a division of Measurement Systems & Controls Inc., Orange, is getting ready to announce another kind of "new thinking" approach to programming. Called Business Express, it's offered on the firm's Z80-based small business systems.

"It's an operating system of a sort," said Lowell Dunn, Systems Group's vice president of engineering. "It generates internal tables immediately, ready for use." He called it an easy way to do custom jobs. "We have predefined in the computer any problem a user might need to solve. We've squeezed all the power of the Z80."

As with Pro, a Business Express user simply has to know how to define his needs. This can be learned with a quick reading of a short manual, said Dunn.

While the key to Pro is an algorithm that links together common program elements precoded in a computer, the keys to Business Express, according to Dunn, are an ultrasophisticated database manager and database dictionary and a very sophisticated executive I/O processor. It is designed for a multiuser environment and can be used by eight to 10 users with no degradation, he said.

A Pro system is driven by a single, all-purpose, multiapplication program that resides in 32KB of main memory.

Systems Group expects to implement Business Express on a Motorola 68000 by the end of this year and, with this implementation, hopes to support 25 users without degradation.

Systems Group got started on development of Business Express six months ago when it joined forces with American Computing Enterprises, a software firm that had been working on the project for three years. They expect to be able to demonstrate the product next month.

Pro is a little farther along. Microdata, which calls its offering Pro ALL (for Applications Language Liberator), has systems in alpha and beta test sites, as does CIE Systems. General Automation calls its system NoCode and has been delivering it commercially for more than a year.

Although Microdata's version was implemented by DTA in Hawaii on a Reality system, it isn't offered with Reality yet. It is available though with the company's new 32-bit Sequel system (December, p. 172). Microdata dealers are said to be pressuring the company to offer ALL with Reality systems, and that seems to be just a matter of time.

CIE Systems is the only licensee so far going after the big oem market. And it has the muscle to do it. The firm is a spinoff of C. Itoh Electronics, a subsidiary of C. Itoh & Co. Ltd., the big Japanese trading company with activities in every part of the world.

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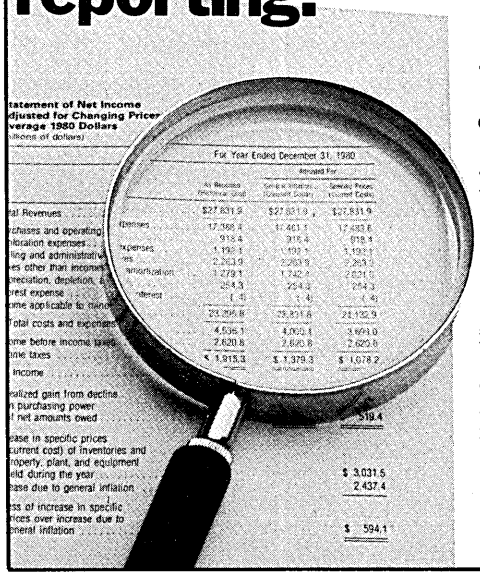

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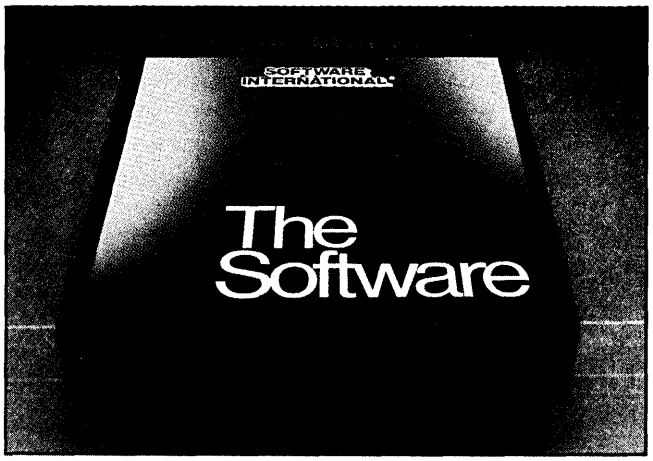

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hardware, originally designed for C. Itoh Electronics by Capro, will be produced by Hitachi, which has the capability to crank it out in quantity.

Capro, which calls its 8086-based system Dimension One, is actively signing up dealers, and expects to have at least 25 signed up by the end of this month. The company began talking to dealers last November at the Comdex show in Las Vegas. "The dealers are excited. They know about Pro and what it can mean to them," said Cal Lee, Capro's president. Capro expects to be shipping systems in June and will continue to sign up dealers until the end of this year.

Capro is after the small business user market. Dimension One will sell to dealers at $30,000. It can accommodate up to 32 terminals with up to 1 megabyte of main memory and 300 megabytes of disk storage. A data streamer is incorporated for file backup. Optional printers include 150 lpm, 300 lpm, and 600 lpm.

Less defined are the plans of Pro IV and Pro Computer Sciences, both headed by Merle H. Amundson, a longtime computer industry investor. Both were started as R&D tax shelter operations. Pro IV, in addition to having an exclusive license to the General Automation implementation of Pro, has a nonexclusive license to offer Pro on DEC equipment. DTA in Hawaii is currently converting Pro to run on a PDP/11.

Conversion to IBM equipment for PCS is expected to start this month. Amundson said in early March that it was unclear whether the conversion would be done in Hawaii or Newport Beach, but, he said, there would definitely be DTA involvement. He was at that time seeking technical people with IBM experience to help with the conversion and had a contract with Cooper Industries, a $3 billion per year Houston oil, tool, and energy company with a lot of IBM know-how, to provide technical assistance.

All of the Pro licensees can trace their licenses back to Capro's Cal Lee, who is also DTA's agent on the mainland. Lee has been associated with DTA since 1970, when it was a service bureau. He was on the company's board of directors until he became an agent and a licensee.

In 1978, Lee saw a prototype of Pro that had been created by DTA's Sushil Garg to solve the company's own programming crunch, and he became excited about its potential. Naturally, he went to his friends.

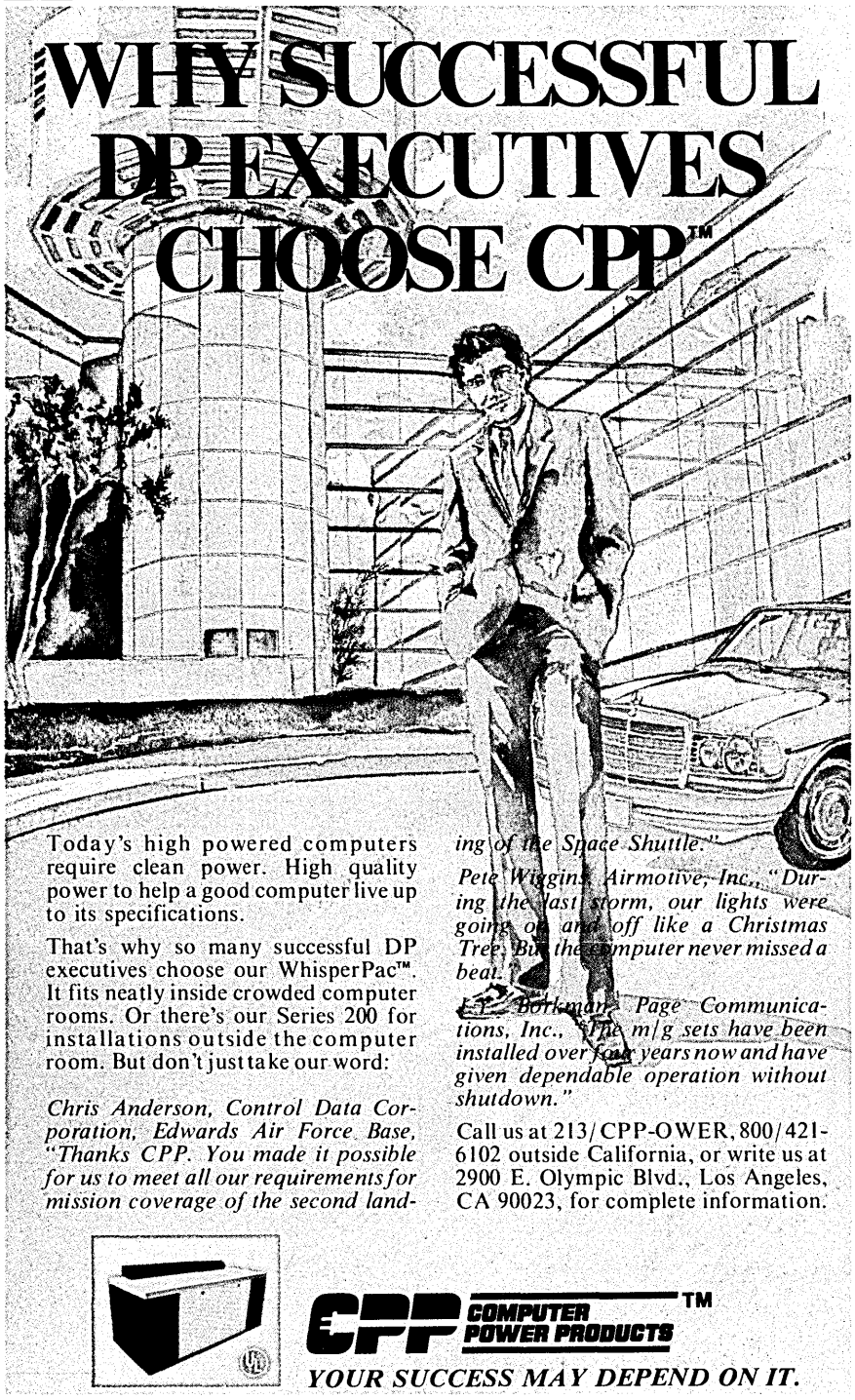
Lee was a cofounder of General Automation, and knew that company to be a natural early licensee since Pro was developed on its equipment. While at General Automation, Lee worked with Jay Kear, who now is president of CIE Systems. He never worked with any Microdata staff, but "I know a lot of the people there very well." DTA president Frank Fukunaga said Al Cosentino, former president of Microdata America, was instrumental in getting the Pro license for Microdata, and "Al is a friend of Cal's."

Business Express is "an operating system of a sort. It generates internal tables immediately, ready for use."

As for Amundson, "we go back a long way," says Lee. "We've done some investing together."

The exclusive licenses, of which there never will be more than five, are quite tight. "We have the right to audit at any time and we have to be notified of any sublicense," said DTA's Fukunaga.

Systems Group is protecting its Business Express by registering the name as a trademark and copyrighting its source listing. As Systems Group plans to move up to a 68000 implementation, DTA also has plans for Pro on other machines. Fukunaga said that following completion of conversion to the PDP/11 and the IBM 370 for Pro IV and PCS, DTA will do some conversions of its own—to the HP 1000, Data General's Nova, and "maybe Wang; the third conversion is up in the air." He expects these



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NEWS IN PERSPECTIVE

conversions to begin in July.

Pro developer Garg is working on enhancements to the product. One is called Systems Analyst. As Pro exists now, no programmer is needed, but a systems analyst is handy to have to define specifications of an application. With the Systems Analyst enhancement, a novice user will be able to type in English instructions. Another enhancement is called Screen Painter. The system sets up a screen and Pro generates the information. Fukunaga says this will be useful as an applications development tool, saving 30% in time over Pro as it presently exists—which already saves some 80% in time over conventional applications development methods.

DTA is also looking at markets for applications developed with Pro. It wouldn't market them, but it would encourage licensees and sub-licensees to do so.

Fukunaga also plans to hold regular user meetings with his licensees. The first will probably take place in June or July. What he hopes to gain from these meetings is ideas for additional enhancements to Pro. He also hopes to get the licensees to standardize their descriptions of Pro to potential

Capro, which calls its system Dimension One, is after the small business user market.

customers. Also on his wish list is development of a Pro interface standard that would allow Pro-developed applications to be transportable.

Beyond the Pro enhancements, DTA's development plans call for work on a new operating system. "One thing we've learned in bringing Pro up with a number of operating systems is that they've all got a lot of problems," said Fukunaga.

Ongoing is the search for a good definition of just what Pro is. Capro's Lee thinks he's found one. It came from a potential customer. "I told him all the things Pro isn't. It isn't a program. It isn't an applications generator, because that takes initial steps like coding and compiling. When I'd finished telling him what it isn't, he decided he knew what it is and I think he's right. It's an automatic programmer."

—**Edith Myers**

WHERE'S THE NICHE?

In a future edition of the magazine DATAMATION will examine the computer-related companies that have been formed since the beginning of 1981—who they are, what market segment they're going after, and how they're getting financing. If you are involved in a startup company or know of one we might overlook, please send us the company name, address and a person to contact for additional information. The material should be sent to: Survey Editor, DATAMATION, 666 Fifth Ave., New York, NY 10103.

DATA COMMUNICATIONS

BEYOND LOCAL LOOPS

While there are many plans for DTS service, only one company is actually ready to provide the equipment on a systems basis.

Much has been written about the potential to bypass existing telephone company local loops with new technology called Digital Termination Systems (DTS). The DTS concept was originally part of the now-defunct Xerox XTEN network, but the principles have survived. In fact, they have survived to the extent that more than 10 applications for DTS service are presently pending before the Federal Communications Commission (FCC).

While there are many plans for DTS service, only one company is actually ready to provide the equipment on a systems basis. Called Local Digital Distribution Co. (LDD), the firm is located in Rockville, Md., and is a partnership of M/A-Com and Aetna. LDD tested its system during last year's FCC-authorized demonstration project in San Francisco and New York. The demonstration featured microwave radio and cable technology from Satellite Business Systems and Tymnet, in addition to LDD.

Although LDD will sell its DTS systems primarily to carriers, users will have to know how to interface their systems to this new alternative to the conventional local loop. One of the key breakthroughs in use of the LDD equipment occurred in December, when the firm's system was type-accepted by the FCC, meaning that it could be installed if the commission approves and authorizes the DTS applications now pending before it.

"LDD was formally founded in 1980 and took the lead in the demonstration program with SBS and Tymnet . . . to get the equipment we were building out into the field into the hands of the operating carriers and through them into the hands of actual end users," explained Lawrence F. Barnett, executive vice president. About 10 large corporate network users participated in the demonstration, which included the use of high-speed terminals, facsimile devices, and teleconferencing equipment. Data were transmitted between New York and San Francisco, using SBS and Tymnet facilities, which together with the LDD equipment forged end-to-end links that

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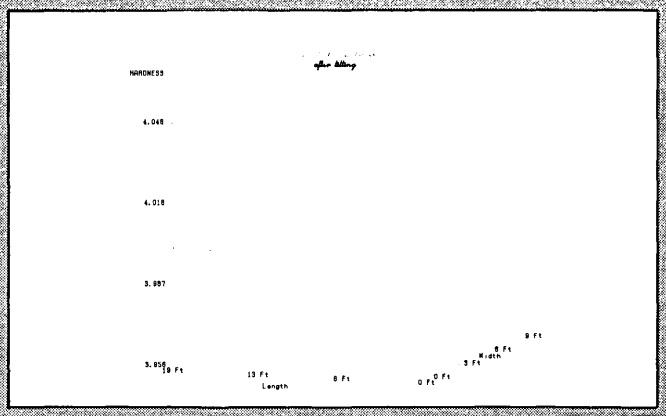
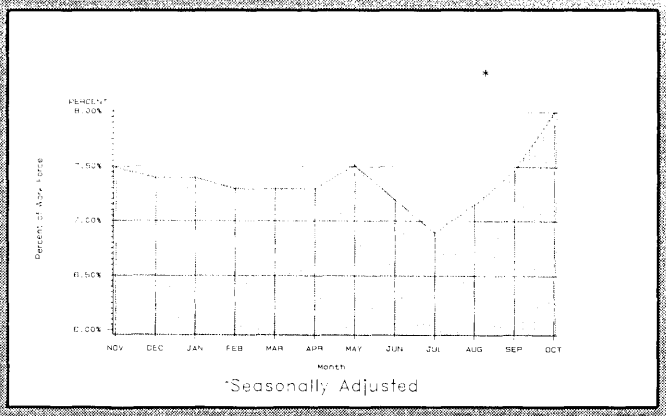


Zeta 1453



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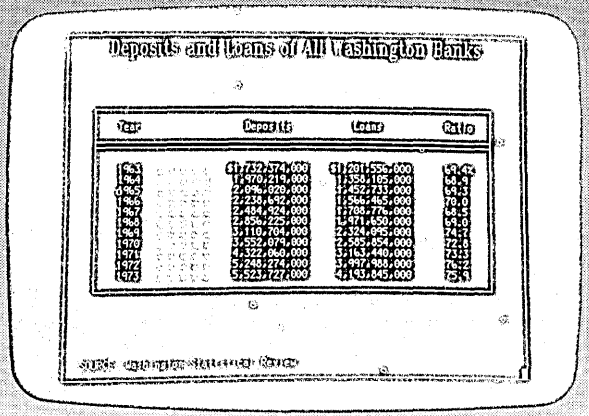

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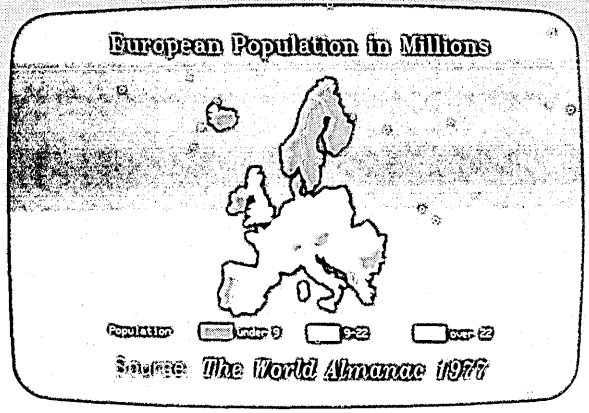

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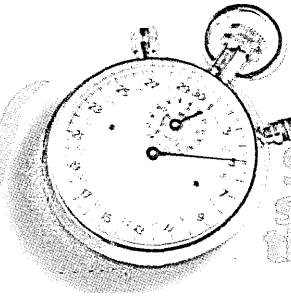

CIRCLE 83 ON READER CARD

completely bypassed conventional phone company technology.

But Barnett is quick to point out that DTS should not be viewed as a way to bypass the phone company. He believes that local telcos will be in the forefront of implementing the DTS systems, even though the recent AT&T antitrust settlement proposal does not address this type of service. Regardless of whether it is AT&T or the spun-off operating companies that provide the service, Barnett sees Bell, and other carriers, as ultimately being heavily involved in the new service.

The first user of LDD equipment will be Isacomm, a subsidiary of United Telecommunications that is using the SBS satellite network to serve insurance companies. The systems being supplied to Isacomm are actually second generation units that incorporate advanced features that grew out of the demonstration project, according to Donald Silverman, LDD vice president of engineering.

LDD systems include two major technologies. The Radio Packet Communications System (Rapac) uses microwave radio for cellular-type transmission in down-

One of the key breakthroughs in use of the LDD equipment occurred in December, when the firm's system was type accepted by the FCC.

town locations, while the Cable Packet Communications System (Capac) uses cable distribution systems. A key element of the LDD distribution technology is that both Rapac and Capac can operate interchangeably, depending on the best transmission method for a particular area. DTS service is currently planned for the 10 GHz frequency band, but Barnett said the FCC may authorize the 18 GHz band for additional DTS use.

User costs of DTS services are still a question mark, because LDD will sell its systems to carriers. The carriers will then provide the new servcice to customers as tariffed offerings. But Barnett said the costs of typical DTS facilities are 50% lower than those of existing local loops. Even if carriers have high overhead costs in their rate bases, the lower cost DTS should be reflected in tariff savings to users. This is especially significant when one realizes that local loop costs have gone up 36% in the last two years, Silverman pointed out.

An important feature of the LDD system is its ability to provide either full period or demand assignment-type service to users. Using the packet technology of their system, carriers with LDD equipment will be able to provide 24-hour links or specifically allocated usage slots, depending on the needs of individual subscribers. But increased bandwidth is a major benefit of LDD's system. Silverman explained that the equipment handles low-speed transmissions ranging from 1,200 bit/sec to 19.2K

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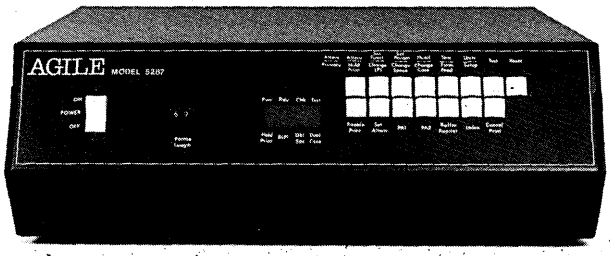

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bit/sec, while the high-speed capability ranges from 56K bit/sec to T1 carrier transmission rates. Along with these higher rates, LDD systems provide 1.8 Mb bandwidth, which will make it possible for DTS systems to be used for teleconferencing and other applications now prohibited by the nominal 2 kHz bandwidth on conventional wire-pair local loops.

User devices will interface with LDD systems on an EIA RS-232 or 449 level providing standard plug connections. An individual Rapac controller will be able to handle multiple units depending on speed and bandwidth.

Similarly, a carrier will be able to share a DTS link in a downtown area depending on volume of data being transmitted and the amount of bandwidth being used. One RF channel could be used by as many as 256 devices, Silverman said.

LDD is quick to point out that DTS should not be viewed as a way to bypass the phone company, believing that local telcos will be in the forefront of implementing DTS systems.

LDD is currently studying how its DTS technology could be interfaced to local data networks. Siverman said one method would be to build a gateway that would translate the local network protocol into the DTS protocol. The fact that Capac already can run on conventional cable tv systems is one step in the right direction. Even so, Silverman admits that the CSMA/CD systems (carrier sense multiple access systems with collision detection) such as those used with Ethernet would not be compatible with the TDMA (time division multiple access) protocol used on LDD systems.

Nevertheless, the DTS service promised by LDD equipment will be a great improvement over the limited local loops now available to data users. DTS can handle only digital data transmission and not analog voice under present technology, but that does not present a serious drawback to Barnett.

A recent LDD market study shows that 1982 local loop revenues should be about $100 million for existing carriers. By 1986 that revenue will jump to $1 billion, representing a compound growth rate of about 75% per year, Barnett noted. At present five of the DTS applicants have proposed using LDD equipment. One applicant has proposed a DTS system from Nippon Electric. But Barnett maintains that only LDD provides complete DTS systems engineering. Based on that capability, the company should get a major share of the projected growth rate for DTS services.

—Ronald A. Frank

SWITCHED ON BYTEX

Bytex Corp. has devised a microprocessor-controlled matrix switch to automate the capabilities of the manual patch panel.

Most large communications network users have centralized control centers where communications and computer functions meet. Typically these centers will be equipped with manual patch panels that are similar to old-style telephone plug boards. The patch panels provide connections between network and dp facilities and are changed as requirements dictate.

Now a company called Bytex Corp. in Newton, Mass., has devised a microprocessor-controlled matrix switch to automate the capabilities of the manual patch panel. The intelligent matrix switch allows users to dynamically reconfigure their lines according to preprogrammed sequences and also perform monitoring of key line parameters.

Intelligent matrix switches are a specialized business, according to Bytex

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vice president of marketing Alan Greenfield. He lists only Codex and T-Bar as potential competitors, but claims that the new Bytex Autoswitch 240 has better price performance with additional features.

Bytex is actually a Codex spin-off enterprise that began life early in 1981 after getting venture capital backing in only five weeks, Greenfield boasted. After looking at available matrix switches, the company founders (including Greenfield) felt they could offer a more cost-effective alternative. After a year of product development, Bytex unveiled its initial system at the recent Interface conference, and first user installations are now being scheduled.

A major benefit of the Autoswitch 240 is its ability to handle both analog and digital lines, Greenfield said, adding that other intelligent matrix switches handle only digital data.

Codex and T-Bar are potential competitors, but Bytex claims its Autoswitch 240 has better price performance with additional features.

The Bytex unit actually converts the analog data into a digital format so it can be handled by the 240, he said. Bytex has also originated a test feature that allows test technicians to exercise the unit on a remote basis. Called Tele-Test, it enables company technicians to dial into an installed system to perform diagnostic functions. For security purposes, the test capability can only be initiated with approval from the user.

Bytex expects that it will become a major oem supplier to companies that provide full network management systems, according to Ralph Lowry, vice president of sales.

"These system suppliers like Intertel and Paradyne . . . either do not have the technology or the ability to get started in time to get into this market. So they want to supplement their product line for some period of time," he explained. On the user side, Lowry said, "We see the major customer as being the larger on-line data networks such as banking and reservations, the same sort of people who are basically oriented to network control requirements. They have very significant networks and it's essential that they be maintained with the greatest flexibility possible." Lowry said that one of the major applications will be to switch network functions among multiple front-end processors.

Although it is called a switch, the 240 is programmed via a crt control console on which instructions can be entered by the network control center staff. "What we wanted was more than just a basic switch. It was a patch panel, but instead of patching, you operated it through a console," Lowry stated.

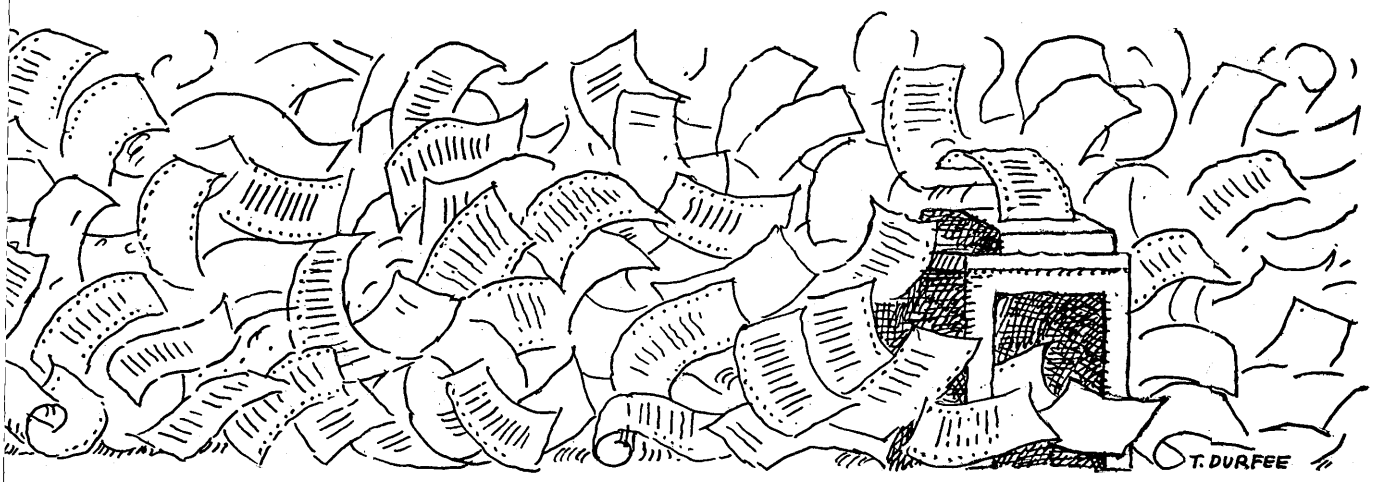
A basic 240 system costs about $30,000, while a smaller Autoswitch 100 will be priced at about $20,000, Greenfield said.

A key element in the intelligent switch is the system software, and Greenfield acknowledged that future software could carry users into new application areas. While not being specific about Bytex's plans, Greenfield said that the key position of an intelligent matrix switch in a communications network would make it a logical point to join various elements of corporate information handling. As an example, he said, an intelligent switch might be a good place to interconnect local data nets with corporate communications.

Although it is called a switch, the 240 is programmed via a crt control console on which instructions can be entered by the network control center staff.

But for now, Bytex will concentrate on providing more conventional switching features at a price that is lower than existing products, he said.

—Ronald A. Frank



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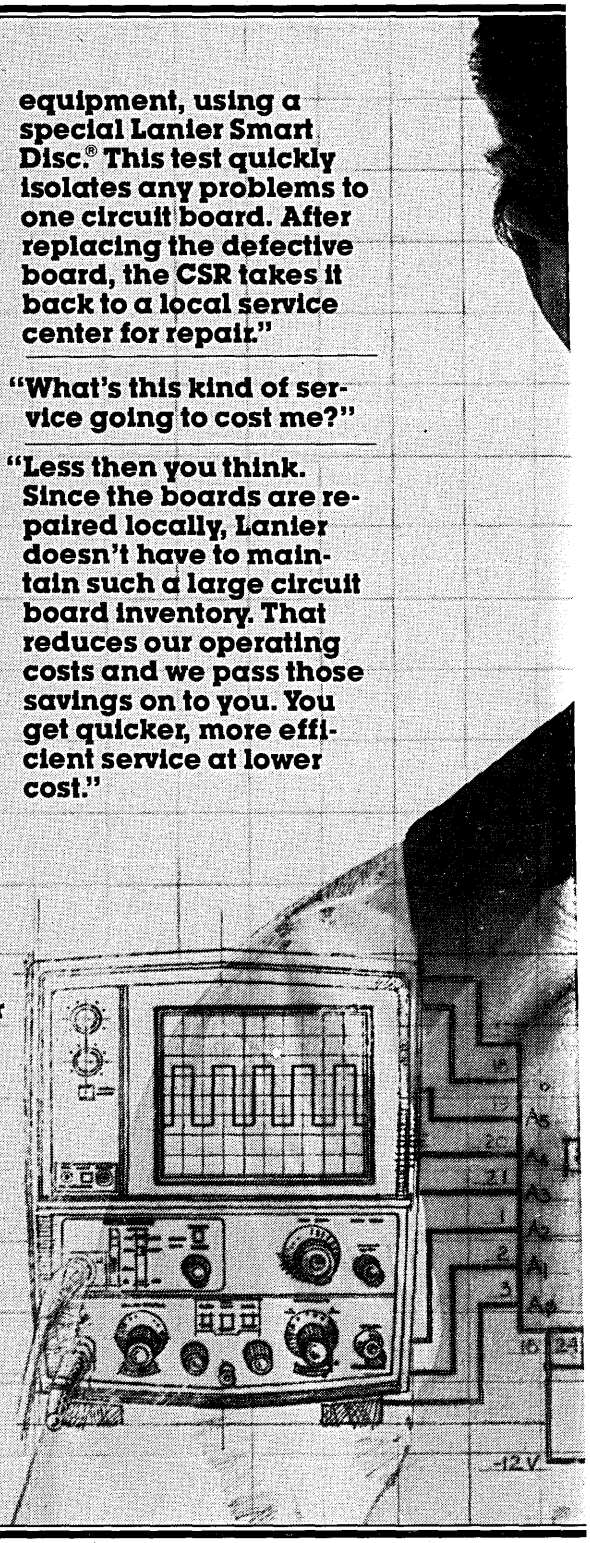

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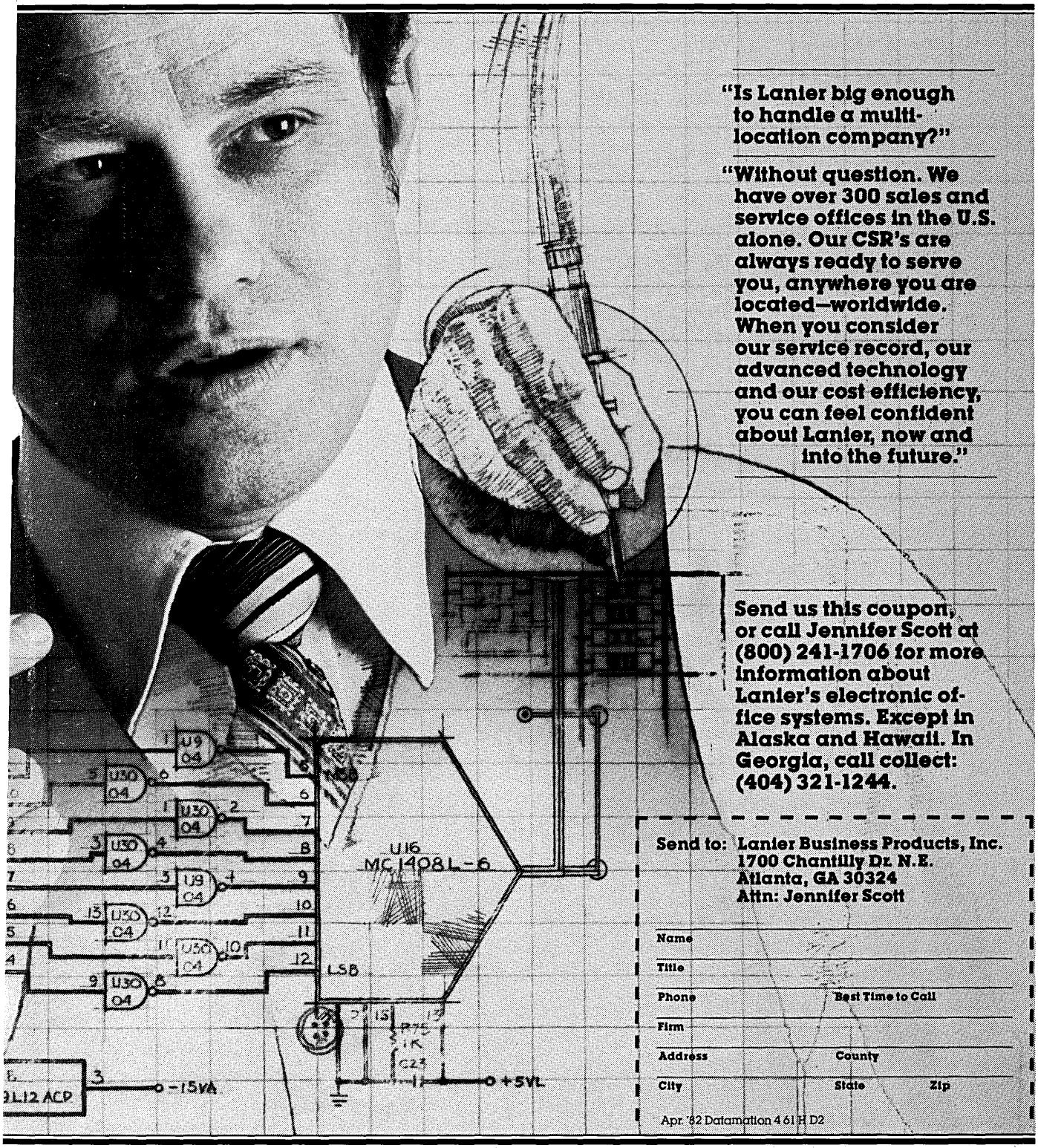

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APPLICATIONS

MICKEY'S ASTUTER COMPUTER

When Epcot Computer Central opens at Disney World in October, the showcase computers will be Univac's.

Back in 1956 when a Univac computer was used by CBS to predict the outcome of the presidential election, the name Univac began to be synonymous with computer.

But the years went by, and computers ceased to be called Univacs and, more often then not, were thought of as IBMs. Possibly after Oct. 1, with the opening of Epcot (Experimental Prototype Community of Tomorrow) Center in Lake Buena Vista, Fla., the trend may be reversed.

Epcot Center is described by its designers at WED Enterprises, a subsidiary of Walt Disney Productions, as "the continuing realization of Walt Disney's great dream for a community of creative concepts for the future, where the best ideas of industry, government, and academia can be showcased together."

It will have its computer center, Epcot Computer Central. Its computers are from Sperry Univac. And they'll be on public view after Oct. 1. There's more. WED designers have great respect for computers, but as something to look at, "they're dull," said Pat Scanlon, director of research and future planning at WED Enterprises. "We've made them entertaining."

Univac in a sense inherited its Disney connection from RCA.

Visitors to Epcot Computer Central will see a portion of a real computer room with real people working in it. But they'll see much more. Above the room, three large screens will show visitors portions of the rest of the center. From one of these scenes, that of an English pub in the English pavillion at the center, will come the star of the show. Ken Jennings, straight from the cast of *Sweeny Todd*, in the role of an English "Pearly" (an early English street and pub entertainer whose suit and hat were covered with pearl buttons).

In real life five feet three inches tall, Ken will emerge from the screen at Epcot Computer Central a mere two feet tall. "Some of his magic went wrong," quips Scanlon. He will cavort around the computer room as a wispy, transparent being, thanks to the same technology that makes possible the ghostly beings who inhabit the haunted mansions at Disneyland and Disney World. Visible to the audience, he will not be seen by computer room workers.

During the 10 minute show, Jennings will sing "The Computer Song," written about "me friend, the computer" by Richard M. and Robert B. Sherman, creators of the score for *Mary Poppins* and originators of the word supercalifragillisticexpialidocious.

The "Pearly" will hop from computer to computer, introducing each machine and explaining the functions it controls in both Disney World and Epcot Center. From time to time he will pop back onto the screen, only to be outfitted in the uniform of a different park personality—all controlled by a given computer.

Sperry Univac signed on as an Epcot Center participant in September 1980. "We were a little hesitant when the Disney folks first approached us," said Jim Fullam, vice president of communications at Univac, "but now we're enthusiastic. When we were only making big mainframes, we talked to a different audience. Now we want to reach everybody." Everybody is expected to visit Epcot Center at the rate of 1,000 people per hour. Fullam noted that a good portion of Disney World's attendance, and presumably that of Epcot Center, will be the same.

Univac intends to make more of Epcot Computer Center than entertainment for Mickey's fan club. "We'll take prospects there," said Fullam. "We'll have a conference room and a hospitality room."

Epcot Center and Disney World, now referred to by the Disney people as the "Magic Kingdom," are situated on a 27,000 acre site (Disneyland occupies only 300 acres). "Eventually the whole thing will be Epcot," said Marty Sklar, vice president of creative development for WED Enterprises.

There was no competitive bid for the computer involvement with the center, so it's anybody's guess as to whether another computer company might have been interested in this project.

Univac in a sense inherited its Disney connection from RCA. When Walt Disney Productions got a computer operation going in the late '60s, it was with RCA Spectra 45s. When Univac took over the RCA customer base in 1971, Disney was one user whose transition was fairly smooth. "They had people on site right away and our wish was their command," said Jack Cornwell, then Disney Productions dp manager and now the firm's MIS director.

The Univac takeover of the RCA customer base came close to coinciding with the opening of Disney World. Cornwell said everything went smoothly, with most of the dp for Disney World being handled out of Walt Disney Productions' headquarters in Burbank, Calif.

Today, the Disney organization has three major computer centers, one in Burbank and two in Florida. Of the Florida installations, one is underground at Disney World and the other is Epcot Center.

At Burbank there are four Univac 90/80 (Model 4) systems, one Univac V77-800 minicomputer system, and numerous Univac UTS visual display terminals. In Florida's center under Disney World, there is one 1100/62 and a V77-800 minicomputer. Epcot Computer Central is made up of three V77-800s, two V77-500s, and three V77-200 systems. Nationwide, the Disney organization supports more than 500 Sperry Univac UTS 400 crt terminals in Burbank, Orlando, and 17 other major cities.

But not all of Disney's computerization originates from Univac gear. Since the opening of Disneyland, the organization has been heavy in point of sale, and, when Epcot Center opens, the front gate will be a point-of-sale operation. All restaurants and shops will be equipped with POS terminals, and Cornwell estimates the total number of these terminals in the neighborhood of 10,000. These are all from NCR.

"The Computer Song" was written about "me friend, the computer."

The applications for the Univac computers in both California and Florida are possibly unique in both nature and numbers. They not only are used for such now-ordinary things as hotel reservations, film distribution, travel arrangements, distributed inventory, item tracking, payroll, financial planning, employee timekeeping, etc., but they also control everything happening in the theme parks, including curtain cues, special event controls, and total monitoring.

The computer complex in Florida is a $450 million installation, but Univac's Fullam noted that "our financial arrangements with the Disney folks are complex." For the Epcot show, Univac has paid a fee to Disney. No bartering, said both sides.

Cornwell's job has grown in geometric terms since he joined Disney in 1968 to get a dp operation going. All dp operations report to his Burbank organization. The next Disney attraction after Epcot Center will be a theme park in Tokyo. But that operation will be handled differently. "They will have an outside contractor running dp for them and all we will have to do is some training," Cornwell said.

Meanwhile, back in Florida, hoards of people will be treated to a show designed to portray computers as benevolent, friendly, and helpful. The computers they see will be from Univac.

And if Univac's fondest hopes are realized, people will go away from the show thinking about friendly, helpful *Univac* computers.

—Edith Myers

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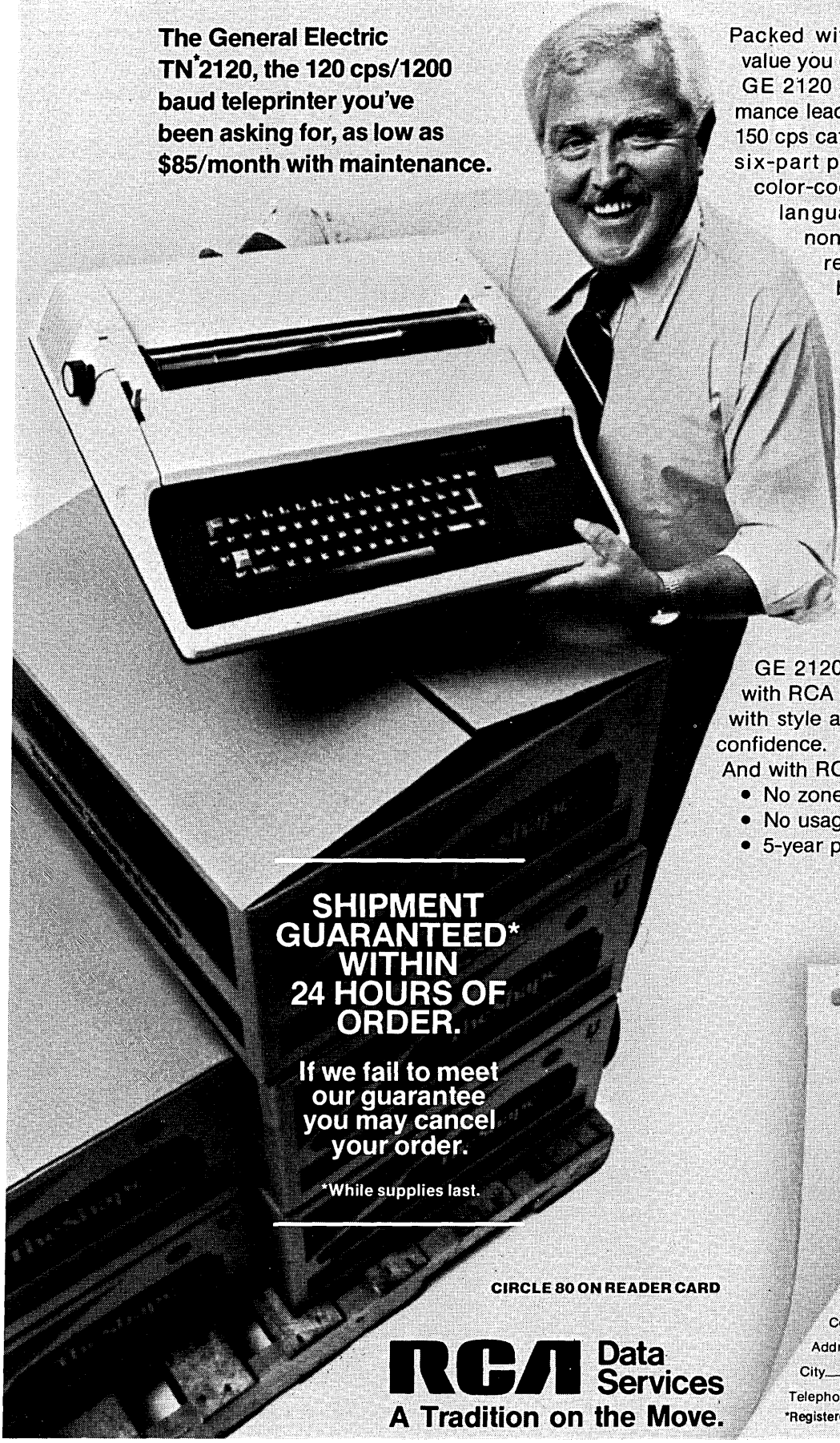

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NEWS IN PERSPECTIVE

BENCHMARKS

APPLE SIDER: A group of entrepreneurs from crt maker Delta Data Systems has formed Franklin Computer Corp., in Pennsauken, N.J., to sell microcomputers that are software- and peripheral-compatible with the popular Apple personal computer. Hoping to tap the mail order markets that Apple abandoned in a controversial decision several months ago, Franklin's Ace 100 machine will sell for $1,595 with 64K RAM, compared to Apple's list price of $2,068 for a comparably configured model 2. The Ace 100 currently lacks color capability, but it does use the 6502 microprocessor so it can handle the same software as the Apple machine. The company says it's ready if Apple tries to block its actions in court, and it doesn't think it will have problems in running the Apple disk operating system.

IN GEAR: Encouraged by a Federal Reserve System finding that its proposed timesharing services subsidiary is an allowable entity under current banking laws, Citibank is apparently going full speed ahead with its Citishare plan. Although the company did not return numerous phone calls, it has been learned that the Citishare operation recently set up a data center in Atlanta where it has installed two large Honeywell DPS/8 mainframes as well as some DEC 2060 systems. The Honeywell hardware was bought primarily because of an $8 million credit line the bank had with Honeywell after a certain Project Mustang, designed to provide bankwide data communications services, failed. Bank sources say the Citishare operation is currently aiming to sell services to other banks and financial departments of large corporations. It has licensed several applications packages from Syosset, N.Y.-based Tekkon Computer Services Corp., which is also acting as a local sales agent for Citishare services. ADAPSO, the computing services trade organization, has been fighting vigorously to severely limit Citibank's marketing of such services.

J'ACCUSE: Almost two months after the massive government suit against IBM was dropped, Judge David Edelstein publicly questioned the conduct of Justice Department's antitrust chief William F. Baxter in not disclosing work he had done for a West Coast law firm that had helped defend IBM in a private antitrust suit some six years ago. Edelstein reportedly was tipped off to Baxter's earlier connection to IBM by Memorex chief counsel Robert L. Erickson. Baxter responded at a news conference by calling the judge's conduct "absolutely unreasonable and outrageous." Observers were divided in determining the seriousness of the alleged conflict of interest. Some contended that Edelstein was angered for personal reasons when Baxter and IBM jointly dropped the huge case in early January and denied Edelstein the chance to make a decision on the case he had sat through for its almost 13-year duration. Baxter was criticized by many legal beagles for not having disclosed his IBM-related work, insignificant as it may have been, at his confirmation hearings early on in Reagan's term of office. After all, they said, Baxter knew he would be involved with the IBM suit right from the start. At press time it appeared that the Justice Department's Office of Professional Responsibility would look into Baxter's conduct.

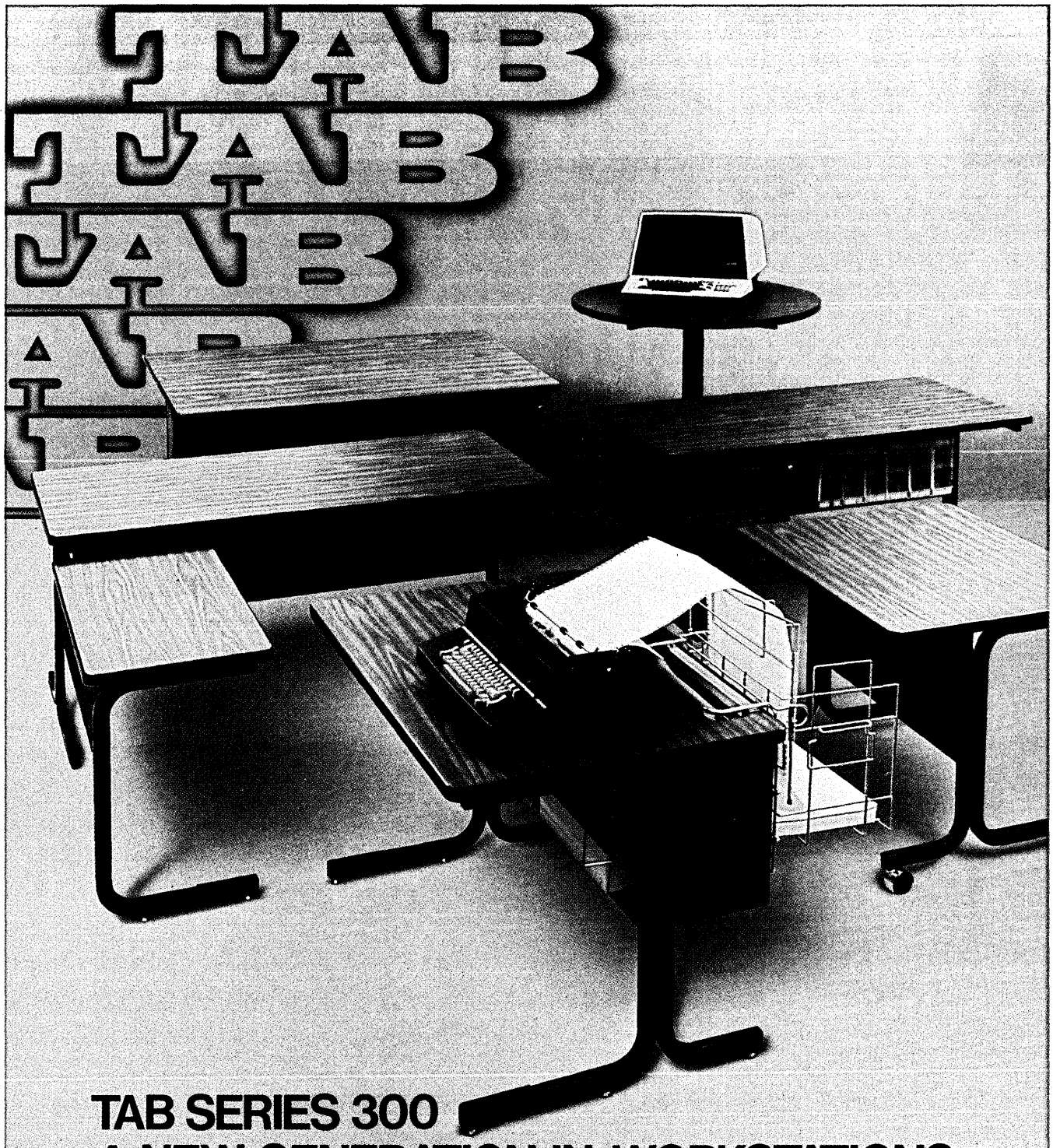
CHIPS AHOY: Semiconductors from Japan have been the focus of much concern in recent months as the Reagan Administration looked into possible dumping by the Japanese in U.S. markets, as Hitachi signed a technology licensing deal with its good customer Hewlett-Packard, and as a wide variety of computer and semiconductor makers met to devise a joint research venture to compete more effectively with the government-coordinated Japanese industry. Although informal at press time, the Washington inquiry into Japanese exports to the U.S. was expected to lead to a formal study of the issue, sources believed. Tariffs and import quotas are among the remedies available to the Administration, which has been prompted to look into the issue by the Semiconductor Industry Assn. Meanwhile, HP said it had signed a deal under which it would gain know-how and technology to manufacture 64K random access memories, an area in which the Japanese have managed to be a price leader while gaining fully 50% of the U.S. market. HP was chosen for the deal because it might help ease U.S. concern over Japanese dominance in the 64K market and because it has been a good Hitachi customer. HP currently makes its own logic chips, but they are produced in small quantity compared to the huge amounts of memory chips it uses. Finally, Control Data's feisty leader, William Norris, called a "secret" meeting in Florida to plan a joint venture microelectronics R&D firm that would develop VLSI circuitry and reduce costly duplication of effort by its computer and semiconductor maker partners. Attending the hush-hush meeting were top representatives from Sperry Univac, National Semiconductor, American Micro Devices, Digital Equipment, Mostek, Burroughs, and the Defense Department, among others. The meeting was only preliminary, and it was not clear how many attendees would show up for further meetings. In any case, Norris garnered a strong showing for his firm, which has been active in several joint development activities over the past decade.

CRIB SITES: Two data centers, slated to provide "planning, programming, and data processing support" to AT&T's proposed unregulated services operation, commonly called Baby Bell, will be located in Orlando, Fla., and Piscataway, N.J. AT&T said the Orlando site would employ some 1,000 workers with an annual payroll of $36 million, while the Piscataway site would have about 600 workers. Most of the jobs will go to Bell employees, a company spokesman said, noting that the centers should be in full operation by the end of this year. The subsidiary is expected to offer dp services such as the proposed ACS data communications network, as well as the selling and leasing of telephone equipment. Bell is going ahead with setting up the new subsidiary despite the still pending settlement of the government's antitrust suit, which could necessitate changes in its plans.

THAW: An easing of export restrictions for goods headed to South African government agencies was put into effect in early March by the Reagan Administration. Claiming it was still firmly opposed to that government's apartheid policies, the Administration made it easier for U.S. firms to ship word processors, personal computers, home electronics, handheld calculators, electronic copiers, and personal communications devices as long as there were no national security restrictions on them. Under an embargo instituted by the Carter Administration, such goods, along with larger computers, were virtually blocked from going to South African agencies that were deemed as enforcing that country's racist laws. It was thought that large computers in particular would lend themselves to controlling the population.

Such large systems still require an export license, a Commerce Department official said, but smaller items no longer do. Except for computer exports to Eastern Bloc nations, only those to Pakistan, Iraq, and India come under close scrutiny to make sure they are not used to develop nuclear weapons, one official said.

BIG ONE: British computer firm ICL Inc. has put quite a feather in its cap, having won a $27.6 million contract to supply the New York State Social Services Department with some 2,400 distributed processing systems. The largest contract ICL has ever scored in the U.S. after several years of lackluster showings was won over several "large" unidentified competitors after benchmarks and evaluations of pricing were conducted, said Ron Kiyohiro, vice president of marketing for ICL's U.S. arm. The machines, ICL's DPS 20 models 10 and 50, will be attached to a Univac 1100/80 mainframe and will track public assistance, Medicaid, and related programs. The ICL equipment will replace Raytheon terminals, according the Kiyohiro. When asked if the New York State contract would help ICL garner more U.S. business, he said, as expected, "Absolutely!" ✱



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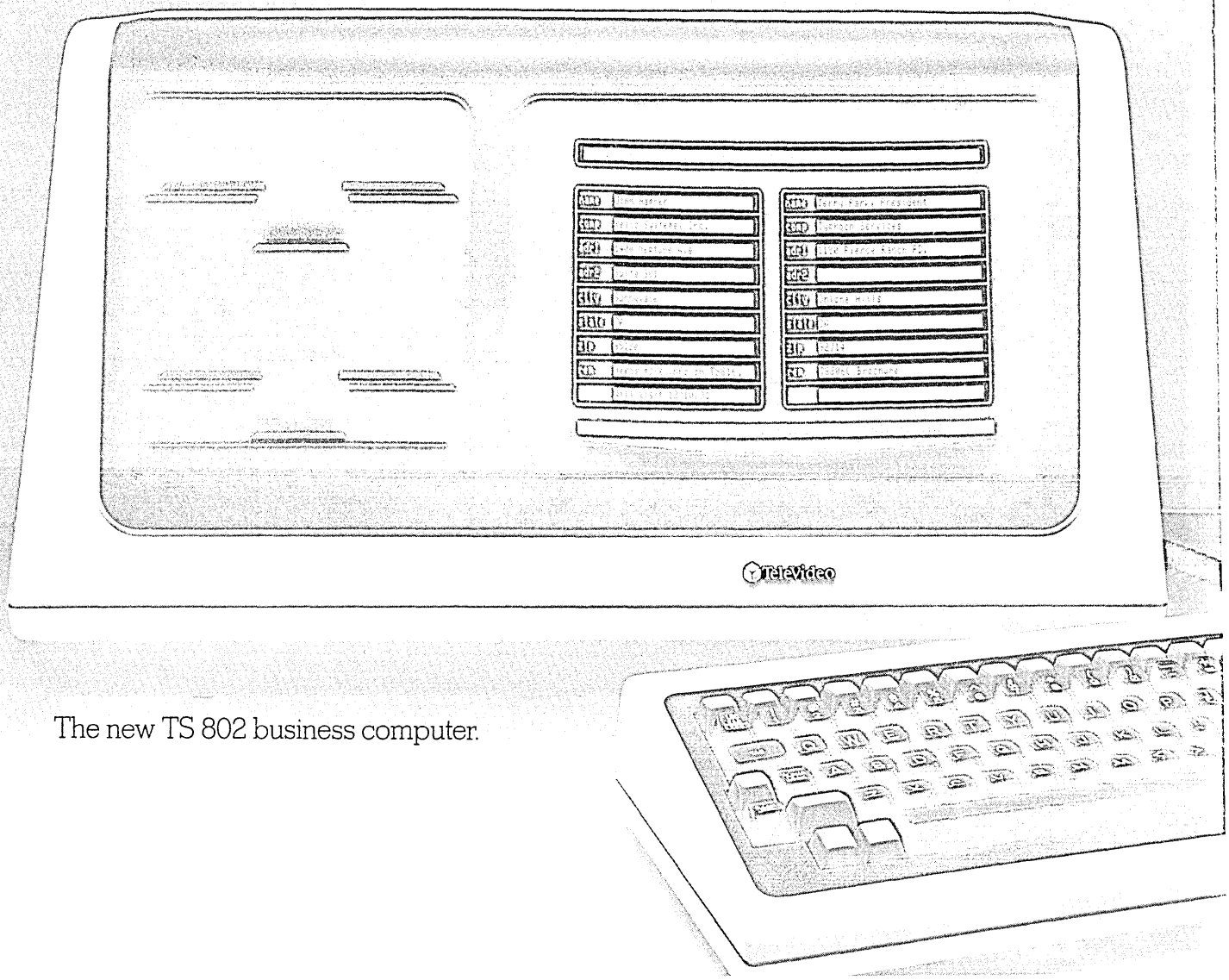

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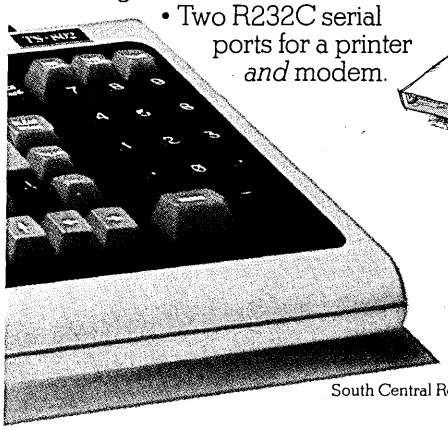

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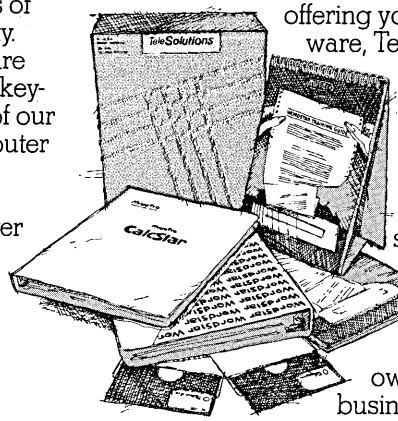

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INTELLIGENT TERMINALS: THE BEST OF BOTH WORLDS

by Margaret L. Coffey

On the surface, Terminix International Inc., a termite and pest control company, Arthur Young & Co., the accounting firm, and the Associated Press news agency would seem to have little in common. But these three firms have at least one bond: they have all made intelligent terminals an integral part of their data processing strategies.

Like many other companies, these three have found that intelligent terminals offer the best of a number of worlds. Since intelligent terminals can do some local processing without communicating with the host computer, they offer users flexibility while freeing the host for other tasks. Yet unlike some standalone desktop computers, they do have extensive communications capabilities. Better still, from the data processing department's point of view, they also allow some measure of control over what users are doing. "They fit the hardware to the need," says Jon Perlman, director of edp education at Arthur Young in Reston, Va.

Perlman brought intelligent terminals to Arthur Young about a year ago in the form of one Harris 1660 and 16 multifunction terminals. As is often the case with intelligent terminals, the system that he has developed works to free the company's IBM 3033 host computer from mundane tasks. Much of the work in his department is programming. All text editing and field processing can now be done locally on the terminals, which has cut Perlman's timesharing costs significantly.

What is more, Perlman's department is able to use the terminals for other tasks as well. Perlman boasts that the terminals can do most things that a personal computer can. In addition to systems for course registration, sleeping room arrangements, and class processing, "we actually have the facility for doing compiles at one of terminals," he says. "I believe that the term that has been coined around here is 'brilliant' terminal."

Distinguishing an intelligent terminal from a brilliant terminal or even from a merely smart terminal is no easy task since the capabilities of such terminals and their applications vary widely. In general, however, the key is programmability. Intelligent terminals are usually described as those that are user-programmable. Smart terminals, on the other hand, have their functions hardwired into their firmware. That definition does not mean that users actually have to program their terminals—many leave that to the vendor. Rather, it denotes the ability to accept a dynamic load locally or down line, or a facility for program development regardless of whether or not that facility resides within the terminal.

Other characteristics likely to be found in an intelligent terminal are the ability to edit, manipulate, store, and process data locally; communications connections; some storage; and other attributes of most small terminals such as a crt. Some of these terminals are sold as single, standalone units by companies such as Datapoint, Burroughs, Texas Instruments, Zentec, Ontel, and Hewlett-Packard. Others, sold by such companies as Harris, Four Phase, Mohawk Data Sciences, Raytheon, Honeywell, and Nixdorf, operate in clusters, replying on the shared resources of a single processor for power.

Yet another group of machines that fit the requirements for intelligent terminals comes from a different set of manufacturers altogether. These are the desktop or personal computers manufactured by companies such as Apple Computer and Tandy. Because many of their users are already using these machines as personal workstations, some data processing departments are bowing to the inevitable, incorporating personal computers into their data processing networks as intelligent terminals.

"They give us the best of both worlds," says Donald Brown, senior vice president for computer communications at Paine Webber Mitchell Hutchins Inc., a New York brokerage house. Brown, who is testing TRS-80 personal computers as intelligent terminals on a network for the company's brokers, says, "We know that the data we are sending are controlled, but we also allow the individual broker to use the data with his own applications."

Pressure to move computer power out of the computer room and into the hands of users is expected to keep sales of intelligent terminals growing fairly rapidly. Quantum Science Corp., a New York market research firm, predicts that 92,000 workstations for clustered intelligent terminals systems will be shipped this year, and expects that number to grow by 25% through 1985. Standalone terminals will total some 50,000 this year and grow by 16% through 1985, according to the company.

The reasons that companies will turn to these terminals will be as varied as the applications for which they will be used. Associated Press, the worldwide news service, began to use intelligent terminals manufactured by Delta Data Systems Corp. about five years ago to increase the speed of its news system. Roughly 200 AP staffers use the terminals as word processors to prepare news stories for transmission. Since the terminals have a very high text editing capability without host intervention, they only interrupt the processor when they want to send on a completed story.

"That gives us far more efficient use of the processor which is reflected in its speed and operation," says Dan O'Callaghan, a research and development programmer for AP in New York. "If you only go to the host to retrieve a story or to send one, it can handle commands faster."

Increased speed was one of the reasons that Terminix invested almost $500,000 in a network of 101 Datapoint 1500 and 1550 intelligent terminals. The company wanted a faster way to transmit accounting information from its branches across the country to its headquarters in Memphis, Tenn., than the manual and mail system it was using. Dave Arnold, manager of systems development at Terminix, looked at dumb terminals but decided against them because of the communications costs involved in their use. "We would have had to go on-line and the line charge alone would have cost me $50,000 a month," he said.

Now the company uses the terminals and a Datapoint 6600 minicomputer. The people at the branches enter their data on the terminals during the day without going on-line to the host; then at night the 6600 polls the terminals. The fact that the terminals are programmable means that Terminix can expand their use as time goes by, and that is what it intends to do.

ILLUSTRATION BY BOB WEBER

"These terminals are, in effect, microcomputers," says Arnold. "We have several projects to use them to take more of the manual work off the people in the offices." At present, none of the offices are equipped with printers, but Terminix is considering adding them. "We're looking at the possibility of putting more and more information through the terminals," says Arnold.

COSTS MOTIVATE AUSTIN

Concern about the cost of communications between dumb terminals and host computers is motivating Austin Information Services, a division of Austin Co., to take a close look at intelligent terminals. Currently, Austin uses some 200 dumb terminals to communicate with its six Hewlett-Packard 3000 minicomputers. But, says Bill Crow, director of systems development there, "it is absolutely essential to move in the direction of intelligent terminals because the dumb terminal interconnect is not one that we will be able to afford."

Crow is looking at micropcomputers in his search for new terminals. Like many others in his position, he realizes that managers in his company are buying personal computers for their own use. But he is not happy about the communications capabilities that those computers offer. "We clearly want to give the manager the capacity for local tools that a personal computer offers," he says, "but we would like to do it as an integrated part of our information system. Right now I don't see the box out there that allows us to do that."

While many people like Crow are deterred from using microcomputers as intelligent terminals for this reason, a number of other companies have already taken the plunge. One reason: the price. The average shipping price for a terminal in a cluster system is about $4,000, rising to about $7,000 for a workstation in a highly sophisticated system, according to Quantum. For a standalone intelligent terminal, the average price is about $6,400. A very minimal intelligent terminal could cost slightly under $3,000, while a very advanced terminal could cost as much as $10,000, the company says. Personal computer prices also vary, but systems with a reasonable amount of software and peripherals tend to cost between $4,500 and $5,000.

That kind of pricing provides compelling logic for using personal computers as intelligent terminals, says Dr. Scott Cutler, manager of video systems programs at General Electric's research and development center in Schenectady, N.Y. "The cost is so low and when you get a Radio Shack or an Apple there is a wealth of software available for it," he says. After all, "there is no Visicalc equivalent for intelligent terminals."

GE is currently using some 25 personal computers in its research center for a variety of applications, including data processing, word processing, controlling expenses, and scientific computation. Using the computers as intelligent terminals "provides a less expensive distribution system," says Cutter. "It offloads the need to use the central resource and is often quicker because you can do some processing without going to the host at all."

Brown at Paine Webber is equally sold on the idea of using personal computers as intelligent terminals on the company's information network. Currently, the company is running a pilot test to see how well nine brokers in strategic locations like using TRS-80s as intelligent terminals. Each night Paine Webber's mainframe computer sends to the personal computers the data on stocks that the broker will need the following day. Then each broker can use various applications programs to message the data any way he likes and can come up with sophisticated extra data for clients beyond what Paine Webber usually provides, such as in-depth portfolio analysis and stock analysis.

Paine Webber's 500 brokers already have GTE Quotron terminals which allow them to call up stock prices as needed. But Brown believes that supplying the brokers with Radio Shack machines will add another dimension to what they can do. "This gives them computer power and inquiry power into the books and records of the firm," he says. The company picked the Radio Shack machines for several reasons. They were cheap, were widely available through the company's retail stores, and, says Brown, "the brokers were buying them anyway."

That kind of pragmatic approach could mean that a lot more personal computers will be used as intelligent terminals in the future. More and more data processing managers, aware that managers at their companies are taking data processing into their own hands and buying these machines, are looking for ways to integrate the machines into their networks. "We're pushing to try to take

THE SHIFT TO INTELLIGENT TERMINALS

The terminal market is expected to change significantly over the next few years. Here's a look at how the experts think the market will develop.

QUANTITIES IN UNITS INSTALLED	1981	1985
Total	2.69 million	5.38 million
Single-station nonprogrammable terminals (dumb and smart)	55.9%	63.4%
Single-station programmable (intelligent)	6.5	7.1
Multistation nonprogrammable (dumb and smart)	25.4	15.4
Multistation programmable (intelligent)	12.4	14.1

VALUE IF SOLD AT ORIGINAL PRICE (DOESN'T INCLUDE DISCOUNTS)	1981	1985
Total Installed Value	$8.77 billion	$13.18 billion
Single-station nonprogrammable terminals (dumb and smart)	24.1%	24.8%
Single-station programmable (intelligent)	9.9	11.6
Multistation nonprogrammable (dumb and smart)	53.7	46.4
Multistation programmable (intelligent)	13.3	17.2

MAJOR COMPANIES IN THE STANDALONE MARKET	MAJOR COMPANIES IN THE MULTISTATION MARKET
Datapoint	Four Phase
Beehive	Harris
Burroughs	Honeywell (Incoterm)
Texas Instruments	Mohawk Data Sciences
Zentel	Nixdorf Computer
Ontel	Raytheon Data Systems
Megadata	
Hewlett-Packard	
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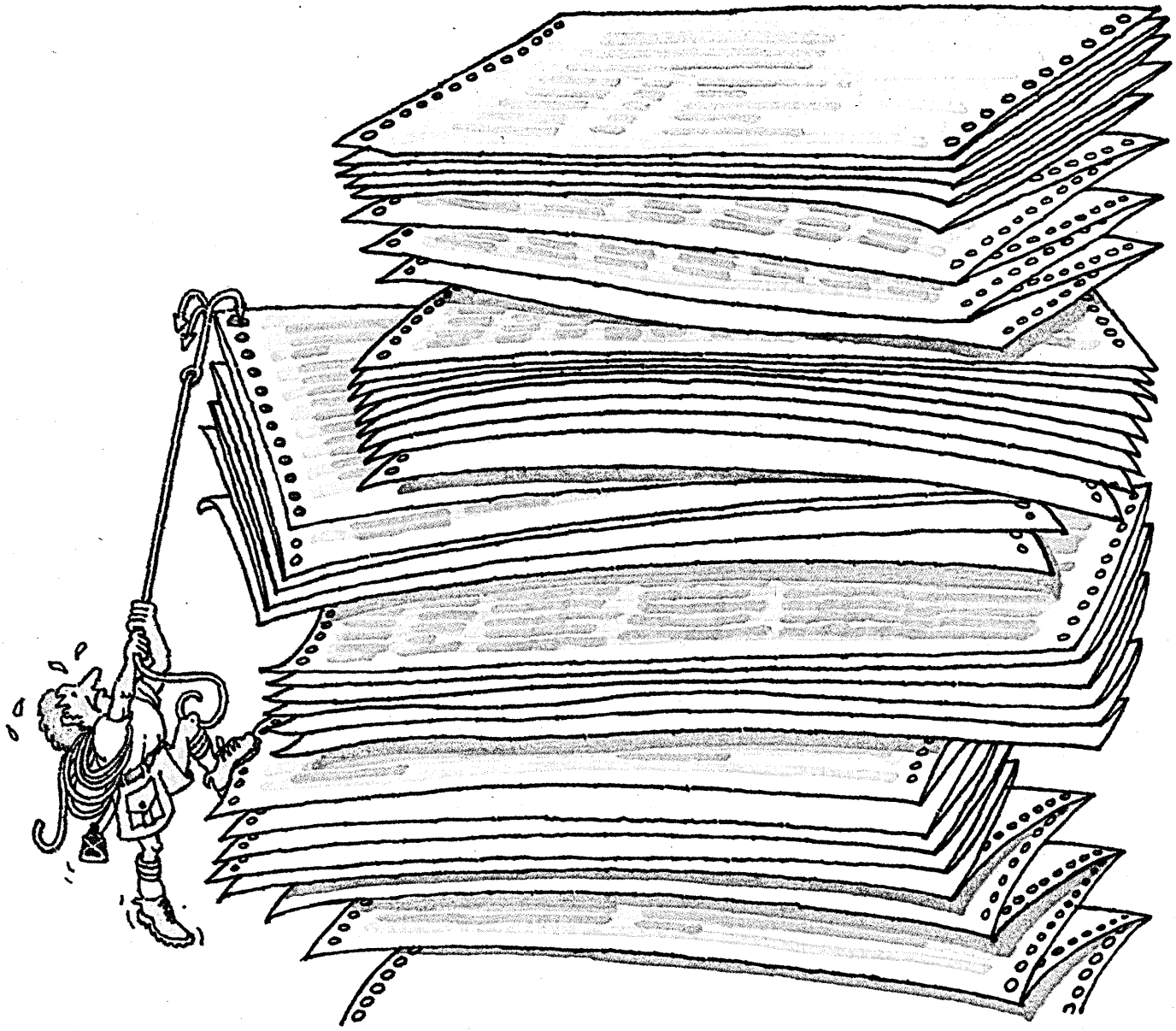

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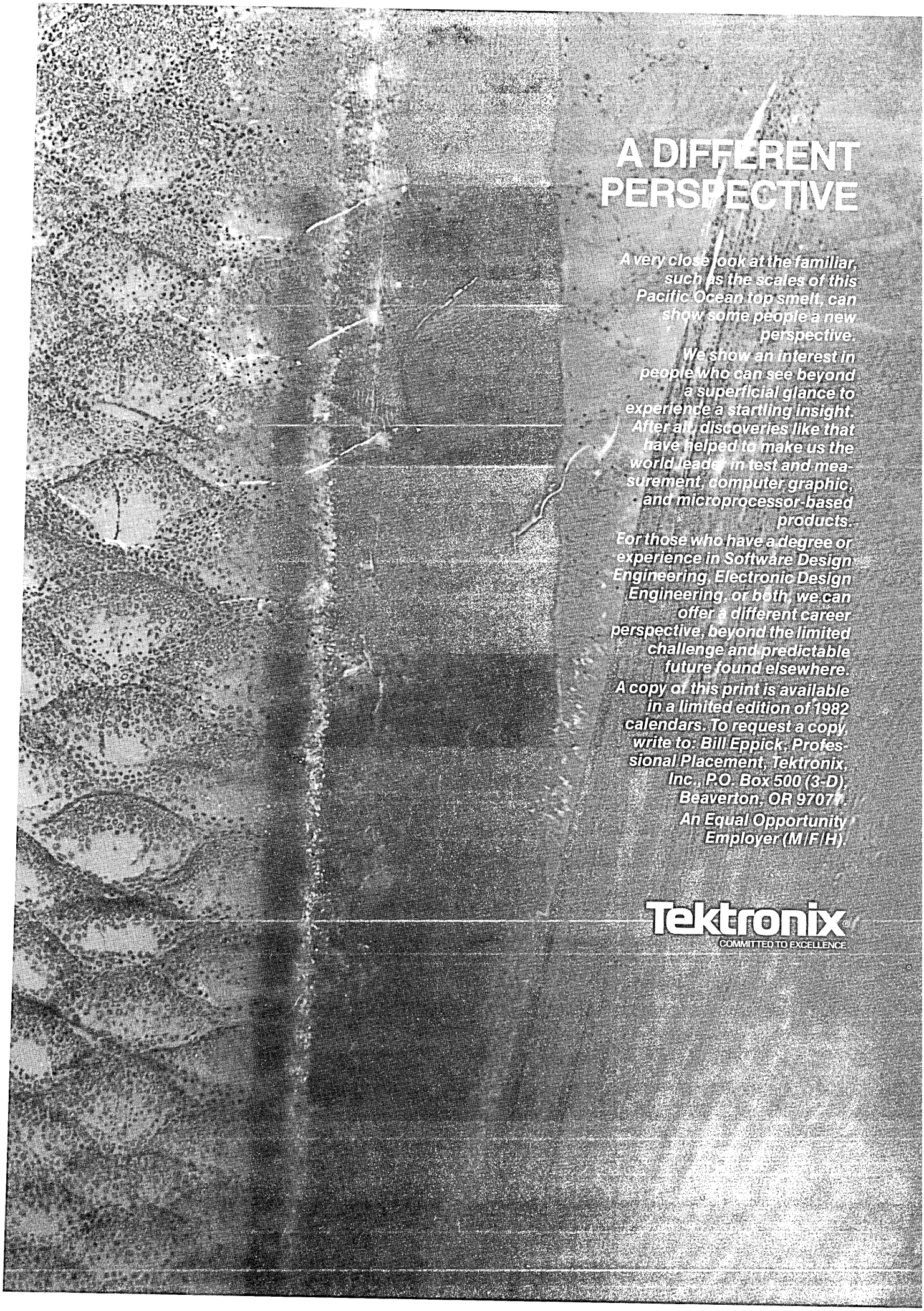

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Unlike some standalone desktop computers, intelligent terminals have extensive communications capabilities.

the lead in computing in the company," says Larry Woods, manager of special purpose computing at Deere & Co., Moline, Ill. "We want to let managers use a desktop computer but also give them the power of the host."

In order to do so, Deere is now testing Radio Shack computers in various capacities. The company is looking for a machine that gives it communications capability for about the same price as the dumb terminals it is using now. Wood believes that the trend should be to integrate personal computers into the total computing resources of a company. "That could be done if vendors come up with ways to marry them into the host," he says.

The realization that personal computers are here to stay as a management tool is likely to have a profound impact on the future of intelligent terminals. At the moment, the two types of machines are largely distinguished by the way they are sold. An Apple computer with a communications option can be made to perform exactly like an intelligent terminal. But, says Donald Maguire, a vice president at Quantum, "if I'm looking for a device that integrates into my network, the person that I call is a terminal manufacturer because he knows what I am talking about." As personal computer manufacturers realize they are missing out on a potentially lucrative market, this marketing distinction will become less clear.

At the same time, prices of both intelligent terminals and personal computers are expected to fall. "All of the elements of terminals are on pretty good price/performance curves," notes Quantum's Maguire. Much the same is true, of course, for personal computers. Barry Gilbert, manager of corporate planning services at International Data Corp., a Waltham, Mass., market research firm, believes that over the next three to five years, the cost of desktop computers will come down to around $2,500.

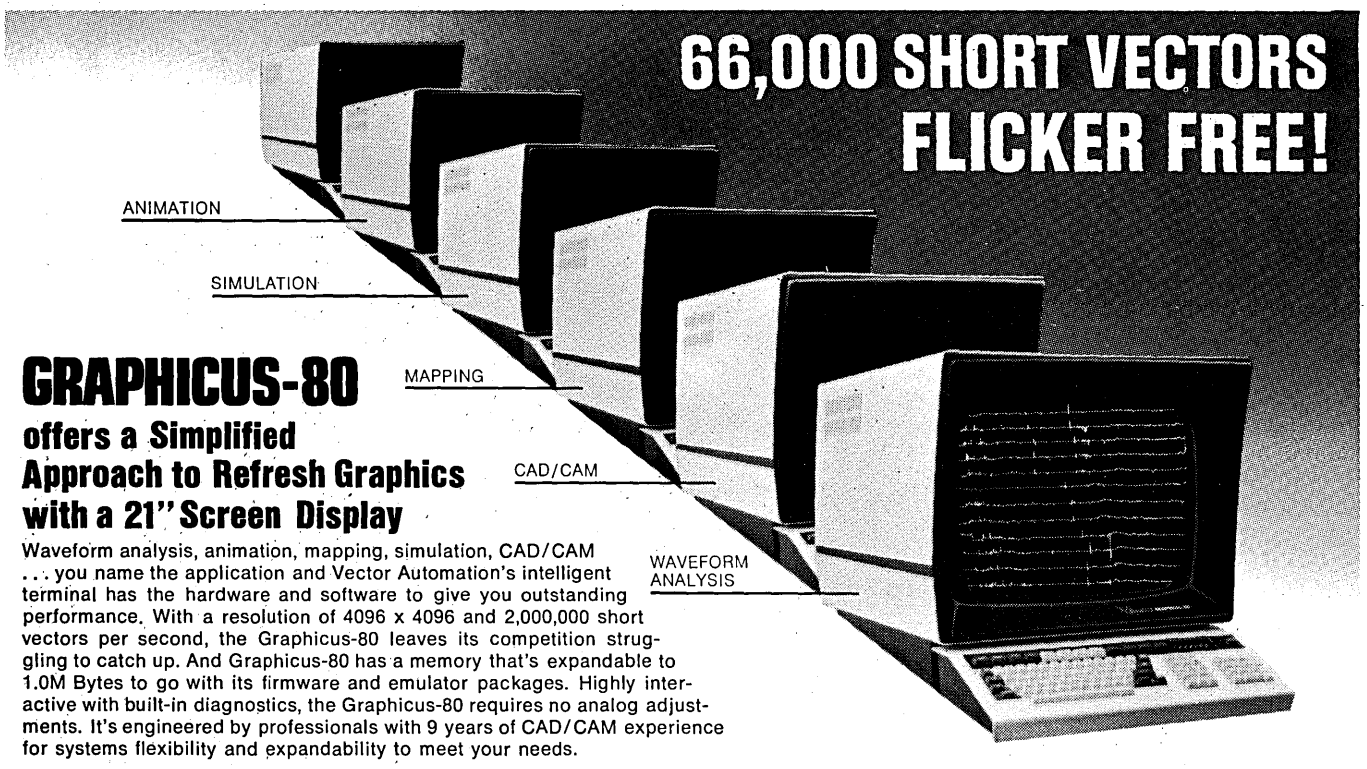
As the distinctions between these two markets begin to blur, there will be increased pressure on intelligent terminal manufacturers to add more function to their products. "The longer range trend is towards more intelligence in the terminals or terminal systems," notes Quantum's Maguire. "The more intelligence a manufacturer puts in a terminal, the more flexibility he has down the road to exploit multifunction environments in the same way that personal computers do."

Indeed, some experts are already predicting that unless terminal manufacturers recognize this trend, they will run into trouble. "I don't think that the intelligent terminal will do a disappearing act," says IDC's Gilbert, "but manufacturers will either have to meet desktops or rethink what the market is about. Increased bells and whistles are what attract the user now."

That, in fact, is what manufacturers will likely provide. Suppliers are already adding more intelligence to their terminals, a task made easier by the advent of microprocessors. Some are even beginning to make available for their products the operating systems used on personal computers in order to give their customers access to the software written for those machines.

Eventually, it may even be difficult to distinguish intelligent terminals from desktop computers. Says Thomas Arnett, a vice president at Creative Strategies International, a San Jose, Calif., market research firm: "The historic boundary definitions are simply going away." ✱

Margaret L. Coffey is a New York-based free-lance writer.



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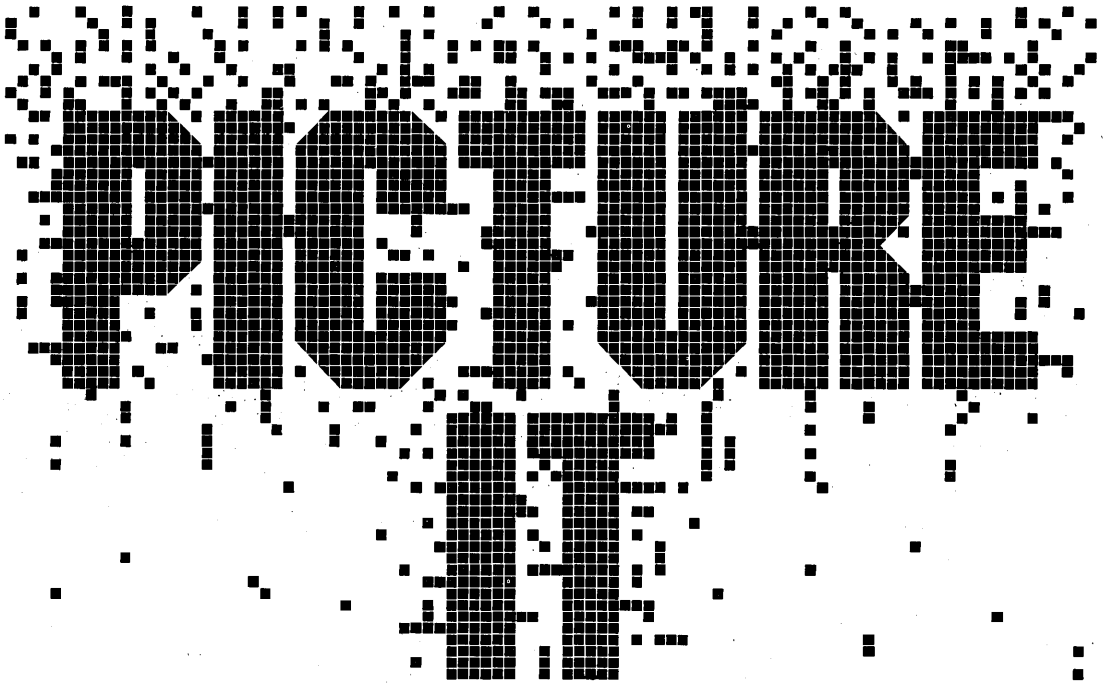

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Transistorized series-resonant-inverter (SRI) technology has been advanced to a resonant operating frequency of 200 kHz in another step toward minimizing inverter size and weight for spaceborne power-conditioning applications. The new Hughes SRI design uses power field effect transistors, which permit higher switching speeds. The design allows use of smaller inductors and capacitors, resulting in faster response to transient load changes and input-voltage variation. The SRI could be used as a beam power supply of an auxiliary propulsion ion thruster, or as a power conditioner for a high-power traveling-wave tube.

A new software system can translate naval tactical messages into understandable form. Messages within a command, control, and communications (C^3) system are typically hard to understand because they are transmitted in telegram form and often omit subjects, direct objects, articles, prepositions, and punctuation. If grammatical errors creep in, messages can be rendered unintelligible. While conventional computer techniques can't make sense of a garbled message, a Hughes message understanding system called GRACIE can. Using artificial intelligence techniques, GRACIE understands general descriptions of flights of aircraft over ships, of attacks, and of encounters with hostile ships. It constructs grammatical sentences based on what it expects messages to be, referring when necessary to a "rule book" of examples. It can be adapted for other than naval use.

An advanced radio-telephone switching system for military shipboard communications eliminates the need for separate equipment for plain and secure voice channels. The Secure Voice Switch (SVS) system lets radio-telephone users select either secure or plain channels. It uses a microprocessor-controlled single audio switch. Large-scale integrated (LSI) circuits designed and manufactured by Hughes prevent crosstalk between the two kinds of channels. Hughes is producing the SVS system for the U.S. Navy for use aboard a wide range of ships, from frigates to aircraft carriers. The first production unit is being installed aboard the cruiser USS Long Beach.

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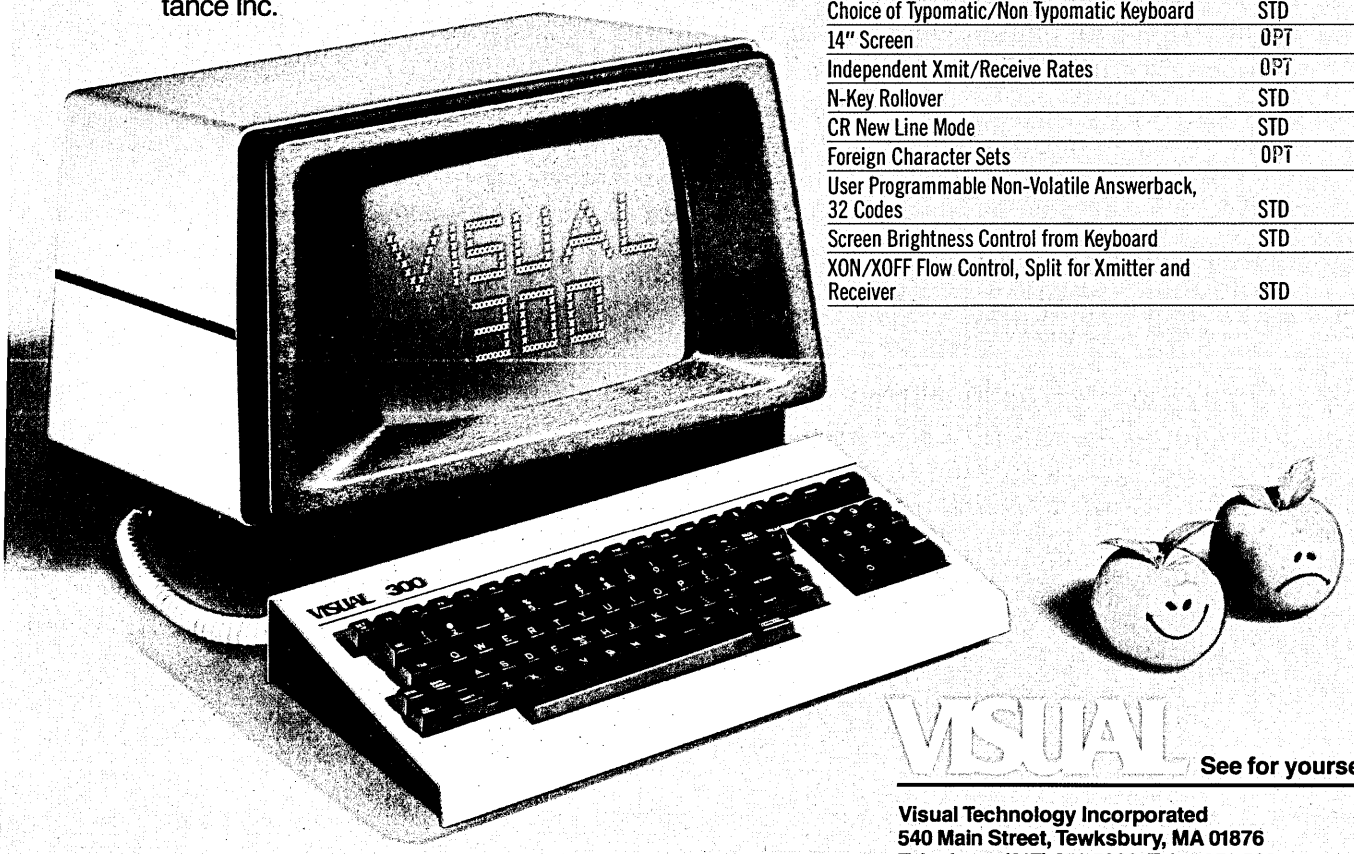

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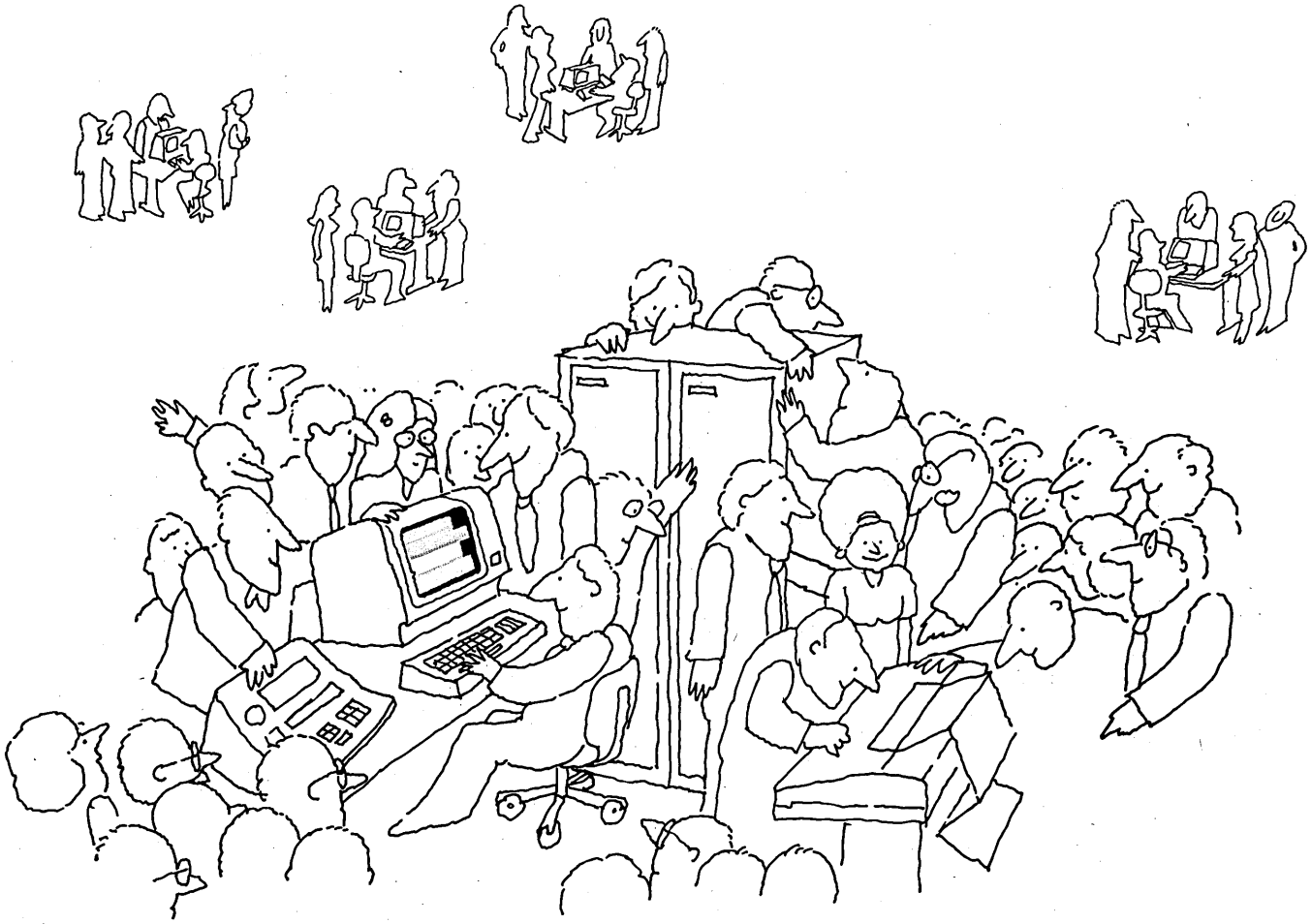

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WHAT USERS WANT

by John A. Moynihan

From a user's point of view, what distinguishes a successful system from an unsuccessful one? In empirical studies that have tried to answer this question, the success of a system has been operationally measured in two ways. When a user can choose whether or not to use the system for a particular job, success is generally measured by the extent of use. When the user is obliged to use the system, the usual measure of success is the user's overall degree of satisfaction.

The results of recent empirical research will not surprise experienced dp professionals. But a summary of the more important findings can be a useful aide-memoire for the systems designer and user.

The findings are summarized as shoulds and should nots for the qualities of a successful system, as judged by the user. Examples from real businesses are offered to illustrate the more subtle points.

1. *The system should be forgiving when users make mistakes.* When a user makes a mistake on input, the system should respond with helpful instructions or explanations that allow easy recovery from the error. Users should feel confident of not being able to damage the system with a minor mistake. In particular, users should be confident that any potentially serious error will be caught by the system. This is critical in an integrated system where one user might think his mistake could cause problems for other users.

2. *The system should be dependable.* The system should rarely break down or throw confusing surprises at the user. Scheduled outputs should be produced on time, and all outputs should be up to date and accurate.

Unexplainable errors on output should be very rare because such errors can quickly cause users to lose confidence in the system. Consider the case of a survey analysis package that had been working well but had suddenly produced an analysis that was internally inconsistent. Users who had trusted the system could find no explanation for the problem, but it appeared to right itself with the next batch of data, and they gradually regained confidence. Four weeks later, however, another error appeared. Although the problem has not recurred in the past three years, users still spend hours checking the system's reports with a calculator.

Users should rarely experience situations that the system can't cope with. For example, a manufacturing company was using a system to plan production for a range of 250 items. When the system was first designed, the firm rarely organized in-store promotions for its products. As promotions became more frequent, users had to amend formulas manually, then further adjust the forecasts provided by the system. Because they couldn't rely on the system to handle these regular events, users soon rejected it.

NEED FOR EASY ACCESS

3. *Users should have easy access to the system.* The system must be physically convenient. This is especially critical in terminal-based systems. For example, managers generally won't use an electronic messaging system unless they have terminals on or very near their desks. They will not use the system themselves if they have to walk any significant distance. In addition, sign-on procedures must be quick and simple, and response times on terminals must be low (generally less than five seconds).

4. *Users should get any help they need to use the system well.* Users should feel their views are important on both the design and maintenance of the system. A specific staff person should have responsibility for promptly handling problems and making necessary changes. In addition, users should get enough training to feel they understand the system sufficiently. Manuals and computer-based tutorial aids should be kept up to date, and training should be available continually—especially if there is high staff turnover.

5. *The system should not damage users' jobs or make users feel unimportant.* As an organization grows more dependent on computer-based information systems, employees may feel that human judgment in decision making is being supplanted by analysis of empirical data. They may also see increases in the specialization of work and in the degree to which their work is set down in standard procedures. Some programmable decisions, previously made by people, may now be made by the system. Changes such as these can damage jobs.

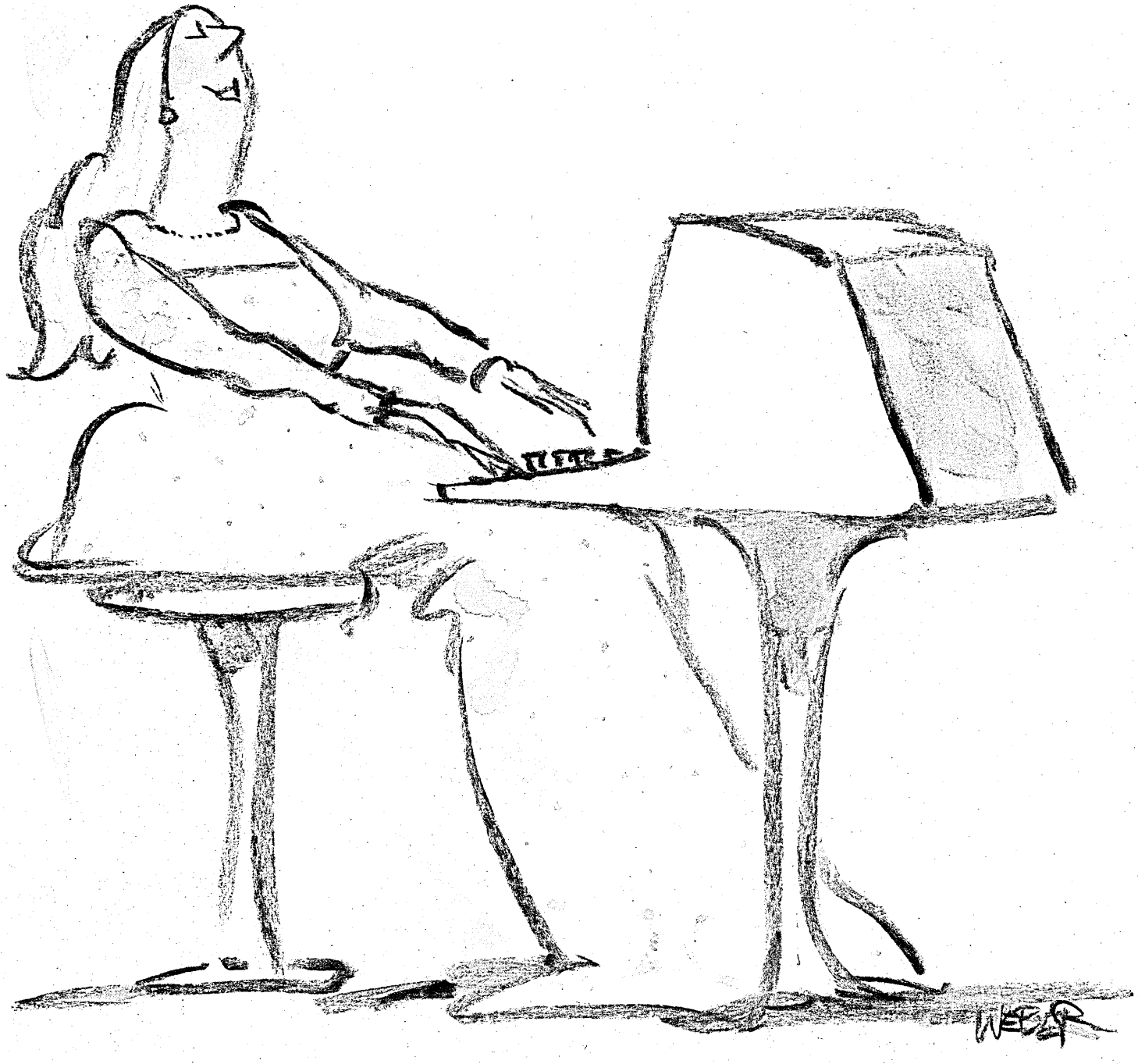
Overspecialization and increased standardization can make users feel that the system is controlling them rather than vice versa. Consider the experience of one company that makes perishable products at a central plant and distributes them by truck to sales reps around the country.

The sales reps had control over how much stock to reorder each week, and many reps viewed their individual operations as minibusinesses. Several years ago, corporate management became concerned that some sales reps were poor stock managers and imposed a new system involving central computer forecasts of the "right" stock replenishment for each rep. Although the new system reduced the cost of stock holdings and improved service to store owners, the sales reps argued that their personal forecasts were better. The issue was not technical performance, but how the salespeople saw the system encroaching on their jobs.

Eventually, a compromise was reached: the sales reps resumed making their own stock requests, but these were compared with the computer forecasts. If there was a significant discrepancy, the sales manager at headquarters had the authority to override the sales rep.

6. *The system should not make users feel isolated.* In computer-based systems some interactions between people are replaced by interactions between the individual and the system, through terminals. One user of a newly installed information retrieval system said, "When my boss gave me a query, I used to ring around the company to get the answer. Usually I had to talk to people. Now it's all in the computer. I spend most of the day in this room, all by myself with a terminal." In most cases it is possible to reconcile the needs of the system with the needs of a good job design. This should be a prime concern of management.

ILLUSTRATION BY BOB WEBER



Users should rarely experience situations that the system can't cope with.

HARD TO HIDE MISTAKES

7. *The system should not make users feel overexposed to scrutiny.* In computerized systems it is usually more difficult for people to conceal their mistakes and to escape explicit performance measurement. One user of a system for integrated material requirements planning put it this way: "Your mistakes never go away with this system. . . . they keep coming back at you. It's hard to fudge issues. Arguing with the figures doesn't work anymore. It's always there in the computer and it always balances!"

As another example, consider a large manufacturing company with plants in the United States, South America, and Europe. The company is installing direct cpu-to-cpu links between the computers in corporate headquarters and in the subsidiary companies. The company is shifting to database with standard data definitions, so corporate headquarters can now look in at any part of the database located in any of the plants. This capability for very tight surveillance by corporate headquarters is causing a problem in at least one plant. Local managers are seriously considering locking headquarters out of the part of their local database that contains details of back-order levels and other sensitive performance areas.

The potential for close monitoring of performance need not cause a problem. At another manufacturing company, the financial controller of nine subsidiary plants said, "Yes, they [management] have all these data available to them, but we still report to them period by period as before—though I guess they actually have the data before we have it! They can keep a very close eye on us, but they don't seem to be too obtrusive."

The systems design in each of these cases is rational, in terms of achieving efficiency in day-to-day operations. For example, the direct cpu-to-cpu link between the corporate head office and each local plant in the second example allows for greater coordination of the movement of components between plants. It also allows rapid updating of engineering specifications and product structure files. Differing users' reactions to the potentially high level of performance monitoring are probably a result of how the performance data have been used in the past. Consultation during systems design and agreement on the rules of the game by which performance information can be used can help minimize negative reaction to systems with high potentials for surveillance.

WORK ANYWHERE, ANYTIME

8. *The system should not make it hard for users to escape from their jobs.* Computer-based systems are reducing the need for simultaneity in organizations. People no longer have to be physically present at the same time and place to do their jobs. For example, the financial controller of a large supermarket chain has a computer terminal in his home. Through the terminal, he can gain entry to company financial and accounting data at night or on weekends. He can assemble budgets, make projections, and generally do a lot of useful things from his home.

A chief executive at another firm observes: "Wherever I go I bring my terminal with me. I can dial in to our computer from almost anywhere to get my messages and reply if I want to. I can get into the database at the plant and see how things are going, and I can leave messages in the system for the plant manager."

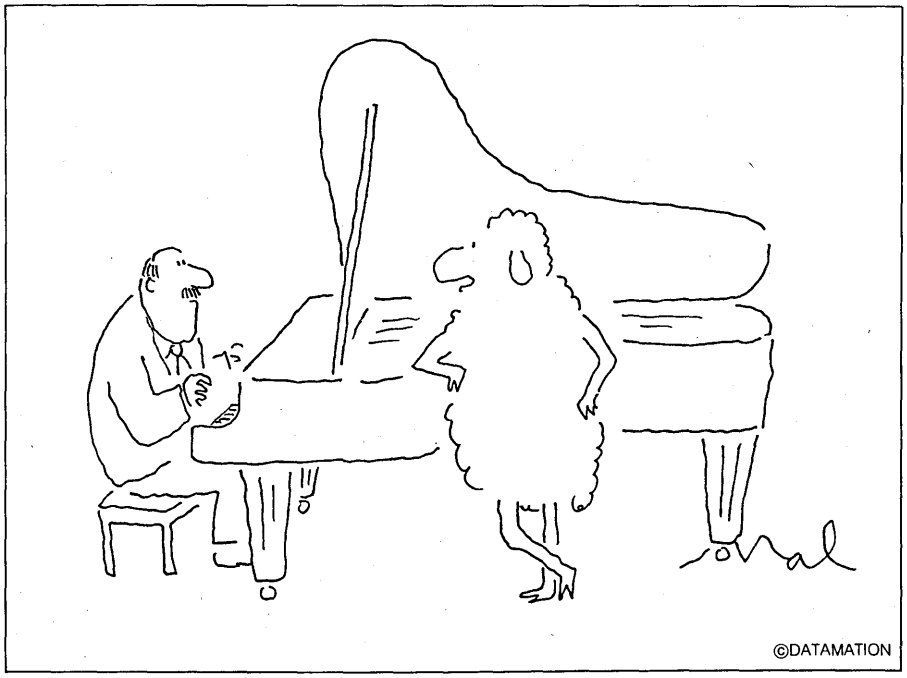
Some people find this facility liberating. As one manager says, "I never feel cut off. I can work at home or at a hotel almost as easily as I can work in the plant." But other managers find this facility oppressive: "It's fashionable in our company to have a terminal in your briefcase. I have one, but it makes me restless—I fidget around at home wondering what's in the system for me. If I don't check, I feel guilty, and if I do look, I'm afraid I'll find something that screws up my evening."

This inability to escape from the job may become a problem for some people as organizations make more use of recent developments in office automation. As in the case of increased performance visibility, senior management should create rules of the game that limit unwelcome intrusions of these systems into employees' lives.

9. *The system should not create unfinished business for users.* Good systems give users a sense of closure. As one user of a new on-line stock control system explained: "When I put a stock movement in through the terminal I know that's that. In the old batch system my office was full of bits of paper with reminders on them to make adjustments and postings. I was always worried that I would forget something. Now I put things through on the terminal as they happen, and I get them off my mind."

10. *The system should behave like a machine, not like a person.* Obviously a system should be easy to use and should be "friendly," helping guide users through operating sequences. But user friendliness can be overdone. Some users with little technical knowledge are put off by "chatty" systems that try to mimic the language of a person. Systems that try to behave like people can be very menacing to the uninitiated, who begin to wonder just what *is* at the other end of the terminal.

11. *The system must be important to the user.* Though this point may seem obvious, it is really the most critical factor in the system's success. Users will only take a system seriously if they truly believe it helps them do a good job, and if they see that the boss is committed to the success of the system. ❋



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Dr. John A. Moynihan is senior management specialist with the Irish Management Institute, Dublin, Ireland, and a member of the faculty at Trinity College. At IMI, he works with member companies to evaluate their use of computer technology.

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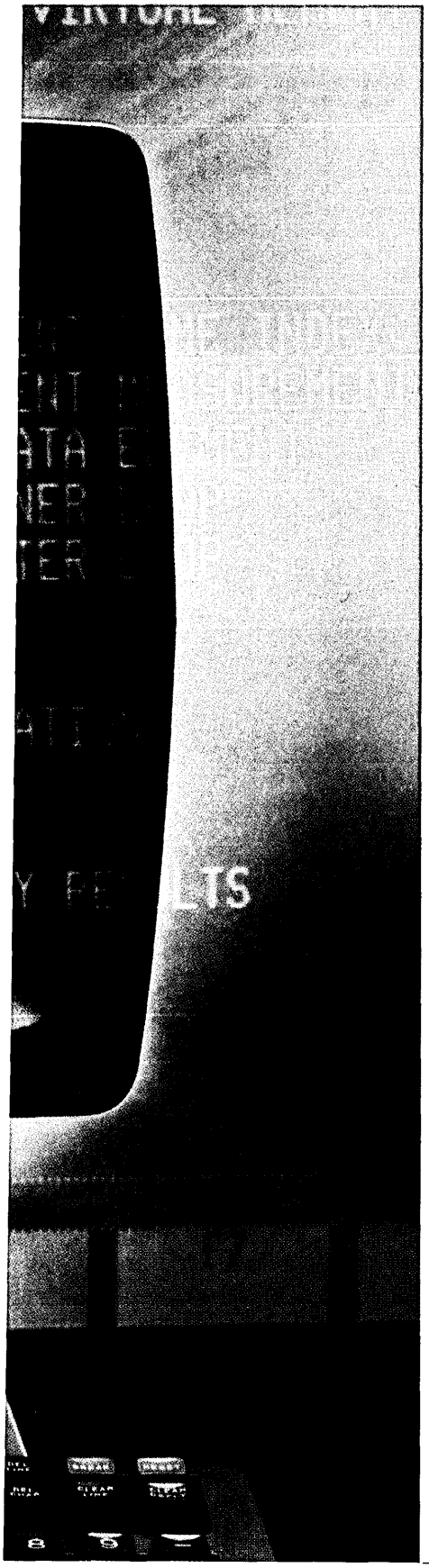

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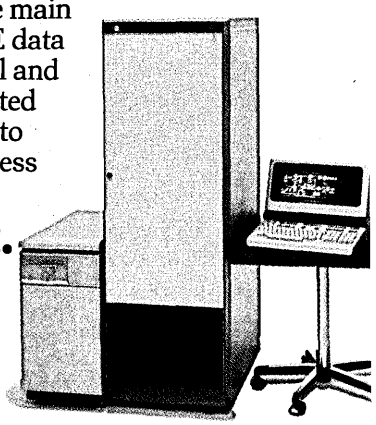

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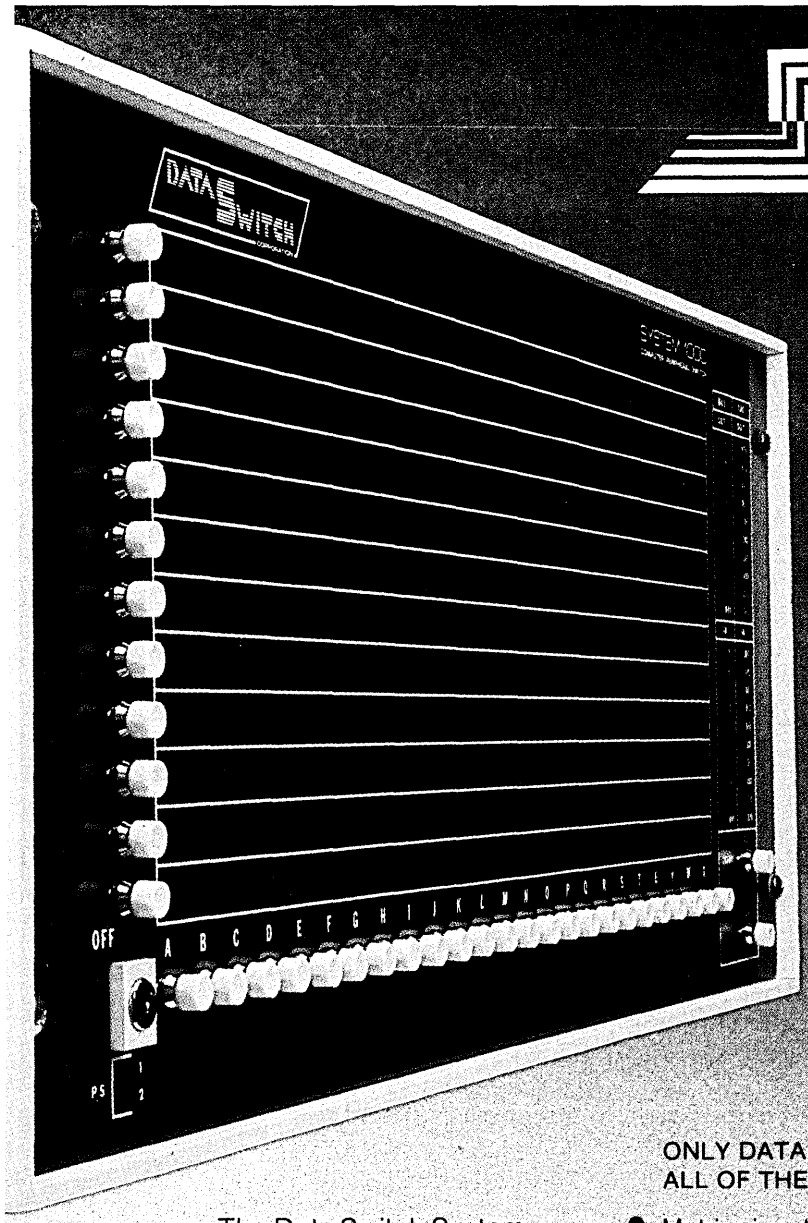

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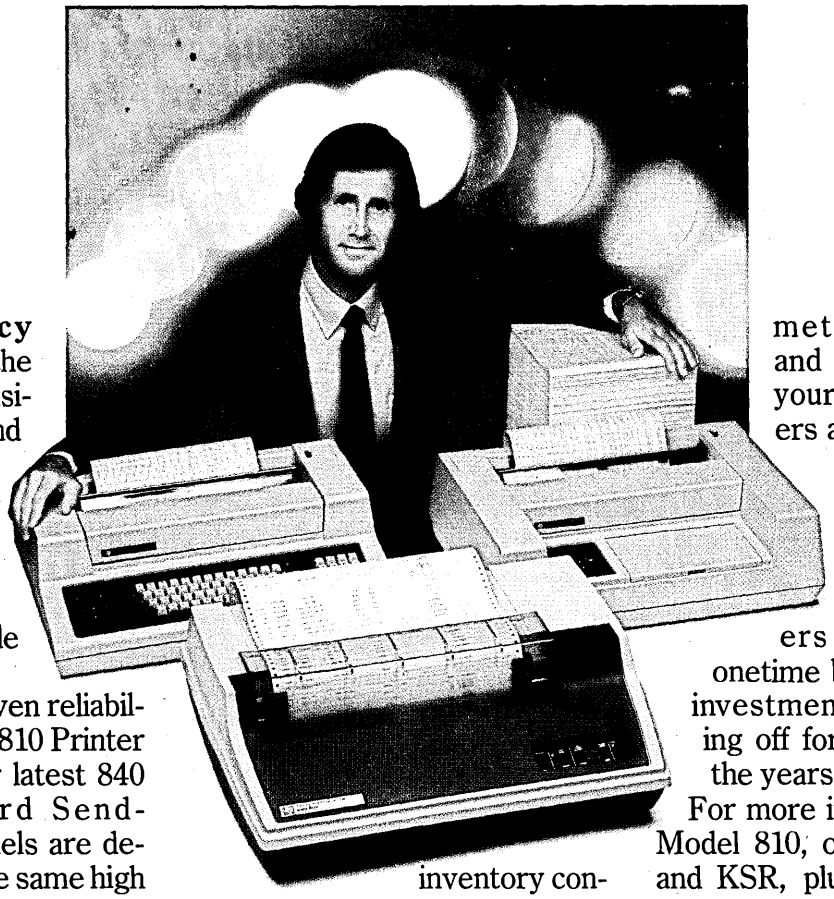

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CIRCLE 108 ON READER CARD

The previous article described what users want, and don't want, from interactive systems. Here are some suggestions for putting the human factor into systems development.

HOW TO DESIGN WITH THE USER IN MIND

by Ben Shneiderman

All project managers, system designers, and programmer/analysts want to build quality into their computer systems. Traditionally, quality meant reliability, ease of maintenance, correctness, on-time job delivery, cost effectiveness, and efficent use of hardware resources. But as the user community expands beyond dp professionals to include novices with little technical training, human factors play a larger role. "Computer shock" and "terminal terror" cannot be cured, but they can be prevented by using careful human engineering in system design.

The increasing use of computers in life-critical applications—air-traffic control, industrial plant process control, intensive-care units, or nuclear reactor monitoring—also necessitates greater attention to human factors. In these environments, low error rates, lucid displays, and easy-to-remember, fail-safe commands are crucial.

Encouraged by user demands, the computer community is recognizing the importance of user friendliness, simplicity, flexibility, and elegance in the design of interactive systems. Unfortunately, we are just beginning to learn to measure these vague qualities and to build them into system development. Human factors must be a central concern from the initial requirements analysis through every design stage. Adding them as refinements to a completed design is a hit-or-miss approach.

Although there is no foolproof plan for quality human engineering in interactive systems, here are four related approaches that may be useful:

- Create like an inspired inventor.
- Think like a clever scientist.
- Manage like a shrewd executive.
- Test like an energetic astronaut.

This list is not exhaustive. A parent's loving care, a prophet's wisdom, a symphony conductor's coordination, and an artist's imagination can also help, but these attributes are beyond the scope of this article.

1. *Create like an inspired inventor.* The lack of firm guidelines for interactive systems challenges designers to come up with creative new ideas. A good designer will not be content with the first set of commands that comes to mind, but will explore a wide variety of approaches. Why stick to command languages with complex syntactic forms that are hard to remember? Why not try menu selection, graphic displays, form fill-ins, cursor movement, touch panels, voice input/output, joysticks, or dual displays? You can't begin to consider the attributes of a good solution unless you have several choices. Brainstorming can provide clearer insights—and can also help you come up with multiple front ends to satisfy different user communities.

But just dreaming up the ideas is not enough. Thomas Edison stressed that inventive genius is 1% inspiration and 99% perspiration. You must do a great deal of background work to understand the problem before you can create six alternative designs. Interviewing users, developing system requirements, consulting with management, and tracking previous efforts are all precursors for the creative act.

Once you come up with a half a dozen approaches to the design, much work remains in fleshing out the details and following through to reduce the negative side effects. Edison had working light bulbs for years before he found the combination of materials that would make them bright and durable.

CONSIDER EACH VARIABLE

2. *Think like a clever scientist.* The reductionist approach of scientific research requires treating individual issues before examining more complex interactions. A good experimental scientist will consider independent variables (which can be changed) separately from dependent variables that are to be measured.

For example, in interactive systems design a crucial independent variable might be the display rate—say, 30, 60, or 120 characters per second. A good designer will evaluate the impact of the independent variable levels on the dependent variables, such as human performance time, user error rates, and user satisfaction. Performance time and error rates are relatively easy to measure and user satisfaction can be assessed with questionnaires.

The competent designer can informally consider the effect of different display rates on certain groups (novice users, infrequent but knowledgeable users, and frequent users) and tasks (menu selection, command language, text-editing display, or fill-in-the-blanks). Higher display rates are more important for frequent users of menu selection than for novice users of fill-in-the-blanks. For a high volume of information, higher display rates will speed task performance and probably increase user satisfaction—but a slower rate may reduce errors. The designer also has to consider the interaction of the display rate variable with response time delays and both hardcopy and softcopy devices. These aren't simple tasks, but an experimental scientific method can provide valuable insights at a relatively low cost in time and resources.

3. *Manage like a shrewd executive.* Designing a sophisticated interactive system requires the coordination of many people's activities. The system may change job

An experimental scientific method can provide valuable insights at a relatively low cost in time and resources.

requirements at all levels. Since the system gives administrators fast access to detailed performance information, the role of middle-level managers changes. When clerical workers can make decisions based on comprehensive, up-to-date information, the role of the team leader changes.

Because of these upheavals, personnel at all levels must be interviewed and kept informed throughout the design of an information system. Surveys have demonstrated that the success of a system depends heavily on user involvement in the design process. In addition, user involvement creates interest and enthusiasm for the system.

A second management technique is the use of project development benchmarks to measure progress. User representatives and management should be asked to review and sign off on the requirements, specifications, final design, and several stages of implementation. This gives participants an opportunity to express concern at each stage, further increasing user involvement.

The third management strategy involves evaluation mechanisms like pilot studies and acceptance tests, which are the norm in industrial design of other products. A pilot study to test comprehensibility could be done informally, with a few representative users examining typewritten or hand-drawn versions of the screen displays or, more elaborately, with dozens of trained users and an on-screen mock-up. Data collection can range from informal comments with stopwatch timing to complex problem-solving situations with a computerized collection of performance times and error rates. Subjective questionnaires are also valuable.

Acceptance tests should be more rigorous. For example, the following criteria might be applied to in-house development projects or to software development contracts:

An acceptance test with ____ typical users must be conducted with the enclosed benchmark set of tasks. After ____ minutes of training, these users must successfully accomplish ____ % of these tasks within ____ minutes.

More elaborate acceptance criteria would be necessary for systems that serve diverse classes of users or require extensive training time. Strict acceptance criteria would compel the design team to consider carefully the human factor issues and would stimulate early pilot studies.

TEST EVERY PART

4. *Test like an energetic astronaut.* Each component of the interactive system is a candidate for testing, from the type font and keyboard arrangement to the task sequencing and the physical environment. Every system message, menu-selection frame, screen display format, cursor movement technique, and on-line tutorial should be tested.

Not every test requires dozens of subjects or days of effort. Type font choice or system message wording, for example, can be tested in a few minutes with a few subjects. Critical features like task sequencing, command language syntax, query language styles, or on-line tutorial aids may require many more subjects and lengthy testing.

Good design and thorough testing do require an investment of time and resources, but that investment pays off in savings during the implementation phase and the system lifetime. A well-designed system is more easily and quickly implemented and leads to higher user performance after installation. Faster task performance, lower error rates, and higher user satisfaction should be paramount goals for the designer.

Reducing testing to speed the design phase is shortsighted economy. If commercial aircraft manufacturers are willing to spend great effort in testing wind-tunnel models and in building full-scale mock-ups, then interactive systems designers should be willing to test alternate screen displays of keyboard layouts. If NASA is willing to spend $70 million for a shuttle simulator, then project managers should be willing to build prototype versions for testing.

The human factors side of contemporary interactive systems design can be substantially improved. While academic and industrial researchers pursue basic guidelines and fundamental theories, system developers can pay greater attention to human factor issues to improve their designs. That means assigning an individual or team the responsibility (and the resources) for the human interface design. Collaboration with psychologists and human factor experts can be useful, but these consultants must be brought into the project at the earliest possible stage.

Eventually, every system design professional will have training in human factors and experimental methods, and numerous design and pilot studies will be routine. When that day arrives, interactive systems will effectively serve, rather than frustrate, users. Novices will look forward to using computers, frequent users will see the computer as a powerful tool that aids them in doing a day's work, and system designers will feel proud of their contribution. ❋

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CARTOON BY MICHAEL ARTELL

Ben Shneiderman is an associate professor of Computer Science at the University of Maryland. He has produced five books and more than 70 technical articles. This paper was adapted from the Proceedings of the ACM Special Interest Group on Computer Personnel Research Conference, June 4-5, 1981, Washington, D.C.

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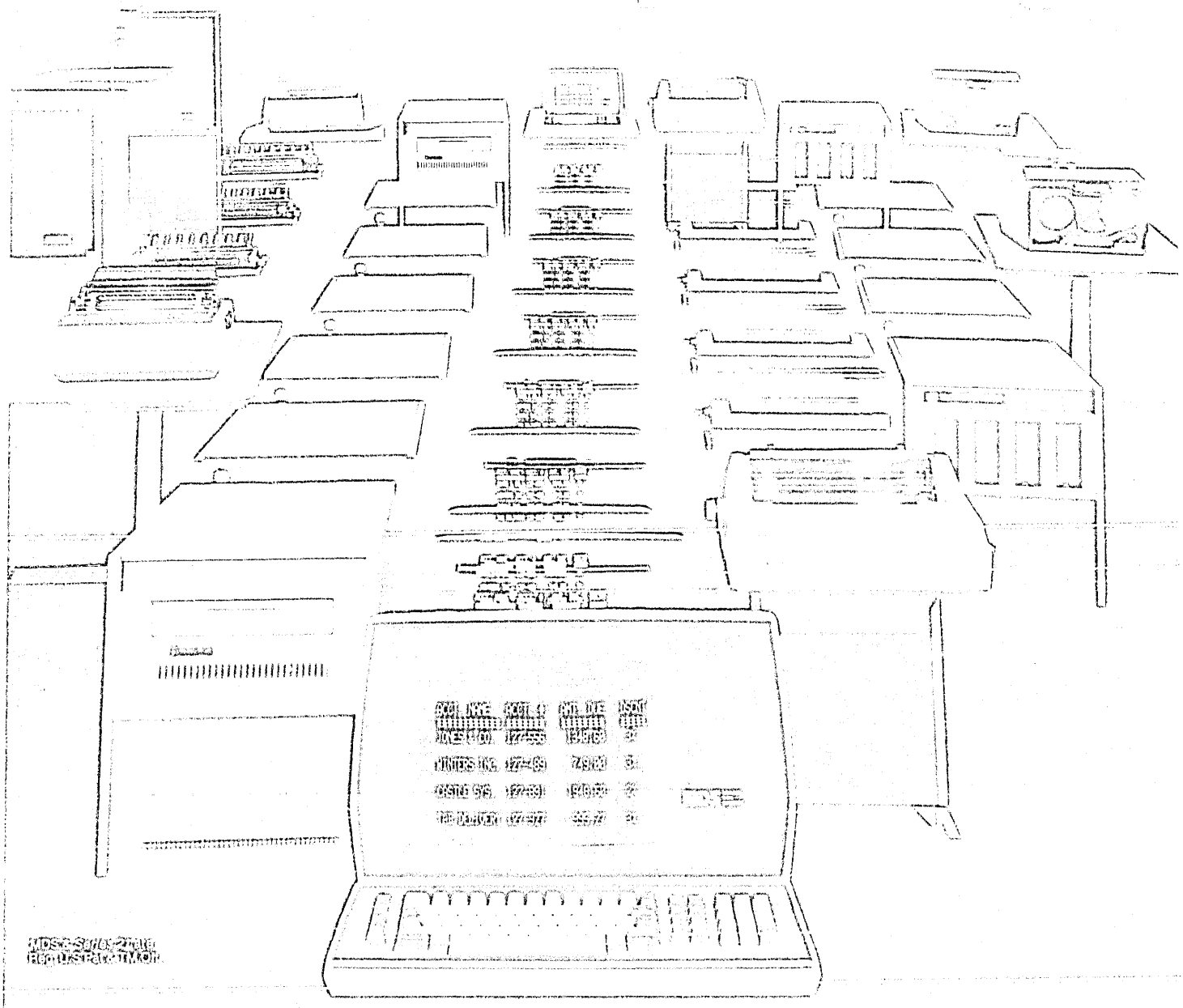

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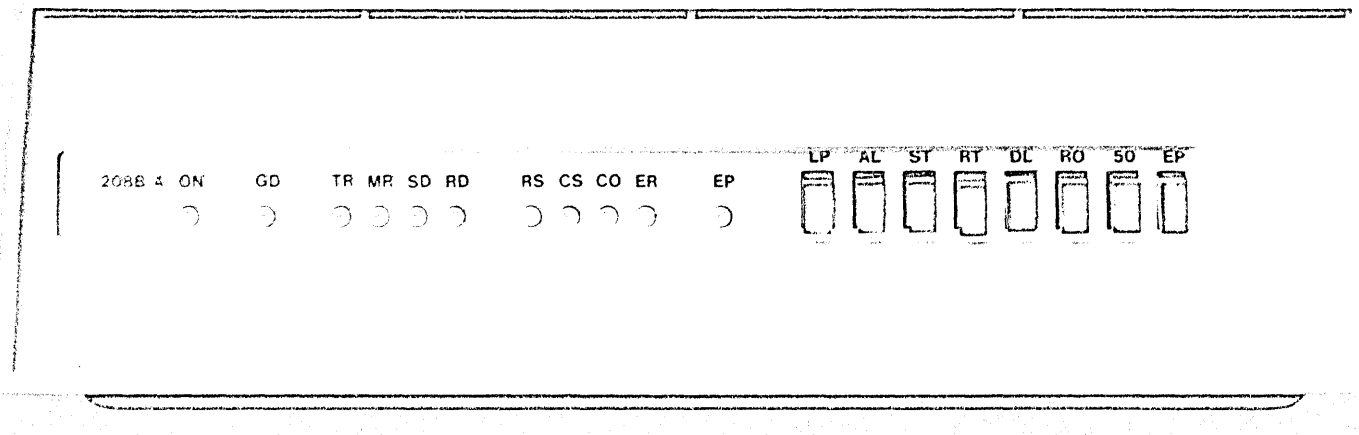

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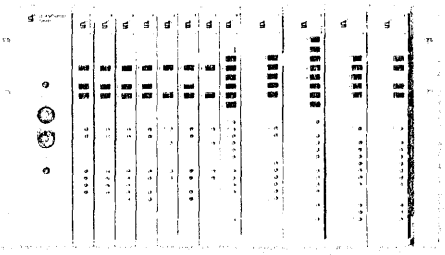

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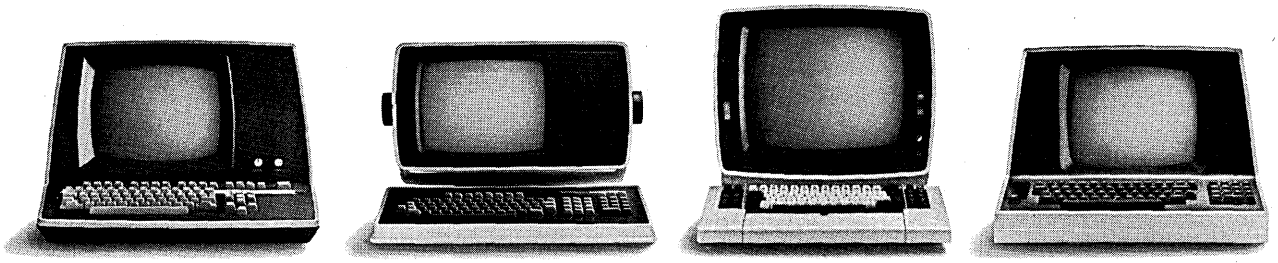

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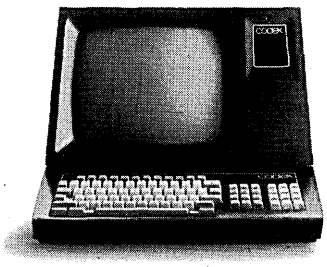

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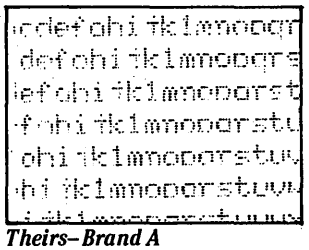

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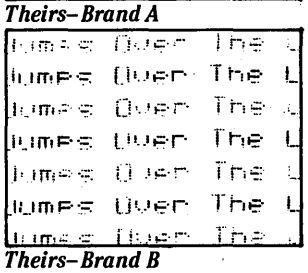

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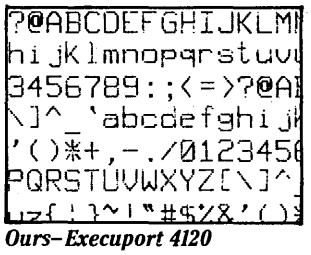

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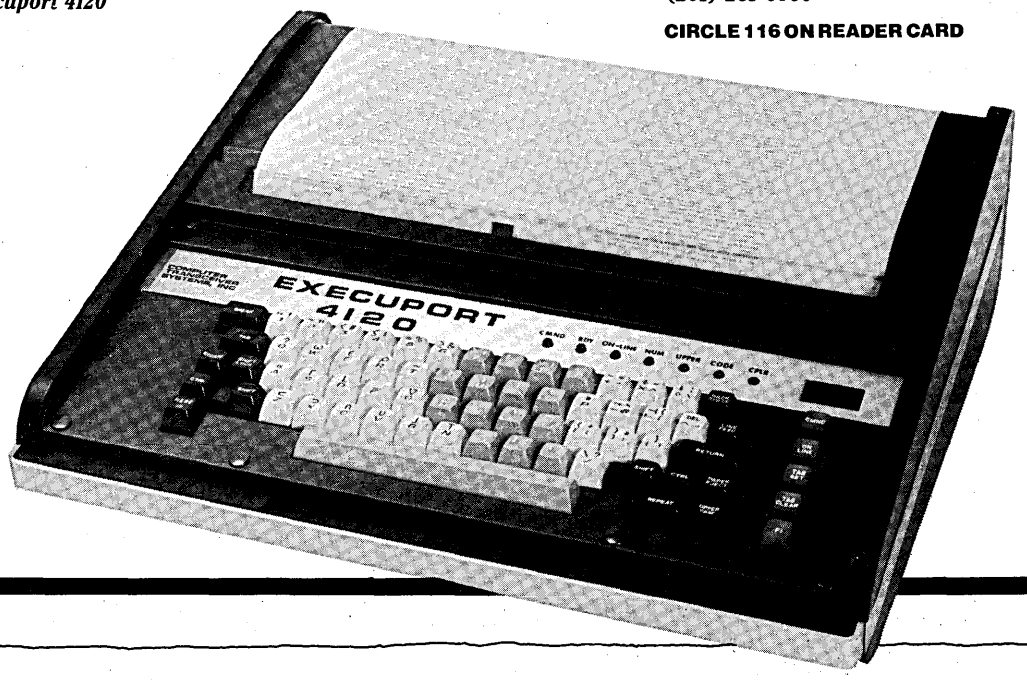

How can you demonstrate that one program is a copy of another? Here's a proposed solution to one of the knottiest problems in computing.

FINGERPRINTING A PROGRAM

by Karl J. Dakin and David A. Higgins

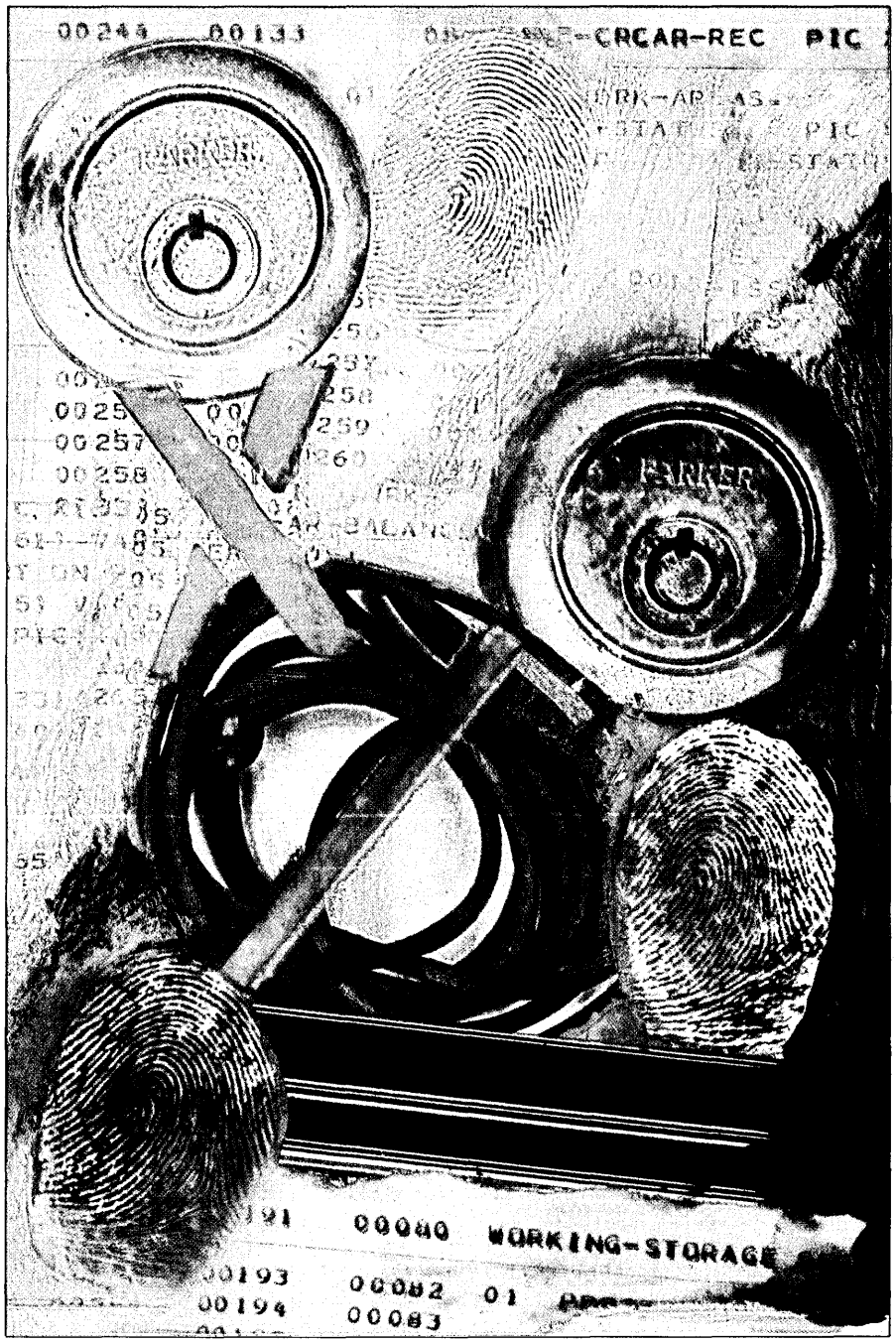

ILLUSTRATION BY JANE STERRETT

As the law is written now, developers of computer hardware have many adequate types of legal protection available. This level of protection, however, does not extend to computer software. There are only a few forms of legal remedies available when misappropriation of software occurs, and those that do exist are difficult to enforce.

It is clear that some form of reliable protection should be available to the developers of software: the loss of a software package can result in lost profit and/or a lost competitive advantage. This lack of protection has additional ramifications since it retards the creation of new software by removing incentive for development.

The current lack of legal protection arises from the fact that software has not been well understood by either the data processing or the legal profession. There has been a decided lack of established criteria, identifiable traits, quantifiable features, measurable attributes, or indeed anything else to "sink one's teeth into" for defining and working with software. This has, understandably, caused a great amount of anguish and confusion.

Under the traditionally held paradigm, computer programming is viewed as a metaphysical practice—a "black art," in effect—and the only thing that is certain about it is that a computer won't work without it. This confusion is compounded by the fact that protection is usually accorded to a physical manifestation of the software but not the intangible concept behind it. Software is a series of instructions necessary to accomplish a given task, but those instructions are manifested in a wide variety of ways—from printed source code or display upon a crt to a series of magnetic impulses stored on disk or tape. To fully understand software and its protection, one must keep in mind its intangible nature.

The inability to deal with fundamental software concepts has been reflected in much recent legislation and in many court decisions. The results have been inconsistent at best. For instance, the U.S. Supreme Court

Every computer program has attributes that are as distinctive to software as fingerprints are to humans.

recently permitted a patent application for the automation of a known process (In re Diehr) simply because the logical instructions had been imbedded on a chip as firmware. In an equally questionable decision, a court ruled that a copyright on the source code for a program does not extend to its derivative object code, holding that object code is a separate physical manifestation requiring its own registration. Other decisions have been less extreme, but the situation is far from satisfactory. The long-awaited Federal Computer Crime Act of 1976 remains trapped in committee, caught between those who think it is overly broad (it is) and those who think it has loopholes (it does).

Fortunately, this confusion may be coming to an end. Within the past few years, many advances have been made that raise software development to a more precise practice. With the introduction of the structured design methodologies—not the so-called structured programming languages like Pascal and Ada, but systematic techniques for analysis and design—software building has been advancing from an art to an engineering discipline.

This recent provision of substance to the act of software creation has begun to permit consideration of topics that were not addressable before. One may now discuss with some certainty such subjects as the

- similarity or dissimilarity of programs
- requisite novelty for patent applications
- benchmarks for software development contracts
- enhanced security and privacy measures for software
- third-party audits of software systems

Rather than try to tackle the entire spectrum of possibilities in one fell swoop, we shall content ourselves in this article with a discussion of the first area mentioned: that of showing similarity or dissimilarity of programs. This procedure will permit one to offer proof of misappropriation, thereby allowing software developers to take full advantage of the forms of protection currently available. Basically, there are three such forms: copyright, trade secret, and patent.

WAYS TO PROTECT SOFTWARE

Copyright protection is by far the most limited of the three. It does not protect the ideas behind the software but only the physical manifestation of the program that has been registered. If a program's source code is copyrighted, protection does not extend to the object code for the program, nor to the same program translated into a different language, and probably not to any other form of the source code (i.e., magnetic impulses on tape or disk) that is not directly readable with the naked eye.

Trade secret protection is much more comprehensive. It protects both the idea behind the program and the investment in the development of the program. Trade secret protection, however, cannot prevent the creation, and dissemination, of a similar program that has been developed independently.

Patent protection is the strongest form, if available, since patents protect against independently created software as well. There is, though, quite a controversy as to whether software qualifies as a patentable item.

All of this aside, invocation of remedies provided for in the above areas is contingent upon the ability to prove that one program is a misappropriated version of another. Until recently, such a proof was difficult, if not impossible, to come by.

We begin by asserting that each and every computer program has attributes that are as distinctive to software as fingerprints are to humans. We further assert that each program has specific characteristics, measurable quanta, and patterns of logic that permit its identification.

How would one go about demonstrating that two programs are one and the same, though? Are there features to investigate that would allow one to depict similarities and differences between two software products?

Obviously, if two programs are simply word-for-word copies of one another—written in the same computer language for the same kind of computer—an offer of proof of similarity between the original program (A) and the copy (Program B) would be a trivial matter. Such an offer would be difficult to refute. It is more than likely, though, that the two programs in question are not written in the same language, or for the same kind of computer. Even if they were, the source code for one may bear no superficial resemblance to the other.

There are too many simple things that can be done with a text editor or a word processor that will disguise a misappropriated program without altering its performance. Procedure and data names may be changed and whole sections of code may be rearranged with just a few keystrokes on a terminal. An individual proficient in the use of such a text editor can render a program virtually unrecognizable in just a few minutes.

So the big question becomes: is it possible to show that two programs written in different coding styles and/or in different languages for different computers have a common heritage? Yes it is, and not just in a limited fashion, either. There are six distinct areas of investigation that allow us to uniquely identify any program and, further, to detect a copy of that program in any form. Before we consider these areas, however, it is important to understand how this ability to fingerprint programs came about.

Over the last few years, many people have been working toward the development of a consistent software design technique that would allow the correct building of new software systems. One of the more promising of these techniques is known as the Warnier/Orr Data Structured Systems Design (DSSD) method, in recognition of the two primary contributors to the approach—Jean-Dominique Warnier and Kenneth T. Orr.

DSSD has been evolving for over 10 years, first with Warnier in France and later with Orr in the United States. It has met with a great deal of success since its roots were introduced by Warnier in the early 1970s. The lessons that have been learned about the correct design of new software have important applications in the investigation of old software as well, and it is these that interest us here.

HOW THE METHOD WORKS

The Warnier/Orr DSSD method is based on just three fundamental design principles. It states that good software designs must be *output oriented, logical before physical,* and *data structured.* The implications of these three principles are as follows.

1. *Design should be output oriented.* A good program must begin with a thorough understanding of the output that the program is to produce. If the output is not understood well at the outset, false starts and reworked code will likely render the finished program bad.

2. *Design should be logical before physical.* The words "logical" and "physical" are used here to emphasize the difference between those elements of a design that are independent of a computer and those that are dependent upon one. Given that an output must be produced, the manner of its production is immaterial; it does not matter whether a computer program produces the output or a clerk using a typewriter does. Those features of the design that would be common to both a computer and a clerk are called logical, while those that are specifically oriented toward a computer are called physical.

3. *Design should be data structured.* One of the fundamental discoveries made by Warnier states that the structure of a good program will be the same as the structure of the data that is being operated upon. Thus, an investigation of the structure of the data to be processed will give us the structure of the program.

These fundamental design principles work so well and so consistently for the creation of new software that we began to wonder whether they might also serve as a basis for the investigation of old software as well—even software that was created without the use of the method. We found that they can be

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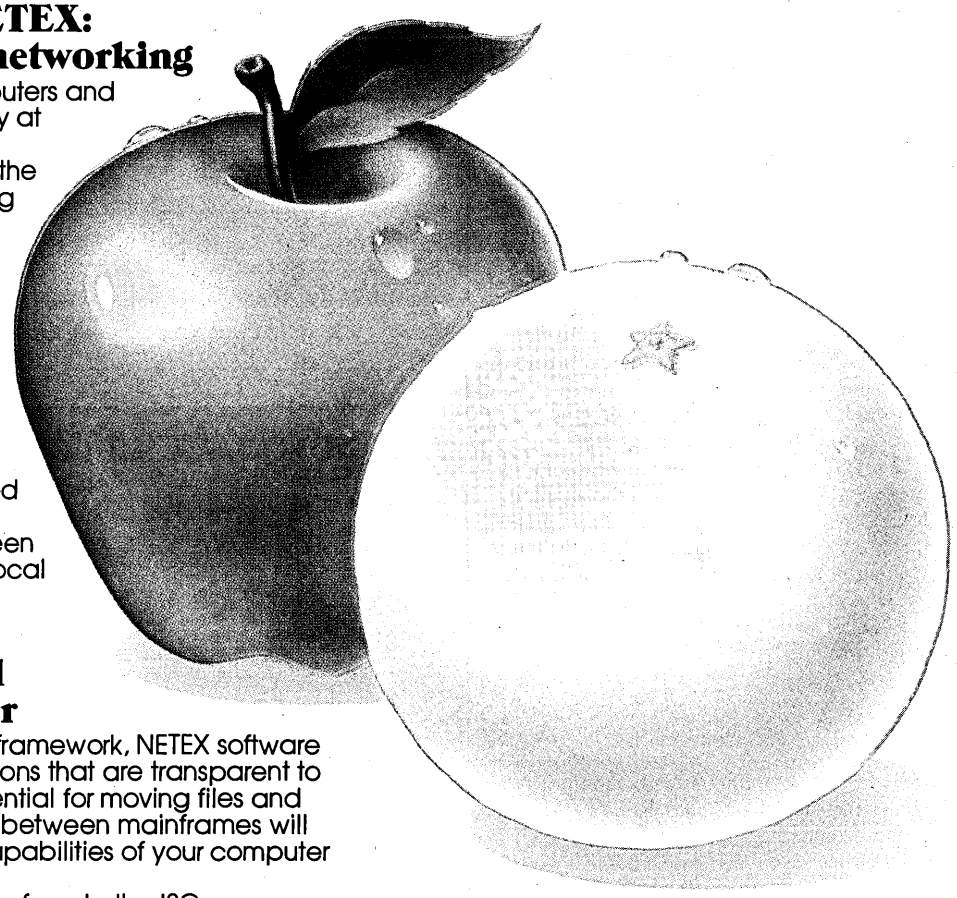

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The ability to show logical similarity without having access to a copy of a stolen program is extremely important if misappropriation is suspected.

applied to the investigation of old software, and in doing so we found some interesting areas for program evaluation.

Of primary importance in any misappropriation action is the output that the alleged copy program produces—that is, the results (graphs, reports, charts, etc.) produced by the program. If Program B produces an output similar to that of Program A, then it is a candidate for having been misappropriated. On the other hand, if the output of Program B is not similar to the output of Program A, then the issue of theft or misappropriation never occurs. One would never assert that a program that produces general ledger reports is a misappropriated version of a program that produces highway maps. Only when two programs produce similar output does the question of misappropriation arise. This seemingly trivial realization brings us to our primary point about the investigation of program similarity.

An alleged copy program must produce an output similar to the original program's. Our proof of logical similarity begins with an investigation of three areas: the structures of the logical output requirements; logical input requirements; and logical processing requirements.

All three structures are derived from an investigation of the program output. There is a direct relationship between the similarity of results of two programs and the similarity found in each of the three areas. In programs that produce identical output results, the three structures mentioned above will also be identical. As the difference in the results increases, so will the differences in the three structures.

FIG. 1

A SAMPLE OUTPUT AND A LOGICAL OUTPUT STRUCTURE

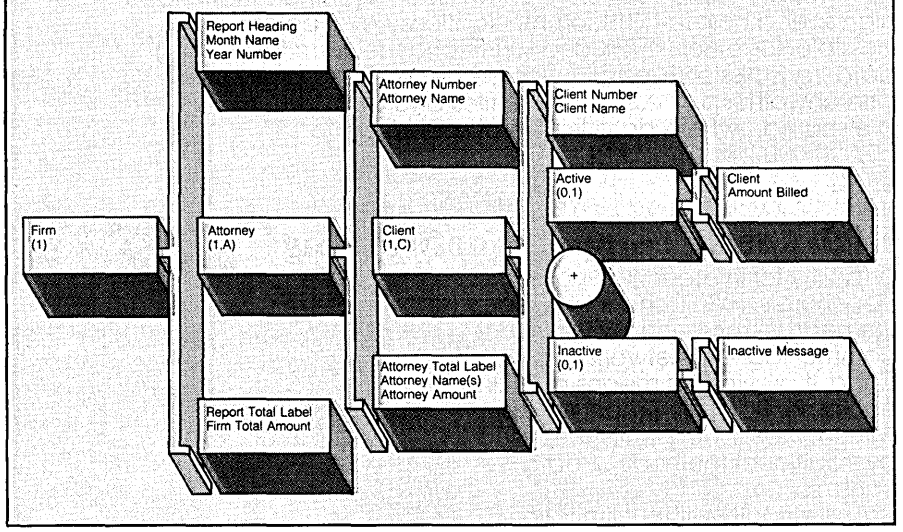
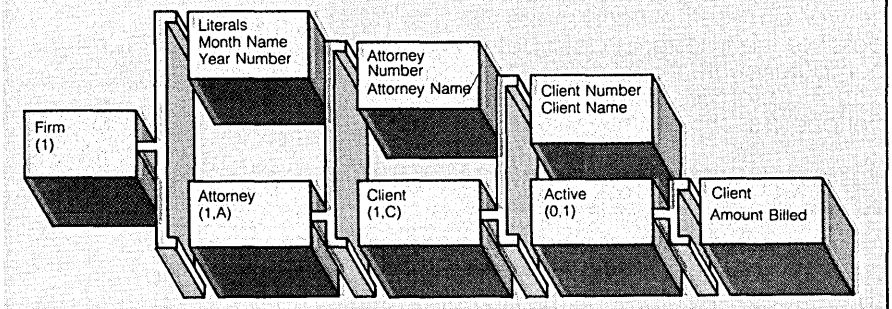


FIG. 2

A LOGICAL DATA STRUCTURE



PROVING LOGICAL LIKENESS

The first and most basic step in the development of a proof of misappropriation is the creation of two charts that depict the output of the original program and the supposed copy. The diagrams that result are called logical output structures (LOS). In this step, one considers the output of a program to be independent of the computer, the language, or the output medium (printer paper, magnetic disk, microfiche, etc.). By taking this view, one may develop a graphic representation of the output requirements. Such a diagram is shown in Fig. 1.

The bracket chart is called a Warnier/Orr diagram, and it is used to depict graphically the form of the output. This logical output structure states that the output shown above it is to be a list of clients for a firm, ordered by the attorney who is representing them, and that each client listed will be either active or inactive. It further states that there are certain data elements that appear at specific places on the output. For instance, this chart tells us that at the end of each attorney, we are to find an attorney total label, the attorney's name, and the attorney's amount. For each active client, we are to find the client's amount billed, etc.

The logical output structure is a convenient way of representing the requirements of an output. It is a very dense charting form: it allows the representation of even a complex output in a very small space—typically less than a page. It also has the advantage of being visually oriented: a logical output structure for each output of two different programs will graphically illustrate the differences between their output, or demonstrate the similarities. This property will hold true even if the data shown on the sample outputs are different. Thus, this form of diagram can be very useful in proving that the two programs in question produce the same results.

Having demonstrated similarity of output, one would next like to demonstrate that the input data required by each program is similar. This is done with a diagram called a logical data structure (LDS). The LDS is not a chart of the actual input to the program, but is derived from the output requirements. It is a chart of the necessary and sufficient data to be input to the program. For this step, one sets aside all of the output data whose contents can be derived through simple arithmetic, and builds a Warnier/Orr diagram of the minimal data needed to be able to produce the output. Such a diagram is shown in Fig. 2.

To further emphasize the point: this is not a chart of the data that *are* input to the

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All programs, no matter how they were created, must respond to the same data in the same sequence.

program, but rather a chart of what data *must be* input to the program. The LDS states that the necessary input must be organized by client and by attorney for the firm, and that active clients must be somehow identified as such. It goes on to say that all of the constant elements, the month name, and the year number must come in at the beginning of the firm; that the attorney number and attorney name must come in at the beginning of each attorney; that the client number and client name must come in at the beginning of each client; and that the client amount billed must be provided for those clients that are active.

Any output similar to the one given would require similar input data, thus making its LDS very much the same. Showing that a suspected copy program requires the same data input as the original is another demonstration of logical similarity.

The last step in the demonstration of logical similarity deals with the processing activities necessary to turn a simple form of the required input into output. A diagram showing actions that must be taken in a program and how often they need to be executed is called a logical process structure (LPS). The LPS for this output is given in Fig. 3.

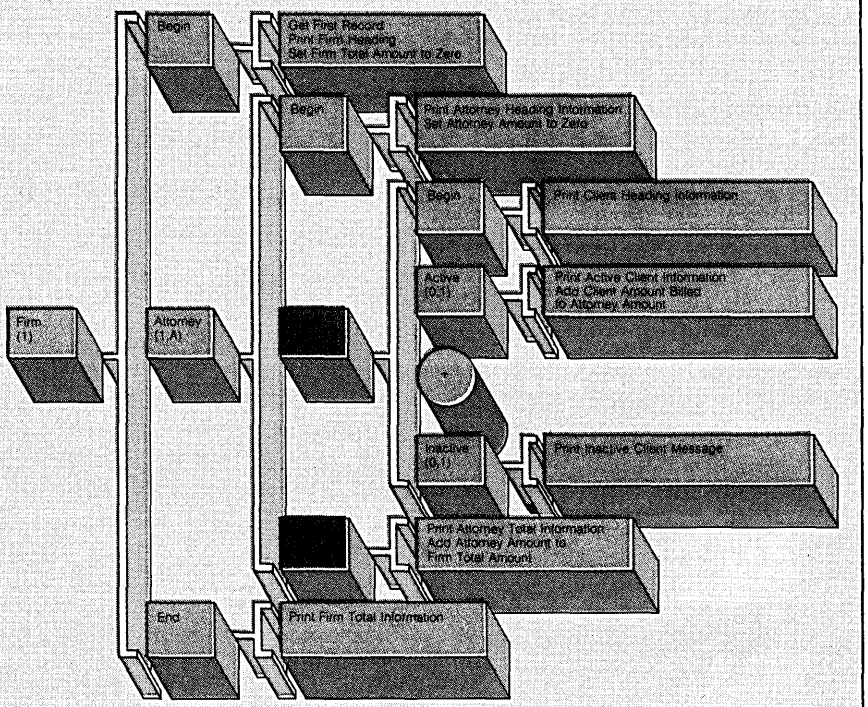
This diagram tells us about three classes of processing functions: getting data into the program, performing arithmetic, and getting results out. It says that certain functions must be done at specific times; for example, printing out the attorney totals is to be done at the end of each attorney. Adding into the attorney amount is to be done for each active client, etc. Again, a program producing an output similar to the one shown will require an LPS similar to it. Proving two programs need the same logical processing is the third element in showing logical similarity.

Note that for the purposes of demonstrating logical similarity, the actual programs (source code) are not considered. Demonstrating that Program B produces substantially the same output, requires the same input, and requires the same processing as Program A is sufficient to determine that Program B is a candidate for having been misappropriated. The ability to show logical similarity without having access to a copy of a stolen program is extremely important if misappropriation is suspected; in many cases such proof may be sufficient for a court to issue a search warrant or grant an injunction.

For novel applications, proof of logical similarity may be all the evidence of patent violation needed. It would also be a strong indication of a trade secret violation.

The concept of building data-structured programs—programs having the same structure as the data they process—is not particularly new. What is new is the realization that all programs, no matter how they were created, must respond to the same data in the same sequence: i.e., a "good" program and a "bad" program that perform the same function must accomplish basically the same tasks in the same order. Therefore, in addition to the three areas of logical similarity, there are three areas of investigation in the realm of physical similarity: the structures of the physical output; physical input; and physical encryption algorithms.

FIG. 3
THE LOGICAL PROCESS STRUCTURE



Any program that operates in a particular physical environment must respond to that environment in some fashion. The mechanisms employed in the program for such a response are called the physical characteristics of that program. These physical (computer and language specific) characteristics of software, however, have properties quite different from the logical ones just mentioned. Two programs that have independently been created for the same output requirements will have a logical similarity approaching 100%. The same two programs, however, may show little or no physical similarity. Even if both programs must respond to the same physical environment, the forms that such responses take are likely to be quite different. There are simply too many different ways of doing the same kinds of things physically.

Developing an understanding of how a program handles the physical formatting of the output, how it responds to actual input, and how it reconstructs required pieces of data from the actual input will enable us to uniquely identify a program. Programs that respond to the same physical environment in the same manner are copies of one another.

As has been stated earlier, demonstrating logical similarity is critical to a misappropriation case: if a suspected copy program shows little or no logical similarity to the original program, then it is probably not a copy. Even if the logical similarity of a suspected copy is very strong, however, one still does not have proof of theft: the program may have been independently reengineered. For proof of theft, one must look to how the two programs handle physical data structures.

To determine logical similarity only, the program itself, the actual input files, and the actual output medium are not considered. For the demonstration of physical similarity, they must be. Every program must not only handle the processing activities mentioned on the logical process structure but must also operate correctly within the physical environment in which it resides.

In a good program, the logical process structure given earlier would become the main core of the program. That much of the program will assume that there exists a very simple way to interface with the physical environment. For instance, it will assume the existence of an "intelligent" output device that can handle all aspects of the physical

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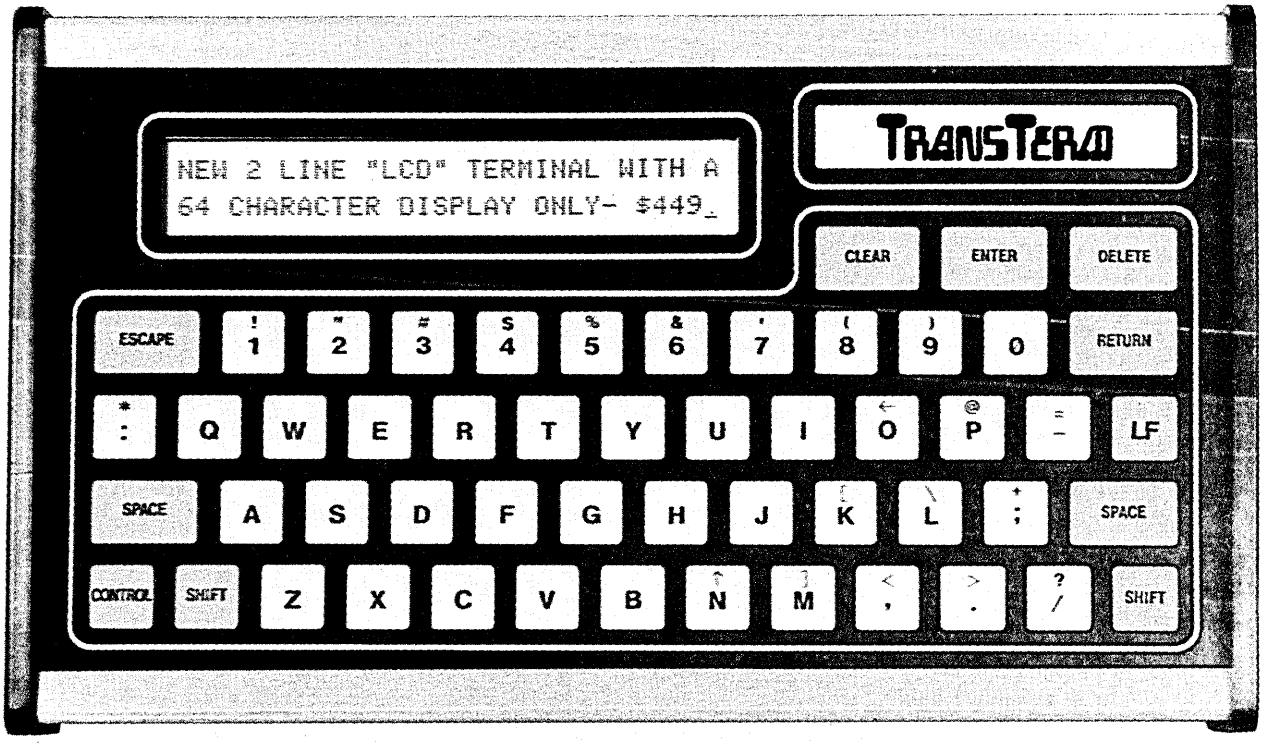

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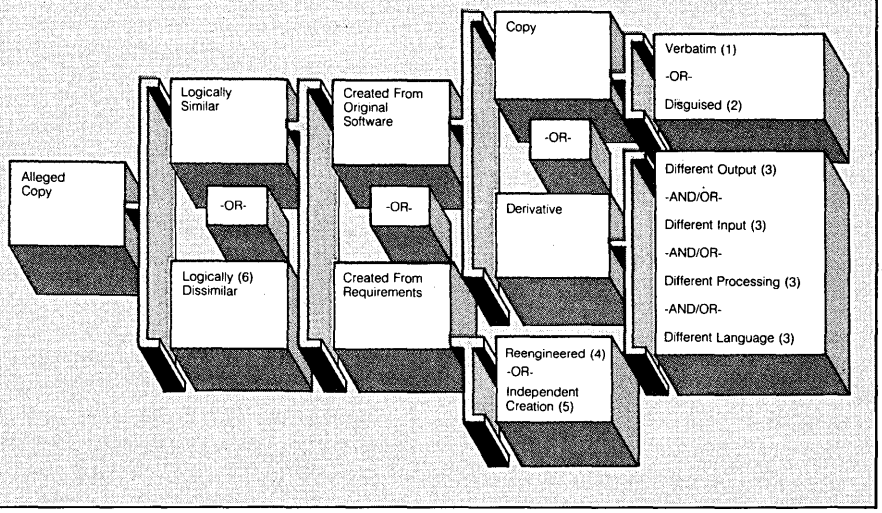
Demonstrating logical similarity is critical to a misappropriation case.

formatting of the output it is producing: for a printed report, the LPS part of the program will assume that the printing device has sufficient intelligence to be able to handle pagination, line spacing, etc. It will also assume that it can get information it needs as input from an "ideal" data file—a file that contains only the records desired, in just the order necessary, with each record containing all the necessary input fields.

Since in actual practice, a program will not be reading from an ideal file and writing to an intelligent printer, it must contain buffering routines to do just that. All programs, not just good ones, must contain those buffering routines in some fashion. The manner in which a program handles this buffering can identify that program just as uniquely as a human fingerprint can identify a person. The three different physical buffering mechanisms that can be examined are briefly explained below.

FIG. 4

DIAGRAM OF ALLEGED COPY



PHYSICAL BUFFER METHODS

How good physical buffers are derived for a program is a topic beyond the scope of this article. Suffice it to say that for each type of output device—printers, disk files, tape files, card files, etc.—there are only a handful of different ways to correctly build in the intelligence necessary to correctly produce the physical format of the output. Quite a bit of intelligence can be built into such output buffers, including logic for the handling of variable length line spacing, repetition of pertinent information across page boundaries, etc. There are only a few different ways of accomplishing the same kind of output process. The one that a particular program uses serves as one of the bases for its physical fingerprinting.

Whereas the variety of output buffering mechanisms is somewhat limited by the type of output device used, responding to a physical input file is another matter. In the physical input buffer, a program must take the information as it is given and transform it into some representation of the logical data structure mentioned earlier. Remember that the logical data structure is a picture of the kinds and quantities of the data required as input to the program; the actual method used to store that data may vary widely for independently developed programs.

The capacity to store information in a computer so that the data pathways called for in the LDS can be reconstructed is limited only by the imagination of the designer of the data files. Therefore, the mechanism used to transform the data from the way they are actually kept into the data the program requires will depend upon the method used to store the information. Two programs that produce the same output from the same kind of input file must use the same kind of physical input buffering mechanisms. This buffering routine will also serve to physically identify the programs.

"Encryption" is a word meaning the codification of information; "algorithm" is a word meaning a set of logical rules for deriving a particular product. Therefore, this buffering mechanism deals with the rules for retrieval of codified information. Sometimes a piece of data that is required as input (shown on the logical data structure) is unavailable from the actual input. When this is the case, the intention is often that some rule (or rules) is to be used to build the required element from other data present.

The description of how to go about transforming data from one form into another is called an encryption algorithm. The physical encryption algorithms in a program are really just a subcategory of the physical input buffer—they enable the input buffering mechanism to directly re-create or construct data that are not available from data that are. A common example of a physical encryption algorithm can be found on the back of any credit card statement. The rules for calculating a finance charge are an encryption rule for that piece of data. The data that a designer chooses to encrypt, and the rules used to retrieve that data, will serve as a very strong identifier for a particular program.

The procedures discussed above for determining the characteristics of a computer program may now be applied to the problem of misappropriation.

Set out in Fig. 4 is a breakdown of the different forms of misappropriation ranging from a direct copy to a totally independent creation. According to the diagram, an alleged copy will fall into one of six different categories. Category 1 is a pure copy, in actuality, a mirror image of the original. It has not been changed in any manner; hence, proof is not a problem. Category 2 is a copy in which the source code has been disguised in some fashion, such as a change in file names or a rearrangement of work routines.

Category 3 is a copy in which the original served as a foundation for further development or enhancement. The original program has been converted to work in a different environment, or has been modified to perform additional work or for inclusion in a larger program. Category 4 is a copy created only from an examination of the output and perhaps of the input files. Category 5 appears to be a copy, but has been independently developed without any knowledge of the original program or its functions. Category 6 is not a copy because it has different output and no functions in common with the original program.

All the categories, except number 6, will have a logical similarity to the original program. This similarity will be 100% in categories 1 and 2 and probably in category 3. A change of source code language, output medium (such as a printer or disk), or type of computer used are all physical changes and will not affect the logical similarity of the two programs.

Even with reengineering of a program, as in category 4, the logical similarity will probably be very close. Only in category 5 are significant differences likely to be apparent. Of course, category 6 will be totally different, and an action for misappropriation would not be considered.

As for physical similarity, the further

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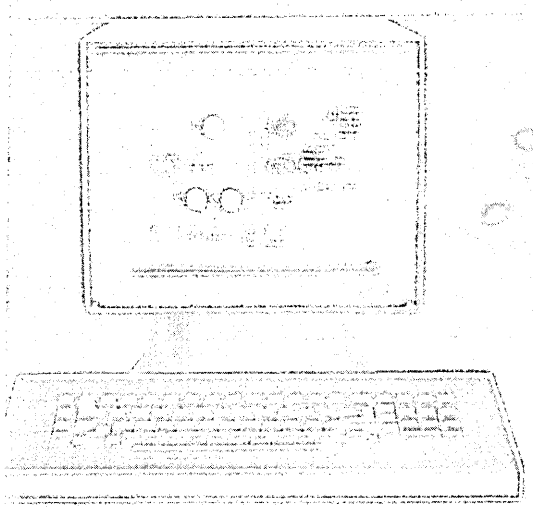

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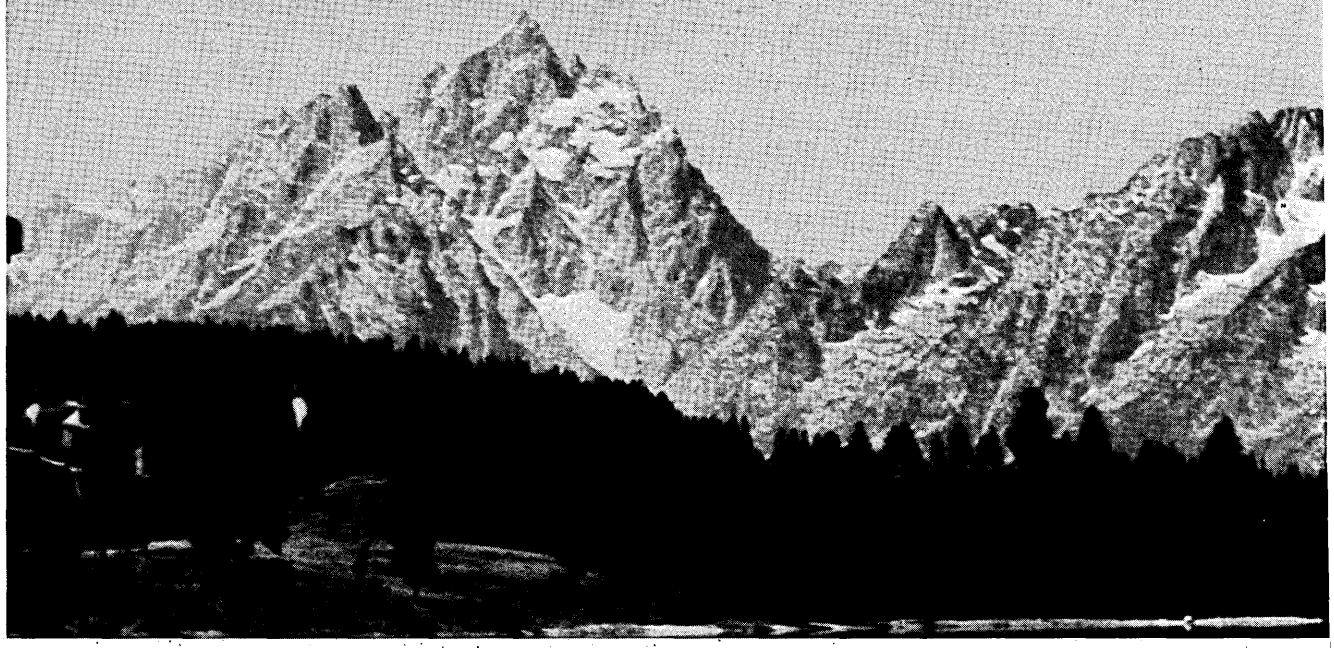

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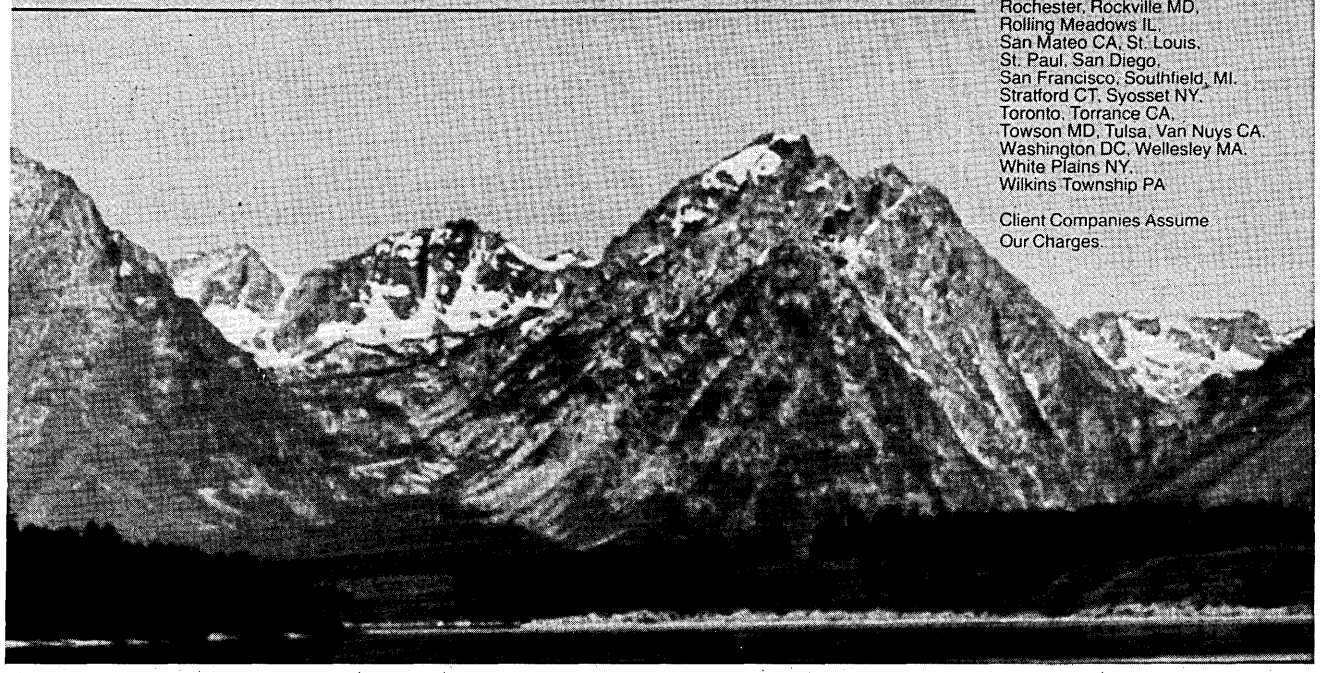

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Without accepted standards, expert witness testimony is often contradictory and confusing to a judge or jury.

the departure from a category 1 pure copy, the greater the physical difference likely. Category 1 will have a physical similarity of 100%, while categories 5 and 6 will probably be totally different. Each change in magnitude of category represents an increased investment, by the copier, in program development.

RESULTS OF COMPARING The results of applying the six areas of comparison to a suspected copy will be as follows. As stated earlier, a program producing different results, such as those described in category 6, will not be a candidate for suspicion of misappropriation. If a program is only logically similar, as in a category 5 independent creation, grounds will exist for a patent infringement action and nothing more.

A strong logical similarity, coupled with some physical similarities, such as those found in programs under categories 1 through 4, will indicate violation of a trade secret agreement. Finally, if the suspected copy program has both strong logical and physical characteristics, such as those found in categories 1 through 3, a good case for copyright infringement will exist.

These procedures for showing proof of similarity and dissimilarity represent a great improvement over methods currently being utilized in misappropriation cases. Currently, proof takes the form of a combination of expert witness testimony and secondary demonstrations of a relationship between the two programs in question. Without accepted standards, expert witness testimony is often contradictory and is particularly confusing to a judge or jury not versed in the jargon surrounding computers. Typical demonstrations of relationship have mostly been secondary proofs: showing that a defendant had access to the original program, that both programs have the same errors, that the alleged copy could not be developed in a short amount of time, etc. Obviously, such proof is not always available nor as strong as desired.

The method of proof offered in this article not only has the advantage of providing a strong and consistent standard for program analysis, but may also be represented in a graphic form for a visual exhibit that may be easily understood. It is hoped that if this method is accepted as valid proof of similarity, software developers will be able to take full advantage of the forms of protection currently available.

And if some of the mystique surrounding the development of software is removed, Congress and state legislatures may be able to create more appropriate forms of protection for computer software. ✻

Karl J. Dakin, general counsel for Educo, is an attorney with Corporan and Keene in Englewood, Colo. He's currently specializing in computer software applications and is the author of *Proprietary Rights in Computer Programs*, due from Prentice-Hall next year.

David A. Higgins is president of Educo Corp., Arvada, Colo., which provides educational services and materials for software development, advanced productivity techniques, and Warnier/Orr design applications. He is publisher of *Software Maintenance Techniques*, a quarterly technical newsletter, and author of *Structured Maintenance*, due from Prentice-Hall this year.

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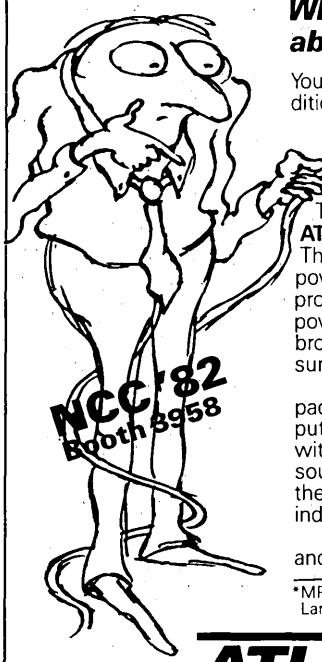

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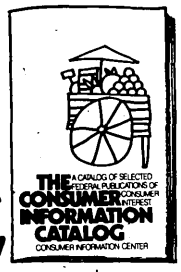

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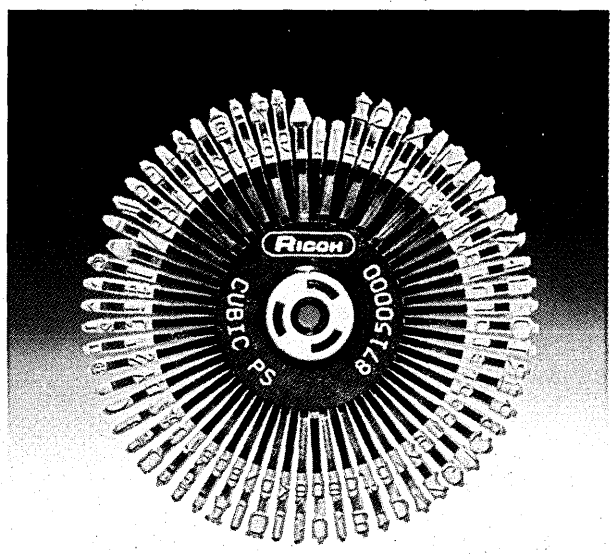
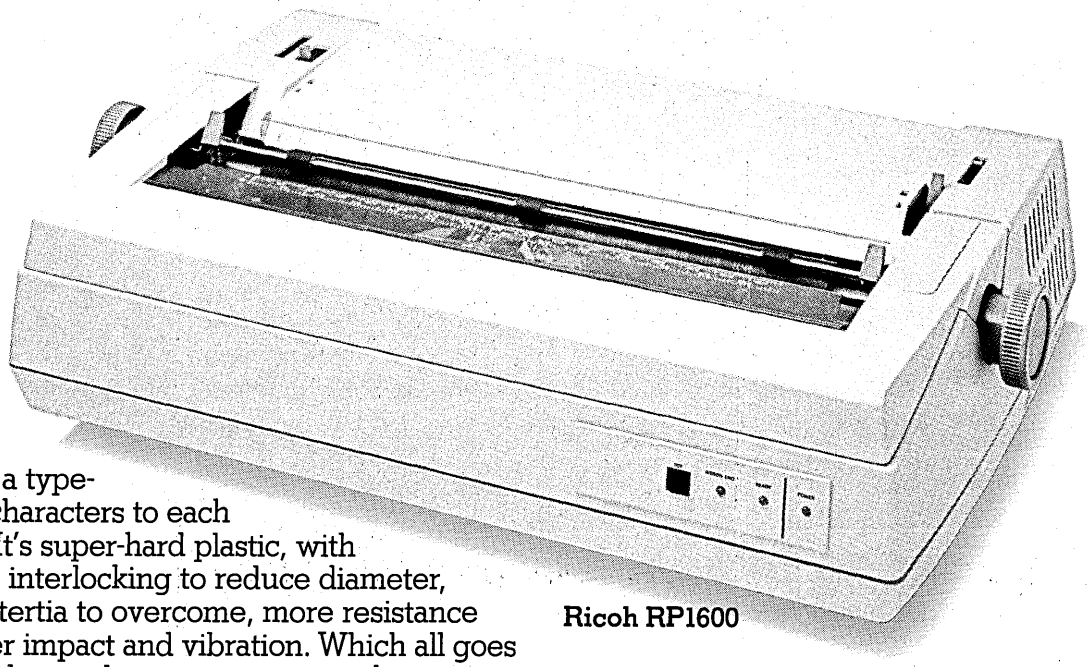


Actual size.

A little wheel's a BIG wheel when it carries 124 characters.



Ricoh RP1600

It's like a typewriter, 2 characters to each type bar. It's super-hard plastic, with the petals interlocking to reduce diameter, for less intertia to overcome, more resistance to hammer impact and vibration. Which all goes to make a longer-lasting, quieter machine.

And the Ricoh RP1600 is *versatile.* Wheels come in many fonts, interchangeable with a touch. And it interfaces with Q-3, H-II, 10DATA, RS-232C.

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Name Title

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For years you've heard the promises—the "Office of the Future," the "Information Age"—and wondered what life would be like when you finally made it to the binary promised land. Well, wonder no more. Come spend a day with Bob Maxwell, BYO-10 at Division Level with Zomdex, in the world of the day after tomorrow.

by Kenneth Klee

The driver was thrown out of his car and down an embankment, breaking both his legs. He was taken to Mother Theresa Hospital, where he is reported in satisfactory condition."

—Doesn't sound very satisfactory to me.

"...the weather, with Bernie Hocus, followed by business news with..."

—The weather. The whether or not of my getting up...

"Good morning, dear. I know how you hate voice mail at this hour but I forgot to remind you that after your conference you have to meet me at the videotek. Gotta run now."

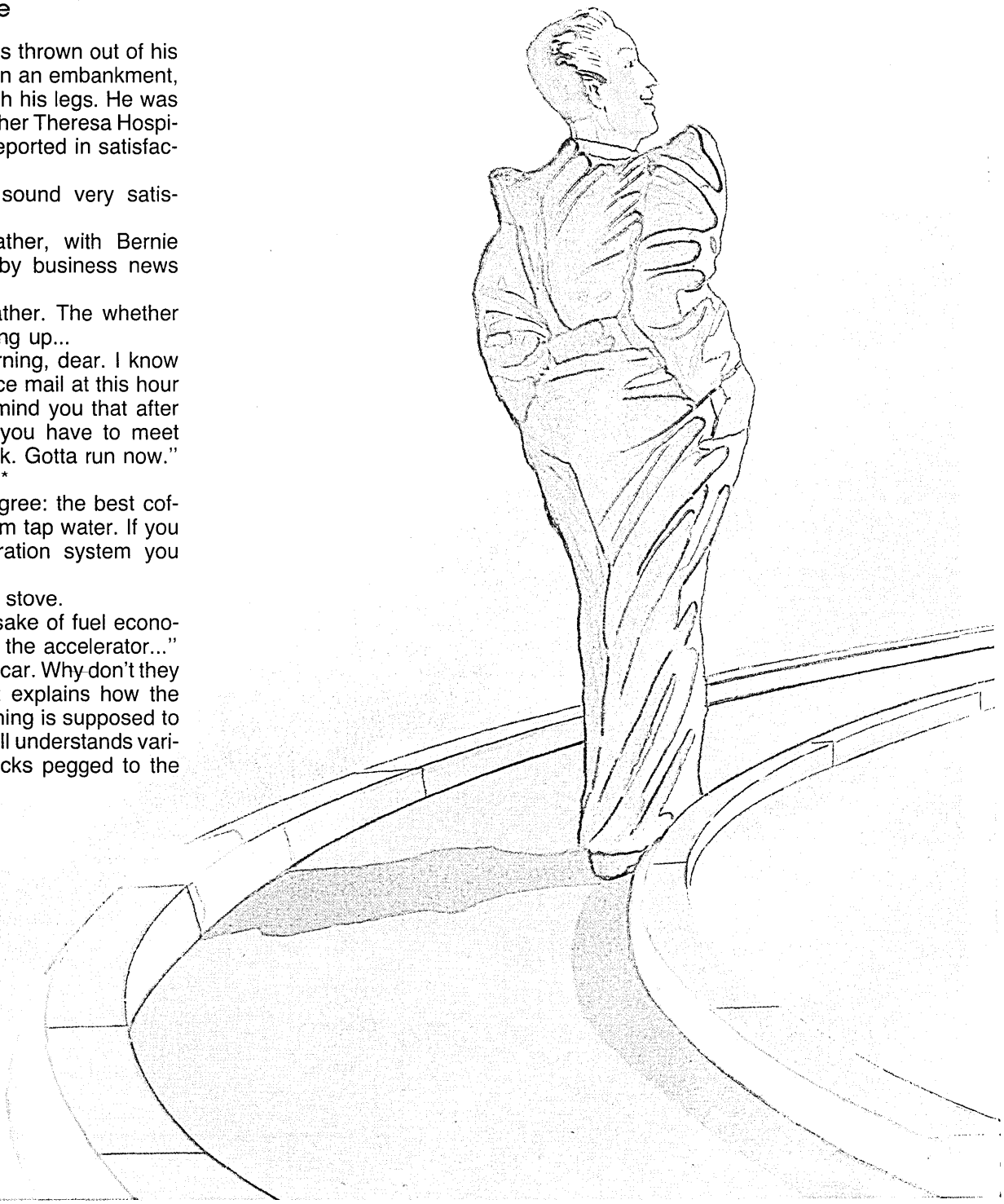
*

"Experts agree: the best coffee isn't made from tap water. If you don't have a filtration system you can..."

—Shut up, stove.

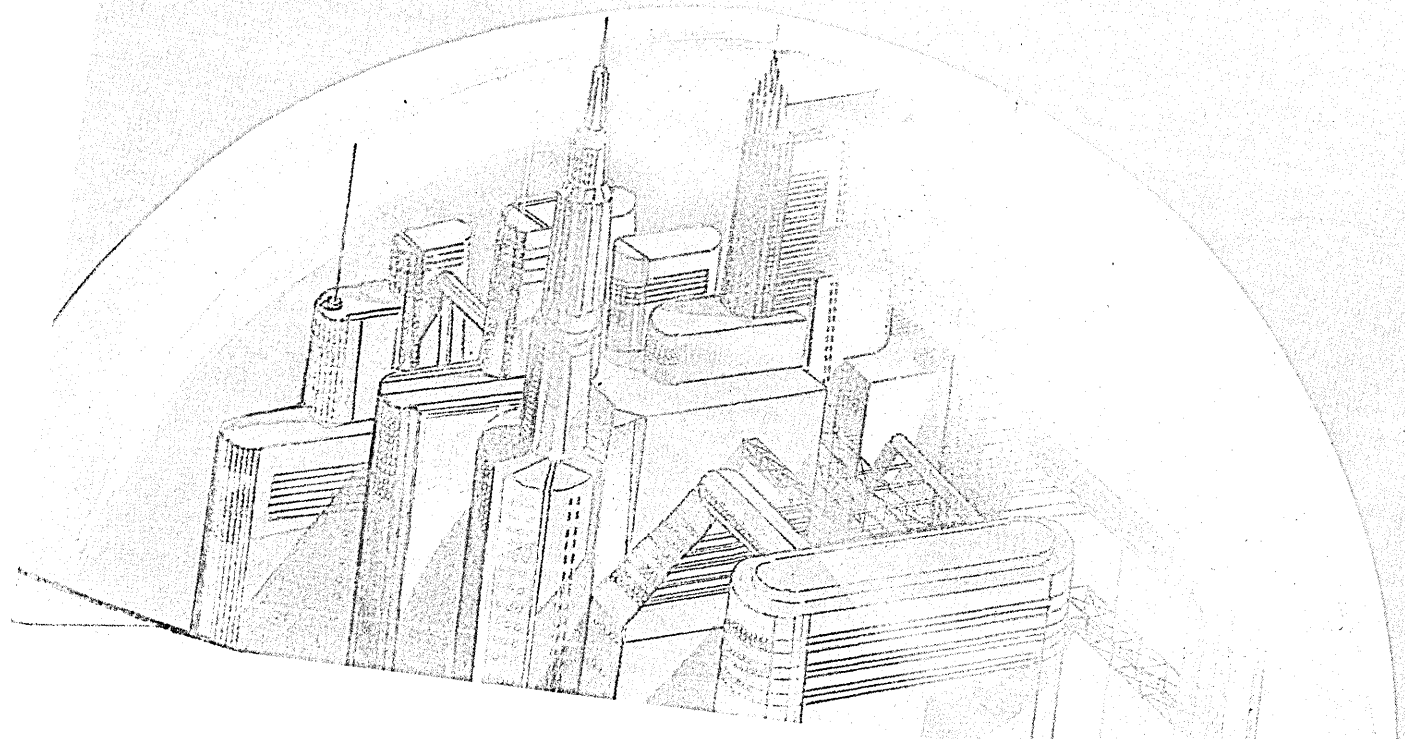
"...for the sake of fuel economy. Tap twice on the accelerator..."

—You too, car. Why don't they make a chip that explains how the financing of this thing is supposed to work? Who the hell understands variable-rate leasebacks pegged to the prime rate?



ILLUSTRATIONS BY ANDREA BARUFFI

DAWN OF THE INFORMATION EPOCH



Good Morning, Mr. Maxwell," says Mathilde. "A lot of messages came through for you yesterday afternoon."

—A lot of messages. A lot of important messages. Well, let's hit the coffee summoner and get down to it. First: how many messages? Two reports and 83 messages? Okay, how many urgent? Thirty-nine urgent? How many from department heads or higher? Only 15? Now we're getting someplace.

"Hey Maxie! When you get out from under those, we'll send you a couple hundred from Corporate. Technology reports, too!"

—That damn monorail. When people had to walk from one end of this complex to the other they were a little quieter about it. Now what was I sorting? Right, 15 from department heads or higher. Anything actionable? No? Well that's that. Erase the whole bunch.... Let's see, one of these reports is also flagged urgent. Probably isn't, though, since it's from Barker...Jeez, he's got it slugged in at 23:30 hours. Well, let's see what keeps the young go-getter working so late at home.

"Good morning," says Barker's image. "As some of you are probably aware, I've spent the past several weeks investigating outlays at our four subsidized cafeterias. On 27 December I was given a broad charter by Division to pursue the matter and sketch the scenario whereby the bottom line is impacted. Herewith my findings."

—Why is he wearing a three-piece suit at home at 11:30 in the evening?

"To briefly recapitulate the status of nutrition subsidization policy, aims, and goals, we'll first consider some figures. As Hawkins showed in his feasibility study"—a graph flashes briefly on the screen—"good food placed close by means employees get back to work quickly." The graph is replaced by four columns of numbers. "Now then. The leftmost column lists total expenditures for foodstuffs, maintenance, and labor, year by year. The rent-free status of the cafeterias as negative profit centers is not figured in because, in the case of the three facilities constructed since 1986, the Capital Accrual Tax Act means that that status impacts this scenario only negligibly."

—Naturally.

"The next column lists, again year by year, the percentage of those costs that Corporate met. You may be amused to note that this nicely mirrors the state of the economy. I've graphed this; push 'print' if you'd like hardcopy."

—I think I'll pass.

"The column second from the right indicates the dollar amount that had to be achieved after corporate subsidies were expended, and the last column gives the actual revenues."

—Well, look at that. Over 12 million bucks a year for lunch.

"Now as you've probably noticed already, the relatively minor revenue shortfall of 1985 starts to accelerate in 1988, and, except for an anomalous fallback in 1989, leads us inexorably to last year's sorry situation. I've prepared a chart that illustrates this quite dramatically."

—And there goes the printer. Better override or I'll be up to my neck in his stupid charts.

"As I said, the situation is not optimal." Barker's face has reappeared on the screen. "But I'm happy to report that I've isolated the problem."

—What is that smear around his eye? Is Barker wearing makeup for this presentation?

"The difficulty lies in lunch meat, specifically ham and salami. For reasons I won't go into here, consumption of these staples has steadily risen. Unfortunately, and for a variety of reasons, the price of pork has consistently outpaced that of beef and chicken since 1985, the year of the initial shortfall. This is dramatically illustrated with a graph..."

—All right, Barker, enough is enough. I'll just fast forward and ask: does it want a decision? No. Should've known. How about a recommendation? Good. I get to make a recommendation. 'This is a perfect example of how time is wasted...' No, I'd better not. Barker's insane but he's very thorough and some of the guys upstairs really like this stuff. So: 'Concur with findings and decision options. Consult accounting for tax angle and move ahead. Commend Barker on optimal use of informagram technology.'

"Mr. Maxwell?"

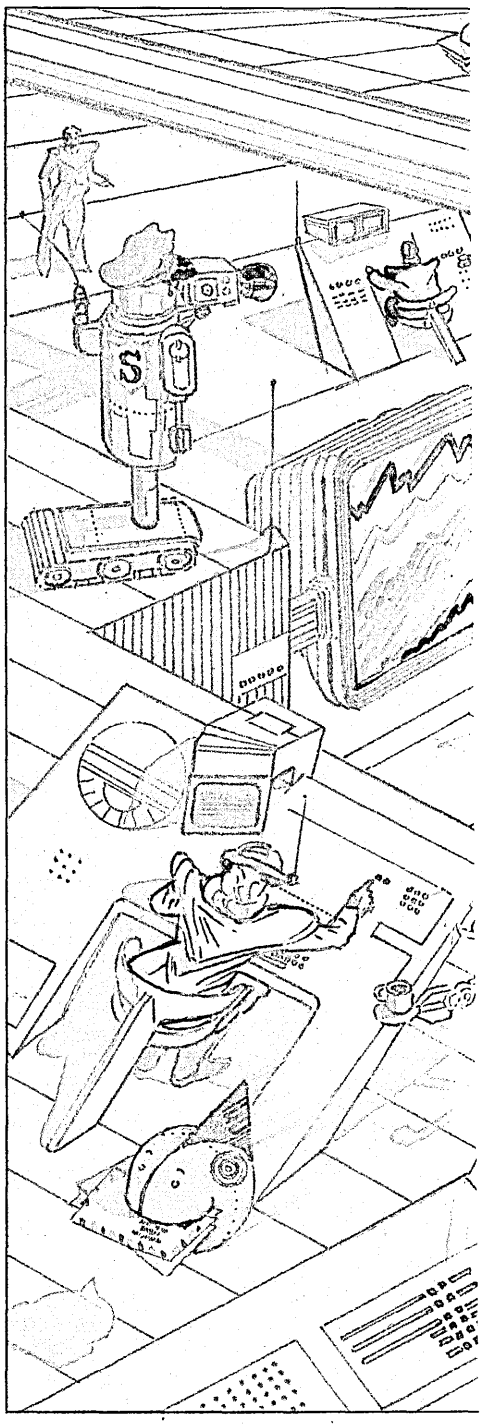
—Yes?

"Mr. Prendergrats asked me to bring you these reports from Data Promulgators and Infoglut. They're about the Inference Engines? He said you had a lunch today and you'd need them."

—Thanks, Lenore. Just dump 'em in the imager, okay? Lunch, lunch. Lunch with that bunch. Why division assigns me to eat with those salespeople I'll never know. It's not as if they ever ask for a level one recommendation.... But if I gotta, well, let's see what the folks at Infoglut have to say about Corporate's favorite technology.

"In most companies, middle-level managers now have their input carefully managed. Decision Support systems utilize well-controlled databases from which workers must draw their conclusions. Decisions based on other considerations are not admissible, and most systems will reject them. Decision options generally number only four or five.

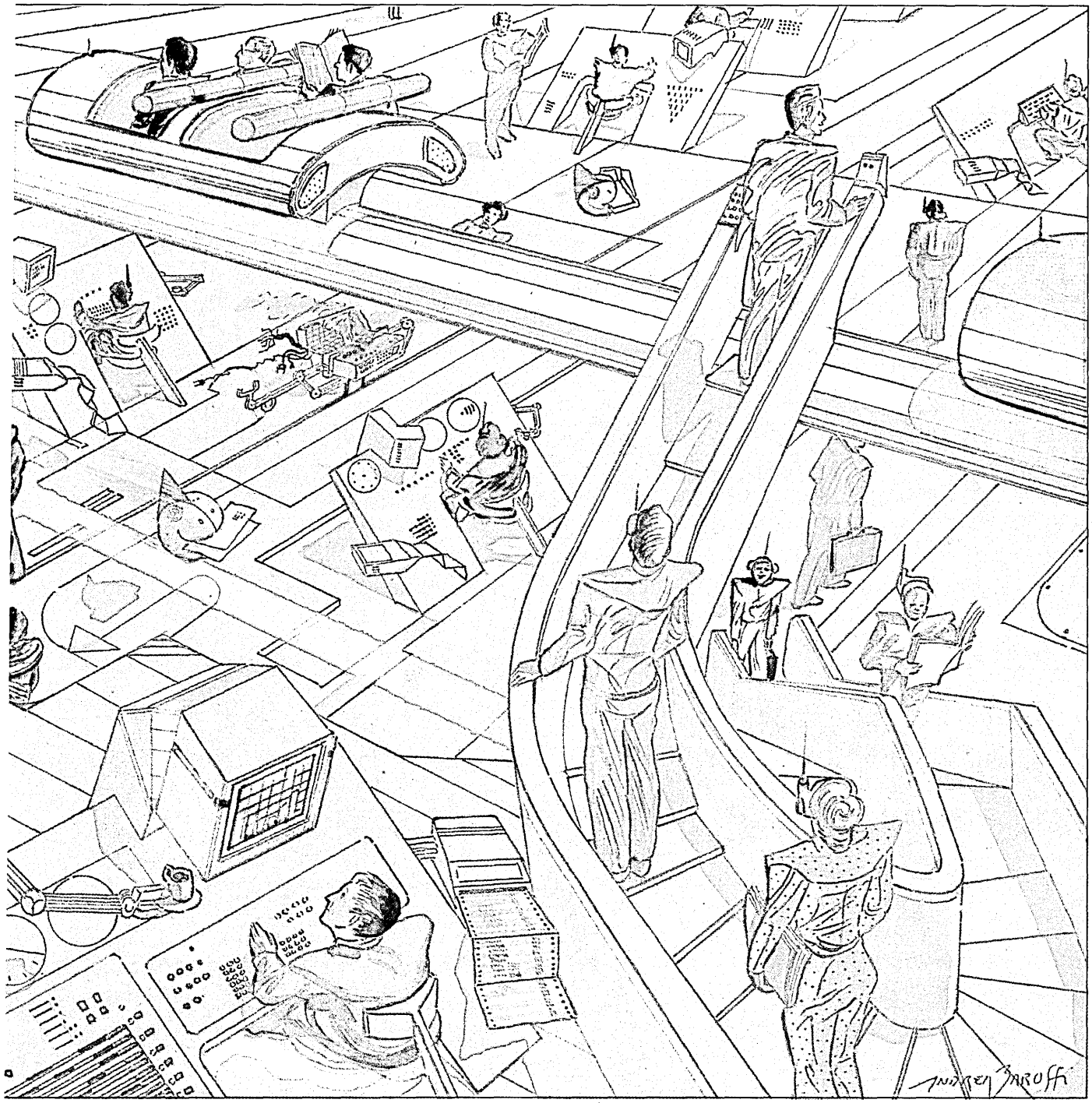
"But the Decision Support Age has not been a great success. Productivity has remained static, and in some cases actually fallen. Managers are consistently, almost perversely, choosing options at the outer limits of their authority, with extremely negative time-frame and bottom-line impact consequences.



What are the reasons for this?

"Infoglut surveys indicate that, despite the powerful tools already available, the abundance of information generated in our journey to the Office of the Future necessitates even more powerful technologies. Various vendors have recognized the need, and introduced products to meet it. The most familiar of these are Informanix's Inference Engines, Hypertech's DECIDER, and Binary Kingdom's Option Analyzer.

"These products, while not yet perfect, are the vehicles that will take us to the Office of the Future. The manager simply plugs the device, along with an interface unit, into his workstation; it analyzes the information he receives, evalu-



ates the options with which he's presented, and then makes a recommendation.

"These products have already been put to good use by the military—witness the rescue of the Aleutian Islands. In the military, of course, the devices are programmed not just to make recommendations but to give orders, and this no doubt enhances productivity significantly....

—If there's one thing I hate it's theory. Let's just skip ahead to the survey results. Hmmm...Inference Engines highest overall. Let's see what Data Promulgators has. What's this? Info nonadmissible? That doesn't make any sense. Why would Prendergrats have sent it? Better try again.. No, still nothing. Better ask Prendergrats...Communicant unavailable, huh? Guess I'll leave a voice...

"Hello?" Prendergrats' face appears on the screen. "Oh, Maxie. What can I do you for?"

—Hiya Prendie. Listen, I got the reports but I get a nonadmiss on the Data Promulgators. What's the deal?

"Sorry about that. Somebody in Corporate got a gander at it and put the kibosh on it. Darned if I know why."

—What were the survey results?

"Look, if it's a nonadmiss it's a nonadmiss, right? You're not supposed to ask a lot of questions about it."

—I know but I've got this damn lunch with the Informanix people and I need something to say."

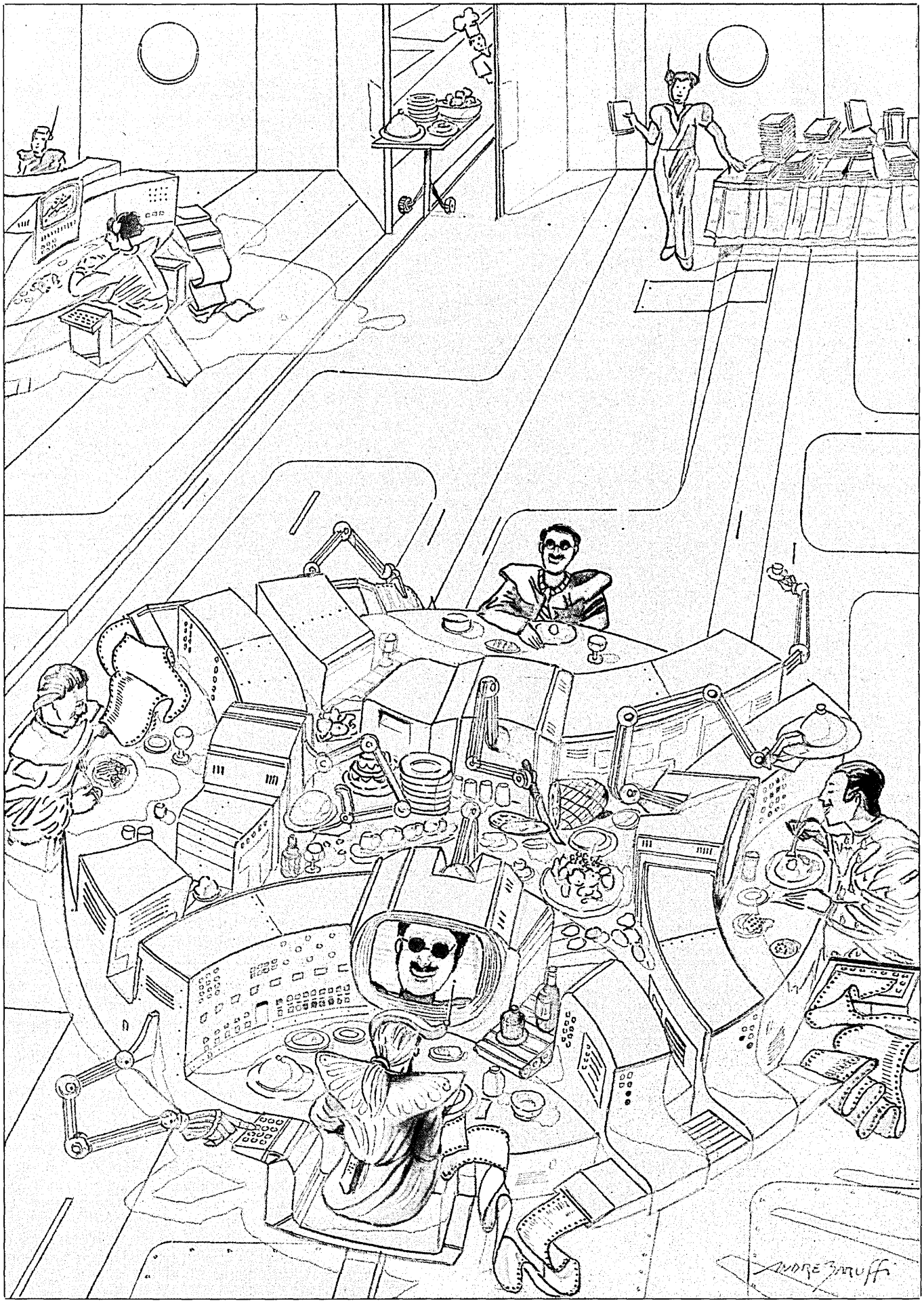
"Look, it's no big deal. Just listen to the spiel and put together a decent informagram. A level four recommendation's all they want."

—Level four? I thought it was level two.

"Nope. Haven't you heard? Barker's been promoted to Corporate Buffer. He'll be looking it over."

—*Barker?* For crying out loud...

"You better not cry too loud. Buffers have monitoring authorization, you know. Look, Maxie, just relax, eat your lunch, make a little report, and forget about it, okay? You wouldn't be so surprised about this stuff if you read the Infrastructure Bulletin once in a while."



Mr. Xmawell?"

"Huh?"

"Mr. Xmawell?"

"What?" This florid fellow seems to have something caught in his throat.

"Mr. Xmawell of Zomdex?"

"I'm from Zomdex alright. But the name's Bob Maxwell."

"Oh, say, I'm sorry. That makes a lot more sense. Damn those data entry clerks anyway. See, it says Xmawell here. I thought you were Czechoslovakian or something."

"And you are..."

"Me? I'm a Hoosier. Born and raised."

"Your name I mean."

"Oh, of course. Put 'er there, pal. Bob Roberts, Informanix. These are my associates, Rob Hobson and Roberta Dobson."

"Please. Call me Robbie."

"Which one?"

"What?"

"Which one of you is Robbie? My screen isn't on yet."

"That's me, silly. You don't have to look at the screen yet. We haven't started our presentation. So you're a Bob too?"

"As it happens..."

"This is quite a coincidence. I mean, we were all amazed when we got assigned to the same sales team. But to wind up with a client who's also named Bob...I wonder what the odds are on something like that?"

"Whatever they are," says Roberts, "I think they call for a little libation. How about a Rob Roy, Bob?"

"Make mine a martini."

"Speaking of martinis," says Roberts, "you know who's here today? Autographing copies of his book? What's-his-name. You know, the author. The guy who wrote *Here's to Success!*, about the right way to drink in the corporate environment."

"Good book?"

"First rate. I saw the guy on a talk show the other night. He eats here all the time."

"Drinks here, you mean."

"Ha! That's a good one. Speaking of drinks, who needs another? Bob? Robbie? Rob? All around? Good. Now let's call up the menu. Everybody see it?"

"Do they really serve all this stuff? There must be 900 items here."

"You better believe it, Bob. A lot of these restaurants try to get by on technology, but this is one place that remembers the eats. So what looks good?"

"Maybe the veal?"

"A veal man, huh? You like it rare? Me too. Now, I want to show you something. If you like veal, you'll like this." Roberts taps at his keyboard and Maxwell's menu disappears. It is replaced by an image of two cowboys on horseback. At first Maxwell thinks he's watching a Western, but then the title flashes on the screen: "The Veal Story," from the American Veal Institute. "Isn't that something?" asks Roberts. "They do this for every item on the menu."

Now the screen shows cute calves being herded into boxcars. There is Western music—it sounds like the old Marlboro theme—and a voiceover Maxwell can't understand. Cattle cars speed across a prairie. When they arrive in Des Moines, the animals are gently inspected by veterinarians in spotless white coats. Now the trembling calves are driven into the abattoir, and Maxwell can make out the words "humanely harvesting the meat America needs..."

"On second thought," says Maxwell, "maybe some seafood?"

"Do you want to see the fishing tape?"

"No, I've seen it already."

"Are you sure? They just got a new one last week."

"No, really..."

"Now, before I forget, ask me how's business."

"How is business?"

"Never better. These little Inference Engines practically sell themselves. In fact, if you already had one, you could plug it in and it would analyze the sales pitch we're going to lay on you. So if you had one, you wouldn't need to know why you needed one. Except you'd want more, because it's a fine product, all kidding aside. But I'm getting a little ahead of myself. Speaking of martinis..."

"Who was?"

"I am. Who needs another? Bob, Robbie, Rob? All around? Good."

"Maybe we should order," says Maxwell.

"I thought you'd already seen the fishing tape."

"I mean the actual food. Can't we just ask for the actual food?"

"Well, sure, but that would be kind of foolish at a place like this, don't you think? I mean this isn't free..."

"I'll take the veal then."

"...in fact, it's damned expensive. But if you're in a hurry to eat, well, that's your decision option. Rob, Robbie, I think you know how to order. I'll take care of Bob here: biggest medallion of veal in the house, rare as a day in June. Bob, what'll you have to start? Some beef tartare maybe?"

"Salad is fine. Hold the film."

"Ha! That's a good one. But there's no salad film, Bob. Films are only for entrees. Unless you want the chef's salad..."

"Green salad."

"Green it is. I wonder what's taking so damn long?"

"You just now keyed it in."

"You don't go to many state-of-the-art lunches, do you Bob? This is the best restaurant in the whole sector. Response time is supposed to be on the order of four seconds."

The serving device glides in from the kitchen and fits a large, covered tray into the slot in front of Maxwell. The lid slides back to reveal a five-pound slab of veal that is nearly raw. Bob Roberts' face is on Maxwell's screen. He has ordered the same thing. He winks. Maxwell looks around the room. The restaurant seems to have about 90 tables like the one where they sit.

"Do you want me to turn the scanner on? You can see what everyone else is eating."

"You're not supposed to be able to do that."

"Hey, I come here all the time. The maître d' gave me the scanning code 'cause I did him a favor. Do you want to try it? It's really a lot of fun."

"Thanks, but I ought to find out something about those IEs you're pushing. I've gotta do a level two rec."

"C'mon, Bob, you're among friends. We know level four's all they want. Think we'd drink this much at a level two lunch? Speaking of drinks, I'd better key in a couple more here. Bob, you've hardly touched your veal. Rob, wake up! Robbie! Turn off that newspaper and pay attention. We're at the business part now."

Maxwell hears a vibraphone play a descending scale. A chart starts to inch out of his graphics slot and the Informanix logo flashes on his screen. Next he sees a picture of an office that looks much like his own, except that it has two monorails instead of just one.

"Productivity," comes the voiceover, "is the key to the Office of the Future. Consider the chart to your left."

Maxwell looks at the graphics slot just in time to see the chart thrust against his martini glass, which topples and shatters. The liquor runs over the edge of the table toward his lap, and in struggling out of its path he dumps his salad bowl onto the chart. The dressing causes the colors to run.

"Whoops!" says Roberts. "Don't worry Bob, plenty more where that came from. I'll just call up another martini, and another chart..."

"What about this mess here?"

"Just shove it on one side. The machines'll get it later."

"There's broken glass..."

"Look, you're not really enjoying this, are you? Tell you what: how about I fast forward to the recs? In fact, come to think of it, I'll go you one better. No point going to all this trouble for a level four. I don't usually do this, but I'm going to give you an informagram format on mag tape. Okay? You're going to the show this afternoon, right? You can pick up a couple of scenarios at our booth and do a little overdub on Zomdex bottom-line impact. Take you five minutes. The charts and all are already there. How does that sound?"

"Fine. It sounds fine."

Destination?" queries Maxwell's car.

"Valhalla Dome."

"Breath analysis indicates alcohol consumption. Enter emergency code if you must drive."

Maxwell keys in the code. The car's hood ornament starts to flash.

"Unwarranted use of emergency code is a felony. Please proceed."

As Maxwell glides down the ramp into the giant Valhalla Dome parking lot, he sees thousands of flashing hood ornaments. It's 15:30 and a lot of people are arriving directly from lunch. To his left looms the dome itself, a geodesic structure some five kilometers in diameter. Bright words circumnavigate it on a strip of diodes: WELCOME INTERNATIONAL INFORMATION CONFERENCE JANUARY 10-MARCH 7.

Arriving in the reception area Maxwell hangs his docupack on his pocket and feels a flush of pride as the scanner in the entryway reads his barcode and sounds the managerial welcome tone.

"Ah," says the greeter who sits at a terminal by the door, "a real infopro. You know, I haven't had anybody with recommendation authority at this station all day."

"A lot of people are still eating lunch. You watch, it'll pick up."

"Okay, Mr. Maxwell, you know the survey questions, don't you?"

"Sure I do."

"Okay. Previous visits?"

"Nineteen."

"It says here 18."

"Okay, 18."

"Right. And your company's Zomdex, and you're a BYO-10 at division level there, right?"

"That's correct."

"Good. Now all I need's your reason for visit."

"Research on Inference Engines. For a level two recommendation."

"I beg your pardon. Did you say level two?"

"Yes."

"I'm sorry. It says here level four."

"That's ridiculous. Let me see that screen."

"I'm not allowed to show it to you, sir. You're not even supposed to come to this door for level four research. You have to go to...103-Y."

"But that's over three kilometers from here."

"I'm sorry, sir."

"Look. I have to go to the Informanix booth to pick up some very important information. It's right over there. I can see it. Can't you please just let me in?"

"Informanix has another booth in the southeast quadrant."

"But the information is here, dammit!"

"Information is everywhere, sir."

"But it's going to take me an hour to walk there!"

"Look, sir, you're not responsible for the integrity of the marketing database. I am. Have a nice day."

Maybe, muses Maxwell, he'll mosey on over for a martini at that ambrosia stand. Since he has to walk all this distance anyway...

Once inside the show he finds himself lost. Aisle upon aisle of vendor booths stretch out in front of him, with Informanix nowhere in sight. To his left the Technosis clown juggles modems; to his right, Videopathic Technologies and Relaxor Hottubs are exhibiting a large redwood tub with crt displays in front of each seat. The infotub is being demonstrated by svelte centerfolds from *Hot Tub* magazine, and this has attracted a large crowd of men who whistle and stamp, drowning out the sales pitch.

In the Valhalla Dome vastness over Maxwell's head the courier disks buzz about. He will not be able to find the Informanix booth until he finds a locator device. These are placed every 500 meters, in odd aisles. Or is it even aisles?

"Hey! Watch where you're going."

"What?"

"Down here, stupid."

Maxwell looks down and sees a tiny, mustachioed man in a red-striped coat and straw boater.

"Hi there. I'm Danny Data, the Dataway dwarf. You've probably seen my demonstration."

"As a matter of fact..."

"Well, how about it, then?"

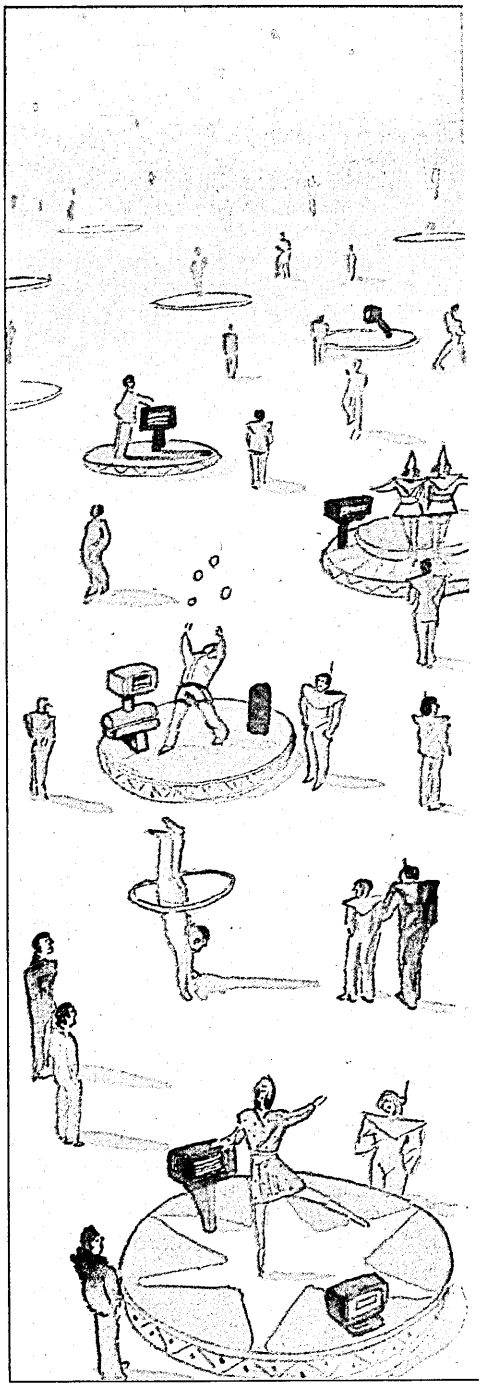
"I'm sorry, but I've got to find the Informanix booth."

"C'mon, I'm working on commission and I haven't had a customer all afternoon. Everybody's over here by the hot tubs."

Maxwell has abandoned all hope of locating the Informanix booth. He decides to head for one of the conference monitoring stations. There he should be able to get a feed from the technical sessions, one of which is bound to deal with Inference Engines. If the format Roberts gave him is any good, that's all he'll need. It is, after all, only a level four rec...

Except for the elderly man minding the door, the southeast quadrant monitoring station is empty. Maxwell gives the old fellow the requisite survey information and sits down at one of the screens. He instructs the indexer to search for an IE session and then scans the offerings: "Inference Engines: Challenge of the Decade," featuring some Infoglut staffers; "IEs for RES in the STA Environment." No, too academic. "Inference Engines—Asset or Liability?" No, too negative...

But wait, look who led that session: Nelson, of Zomdex! *And Nelson's in Corporate Controls!* All he has to do, Maxwell realizes, is cull some doubts from the session and graft them onto his informagram. Barker may not know Nelson spoke on the subject; with any luck he'll casually disparage the gram and



pass it right upstairs, the fool, and Bob Maxwell will have pulled a 21-gun coup! They might even make *him* a Corporate Buffer. If he could just hear Barker's voicemail the next day...

The screen flickers, and then goes blank.

"What's happened?"

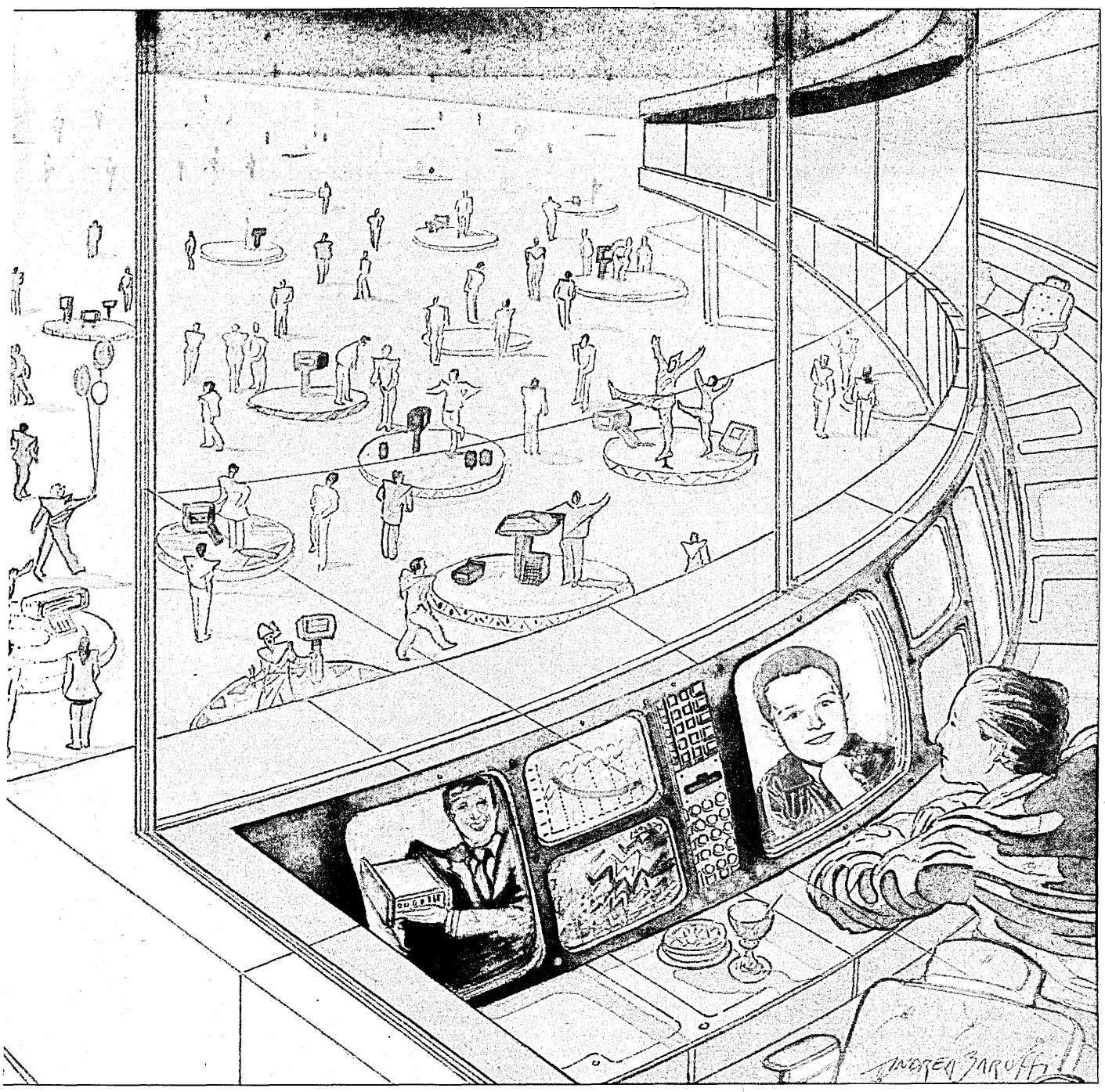
"S'matter, Mac? You never seen a system down before?"

"Look, I'm trying to retrieve some very important information."

"You and 10,000 other BYO-10s. Relax, they'll get it back in a couple hours. We're open all night."

"What am I supposed to do for a couple of hours?"

"How should I know? Visit the



floor. Or do what I do—watch Municipal Cable 12. You can still pick that up."

The tiny, black-and-white people look grainy and quaint on the big color screen. An olfactory memory rises slowly in Maxwell's mind: brownies, that's it. He is watching *Leave it to Beaver*. Now he realizes, as the Beaver trudges glumly through the gate of the white picket fence and up the walk to the perfect white house—the theme playing in a minor key—that this very episode is one of his earliest inputs. He knows why the Beaver is grim. The child has been caught in a lie, and now has to face his father.

Ward Cleaver sits in an armchair reading his paper, which he lowers when the Beaver shuffles in. He wears a cardigan sweater and tie and smokes a pipe.

"Well, Theodore. I guess you realize what you did was wrong."

"Yeah, Dad. I guess it kinda was."

"Do you think you'll do it again?"

Maxwell sits transfixed. For him this is core memory, precious and immutable. Muni 12 shows five episodes that night and he watches them all, whistling along with the theme, laughing at the jokes he knows so well and coming close to tears when the Beaver learns something painfully.

Finally Maxwell's pager snaps his revery; the high-pitched signal code his wife uses is impossible to ignore.

"Robert Maxwell, where the hell are you?"

"Oh, hi, honey. What's for dinner?"

"How the hell should I know? I'm at the videotek and you're two hours late."

"Sorry, dear. Are the boys home from school yet?"

"What boys? What school? What are you talking about?"

"Now, June. I told you I'd be working late. There's a very important informagram I have to finish."

In the dim room the flickering screens lend Maxwell's face a blue-green glow. He sighs and puts his terminal in composition mode.

My name is Ward Cleaver
My kids are named Beaver
And Wally; my wife is called
June... ✲

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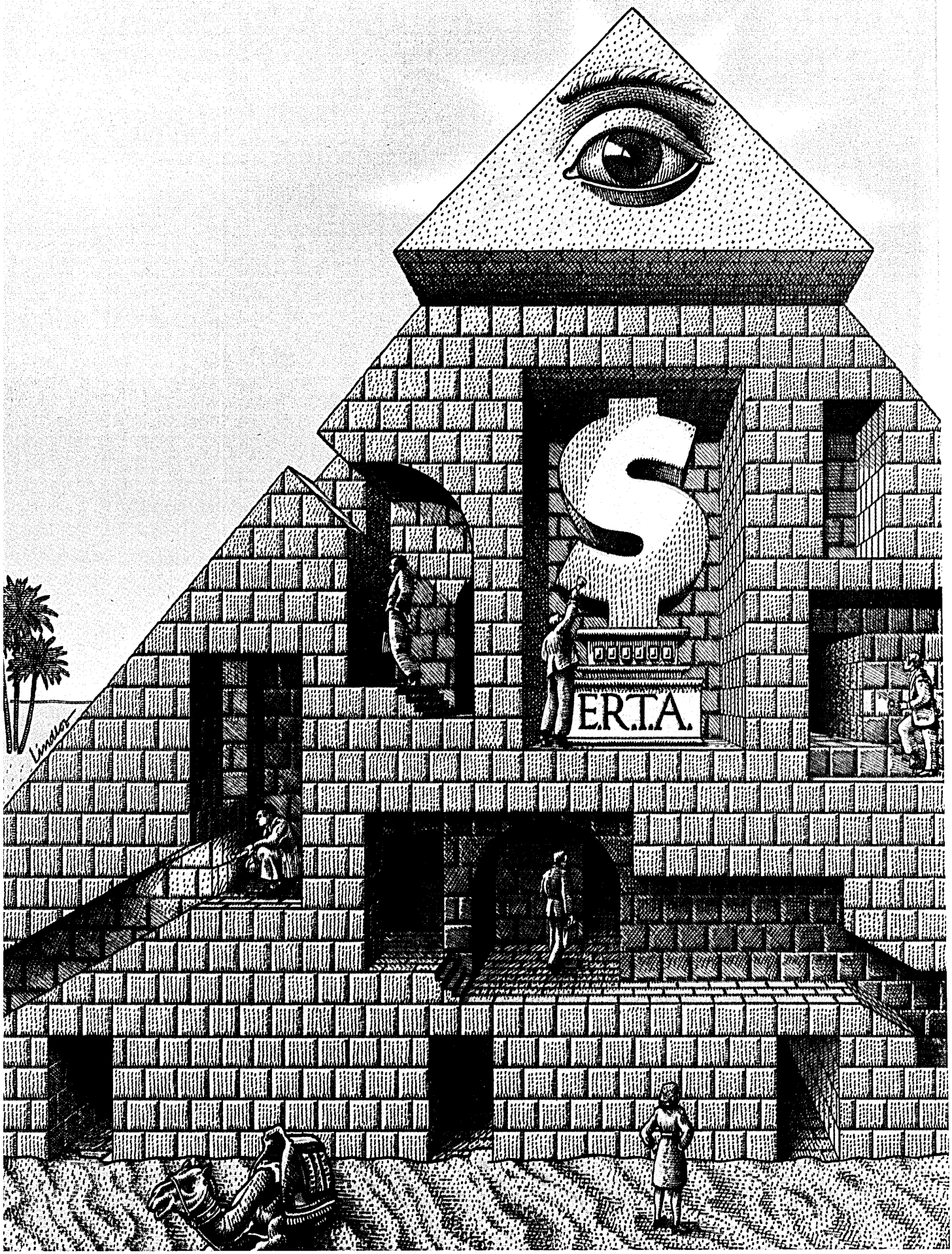
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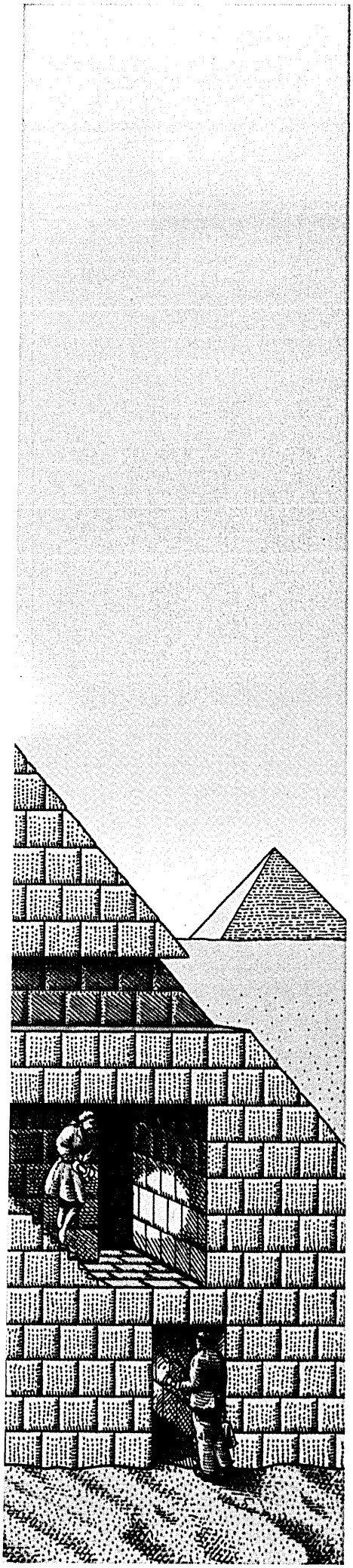


Recent tax legislation can prove a boon to MIS managers who are in the market for new hardware and software.

CASHING IN ON THE NEW TAX LAWS

by William Wewer, Terry G. Mahn, and Mary A. Fruscello

Taxes used to be something the accounting department handled. Let the CPAs *with the green visors worry about depreciation and the like, and you'll look after your end of the business—running the computer. But hold on a minute. Because of recent changes in the tax laws, Uncle Sam now has a big say in how much you'll wind up actually laying out for computer power. The savvy* MIS *manager who knows the ins and outs of the* IRS *rulings can save his company, and department, big bucks indeed. Here's how.*

A key feature of the Reagan Administration's domestic policy is tax reduction, and recent legislation should be especially helpful to both users and manufacturers of high technology.

The Economic Recovery Tax Act (ERTA) which Congress passed last August does far more than merely reduce individual income tax rates. This complex legislation introduces major changes in the economic climate for businesses, representing a significant departure from long-standing federal tax policy.

In particular, ERTA supplements existing tax incentives to high technology companies. Some of the most significant changes under the new law affect businesses that buy, lease, or develop computer hardware and software. ERTA liberalizes tax credits and accelerated depreciation for research and development activities, and creates new opportunities for imaginative venture financing. Additionally, the new law incorporates major incentives favoring the acquisition of capital equipment, particularly research and development equipment.

Vendors of computer systems will also find helpful changes in the basic rules for putting together financial packages to fund procurements.

In analyzing the tax effects of alternative financing structures for computer systems, vendors and users generally focus on two important issues:

- What tax benefits or disincentives are available to the parties concerned?
- How can these benefits and disincentives be distributed to the advantage of all parties?

As these issues suggest, structuring the financing of a systems procurement from a tax perspective is a critical element in the contracting process. Even with government sales, procurement officers must be knowledgeable about the effect the tax laws have on procurement negotiations, because these often substantially influence their negotiations with private vendors/lessors seeking to minimize their tax liability. In a properly structured agreement, therefore, the government can structure a vendor's tax advantages to reduce its out-of-pocket costs and thus lower appropriations requirements.

This article will discuss and analyze those aspects of the new tax law that affect vendors and users of computer technology, and will explain how these changes affect procurement decision making.

In general, there are three types of tax benefits available to parties in a hardware, software, or systems procurement: expenses, depreciation, and tax credits.

EXPENSES AS TAX BENEFIT

Section 162 of the Internal Revenue Code permits deductions of ordinary and necessary expenses incurred in carrying on a trade or business. Under this section, 100% of qualifying expenses may be deducted on a dollar-for-dollar basis in the calculation of the current year's taxable income. Expensing a business cost is generally preferable to depreciating it, because the entire amount may be deducted in the year it is incurred. (With depreciation, only a portion of the expenses can be deducted and these over several years.)

Some form of business expense deduction is normally available whether the system or product is acquired through lease, purchase, or in-house development. The amount of the deduction, however, varies substantially with the type of financing chosen. For example, because lease payments are directly deductible as ordinary and necessary business expenses, an immediate tax

ILLUSTRATION BY ED LINDLOFF

ERTA permits the use of simpler, more flexible depreciation techniques than provided under the old tax law.

benefit is available in a hardware or software lease arrangement that is not available with purchase, where depreciation must be used, as explained later.

Lease. ERTA contains important provisions that liberalize the definition of lease transactions and ensure the transaction cannot subsequently be recharacterized by the IRS as a sale, a characterization that carries disastrous consequences for everyone but the tax collector.

The easing of the qualifications of a lease transaction has created a marketplace for tax benefits (see Table I). Companies with depreciable property but little income to offset can now enter into sale/leaseback arrangements with profitable companies having substantial tax liability. As a result of the sale/leaseback, the buyer/lessor can reap sizable tax benefits, while the seller/lessee converts currently unusable tax benefits into much-needed cash.

The availability of liberalized lease transactions, combined with the deductibility of lease payments, makes leasing an attractive option from a tax perspective for both lessors and lessees. The owner/lessor of the leased equipment is allowed investment tax credits and depreciation, while the lessee has the advantage of expensing lease payments. The lessee also may benefit from a flow-through reduction in lease costs due to ERTA's generous depreciation and tax credit provisions now available to lessors.

Purchase. The outright purchase of a computer system is the acquisition of a capital asset, and must be amortized rather than deducted as a business expense. When the purchase transaction is financed, however, the full interest expense associated with the loan is deductible. Although the net effect of this deductibility is to lower the cost of purchase in a leveraged transaction, leasing generally provides more immediate tax benefits in the form of deductible expenses than a financed purchase.

The new tax act adds an additional benefit for purchasers of computer systems. Under the old law, additional or "bonus" first year depreciation was permitted, but this treatment was of little use unless large amounts of property were puchased. Under ERTA, the bonus first year depreciation is eliminated, and an election is created to treat the front-end cost of new property as an expense. The act provides that for the year 1982-83, up to the first $5,000 spent on capital items may be expensed for qualifying property. For tax years beginning in 1984 and 1985, the maximum is $7,500; in 1986 and thereafter, the maximum is $10,000.

There are some strings attached to the use of the bonus expensing provision. The portion of the cost of depreciable property expensed under this provision will be treated as depreciation, and will be subject to the recapture rules upon sale of the property. Additionally, that portion of the property for which this immediate expensing is permitted will not qualify for the investment tax credit as explained later. In considering whether to elect the special expensing provision, therefore, systems purchasers should consider the effect of the loss of other benefits such an election would have.

Development. Users who elect to develop their own systems have a choice as to the treatment of the expenses associated with that development under the tax code. Under section 174 of the Internal Revenue Code, "research and experimental" expenditures may either be 1) deducted as expenses in the year incurred, or 2) treated as deferred expenses and amortized over five years. Generally, both hardware and software R&D qualify as research expenditures under IRS guidelines. Once an election is made as to the treatment of development expenses, however, it cannot be charged in subsequent years for other R&D projects without the consent of the IRS.

TABLE I

SALE/LEASEBACK: AN EXAMPLE

The new tax law creates a "safe harbor" for certain lease transactions and permits, in effect, the "sale" of benefits of ownership by corporations that cannot take advantage of the deductions and credits available. An example of a sale/leaseback arrangement:

(1)

Data Corp. buys minicomputer and associated peripheral equipment for total purchase price of $100,000. Data Corp., however, cannot use write-offs associated with ownership.

(2)

Nondata Corp. agrees to sale/leaseback; pays Data Corp. $20,000 cash as down payment and gives note for $80,000 balance of purchase price.

(3)

Concurrently, Data Corp. leases minicomputer and equipment from Nondata Corp. at total lease price of $80,000. Lease payments are same amount and frequency as Nondata's payments under its purchase note.

(4)

At the end of the lease/note term, Data Corp. purchases the minicomputer and equipment from Nondata at an agreed upon price.

(5)

Effects of sale/leaseback:

Data Corp. has saved $20,000 on the purchase price of its minicomputer and peripherals, its savings equal to Nondata's cash down payment.

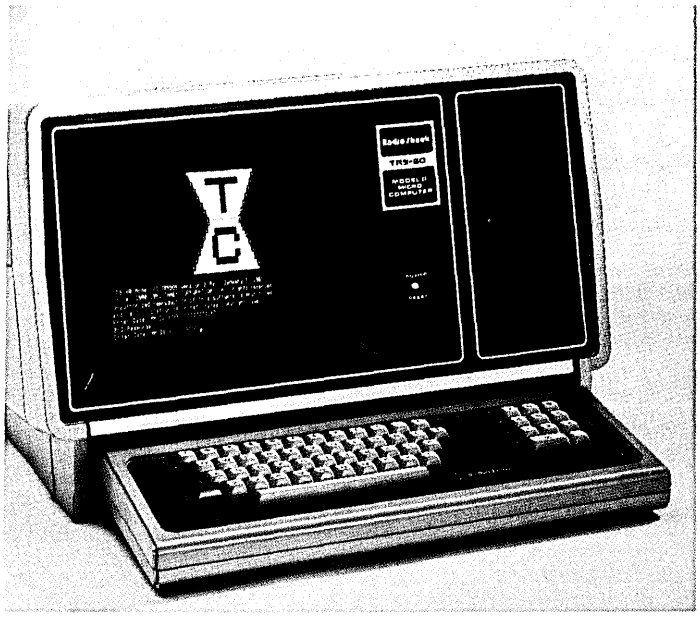
Nondata acquires tax benefits of ownership for its $20,000 down payment.

DEPRECIATING AN ASSET

Under section 167 of the code, the purchase price of a capital asset such as computer hardware may not be written off in the year it is acquired. Rather, the law requires that the cost of such assets must be spread over several years, to approximate the "useful life" of the asset.

Depreciating an asset rather than expensing it reduces cash flow. Although the interest expenses of financing the purchase are deductible, the total cost of the system is recovered only over time. In this respect, a systems purchase can be significantly more expensive than leasing, where payments are immediately deductible.

The new tax law contains provisions



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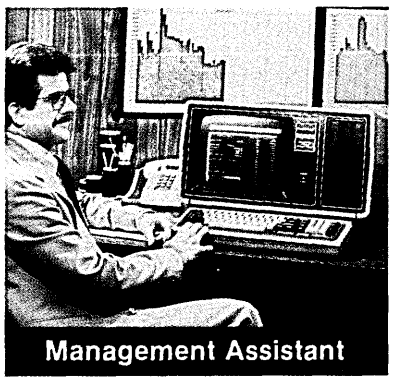
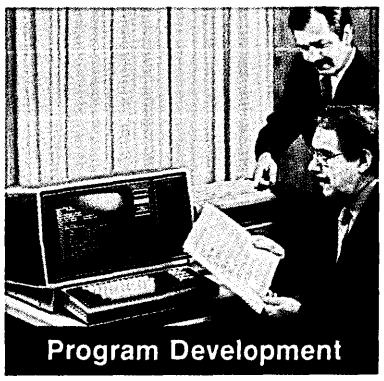
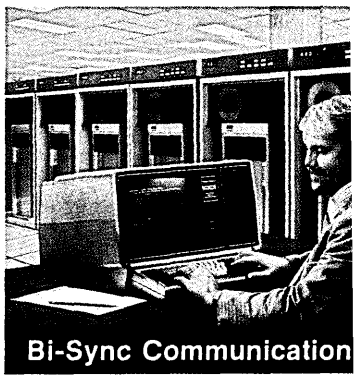


Management Assistant



Program Development



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that speed the rate of cost recovery, however. To encourage business and capital investment, ERTA permits the use of simpler, more flexible depreciation techniques than provided under the old tax law and allows faster recovery of the cost of depreciable assets.

A major change in depreciation requirements is to accelerate the *rate* of recovery. The new system makes no attempt to relate the recovery period to the actual useful life of an asset, nor does it require that salvage value to be calculated before determining the amount eligible for depreciation. Rather, the new Accelerated Cost Recovery System (ACRS) permits a business to depreciate property over an arbitrary period of time, frequently shorter than its expected useful life. The ACRS covers most tangible depreciable property, but excludes software and databases.

To get the full investment tax benefit, computer equipment previously had to be depreciated over a seven-year period. Under ACRS, however, computer equipment now is depreciable over five years. If the equipment is used in connection with research and development, it is depreciable over three years.

In addition to shortening the recovery period for tangible property, ERTA simplifies depreciation techniques. Straight line depreciation may be used over the prescribed recovery period or over specified longer periods, at the taxpayer's election. Additionally, ACRS introduces changes in the methods for accelerated depreciation. The new law prescribes certain percentages to be applied to the readjusted basis of the property according to its recovery period. These percentages vary during a transition period between 1981 and 1985, roughly equaling the 150% declining balance depreciation method in the early part of the period, and gradually moving to 200% for property placed in service after 1985.

In the latter part of the recovery period, after most of the depreciation benefit has been taken, the depreciation method is changed to another method to exhaust the remaining value of the asset.

The new ACRS is applicable to all computer hardware equipment. As noted above, computer software standing alone is not "tangible property" for purposes of the ACRS, and must be amortized under the "useful life" provisions of the code.

The IRS has ruled, however, that for depreciation and investment credit purposes, software provided as part of a turnkey system (i.e., where the cost of the software is not broken down or separately stated in the contract) is tangible property and may be depreciated as part of the entire cost of the system. Accordingly, turnkey systems generally will be eligible for the faster depreciation under the new ACRS.

TABLE II

COMPARING PROCUREMENT METHODS

Each procurement method offers a different mix of tax benefits. Below is a summary of the effects of each.

Purchase

+ ITC available for hardware (software in turnkey systems)
+ Special first year expensing
+ Financing (interest) costs deductible
+ Accelerated depreciation available
− No immediate write-off of purchase price

Lease

+ All lease payments fully deductible (hardware and software)
+ ITC negotiable with lessor
− No first year expensing

Development

+ R&D costs (e.g. wages, overhead) fully deductible
+ First year expensing available
+ Accelerated depreciation for R&D equipment
+ R&D credit for incremental costs
− Substantial capital/time investment

Service Bureau

+ Payments fully deductible
− No other tax benefits
− Costs may be high

USING TAX CREDITS

Historically, Congress has used tax credit policy as a principal means of achieving certain social and economic goals. Tax credits are valuable across all tax brackets because they represent dollar-for-dollar "below the line" write-offs against tax liability, rather than mere deductions from gross income. For this reason, tax credits must be considered carefully in all major procurement decisions.

The Investment Tax Credit (ITC) provides a credit of up to 10% of the cost of new and used depreciable property. The new law changes some important features of ITC, most notably by simplifying and broadening the class of property eligible for the credit. Eligibility is now based on the artificial recovery periods created under ACRS rather than the actual useful life of the property.

An important feature of ITC is its mobility from lessor to lessee. The law permits the owner/lessor of qualifying property to treat the lessee as the owner for purposes of claiming the appropriate credit. This provision may be an important negotiating element in computer leasing contracts. A lessee who successfully negotiates the right to claim the tax credit associated with the leased property has obtained a significant advantage normally available only with ownership. In effect, the lessee now has the best of both worlds: he is able to fully expense his lease payments while at the same time take a tax credit for the leased property. The combination of these tax benefits can work to make leasing an extremely attractive procurement alternative. Thus, although the ITC generally favors equipment purchase, it may benefit lessees as well.

ERTA also creates tax credits for certain research and development expenses. This new law permits a 25% credit for certain incremental R&D expenses, i.e., R&D expenses greater than the average expended by a company over a given base period. The credit, however, is applicable only to qualified expenses, such as wages to an employee conducting qualified research, the cost of supplies (but not depreciable property) used in research, and amounts paid to another (e.g., leasing costs) for the right to use personal property in conducting qualified research. All such in-house expenses for qualified research are eligible for inclusion in the computation of the credit.

Outside contract research expenses are also eligible for the credit, but only 65% of amounts paid for such contract research is eligible.

The R&D credit has a "sunset" provision which makes it available only for qualified expenses incurred after June 30, 1981 and prior to Jan. 1, 1986. It is an additional incentive to the development of new hardware and software, and may be used together with the election to expense R&D costs to create important tax savings to manufacturers and developers in the computer industry.

BEST WAY TO GET A COMPUTER

Computer systems generally are procured in one of four ways: purchase, lease, development, or service bureau. Each method has tax advantages and disadvantages that must be evaluat-

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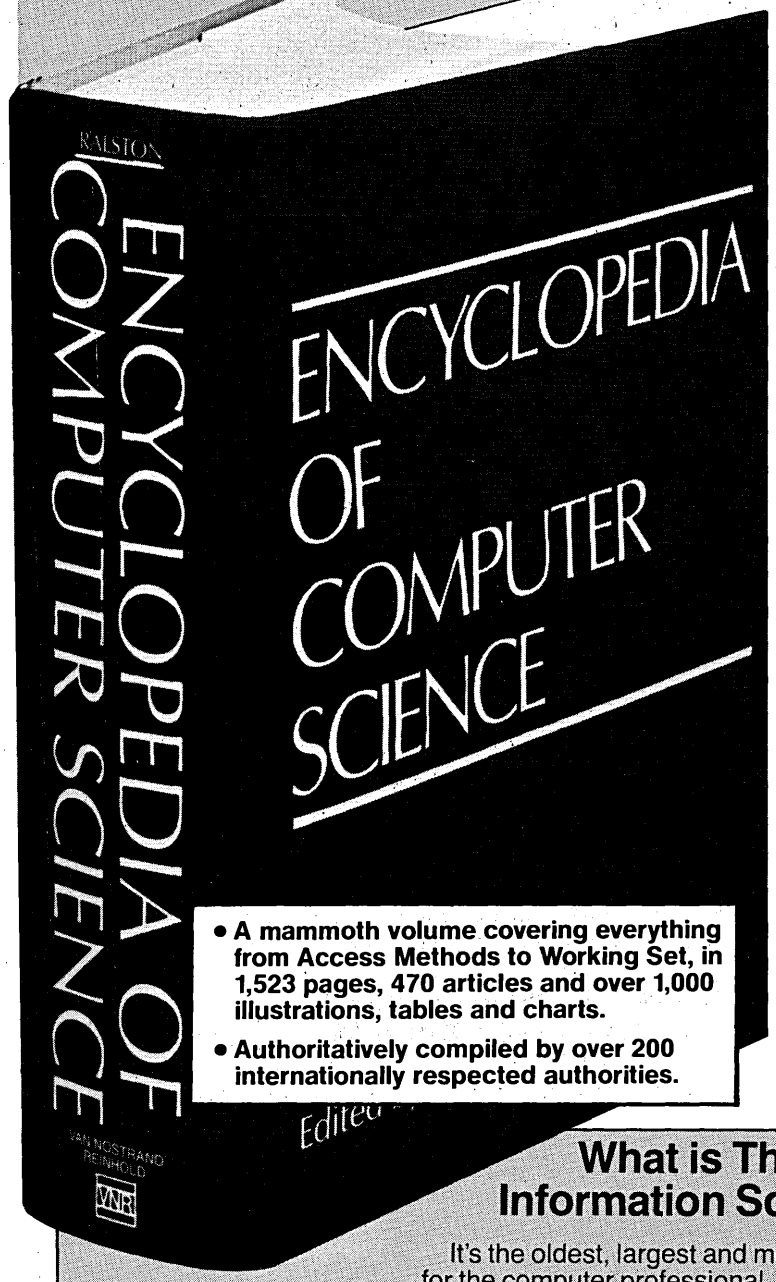

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The new law simplifies and broadens the class of property eligible for investment tax credit.

ed and compared before a particular vehicle is selected. The principal tax effects of each type of procurement may be summarized as follows:

Purchase. The most significant drawback to purchasing a computer system is the inability to expense the purchase price immediately. As a capital asset, the system must be depreciated over five years (three, if the system is used for R&D).

Nevertheless, there are several advantages to purchasing a system. ITC is available for the purchase of computer hardware, and software that is part of a turnkey system. Additionally, the front-end cost of tangible personal property is eligible for the special first year expensing up to statutory limits. Finally, interest expenses associated with the financing of a purchased system are deductible.

Lease. Generally, the tax benefits of leasing a system are the reverse of those available with the purchase of a system. Payments made under the lease are entirely expensible irrespective of whether the property is tangible or intangible; thus, a software lease is fully expensible. Additionally, the lease technique has the advantageous feature of permitting the ITC to be negotiated between the lessor and lessee. A lessee who negotiates successfully for the credit will have the advantages of the deductibility of his lease payments and the tax credit normally associated with purchase/ownership. By the same token, a lessor in a high tax bracket would wish to retain the tax credit, and may be willing to offer more favorable lease terms in exchange for retaining that benefit.

Development. System development, whether in-house or contracted out, provides important tax benefits. Costs associated with R&D, such as wages and other overhead, are deductible as ordinary and necessary business expenses. Equipment used in development may be eligible for the new first year additional expense provision, as well as the ITC. Accelerated depreciation may be taken for R&D equipment; thus, new computers used for R&D may be depreciated over a three-year rather than a five-year period. Finally, qualifying R&D expenses are eligible for inclusion in the calculation for the R&D credit, available until 1986, for incremental expenditures above the base year.

Although development offers a broad spectrum of tax benefits, it is important to consider whether the developmental work done will lead to a product significantly better or different from that already available on the market. This is particularly true for hardware. The cost in both dollars and time of reinventing the wheel may outweigh the tax advantages available from this alternative.

Service Bureau. Use of a service bureau or timesharing company provides the least number of available tax benefits among procurement options. Payments to the service bureau are deductible as business expenses, but otherwise there are no tax advantages. Nevertheless, a service bureau provides the user with ready access to substantial amounts of software and hardware without a lengthy procurement negotiation.

In recent years, a new financing technique for major hardware and software development has become increasingly popular—the use of R&D limited partnerships. For companies seeking low cost funding for major developmental work, the limited partnership is a vehicle that can be designed to provide low cost financing, while offering investors an attractive tax shelter.

Briefly, the technique works as follows. A limited partnership is created with interests sold to outside investors. The limited partnership finances the development of the software or hardware, and all related deductions, such as business expenses and the R&D tax credit, flow through to the limited partners in the proportions stipulated by the agreement—generally 90% to 95%.

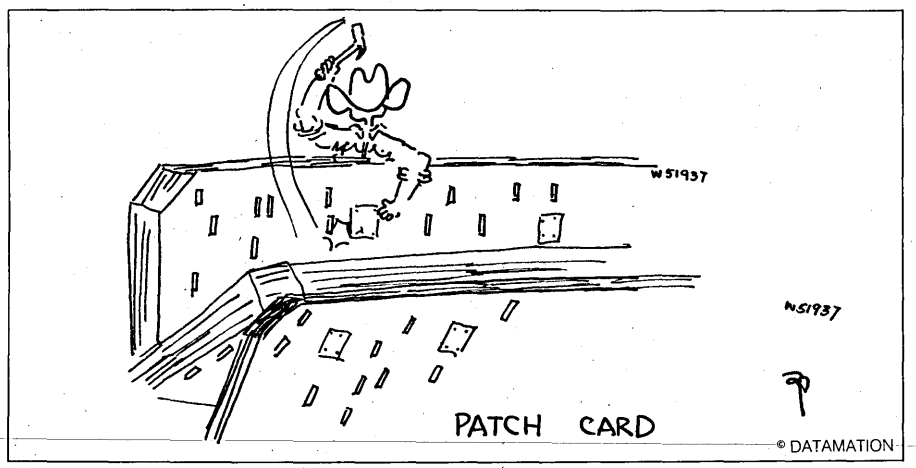
As developmental work nears completion, one or more separate marketing arm companies may be established in the U.S. and in foreign tax havens that are licensed by the partnership to sell the product once the research and development work has been completed. Under the terms of the licensing agreement, the partnership receives royalties on each sale, providing cash flow to investors.

Frequently, the limited partnership agreement provides that the partners may be bought out when they have recovered two or three times their original investment. The buy-out provision, which usually is exercised by a domestic marketing arm, specifies the buy-out price, and permits investors to choose cash or stock. A buy-out for cash provides investors with capital gains treatment on their profits, while a buy-out for stock may permit investors to defer taxes entirely.

The R&D limited partnership has received increasing attention as a financing vehicle for high technology companies, including both startups like Gene Amdahl's Trilogy or established concerns such as Storage Technology Corp. The complexities of the limited partnership technique, however, require sophisticated tax, securities, and business planning to structure a successful offering both for investors and promoters.

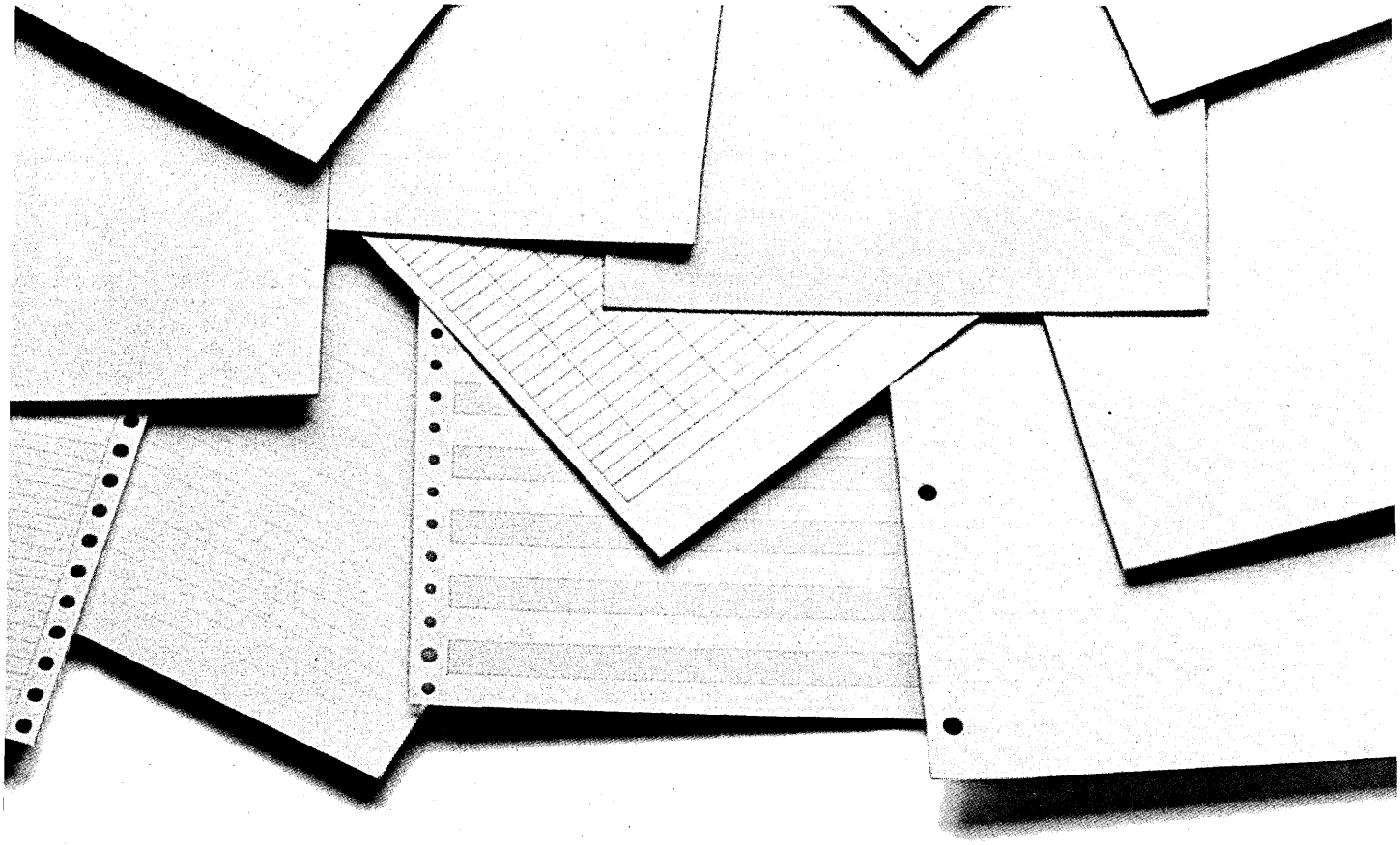
The limited partnership is merely one example of the kinds of esoteric financing vehicles adaptable to a major R&D effort. Imaginative use of joint ventures, subchapter S corporations, and other capital-raising means can be combined with knowledgeable use of the tax code to finance the expansion or initial development of new venture companies and to provide incentives for entrepreneurs.

The decision to procure a new computer system requires a series of basic elections to be made by both vendors and users. In addition to the financial and technical decisions associated with purchase, lease, or development, a user must attempt to evaluate the tax effects of each available procurement option. A properly structured procurement can provide benefits and incentives to all parties to the transaction, while an inappropriate financing vehicle can entangle a good technological system in business and financial problems from the start. The new tax law has changed the rules of computer hardware and software procurement, so that today both users and vendors of computer systems must be sophisticated enough to design procurements that meet their financial and tax needs as well as their technical needs. *



CARTOON BY TENGO

William Wewer, Terry G. Mahn, and Mary A. Fruscello are partners in the law firm of Wewer & Mahn, P.C., in Washington, D.C. The firm specializes in representing high technology clients in tax, finance, and regulatory matters and computer contract negotiations.



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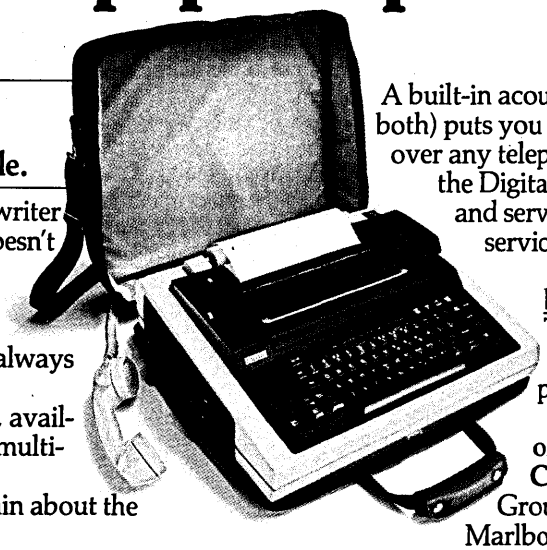

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An old pro invests in a personal computer and gets an education.

MAINTAINING A GRAPEFRUIT

by Daniel D. McCracken

Just got my Grapefruit back for the second time from a repair shop, where the motherboard was replaced—also for the second time. It's exactly as sick as it was before, which is to say, almost as sick as when I first got it.

I should explain. Most of the names here have been changed to protect the guilty and forestall libel suits. I chose the name "Grapefruit" so you wouldn't think I'm talking about an Apple or a Lemon.

Bought my Grapefruit 15 months ago. Needed the FORTRAN 77 that was on it, thought I might use it for word processing on next book, wanted to see what the personal computing phenomenon was all about. Glad I did it. Got an education.

Bought Grapefruit from Computer Store #1, an independent outfit in Connecticut. Fairly complete system, around $5K. Week's delay while they worked up the courage to take my check; never heard of me, of course. Why the hell should they have heard of a past ACM president who has written 17 books on computing? Never wrote a book on BASIC.

Had to go to Computer Store #2 to get two essential pieces to run FORTRAN 77; Computer Store #1 "Outta stock." Guy at Computer Store #2 impressed me as knowing something about computers. Should have gone back there for service.

Took Grapefruit home, put it together, turned on power. Amazing! I could add 2 and 2. Impressed with manuals. Took a couple of weeks to get FORTRAN 77 going, or as far as I could get it to go. Lots of messages like ERROR WRITING DISK BLOCK 147. Tried the operating system diagnostics, discovered three bad blocks on one of the FORTRAN disks. Glow of triumph! Been in this business 29 years; know how to make these babies show a little respect. Erased file in question, tried to copy from backup. Ho ho ho! Disk errors again—and the same three blocks were bad. Got suspicious, then panicky. Decided to lick my wounds after putting the backup disk in a very safe place.

Called Grapefruit hotline 13 times over two days, always getting busy signal. Took Grapefruit to Computer Store #1, where nice young man proved to me that my RAMs were okay. Hadn't doubted it. Showed him the FORTRAN 77 problem, which baffled him. He called the dealer's special Grapefruit hotline at exactly 8 a.m. local time, and managed to get through. Was told about undocumented aspect of using FORTRAN 77 with operating system, which explained the first of the "disk error" problems. Reorganized my files as instructed. FORTRAN 77 worked; I went away cursing and feeling stupid.

Got some work done for several weeks. "FORTRAN 77" turned out to be the subset. I should have been smart enough to check that out; a compiler for the full FORTRAN 77 language would never fly on a machine with 64K bytes of RAM. Felt even more stupid.

Wrote letter to Grapefruit hotline, since phone always busy, describing second "disk error" problem.

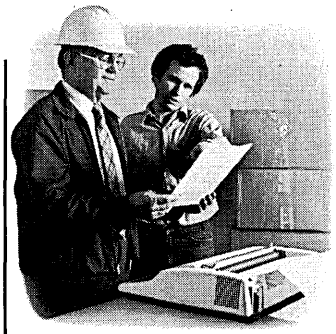
Began to have occasional hardware problems; couldn't always get FORTRAN 77 to boot. No obvious pattern to failures.

Big pain getting the effect of the shift key on keyboard. Had to enter a "Control-A" to get from uppercase to lowercase and vice versa, which discourages use for word processing. Made inquiries and was advised to get a "keyboard enhancer." Called several computer stores; nobody had it. Called manufacturer; nice lady got information about revision number of my Grapefruit and told me what information to put in my order along with a check for $132. Device arrived in due course, and worked as advertised.

Had a whole lot of fun with a variety of software that I picked up to check out the Personal Computing Phenomenon. Loved the games, overwhelmed by Visicalc, fascinated by how easily Sargon could beat me at chess. Tried some word processing software, turned up strange problems integrating hardware. Example: couldn't get system to boot at all if I had my video interface card and the serial interface card for my Diablo in the Grapefruit at the same time. Got tired of the

ILLUSTRATION BY RICK MEYEROWITZ

URAMA
NO LEFT TURN 7AM-7PM
64 ST
GRAPEFRUIT III
OPERATING MANUAL
FLOPPY DISKS INC.



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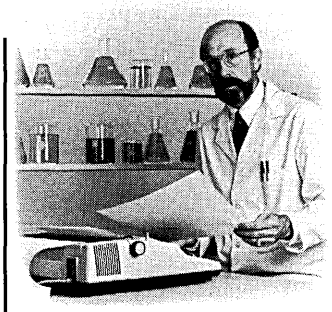

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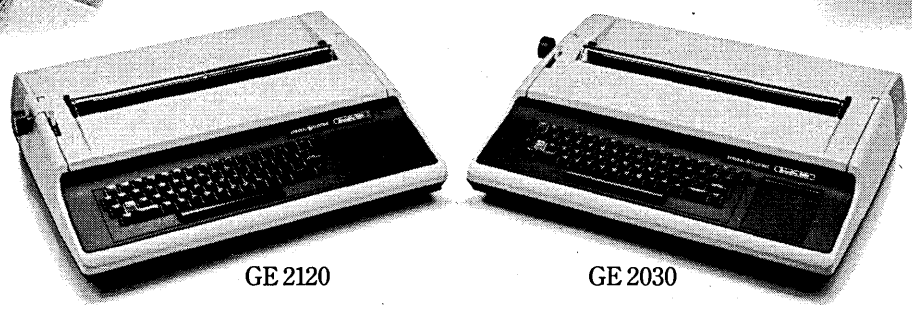

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GENERAL ELECTRIC

CIRCLE 130 ON READER CARD

Began hanging around computer store, hoping for ideas on how to make system work as advertised.

card-flipping involved, never did much with $350 word processing software.

HOTLINE MAN BAFFLED

Nice young man from Grapefruit hotline called in response to my letter, maybe a week after I'd sent it. Explained the second set of disk messages: had something to do with the way the Grapefruit software is copy-protected. Neat; wish the manual had said something on the subject. While I had him on the phone, which would likely never happen again, asked about hardware problems booting FORTRAN and why system wouldn't boot with both video display and serial interface cards in. Grapefruit hotline man baffled. Maybe I had too many cards and was overloading power supply? Wow! Wasn't he familiar enough with the specs to *know* whether I was overloading the power supply? But anyway, I said, if that were the case, what would I be advised to do about it? "Well, maybe you could put an external power supply in parallel with the onboard one." Arrrrgh.

Got out my voltmeter and checked power supply lines on bus; no voltage fluctuation whether the six peripheral cards were in or out. Also looked up specs, and I was definitely not overloading power supply.

Had bought a second disk drive at Computer Store #3 in Manhattan. Began hanging around there a bit, looking for new goodies, hoping for ideas on how to make system work as advertised. Absolutely fascinated to watch high-school types explain computing to the salesmen. Got chummy with one of the salesmen, who confided that he had been in the computer business three and a half years.

I should have mentioned that fairly early in this adventure, before my problems with the Grapefruit began to get to me, I had written to one of the cofounders of Grapefruit, confessing my fascination with The Phenomenon and recalling for him—since he might have forgotten—how as ACM president I had handed him a major ACM award. I suggested the possibility of a visit to share perceptions of The Phenomenon. No answer. Wrote again. No answer. Wrote his partner and cofounder, Grapefruit president, saying same thing. No answer.

Finally took my Grapefruit to Computer Store #3 for repairs. Left a list of problems much like I leave with my car repairman. Got a call or two, along the lines of "Gonna have to replace your motherboard." "Okay."

Got a call: "Your Grapefruit is ready." "Fine. I'll be down to pick it up this afternoon."

Went down. Service manager "out to lunch." (It was 3:45 p.m.) My chummy salesman friend, he of the three and a half years' experience, refused to get my Grapefruit for me; it appeared he was feuding with service manager. Waited. Service manager returned from "lunch" at 4:45. I was a bit huffy by then. Wanted to know what had been done. Service manager became a bit huffy too; seemed to feel that I was raising a question as to whether he had really done any work on the machine. That hadn't been my intention, actually. . . . Never found out exactly why the motherboard was replaced, or whether he had succeeded in booting FORTRAN. Matter of fact, didn't even find out whether he had tried. Seriously doubt it. Paid my bill of $243 to a nice lady who said, "So why yell at *me*?" No good answer, so tried to be cordial. It wasn't easy.

Problems no better. Worse, in fact. By this time had given up on Grapefruit for FORTRAN 77 or word processing and gone back to my old reliable National CSS timesharing system. Grapefruit still willing to play chess with me, though, so I set up a quota system: for every 15 lines of text entered on new book, rewarded myself with one chess move.

POWER SUPPLY BLEW OUT

Grapefruit eventually refused to play chess. Display bounced vertically, and keyboard functions were sporadically unreliable. Picking up the machine about three inches and dropping it helped for a while. (Isn't that the first thing to do with anything electronic that malfunctions?) Power supply finally blew out with a satisfying buzz.

Decided to try Computer Store #4, also in Manhattan. Told service person that power supply was blown, wanted it fixed, but suggested the wisdom of trying to figure out why it blew, on the theory that replacing a blown fuse when there is an undetected short in the wiring is merely going to result in another blown fuse. Not sure I made my point.

Left Computer Store #4 and walked to major New York technical bookstore, which has a smallish computer section in one aisle. While looking at some software, began listening to conversation between salesman and customer. Salesman did not recognize a name mentioned by customer and explained: "I've only been in this business a year. I was doing magic shows in Vegas and came back here to work Atlantic City, but I couldn't get in. So I decided to try computing."

I'm not making this up.

Computer Store #4 service person called in day or two: after replacing power supply, he had detected the "vertical jiggle" problem. He suggested a new motherboard. I described, with vast sinking sensation, history of machine's maintenance. Service person still wanted to replace motherboard.

By this point I was beginning to smell a possible article. Doubted that DATAMATION would pay enough to cover more than about three more motherboards, but told service person to go ahead.

Called in a few days to see how it was going. "All done. The bill is $331.56. Cash or certified check." Cash or certified check? Nothing had been said about that when I took the machine in, and there were MasterCard and Visa stickers plastered on the doors. But never argue with clerks, I always say, so I trekked to my bank to cash a check. Couldn't; computer was down.

Skipped out of an ACM Executive Committee meeting two days later and walked over to Computer Store #4. "I'd like to pick up my Grapefruit." "Ah, that's it right there." Looked "right there" but could see only a Grapefruit with the cover off and all kinds of wires I never saw before running off to a printer that was distinctly not mine—I hadn't even brought my printer in. Stood and stared. A service person finally came over, and, trying to shield my view with his body, began putting my Grapefruit back together. They had been using my Grapefruit as a test bed for checking out someone else's printer. Well, hell; transistorized electronics don't fatigue in normal use, so decided not to make a big scene. Merely asked, as if I didn't know the answer, "What have you been doing with it?" "Mmmmphhh." Decided not to press point.

Grapefruit was presented to me. "Sign here." Well, hell; "Signature above constitutes acceptance of above work as being satisfactory." About all I knew was that it had been in good enough condition to serve for checking out the other guy's printer, but I've always felt that the customer has no practical recourse in that situation anyway, so I signed.

With the blown fuse analogy on my mind, tried to discover whether service folks had found a reason why the power supply went up in smoke. Service person began reading the invoice to me; I admitted I could read, conceded that they had changed the motherboard, but tried to suggest that when a power supply blows there is usually a reason, and if you don't find that reason you're probably going to blow another power supply. Don't think I made my point. Asked if service person who had done work was around. "Yup; that guy over there." Person in question was eating bag lunch, and declined to come talk with me.

Gave up, and here I am. The vertical jiggle is gone, but the keyboard functions are the same scrambled eggs they were two weeks ago. Can't play chess; can't play Space Invaders; can't even see what Grapefruit BASIC thinks 2 + 2 is. Rats. $5K is a lot to pay for a paperweight. And that's without maintenance.

Picking up the machine about three inches and then dropping it helped for a while.

IT WORKS LIKE A CHARM

The above was written Aug. 1. Today is Sept. 12, and my Grapefruit works like a charm. After stewing about problem over a vacation break, decided to take my own advice and got back to Computer Store #2, where the owner had impressed me in December as knowing whatinthehell he was talking about.

Explained the keyboard problem, gave a brief rundown of maintenance history—carefully disguising anything that might blow my cover. Needn't have worried; was not recognized, even after I gave my name.

The staff seemed to know exactly what they were talking about. Pointed out missetting of baud rate on my serial interface card. Asked me whether I had the revision PROM for the communications card; naturally I had never heard there was a revision.

Went away feeling more relaxed about my Grapefruit than I had in months. Went back a few days later when they called to say they had fixed the keyboard problem, which turned out to require replacing a couple of chips. (Oh, yes, they also installed a simple fix that made the $132 Keyboard Enhancer utterly unnecessary for the revision number of my Grapefruit.) Total cost including labor and the communications card update: $133.75.

Tried out most of my hardware and most of my software in their shop, and discovered no problems whatever.

The Grapefruit is purring away behind me as I write this, with Sargon calmly extricating itself from a brilliant move I made 14 lines of input ago. (Hah! I may win this game. Gonna have to move up to level 1 some day.)

The problem with the word processing software turned out to be caused by one of five bugs in the widely used operating system that the word processor runs under. I discovered this news in my accumulated post-vacation mail, in an undated mailing of which I received two copies. I would have preferred one copy, earlier.

"You are gullible and naive. You believe untrained charlatans. You squander your money."

© DATAMATION

1. When you set out to buy a personal computer, pick a store within 10 minutes' drive. You'll be spending a lot of time there.

2. But even if it's a longer drive, pick one where the people know something. The choice between a nearby store staffed by ninnies and a more distant one staffed by people who Know Something About Computers should not be difficult to make. People who have seen a draft of this article assure me that there are many of each; good stores do exist.

3. If someone who presumably knows a little about hardware and software has this much trouble getting a simple machine to work after many hundreds of hours' work over a period of nine months, what on earth is happening to the 70% of the machines that go to small businesses? I am forced to suggest that the ability of the personal computer folks to provide decent service will probably set the limit on the growth of their industry.

Late Flash: Just got a letter from a Grapefruit vice president, who said with what may have been a pained smile that he thought the draft of this article was humorous, but that he did not believe my experience was typical of their dealer network or their product. I dare say that's true, although I've talked to enough people to be convinced that my experience is not totally isolated, either.

He added that the company has grown from zero to $335 million annual sales in four years, which he claimed to be the fastest growth of any company in modern business history. "Inevitably," he adds, "such growth produces strains." Well, that's fair. My point is simply that the "strains" may not be a temporary problem, but may rather be a structural problem endemic to the industry. There is a maximum rate at which an organization can grow, after all. Beyond that rate, you are pouring more energy into training personnel, digging out from the goofs of undertrained people, etc., than you are applying to your basic business.

The Grapefruit is in many ways a very fine product. I do not begrudge the company its financial success. I just hope they don't ruin a good thing by overextending themselves. ✻

Dan McCracken is the author of 17 books on various aspects of computer applications development and past president of the Association for Computing Machinery (ACM), as well as chairman of the History of Computing Committee of the American Federation of Information Processing Societies (AFIPS). He has been a frequent DATAMATION contributor over the years, and is a former DATAMATION editorial adviser. He has never written a book on BASIC.

CARTOON BY SIDNEY HARRIS

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23 Houston, TX	22 Albuquerque, NM	20 Boston, MA
24 Austin, TX	27 Des Moines, IA	25 New Orleans, LA
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CIRCLE 131 ON READER CARD

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CIRCLE 132 ON READER CARD

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How to understand a software system, in five steps.
Also includes the secret of the magic box.

THE EUREKA COUNTDOWN

by Nicholas Zvegintzov

Understanding a system means knowing what to do when things go wrong, knowing how to seize the advantage when things go right, and knowing how to make changes to keep things going in your favor. Knowledge is power—in management, government, love, war . . . and software systems.

How do you understand a software system? There are textbooks and courses to teach you everything else—how to design, document, test, buy, and sell a system. But how to understand? Isn't that a bit "philosophical?" Maybe a skilled programmer can understand a system, but isn't that a luxury the typical manager can't afford? Isn't it something you have to know already, something that can't be learned?

No, on all counts. Understanding is not philosophical; it is a practical, hands-on, tab-A-in-slot-B skill. Understanding is not just for skilled programmers, nor is it a luxury for

Understanding is not a sequence of once-and-for-all phases, but a continual repetition and interweaving of four different actions.

the manager. In fact, programmers are notorious for their incoherence in explaining systems and their unwillingness to distinguish the forest from the trees. Understanding is the key to taking the right action at the right time, which is the essence of the manager's job. And finally, understanding *can* be learned and taught.

The path to understanding is what this author calls the Eureka Countdown, named after the Greek word for "I figured it out!"—what Archimedes shouted in his bath when he realized that a body exactly displaces its own mass of water. The Eureka Countdown will help you displace ignorance with your own brainpower. Here's how it works:

Five: the five questions to ask.

Four: the four actions to take with the answers.

Three: the three places to work. These are the places to penetrate the system.

Two: the two products—what you do with your knowledge.

One: the one golden rule to remember if you forget everything else.

The five questions are WHAT? WHY? HOW? WHERE FROM? WHERE TO? They are visualized in Fig. 1. This figure shows one jigsaw piece. Pieces like it lock onto each other to form a "knowledge network."

The WHAT? pieces can fit either UP/DOWN in a WHY?/HOW? pair or LEFT/RIGHT in a WHERE FROM?/WHERE TO? pair. Fig. 2 shows some pieces fitted together.

For example, in an accounts receivable program, the HOW? of GET INCOME is answered by the invoice sequence ending with the alternatives RECEIVE PAYMENT or PURSUE DEADBEAT. Correspondingly, the WHY? of the invoice sequence is answered by GET INCOME. In the invoice sequence, WRITE INVOICE leads to TRACK INVOICE.

The WHAT?s in your system include any functions important enough to have names. Find out what names your people use, and you'll know what things your people are dealing with. This principle is as old as language itself—people name the things they are interested in.

Where do you find these names?

- The organization chart. The units that people work in have names: "Financial Services Division," "Disbursements Unit."
- The main actors or participants in the organization. Some important categories of people—"Customers," "Auditors," "Data Entry Clerks"—are not localized in any particular unit, but they are the *reasons* for the organizational units. They can be found by asking WHY? about organizational units.
- Job descriptions. The tasks that people work on have names, like "the payroll edit."
- The main functions or products of the organization. Some important categories of action—"Make sale," "New hire," "Service call"—are not really tasks but rather the *reasons* for the tasks. They can be found by asking WHY? about tasks.
- Objects that move around the system. These are often forms or standard memoranda. Their names, though cryptic to the outsider, are often household words to the insider.
- The software. The Job Control Language gives the names of files and programs, and the programs themselves give the names of the fields and processes used.

Database and data dictionary systems are closely related to this naming process. They provide a way of mechanically storing, controlling, and manipulating the names of files, fields, and processes. They are the direct source of the names you need. But if you do not have them in place, your main prerequisite for installing them is to search out, simplify, and standardize names, i.e., perform the first phase of understanding the system. This illustrates that understanding a system is part of controlling it.

FIG. 1

THE FIVE QUESTIONS

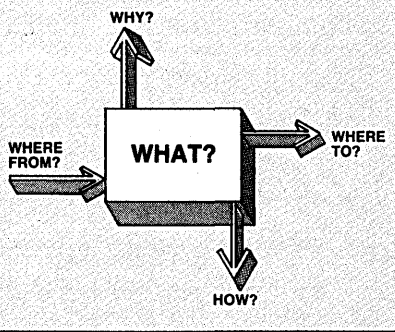
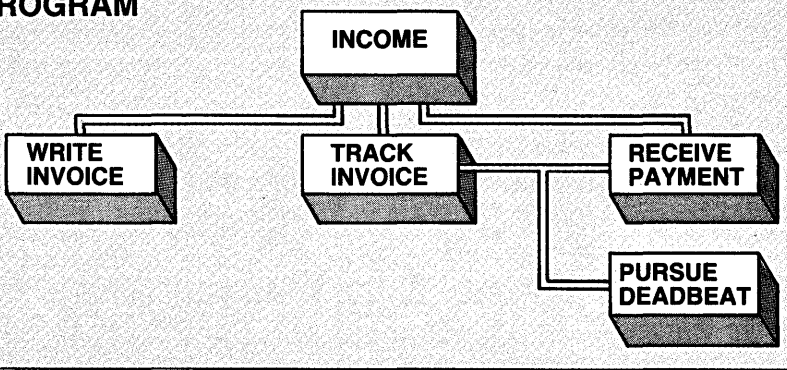


FIG. 2

SOME PIECES OF AN ACCOUNTS RECEIVABLE PROGRAM



LEARN ABOUT THE WHAT?S

The names become the WHAT?s in your system. Your aim is to discover enough about them to relate them to each other either by the WHY?/HOW? (vertical) connection or by the WHERE FROM?/WHERE TO? (horizontal) connection. Things that relate to each other by subordination (e.g., organizational hierarchies) or in a parts-of-a-whole relationship are naturals for the UP/DOWN connection. Things that move are naturals for the LEFT/RIGHT connection. While the UP/DOWN and LEFT/RIGHT connections may not adequately describe all the relationships that can arise, they are a useful simplification for working on a flat paper or screen. When advanced systems allow the manager to see and diagram in seven dimensions, it will be time to introduce a seven-way classification.

The four actions to get and use the answers are shown in the RECYCLE (Fig. 3). All the actions start with RE, to remind you to do them over and over, again and again. Understanding is not a sequence of once-and-for-all phases, but a continual repetition and interweaving of four different actions which supplement and illuminate each other.

In the REVIEW action you look, listen, and perceive what is going on. You should both ask what people are doing and watch them doing it. You should both ask what is in a program or a procedure and look yourself. You should scan any existing documentation, even if it is out of date or incomplete, because its value will usually outweigh its imperfections.

The REFLECT action involves using your intelligence to simplify, correlate, and evaluate. Simplifying is reducing material to its essentials—a bulky manual to its table of contents, a lengthy procedure to its essential function.

Correlating includes finding parallels and/or discrepancies between your findings. Parallels help in simplification; they reveal the regularity and routinization in the organization. Discrepancies, e.g., between what people say and what they do, or between a manual and a procedure, usually re-

CHARTS BY CYNTHIA STODDARD

In a world plagued by uncertainties, it's comforting to know that some things remain constant. Take Uninterruptible Power Systems (UPS) from Franklin Electric, for example. They're available in 50, 60 and 415Hz versions, with power levels ranging from 50 to 1,000 KVA. But that's not the whole story. When you write for details about our UPS line, be sure to ask about our state-of-the-art efficiencies and quick delivery. And remember, when you need uninterruptible power, let it be from Franklin.

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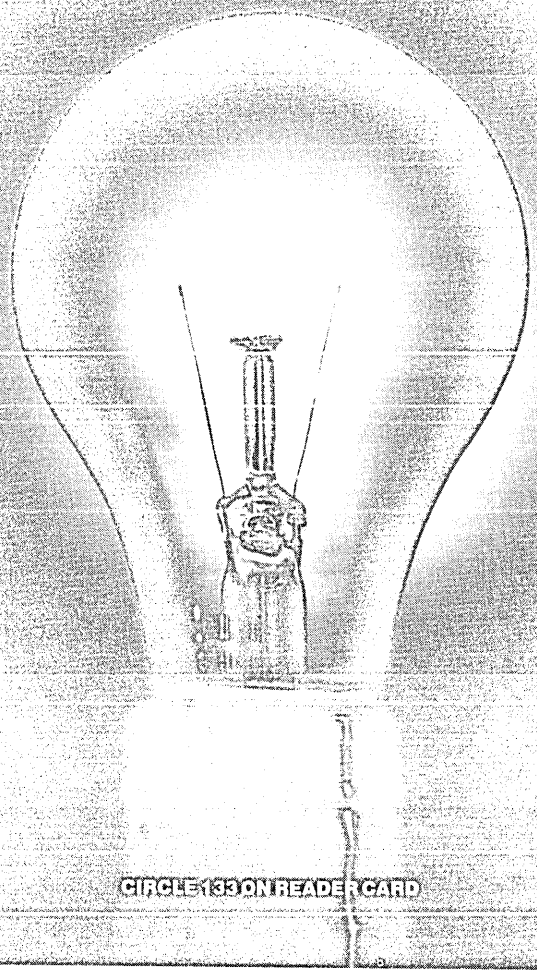


CIRCLE 133 ON READER CARD

Understanding is not a passive state, but a component of action.

veal recent changes. An organization will often change its function to react to outside requirements quicker than it will change its image of itself.

In evaluation, you assign priority or value to information. Not everything that you see and hear can be taken at its face value; it may have to be discounted according to context. For instance, in the classic example of a sales-oriented organization, the announced design aims and methods of the product group would need to be discounted by the external market influences.

The RECORD action in the RECYCLE forces you to use your fingers to put marks on paper or on a screen to supplement your memory. This is surprisingly hard work—there is a great difference between thinking you know something and being able to express what you know.

There are three ways to supplement your memory—diagrams, lists or tables, and text. Diagrams depict an aspect of your system. They can use one of the WHAT?, WHY?, HOW?, WHERE FROM?, WHERE TO? jigsaw pieces described above, or any other symbology you prefer. A diagram should be limited to the amount the eye can scan or the brain handle in one sweep. A piece of paper or a screen is limited in size as well as dimensions. Do not continue a diagram over the edge of the paper onto another sheet. If there is too much material, either discard some or put the extra material on another sheet—but also start a higher-level sheet that indexes the two.

Lists or tables are for large groups of similar items such as files, fields, or forms. Keep them in easily retrievable order, e.g., alphabetically. This type of material can also be derived mechanically from the software by cross-referencers, indexers, or data dictionaries, and can be printed and formatted on a word processor.

Text can introduce, link, or comment on the diagrams and the lists or tables. You won't generally have to write extensive chapters—just notes that enable you to make these introductions, links, or comments if needed. In fact, the text might be so abbreviated as to go conveniently into WHAT?, WHY?, HOW?, WHERE FROM?, WHERE TO? diagrams.

In the REACT segment of the RECYCLE, you use your own position and power in the system to change it. This part of the cycle reminds you that understanding is not a passive state, but a component of action. Furthermore, gaining understanding is an action in itself; like light shone on photographic film, understanding changes the object it illuminates. Be ready to cause changes in the behavior that you observe, and, if you have the authority, to order changes. For instance, one classic method of discovering whether a report or a procedure is redundant is to destroy it, hide it, or abolish it—and see if anybody misses it.

And remember that the RECYCLE really is a cycle—after you react, go on to review, reflect, record, and react again.

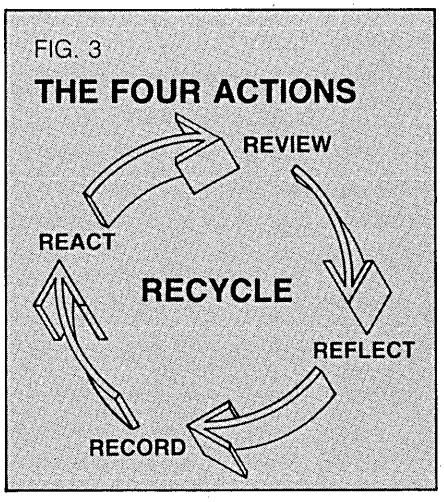
THREE PLACES TO WORK

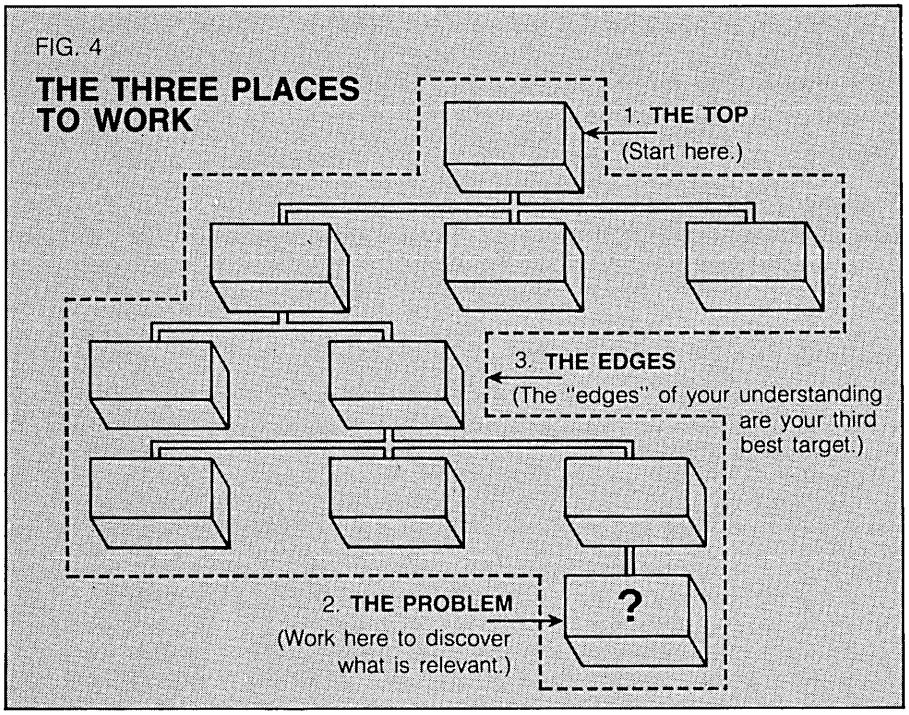
The system is inevitably too large to grasp in a single session. You cannot work on all of it at the same time. The three places to work are the top, the problem, and the edges (Fig. 4).

The first place to work is at the top—a statement of purpose (i.e., the answer to a WHY?) broad enough to include you, your aims, and as much of the organization as you intend to understand. In a strict hierarchical theory of your role, this purpose need be no higher than your immediate boss's job description, since your aims are supposed to be totally determined by your boss's. In practice, you will want to start from a higher point. You cannot effectively work for your boss without an understanding of his or her context in the organization—and your personal aims may reach much farther in the hierarchy.

In any case, the reasons for working on your understanding from the top are:

- The simplest and most succinct descriptions of the system are at the top.
- The same top-level explanation can be used as part of many different low-level explanations.
- If you have to choose between learning to speak the language of your boss or the language of your subordinates, it is always in the interest of your career to choose your boss's.





The second place to work is where the problem is—that is, on whatever prompted you to try to understand the system. Such a problem might be a function that you have been told to change, improve, or eliminate. This is a well-known technique called "working backwards"—studying a system from where you want to arrive back to where you are now. It does not guarantee a solution, but it often works. Also, it steers you away from irrelevancies and it is the best highlighter of what *is* relevant.

This is why, when studying a programming language, it is important both to read the manual and to do problems. Techniques in the language only make sense in the context of problems, and the problems can

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The things that you partially understand—the "edges" of your knowledge—are the best targets for study.

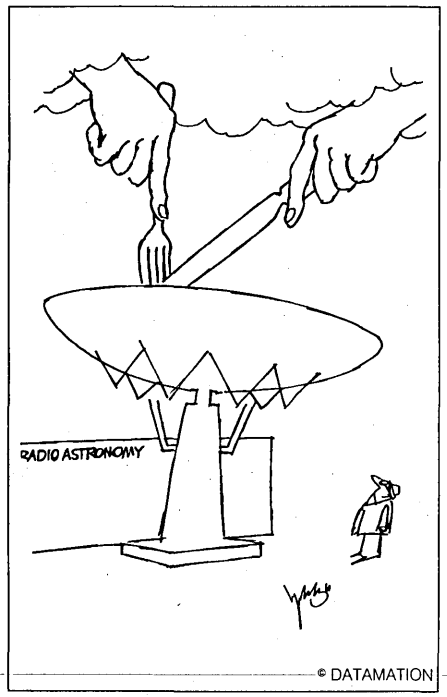
only be done by remembering techniques in the language.

The third place to work is at the edges—that is, from what you know already toward presently unfilled areas. At a given point in your inquiry there will be things you understand completely, partially, and not at all. The things you understand completely need no work, and the things you do not understand at all offer too little to get started on. Therefore, the things that you partially understand—the "edges" of your knowledge—are the best targets.

Something you partially understand is connected to the rest of your knowledge in some but not all directions. You may know how something is done but not why, or why and not how. Ask the missing question. It may link up with something you already know and significantly simplify your quest. Or it may link to something new, extending the edge of your understanding. In either case, your questions are concrete because they build on what you know already.

In the priority order, the three places to work are the top, the problem, and the edges. Nevertheless, you should work at all of them for two reasons: you can become boxed-in or blocked at some point. Or, paradoxically, you can make too much progress at some point and become compulsive about something like writing down all the files and their fields—to the detriment of other, more neglected areas.

Therefore, it may be wise to act like a timesharing monitor and deliberately apportion your time among the areas. This technique is consciously used by many managers.



TWO PRODUCTS RESULT

The two products of understanding are ACTION and READINESS. Understanding isn't measured by having a manual on the shelf, or passing a course, or getting high grades on a test. The true measure of understanding is whether your actions in relation to the system are appropriate and productive. Therefore, the visible payoff is effective action, and the invisible payoff is readiness for effective action.

It is critical to know the answers to the five questions because they are the questions that arise when you have to act. For each function in responsibility, you must know:

1. WHAT it is, so when someone names it, you can channel your attention properly.

2. WHY it is, so you can defend it.

3. HOW it works, so you can implement, supervise, or change it.

4.-5. WHERE its inputs come FROM, and WHERE its outputs go TO, so you can ensure that it fulfills its function.

You can think of understanding as software that runs in your head. The importance of software is not the state it puts the computer into, nor the code with which it is written, but its action or potential for action on the environment. Similarly, understanding is not a state of mind nor a heap of documentation, although both are by-products of it.

In fact, the status of documentation as a by-product of understanding accounts for its awkward position in the data processing world: many people admire it, some people need it, but few people either write or read it. Current action is *never* impaired by lack of documentation, because if the participants don't already have that knowledge, it is too late to consult the documentation. It is readiness to act in the long run that is impaired by lack of documentation, but readiness is not a salient goal for a manager unless change is imminent.

Thus adequate documentation is usually a by-product of change. It is usually out of date quickly because it is documentation of the old or changing system. The new system will probably be understood by key managers and participants, but it will only be adequately documented when it too is about to be changed.

The Eureka Countdown can be integrated with other methodologies and tools. For example, while following the countdown you can use automated tools that derive standardized documentation from your software, word processing to format your documentation, or a database system to store and analyze your knowledge of the system.

The rule for tools is: if it exists, and you have it or can procure it, and you know how it can help you—use it! No one tool will be sufficient; different tools help with different parts of the problem. The only limitation is that where there are alternatives, as the rival methods of diagramming, you may want to standardize so that different people working on the project can link their work.

The Eureka Countdown is not so much a method as an attitude. It does not tell you what records to keep or what tools to use, but how to approach the problem. In fact, as the following Chinese story reminds us, it's not snake oil that keeps you fit, it's elbow grease:

A farmer who believed in magic was near to ruin. His stock was depleted, his harvests were sparse, and his garden was barren. He went to the Sage and said: "Sell me magic to make me prosperous."

For a large sum, the Sage sold him a box and told him: "The magic is in this box. Do not open it—but every day for a year carry it to every corner of your farm."

Every day for a year the farmer carried the box to every corner of his farm. At the end of the year his stock was numerous, his harvest ample, and his garden fertile. He took the box back to the Sage, and said:

"That is certainly a powerful magic in the box. May I see it now?"

The Sage said: "Before you see the magic, tell me what you saw when you carried it around your land."

"I saw fences down, so that my stock escaped. I saw terraces eroded, so that my harvest parched. I saw weeds in my garden, so that the fruit was choked."

The Sage said: "Now you can look in the box."

The farmer looked in the box, and saw that it was empty.

The Sage said: "The magic of making your farm prosper is not in the box. It is in you."

The Sage was an early consultant (and an unusually honest one). His empty but much-traveled box brings us to the last stop on the Eureka Countdown, the one golden rule:

Never give up.

The aim of studying your system is not to understand it perfectly and then make the one perfect decision. The aim is to make satisfactory decisions today on the basis of partial understanding and to learn a little. As you learn, you will understand better, and make better decisions. ❋

Nicholas Zvegintzov is a Staten Island, N.Y., writer and teacher who specializes in the renovation, redocumentation, and enhancement of software systems. He is the author of *Applications Software Maintenance*, forthcoming from McGraw-Hill.

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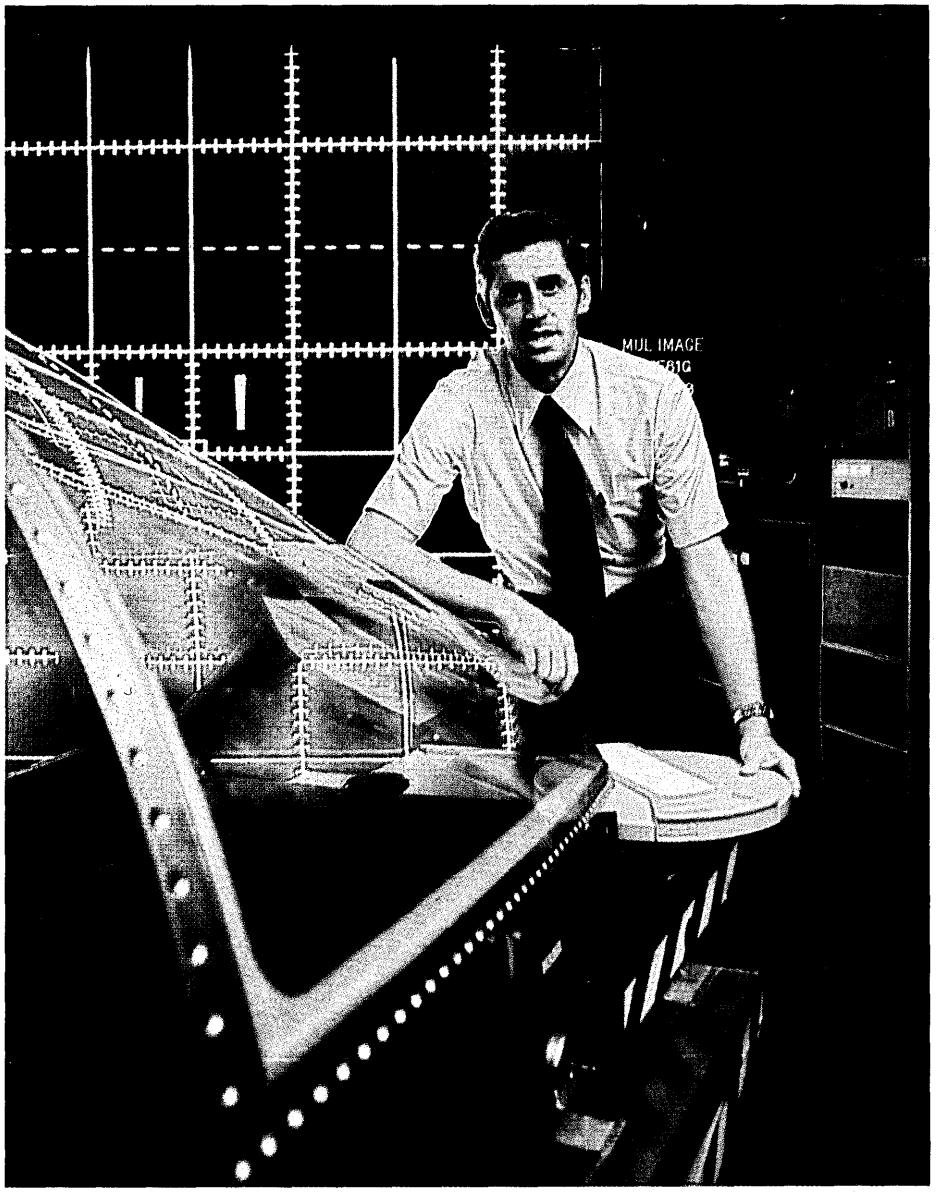

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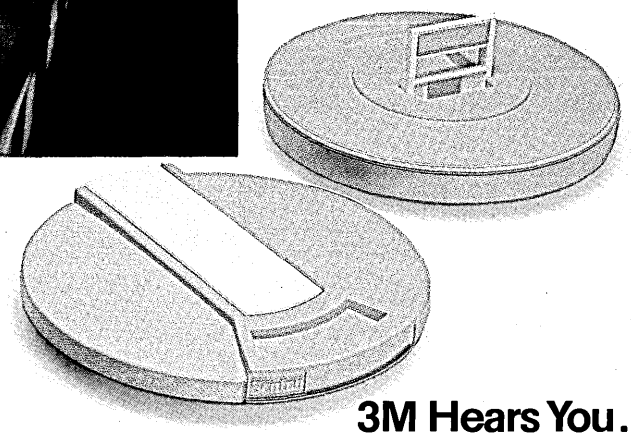

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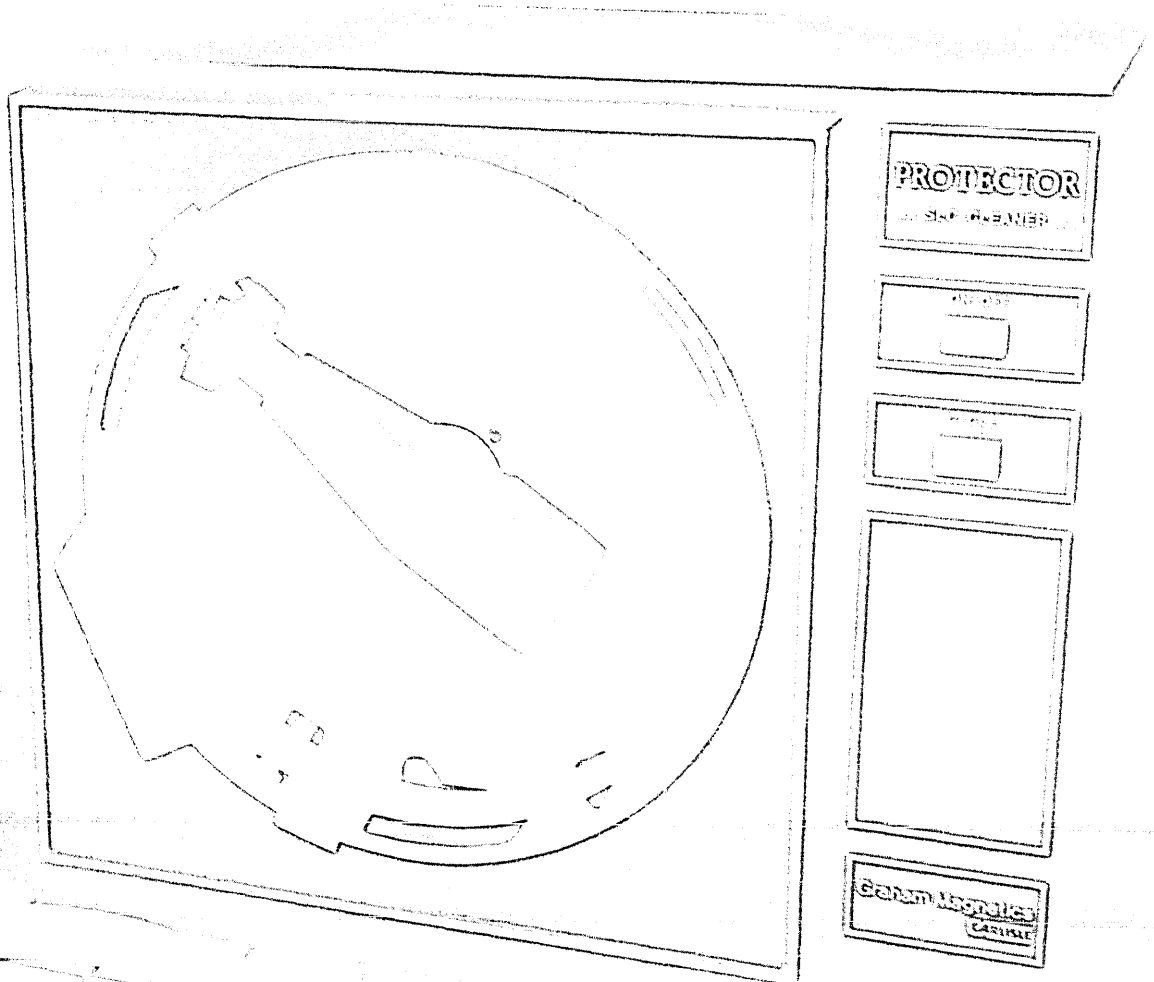

Data administrators and auditors have many objectives in common. Without compromising their operational independence, the two groups can and should work together to achieve them.

TWO TEAMS, ONE GOAL

by Bruce Rollier

In most companies, data administrators have been frustrated in their attempts to move toward long-range goals like a high degree of data sharing or significant reductions in maintenance programming. It takes several years to realize these objectives, and few managements are willing to commit the resources for a payoff so far in the future, particularly when the potential benefits are so uncertain.

At the same time, auditors often encounter great difficulties in coping with the rapid growth and increasing complexity of data processing. Real-time systems, database management systems, distributed processing, and other innovations make it increasingly difficult to audit "around the computer." The ideal auditor is generally expected to have a strategic understanding of the business and an encyclopedic knowledge of the detailed procedures and data, as well as expertise in auditing techniques, internal controls, probability, statistics, data analysis, and fraud detection. Now, in addition, auditing "through the computer" is necessary, so the auditor has to develop even greater breadth of data processing expertise than the increasingly specialized systems professional. The auditor must know hardware operations, operating systems, database management systems, distributed processing and distributed databases, systems programming, and applications programming. Obviously, not many people possess such a wide range of skills. The emerging specialty of edp auditing helps alleviate the problem, but this is not a total solution; the edp auditor still needs an extensive repertoire of skills.

Another auditing concern is that many computer applications are developed without adequate controls. Usually this is not discovered until after implementation, when fixing the problem costs much more than it would have during development. In fact, it may be so expensive to impose effective controls after the system is in operation that it is no longer cost-justifiable. A frequently proposed solution is to assign experienced auditors to application development projects. But besides being very expensive, this can compound the problem of finding enough skilled people.

Auditing and data administration (which is used here to include not only database administration but also such functions as planning and database architecture) are distinct functions, and should remain organizationally independent of each other. Despite dissimilarity in day-to-day tasks, however, there is a surprisingly high degree of commonality in their major objectives. Without compromising their operational independence, these two groups can and should jointly develop complementary long-range strategies that accomplish these objectives much more effectively than separate strategies.

DEVELOP CONTROLS EARLY

The data administration staff is responsible for the integrity of the corporation's data, and is concerned with adequate controls to prevent unauthorized modifications to the databases, preserve data security and privacy, ensure that output is consistent with input, and provide effective backup and recovery facilities. Auditors may have additional concerns that do not involve databases, but they are certainly interested in all of the above. The Foreign Corrupt Practices Act of 1977 (which requires greatly increased emphasis on internal accounting controls and imposes penalties against company officials found responsible for the loss of company assets owing to inadequate controls) has made good control even more important.

Both data administrators and auditors recognize that it is impossible to control the dp environment adequately by means of spot checks; effective controls must be built into the daily routine as integral parts of the information system. They must be established early in the development cycle, not tacked on after implementation.

The old concept of an "application owner" who is responsible for controls and for data integrity is no longer viable. As data flow from an order entry system to a sales record system to an inventory system to an accounts receivable system, and on to perhaps dozens of other applications, there is no way an individual application owner can control them. Controls must be established at a level high enough to track data through these processes. The data administrator and the edp auditor have the required perspective; the application owner and the project development manager do not.

The auditing staff is best qualified to determine what types of controls are necessary. Data administrators can provide expertise on how best to implement the controls, particularly when the environment includes a DBMS. The two departments can jointly develop standards to ensure compatibility of controls across systems. A data dictionary can be valuable here to control data and track relationships, to store edit rules, and to map field-level or segment-level sensitivity indicators.

Both data administrators and auditors must thoroughly understand the dp environment. Both must be able to navigate the system, and to understand what happens to the data at each step. At minimum, a good audit trail should allow one to track any piece of data from source to output, or from output to source.

The data dictionary can be particularly valuable in achieving auditability objectives because it helps the auditor understand the operational systems and the relationships between entities. It also improves data consistency and controls data definitions. "Where used" information in the dictionary can simplify determination of the impact of audit-recommended modifications to application systems—an important factor in deciding whether to implement the recommendations.

There is a catch, however: these are only potential advantages of the dictionary; they won't happen without careful planning. For most current users, the dictionary is primarily a support tool for the DBMS. Very few attempt to use it for modeling the current or future environment or as a central documentation source. Auditors cannot expect the dictionary to provide these capabilities unless they actively participate in planning for them. Managing the dictionary is clearly a data ad-

Data administrators proclaim integration to be their number one goal, but few of them have made any noticeable progress toward it.

ministration function, but auditors should have influence in the following:

- design of naming standards and some usage standards
- establishment of effective enforcement procedures for the standards
- storage and maintenance of clear, unambiguous data definitions and an accurate set of attributes
- implementation of adequate security procedures over dictionary data, with good internal control.

CHANGE NOW, SAVE LATER

One of the major justifications for establishing the data administration function is programmer productivity, which can be achieved primarily through data independence and reduced maintenance programming. There are also productivity benefits from the dictionary and from rules-driven languages.

Auditors' interest in productivity is less direct, but nevertheless very important. A number of studies clearly indicate that modifications to application systems are inexpensive in the early phases of development, but become many times more costly later in the development cycle. One IBM study showed that a change to a program after implementation cost more than 30 times as much as it would have if the change had been made during the coding phase. If the contemplated share is the addition of a control, and if the decision is based on potential risk minus control cost, it is clearly much more difficult to justify adding the control after the project has been completed. Controls established as a part of system design, rather than patched in later, will be more operationally effective and many times more cost-effective.

But can the right controls be put in place early in the project? There are several alternatives:

1. Require that an experienced auditor be part of the application development project team. A number of companies have adopted this approach, and for some it has worked well. It can be quite expensive, however, if there are many separate projects, and it is difficult to find enough experienced auditors with the requisite systems design and auditing skills. Also, the special assignments can interrupt career paths.

2. Rely on the regular system design personnel and let auditors and application owners review each phase for proper controls, provision for audit trails, backup and recovery plans, and effective testing. This is the most widely used approach, and the results are generally poor. Project personnel are concerned with the amount of work finished by the target date; they are not accustomed to being measured on the adequacy of controls or even on the effectiveness of a test plan. There may be a low level of understanding of good internal control concepts. Much work may be accomplished between phase reviews, so that after the review it may already be too expensive to make the needed changes. In addition, it is extremely difficult for auditors and users to understand a project well enough by review time to devise effective recommendations. When the information systems staff is resistant to making changes, auditors and users may not be persuasive enough to sell the recommendations.

3. Use database administrators already heavily involved in the project to ensure inclusion of the needed controls, audit trails, recovery facilities, and other capabilities. Here again, data administrators and auditors have similar objectives: both have a longer-term and higher-level perspective than the typical project manager, and are more concerned with how a new application fits into the present and future dp environment. With the data dictionary, data administration can provide clear documentation and improved system understanding. Auditors and users should continue to be involved in phase reviews and in establishing control standards, reviewing the test plan and test results, etc. This should result in more complete and more effective controls, established earlier and therefore at a substantial saving.

IMPROVING THE DATABASE

We in data administration often proclaim integration to be our number one goal, although few of us are making any noticeable progress toward it. While we have done little to make the concept comprehensible or to justify it as a goal, it is extremely important, and we will have to find ways to persuade the rest of the world of its significance. Fundamentally, integration reduces the total database to a more manageable size, and it can greatly improve data consistency. It simplifies the dp environment by greatly reducing the number of interfaces between files; as the number of files increase, the number of potential interfaces increase much more rapidly. Interfaces between files are established by programming, and all those programs have to be maintained. A change to one key file may necessitate changes to a large number of interface programs. Thus, in many dp environments, integration can substantially reduce programming maintenance.

Integration may be even more important to the auditor, or at least to the corporate controller, than to the data administrator. If a number of redundant files are separately maintained (probably a very common situation), there are often people whose job it is to reconcile the differences between files. In some organizations many people are engaged full time in just that kind of reconciliation, and they aren't needed after the redundancies are eliminated. Also, having one file instead of many redundant ones to represent an asset is probably better protection for the asset. The data dictionary can provide information about the degree of redundancy as it is gradually eliminated.

The major goals of data administration—increased programmer productivity through data independence and greater data integrity through data integration—have proved extremely difficult to attain. They require a substantial up-front investment, scarce skills, the imposition of standards and other restrictions, and more dependence on planning. Benefits may be far in the future and difficult to quantify. What often happens, therefore, is that data administration does not receive the management support it needs.

But the fact that the objectives are difficult to achieve does not make them any less valid; it simply means that we must find better approaches than we have up to now. The organization that elects not to integrate its data today is electing to let uncontrolled redundancy proliferate. The interfacing and integrity problems will get steadily worse and efficiency will decline. Making the start toward an integrated environment will be more difficult the longer it is postponed, and it cannot be postponed indefinitely.

Although this dilemma cannot be solved easily, there is one approach worth trying: build support within other organizational functions. A well-planned data administration program can provide control and auditability benefits in the short run and help justify management support while establishing the bases for longer-range goals. The key tool here is the data dictionary.

Since control and auditability are major audit objectives, the auditing function can and should provide strong support. Auditors should recommend or even demand that the data administration function be established, with the skills and resources, time, and management backing it needs to accomplish its objectives. The auditing department should also participate in developing those aspects of data administration planning which involve control and auditability, particularly the data dictionary plan. Since the areas of cooperation would involve only planning tasks, this recommendation should not seriously affect operational independence. Auditors should understand that their support is essential, and can lead to a more efficient, less complex, better controlled dp environment. ❋

Bruce Rollier is program manager, course development, on the corporate finance and planning staff at IBM. He also teaches business policy at Fairleigh Dickinson University.

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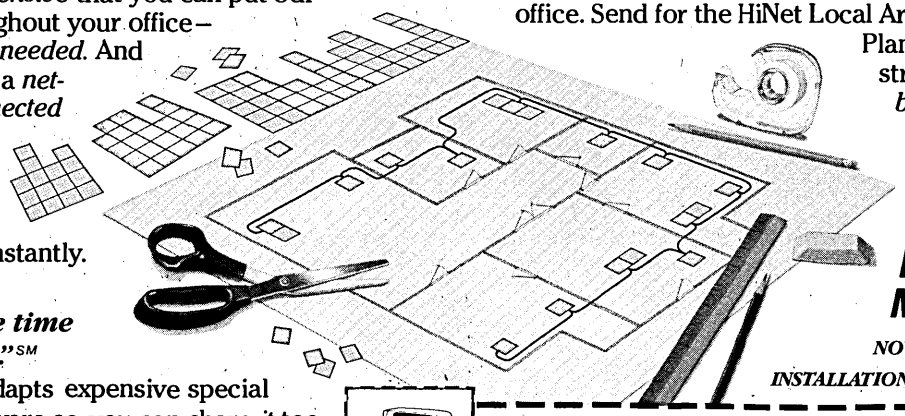

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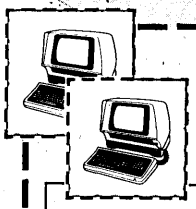

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Attached processors can help data centers cope with a problem that more powerful mainframes won't solve.

KEEPING UP WITH THROUGHPUT NEEDS

by Edward J. Kushner

Most data centers face the problem of maintaining throughput at an affordable price for a wide variety of users. The throughput requirements at a typical university or industrial data center are growing at an estimated rate of 15% to 20% per year (measured in either cpu seconds or connect time). This growth can be attributed both to an increase in the number of applications amenable to analysis, simulation, or modeling by computers, and to the use of increasingly sophisticated analytical techniques and models.

The need for throughput maintenance has been partially met by increasingly powerful mainframes from IBM, Amdahl, Univac, CDC, and others. But discontent with data center throughput and/or the associated costs has led some users to acquire their own minicomputers. Despite this trend, many data centers are losing ground in the struggle to maintain throughput. This problem will undoubtedly escalate, since the speed of logic circuits cannot be expected to continue its past dramatic growth improvement rate.

There is, however, a cost-effective alternative in the new generation of relatively inexpensive attached processors beginning to appear on the market. These products are a direct result of the technology that produced the array processors now used extensively for signal and image processing. Array processors are basically peripheral cpus that perform numerical calculations very quickly.

Several manufacturers' models are available as peripheral devices for minicomputers and mainframes. In a typical application the user splits a program in two: one part—basically I/O—is run on the host computer; the other—numerically intensive—is run on the array processor. In the past, because of data and program source limitations, most array processors were used in dedicated applications—modestly sized programs in which speed is important (e.g., signal and image processing). A few array processors have been used in data center environments, which will be described later in this article.

The new generation of attached processors has improved upon array processor architecture by incorporating hardware to handle much larger programs, more data, and a more accurate representation of data.

EVOLUTION OF HARDWARE

Array processors achieved their speed with state-of-the-art logic elements combined into functional units that display some combination of parallel operation and pipelining. Architectures that incorporate parallelism allow such operations as floating point addition, floating point multiplication, integer arithmetic, and data fetches to occur simultaneously. Architectures that incorporate pipelined functional units increase hardware utilization by segmenting time-consuming operations like floating point addition and multiplication. Consequently, each functional unit can output every machine cycle, even if it takes more than one cycle to perform the entire operation for a segmented unit.

Floating point arithmetic takes longer than accumulator or integer arithmetic operations. Therefore, pipelining a floating point multiplier and adder frees array processor designers from basing cycle time on the relatively long interval required for floating point arithmetic. Since a sum or product can be initiated every cycle, pipelining increases the number of floating point operations that can be performed in a given period of time.

Array processors differ primarily in how closely they are coupled to their host computer and in their use of synchronous or asynchronous functional units. Tightly coupled processors use the host memory as their own, and consequently can only be connected to the host for which they are designed. Loosely coupled systems, in contrast, have their own memory and can be connected to different host computers. The disadvantage of this design is that it requires data transfers from the host to the processor which may be very time consuming. Memory size for loosely coupled systems may vary from a few thousand to several hundred thousand locations for data ranging from 16 to 64 bits in length. In most array processors, 32 or 38 bits are used for floating point numbers, while 16 bits are used for integers.

Processors incorporating synchronous timing contain functional units that operate at the same speed, providing a predictable flow of data. In asynchronous designs the functional units operate at different speeds, so control modules are required to ensure that data flows between units in a correct, timely fashion.

The past year brought the first attached processor incorporating many of the speed-providing features of array processors. It is a loosely coupled, synchronous machine that incorporates parallelism and pipelining. As shown in Fig. 1, there are multiple data paths, which allow parallelism of floating point arithmetic, integer arithmetic, data fetches, table lookups, and operations that use data registers. In a similar fashion, pipelining has been incorporated in a two-stage adder and three-stage multiplier. In this processor, instruction and data words are the same length, so programs can be stored in data memory and then executed via an instruction cache. Integers and floating point numbers are represented by 32 and 64 bits, respectively, allowing the processor to handle more data, longer programs, and more

The first attached processor incorporating many of the speed-providing features of array processors was introduced in the past year.

accurate representation of data vis-à-vis array processors.

The increased complexity of array processor hardware (compared to serial computer hardware) has had a major impact on the software provided with these products. At first, users had to code in assembly language. Because many users resisted this, most array processor manufacturers now provide large libraries of application software. These routines are very tightly coded in assembly language and can be executed via FORTRAN-like calls. Most of these routines involve repetitive, nonrecursive, floating point calculations. They are repetitive in the sense that the same mathematical operations are performed on large arrays of data, but nonrecursive in that operations on the next set of data can begin before the final results of a previous data set are ready. Examples of repetitive, nonrecursive calculations are matrix operations, smoothing and filtering of signal processing data, and image enhancement techniques.

USING FORTRAN CODE

For the past two years FORTRAN compilers have been available for only a few array processors. Presently, these compilers can handle a subset of the ANSI 66 standard for FORTRAN. These compilers have been constrained to modest-sized problems (less than 500 to 1,000 lines of FORTRAN), because of limitations on the size of program source memory.

Compatibility with a FORTRAN environment will be much more important for the new generation of attached processors than it was for the previous array processors. Coding very large scientific or engineering programs in assembly language would not be practical, and library routines won't always be available to duplicate all the mathematical operations of a typical user. Most users will simply run their code through the attached processor FORTRAN compiler. Some users, of course, will take the additional step of replacing very small, numerically intensive sections of code with calls to library routines or with assembly language code of their own.

It is more complicated to obtain an executable program from FORTRAN source code for this attached processor than for a standalone computer. In addition to application routines, these attached processors are supported by a compiler, an assembler, and a linker. All these program development tools reside in and run on the host computer.

Fig. 2 shows that input for the attached processor linker consists of the outputs of the compiler and assembler, together with any library routines desired by the user. The linker will in turn generate two files, a host-attached processor software interface (HASI) and a load module. The HASI performs the communication function between the host and the processor. It must be run through the host compiler and linked with the host resident portion of the program and any host library routines to create a file that the host can execute. The load module contains the code that is run on the attached processor and transferred from the host during program execution.

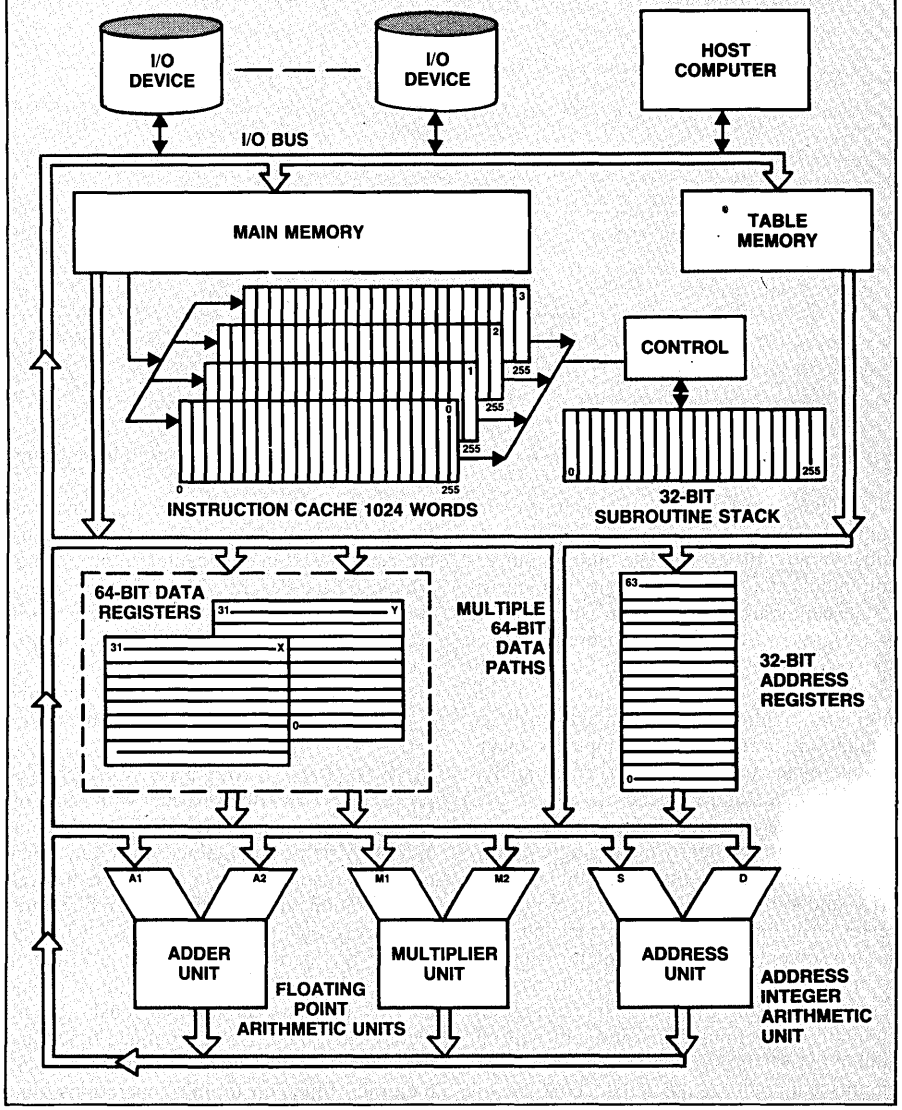
Undoubtedly, the compiler is the software module that will be most crucial to the success of the attached processor described here. Generating efficient code for a computer that is pipelined and capable of parallel operations is a challenging problem. The compiler in the program development scheme of Fig. 2 is compatible with the ANSI 77 standard. It produces code with significant levels of parallel operations. This code, however, is not yet as efficient as that generated by an experienced assembly language programmer.

Most array processors in use today are dedicated to a few highly specialized applications. But a few are operating in data centers that support a wide variety of users. The Computer Services group at Cornell University offers a particularly interesting example of an array processor in such an environment.

Cornell's AP-190L array processor (made by Floating Point Systems, Inc.) has been interfaced to an IBM 370/168 running VM/370 since 1977. Each month it is used by approximately 50 different users for diverse

FIG. 1

ATTACHED PROCESSOR FUNCTIONAL UNITS AND DATA PATHS



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Undoubtedly, the compiler is the software module that will be most crucial to the success of the attached processor described here.

computational applications to such fields as astrophysics, computational chemistry, particle physics, material science, electrical engineering, and library science. The Computer Services group has developed operating system software that can service multiple users, although only one user can use the processor at a time.

APEMAN GETS JOB REQUESTS

Array processor job requests are submitted to the Array Processor Execution Manager (APEMAN) who maintains a job queue, schedules jobs, provides status and accounting information, and enforces time limits. Use of the processor is arbitrarily limited to 15 minutes per job. The user is responsible for checkpointing the calculations if a job is not finished in 15 minutes, but an unfinished job can be placed at the end of the job queue.

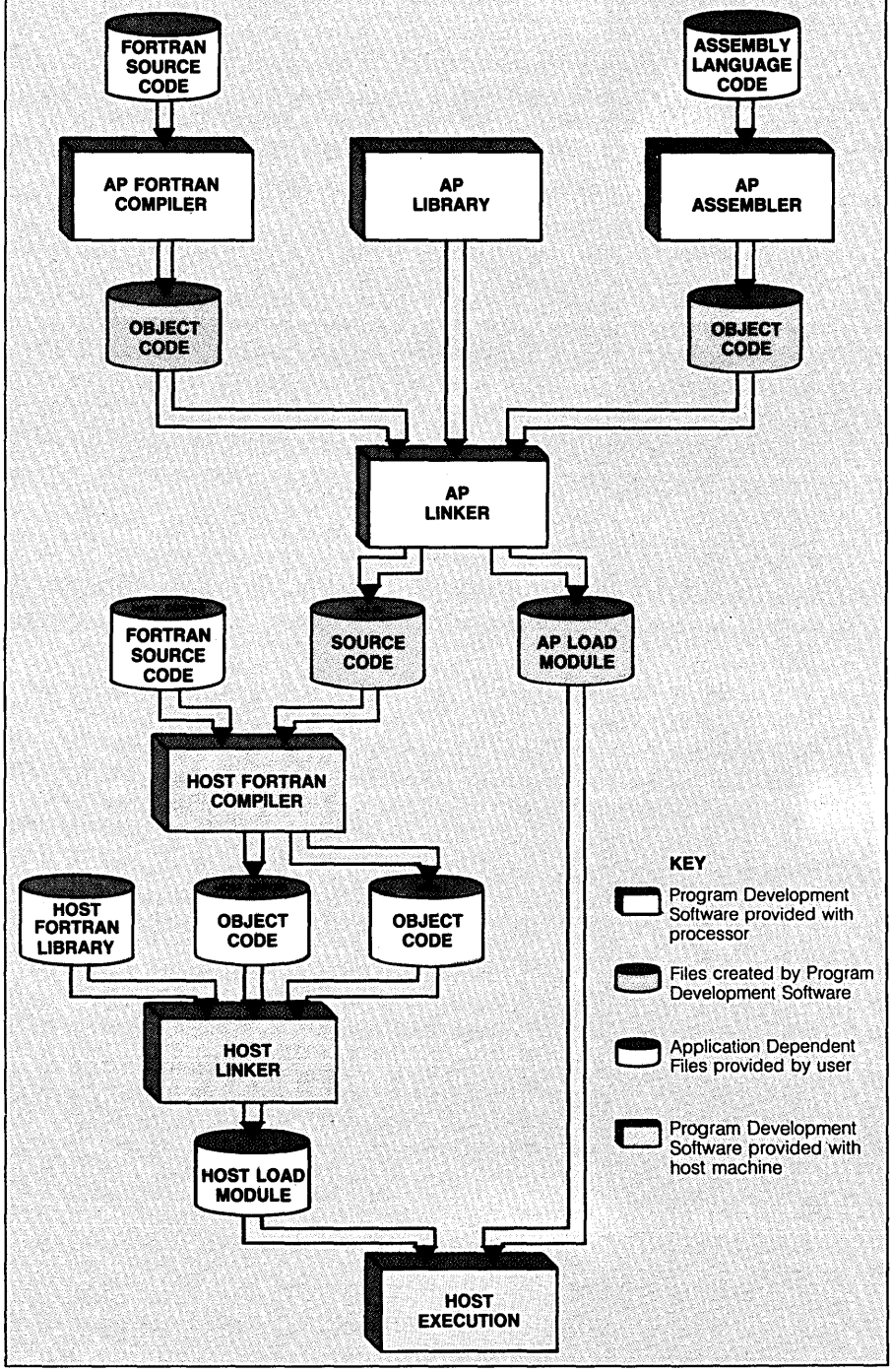
Most users simply run their programs through the array processor's FORTRAN compiler, which allows them to run their programs in about one-third to one-fourth the speed of the IBM 370/168. A few users program small, numerically intensive pieces of code in assembly language and can therefore run programs three to 10 times faster than the IBM machine. People who code at the FORTRAN level use the processor for economy—the processor is still 10 to 50 times cheaper than the IBM for a given computation. Most users apply this advantage either to run larger cases or to run programs more frequently.

The attached processors described here are newly available. They can be expected to become increasingly more sophisticated, since the challenge of designing an efficient FORTRAN compiler has not been fully met. Thus, some present users may have to code very small portions of their program in assembly language or use manufacturer-supplied application software to take full advantage of the parallel architecture. These needs will diminish with the development of increasingly efficient FORTRAN compilers.

Program development is another area where improvement can be expected. Currently, the improvement in throughput for these attached processors is hampered somewhat because program development must be done on the host computer. Consequently, the initial response to these products will probably be characterized more by production work with frozen codes than by code development efforts. This should change within the next year or two as software becomes available for compiling, assembling, and linking programs on the attached processor. These improvements will free the host from the program development chore and further enhance the economy of using these processors in a data center environment. They will allow many more data centers to take advantage of the inherent speed of parallel and pipelined computer architectures. ❋

FIG. 2

PROGRAM DEVELOPMENT PROCEDURE FOR ATTACHED PROCESSOR



Edward J. Kushner is an applications specialist at Floating Point Systems, Inc., Beaverton, Ore. He holds a BA in physics from the University of Oregon, a masters in physics from UCLA, and a PhD in Environmental Technology from the Oregon Graduate Center. He was formerly an aerospace engineer for Logicon, Inc.

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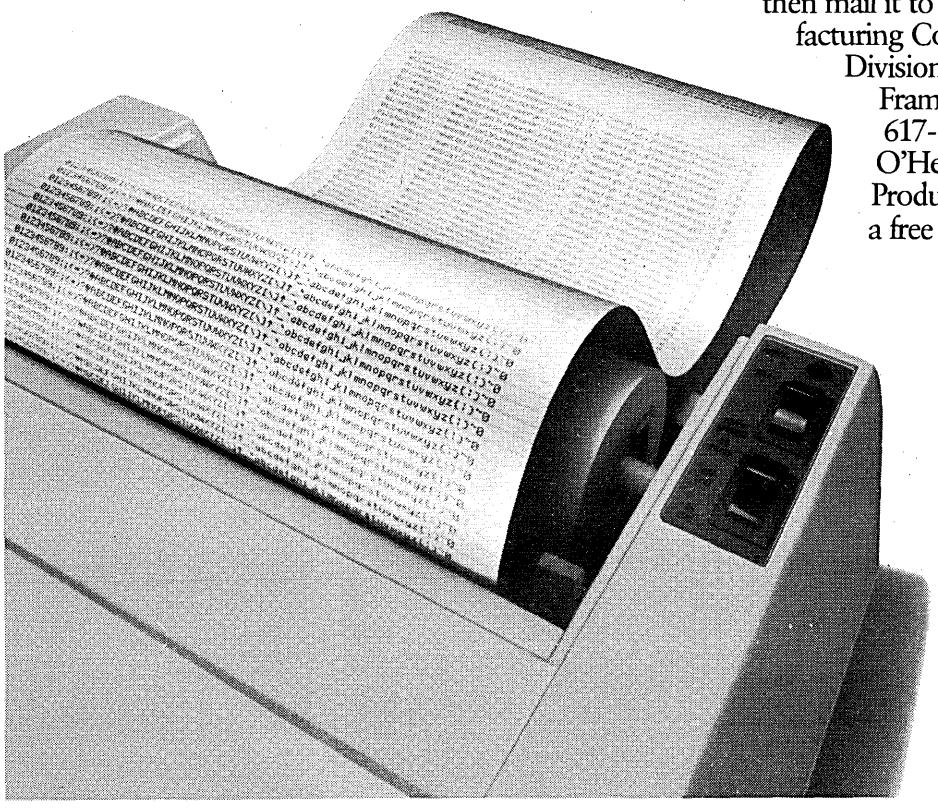

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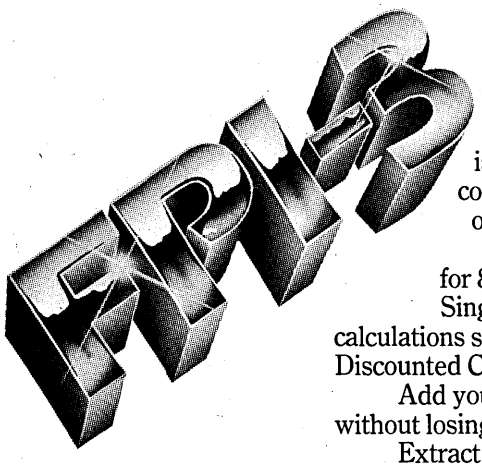

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PEOPLE

THE ROBOT MASTER

"If a man can . . . make a better mousetrap than his neighbor . . . the world will make a beaten path to his door," said Ralph Waldo Emerson. And that's what George Devol believed when, in 1954, he applied for a patent—the first of its kind—for a "universal manipulator." But it was to be 12 years before Devol saw production, and only since 1980 that the world has really discovered this path to the latest phase of the second industrial revolution—the Industrial Robot.

From his first patent in the 1930s for photoelectric doors—not too different from what we use today—through his pioneering in the electronics industry as an independent producer, Devol has held over 40 patents. He has 30 patents for the industrial robot alone, which form the basis of the industry and have earned for him the title "Father of the Industrial Robot." Devol is one of the last of that rare breed of inventor/entrepreneurs whose direct antecedent would seem to have been Thomas Edison.

Born in Louisville, Ky., in 1912, Devol was interested from boyhood in all things mechanical—boats, airplanes, and engines.

He got some practical experience at Riordan Academy, where, in addition to studying traditional subjects, he "built buildings and ran the school's electric light plant."

Although he "wasn't very scholarly," Devol remembers, he read everything he could about mechanical devices—trying to discover what, besides building radios, could be done with the then recently invented vacuum tubes.

GEORGE DEVOL: "It's unfortunate that American industry is run by a lot of bookkeepers who are interested only in the bottom line."

Devol explains that what spurred him on was the belief that "if you want to be an expert in something, you better not be in something everybody else is in . . . try to get into something new."

Choosing not to go to MIT but instead, into business for himself, Devol formed United Cinephone in 1932 to produce "variable area recording" directly onto film for the new talkies. When he discovered that large companies like RCA and Western Electric were working in the same area, however, he decided to discontinue the product. The company did continue to manufacture photoelectric doors and other products using photoelectric cells.

Devol dissolved United Cinephone and offered his services during World War II to Sperry Gyroscope, where he helped to develop radar scanners.

In 1943, knowing that counter-radar measures would be useful, he formed General Electronics as a subsidiary of the Auto Ordinance Corp., to produce counter-radar devices until the end of the war.

After a short stint as eastern sales manager of electronics products for RCA, which George felt wasn't his "ball of wax," he left to develop some ideas which led eventually to the patent application for the first industrial robot.

"I started thinking about magnetic recording systems which had been used during the war," Devol explained. "I said to myself, 'this sounds good, but what's wrong with it if you wanted to do more with it?' It was a dynamic recording system—it had to be in motion to record." In 1946, he came up with the answer, and applied for a patent on a magnetic recording system. "I thought of a static recording where you would put information onto a disk, go in with servomechanisms to the track you wanted, and pick the information out—pretty standard in the computer industry today."

It seemed a good approach for computer memories, and he looked for a company which would license the process and develop it. Remington Rand took Devol on as magnetics department manager and he proceeded to develop his idea. It soon became apparent, however, that IBM was on the fast track with this system, and Devol left to continue research and development work on his own.

He wasn't thinking about robots back then; he was thinking about manipulators and his patent on magnetic recording devices. He "felt the world was ready for new ideas" as he saw the introduction of automation into factories about this time. But with the development of the computer in the late 1940s and the invention and refinement of the transistor, all the ingredients for an industrial robot were available.

The idea of the robot—the word was coined by Karel Čapek in 1920, from the Czechoslovakian word robota, meaning forced labor or drudgery—has been around since the Greek legends. But in the 1940s, the renowned writer Isaac Asimov created a

rational robot who responded to every command a human gave. It was, however, governed by the Three Laws of Robotics, another Asimov invention, and was basically just another tool.

With all this as background, George Devol worked on his invention. In 1954, he applied for Patent No. 2,988,237 for "Universal automation" or "Unimation," coining the word to define the product much as George Eastman had coined "Kodak." In 1961, his patent was granted.

Devol tried to find a company willing to give him financial backing to develop this "programmable articles transfer system" and talked with almost every corporation in the United States in his search. "I began to have a very dim view of American industry in the process," he remembers. The attitudes he met with, he says, ranged from "who needs it?" to "it's crazy" or "we can do it better."

Eventually he was put in touch with Manning, Maxwell and Moorehead in Connecticut, whose chief of engineering in the aircrafts products division was Joseph Engleberger. Engleberger was very interested, and Devol agreed to sell the company his patent and some future patents in the field. Just as this decision was being made, however, Dresser Industries bought the company and couldn't see the need for an aircraft division, industrial robot patents notwithstanding.

Engleberger and Devol looked around for a backer to buy out that division and came up with Consolidated Diesel Electric (Condec), which agreed to put up financing and continue development of the robot. This new division was called Unimation, and Joseph Engleberger became its president.

Five million dollars was spent to develop the first Unimates. In 1966, after many years of market surveys and field tests, production began.

Although Devol sold the first robot to General Motors in 1960, initially it was the European companies that saw the necessity for large purchases. "At one time," Devol cries indignantly, "Fiat had more machines than anyone in the world.

"How come the Japanese are allowed to walk away with the business?" he demands to know. "It's ridiculous! I'll get myself into a lot of trouble," he says, "but I think it's unfortunate that American industry is run by a lot of bookkeepers who are interested only in the bottom line. There's no forward thinking. That's the opposite of the way the Japanese go at it. They're very robot oriented."

Despite Devol's cynical indictment, there is a sudden worldwide explosion of interest in robots—and now it's big business. Devol thinks the answer is "dollars and cents." He explained that traditional automated machines are built for a specific job—nothing can be altered. So, when style changes are required, machines must be junked and the costs go through the roof. Additionally, a human laborer demands a salary; a robot does not. And a robot can work three shifts without fatigue, producing precision parts every single time.

"Anyone who does not buy industrial robots will have trouble staying in business today," Devol predicts. "And the companies that can make their own robots, that can manufacture the best industrial robots for their industries, they'll be way ahead of the other fellow."

In fact, that's what's happening today. GE, IBM, and many other companies are building robots in-house—and it's supersecret. Devol is consulting with some of these companies, giving them advice on how to set up robot production.

Devol says he thinks there are three main parts to the robot business: the body—companies like Unimation and Cincinnati Milacron build those; the brain—companies like Calma Automatics build controls and television approach sensors; and systems. As to the latter, companies will eventually set up the whole system in a plant and offer it as a turnkey operation, just as they

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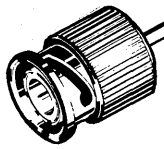

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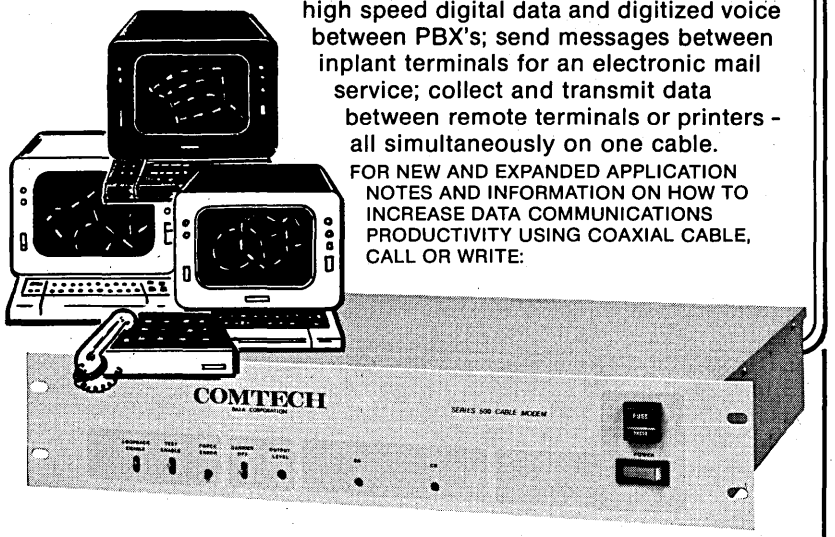

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build power plants today. Right now, there are no such companies, but, Devol says, "someone will do it."

Devol thinks speed will be the next big breakthrough. "You want to be fast and lightweight," he said. "Time is money; if, for example, a plant can turn out 1,800 machines a day with three shifts of robots, and then go twice as fast, your net cost has gone down astronomically." Devol sees the use of more sophisticated accelerometers and mass measurement devices to enable a robot to be more flexible, hence faster.

Although he holds patents on both visual and tactile sensors for robots, Devol says that he does not think "it will be as big as standard high-speed, low-cost units." This is because many operations do not require such sophisticated equipment. Devol cites the difficulties manufacturers have with bin-picking. "You have a sprue made in a certain form, anything except round, so that it can only be handled in a certain way," he explains. "The robot can take it out, put it in a quench to cool it and, rather than dropping it onto a conveyor, which begins to cost money, take the part out and put it into a trim press . . . Do whatever is necessary . . . and when you're through, paint it, put it into a package, and have the robot palletize, and ship it off. You do it all in one process."

In some cases, however, there will be a need for sophisticated sensors, for example, when a stock of material builds up because one machine works faster than another. In these instances the robots will cost more and invariably be slower because, as Devol explains, "more complexity means lower reliability."

Devol talks about a sophisticated sensor he developed to solve an ongoing problem in die cast operations. For years he had observed men being forced to inspect dangerously hot die cast machines by eye to make sure that no metal had been left after the die was withdrawn. Always thinking of ways to relieve men of robotic work he patented a digitally controlled valve that carries an infrared detector built into the robotic arm. His patent No. 3,525,382 goes back into the casting machine after the die has been withdrawn to detect the presence of any metallic substance.

What new developments can we expect to see in the industry in the next few years? Devol predicts several. There's going to be standardization of language very soon, so a user can "go to a computer without having a lot of modems in between." They're working on it in a "number of different countries right now, looking at all existing languages, such as FORTRAN, trying to decide if one or a combination will become the standard. It'll be a common language internationally."

Stanford University is working on artificial intelligence devices which "can make robots where self-determination is in a very crude way accomplished," he adds. "Who's going to use this and for what I don't know."

There won't be any different problems with the introduction of robots than there were with automation, Devol feels. "For all the automation that exists now there are still far more people working than ever in the past," he points out. "I do not see any big displacements in the next five years. You just couldn't make that many robots. There would have to be millions of industrial robots manufactured before there is a serious problem. Then, they'll be retrained and reeducated." Men will be working side by side with robots, on the assembly line—laying out parts for robots to handle, for example. Also, there will be a need for supervision to keep a check on the robots. "There are just better things for people to do than be robots," Devol asserts. "There will be many people you can never replace with robots—those who do thinking jobs."

Devol thinks the increasing acceptability of industrial robots today may be due to the fact that many U.S. companies are "running scared and changing their atti-

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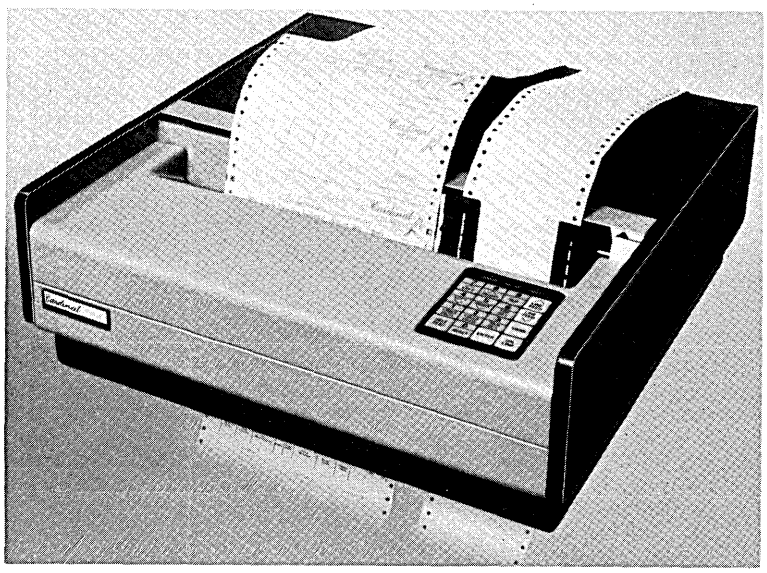

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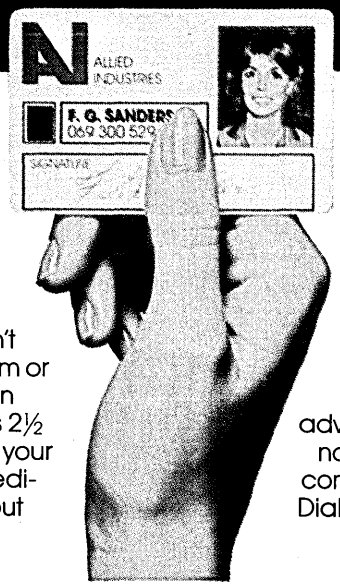

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tudes about what they are willing to do. If this is so," he continues, "it will make a big difference. Also, I think labor has come around to thinking 'maybe we better do the best kind of job we can.' "

At 69 years of age, George Devol is full of energy and enthusiasm. With his shock of white hair, he looks very much the grandfather that he is, but he's not ready to sit home and "look out the window. There are mountains—so I'll climb them," he states with obvious relish.

What mountains is he planning to climb these days? For starters, he has just formed Devol Research Associates, in Fort Lauderdale, Fla., a consulting firm whose aim is "to further the development of robots and related devices in industry." One piece of advice he gives to industry is to install a robotics department and "call that department in when new products are being developed, if you want to have efficient use of robots. There are a lot of things you can do in the beginning that you cannot do later on. You cannot put robots in and expect miracles. The whole system must be thought about beforehand."

In addition, he is seeking financial support to allow him to create a nontraditional robot research company. It would be made up of robotics engineers who would have a share in the company that would develop their ideas. It may have to be a decentralized plant, however. Devol explains that there is a "shortage of good robotics engineers, mainly because this specialty is a hybrid. A robotics engineer would have to be expert in hydraulics, computer software, electrical and mechanical engineering." When he does find good engineers, many of them may not want to relocate.

Devol is also trying to get a robot leasing business started. "Say a small manufacturer can use 10 to 15 robots, but no one in the company knows anything about them. We come along, with our expertise, and lease them robots on a long-term basis, at a price that's less than they're paying for labor at this time."

There will also be room for what Devol calls "the chicken parts business." That would be selling parts of robots for installation on machines a company already owns. For example, a transfer machine: a robot arm could be installed between two sections and transfer parts from one to the other.

And, just to make sure you know he's still in business, Devol whips out a sheaf of papers—his latest patent, this one in the field of magnetostrictive manipulators, or microrobotics, and a field he has just created. It is based on the scientific principle that if you "take a piece of metal and excite it with high frequency voltage, it will grow by an absolute, fixed amount. This is true for nickel and other materials in that family. You could make a robot out of it. It hasn't been applied yet; maybe $10 million later we'll have a piece of equipment. The only application I see at the present time is in disconnecting microcircuits."

As he leans back on the cushions of the sofa, Devol looks out from the enclosed patio of his summer home in Connecticut, onto the green lawns and very blue sky, and says with satisfaction and the quiet pride of accomplishment, "You know, there aren't many people who get a chance to start a whole new industry."

—Marlene Zimmerman

COWBOY COUNTRY

Even as a boy growing up in New York City, Ralph Gabai knew all about Chatsworth, Calif.

"It was cowboy country, where all the cowboy movies were made." Now, sitting in his Chatsworth office, the new chairman and chief executive officer of Micro Peripherals, Inc., sees it as floppy disk country. Of his company's competitors in the 5¼-inch floppy disk market, two are close by, Pertec around the corner and Micropolis in Canoga Park. Wangco and Shugart are farther away, "but still in California."

Gabai likes living and working in Chatsworth, but he's still a New Yorker at heart. "If I could have it my way, I'd spend from mid-September to mid-December every year in Manhattan."

He also likes small companies, which is one reason he joined four-year-old Micro Peripherals. The other reason, he says, was "the challenge." The company has been doubling its sales each year and this year it expects to do $30 million. But it was operating in the red until the middle of fiscal '81, ended April 30, when it finally pushed its way into the black. "It was growing too fast." Gabai's charter is "to get the company on a firm financial footing." The first thing he did was to obtain financial commitments from all the company's investors "to carry us through this calendar year," in terms of operation and expansion.

RALPH GABAI: "Funny how many people still refer to all memory as core."

Gabai joined Micro Peripherals from Dataproducts, where he had served for eight months as senior vice president for marketing and corporate development. "This came along too soon after I joined Dataproducts. But I couldn't turn down this opportunity even though it's not my track record to make one-year hops."

Before Dataproducts, Gabai spent eight years with Pertec, where he was vp and general manager of the Peripherals Div. "When I joined Pertec it was smaller than MPI is today. I stayed through the acquisition [by Triumph Adler], but I didn't want to work for a company that large."

His first job, though, was with a large company. Shortly after receiving an engineering degree from Columbia University, Gabai joined ITT as a design engineer. He subsequently moved into sales and marketing and later joined Ampex's field organization in the New York area. In 1966, he joined the Data Products Div. of Lockheed Electronics Co., first as eastern region sales manager. "In 1969, they moved me to L.A. as marketing manager of core products, and eventually I headed marketing for core and minicomputer products. Funny how many people still refer to all memory as core," he muses.

In 1977, while at Pertec, Gabai recruited Bob Dideon from TRW and together they pushed sales of $35 million a year up to more than $100 million.

"Pete Sidhu hired Bob away from me in 1979." Sidhu was the founder of Micro Peripherals and is still a director of the firm. Dideon was hired as president and still retains the position.

"Bob and I wanted to pursue offshore activities when we were at Pertec," Gabai recalls. Now Micro Peripherals is doing just that. A new Singapore subsidiary shipped its first batch of floppy disks, made from kits supplied by the parent company, in September.

Gabai's goal for Micro Peripherals is to get the firm to $100 million a year in sales in three years. The company claims to be world leader in high-density 5¼-inch floppies. And it's gearing up to get into Winchester disks which will be introduced by the end of the year. Coming sooner is a "slim line" 8-inch floppy which Gabai contends is the smallest 8-inch floppy ever produced.

—Edith Myers

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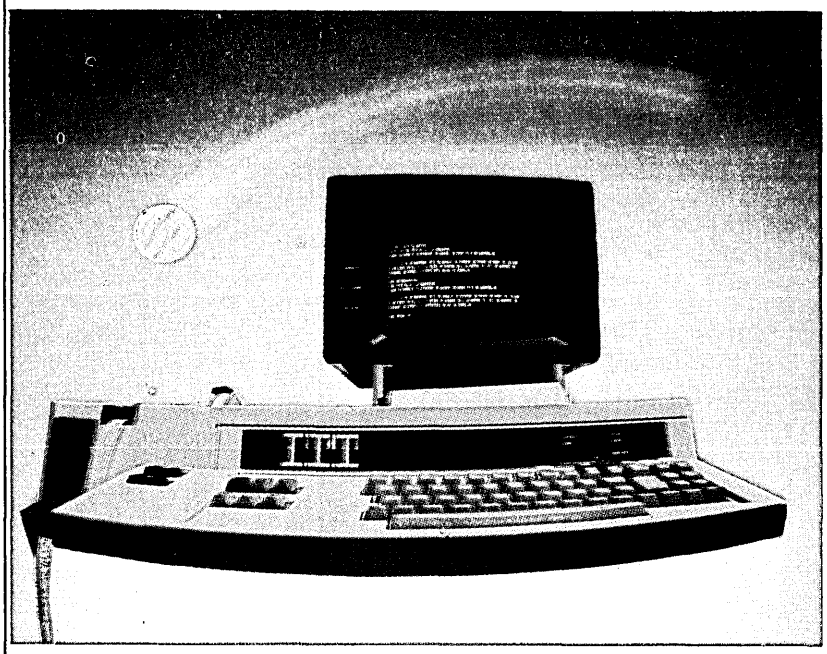

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HARDWARE

OFF-LINE

Hewlett-Packard released details of a 32-bit VLSI processing system at the International Solid State Circuit Conference. The company did not disclose where it would use the VLSI chips, but it indicated that it plans to introduce a product sometime within the next year or so.

Speaking for the company, S. Dana Seccombe, manager of the R&D Lab at HP's Systems Technology Operation in Fort Collins, Colo., described the six-member chip-set as consisting of cpu, I/O processor, memory controller, RAM, ROM, and clock. Each chip is fabricated using one-micron NMOS-III technology, providing a three- to eight-fold increase in circuit density compared to current, commercially available processors. The quarter-inch-square cpu contains 450,000 transistors, while system RAM is the densest chip, with 660,000 devices. The 32-bit cpu offers 230 instructions and operates with a 55nsec microcycle time. The RAM chip comprises 128Kbits organized as 16K by 8; it has a 165nsec access time. ROM is laid out as 16K by 40 bits (640Kb). DMA and interrupt handling are provided by the microprogrammed I/O processor. The memory controller manages 256KB of RAM or 512KB of ROM. The nonoverlapping 18MHz are generated by the clock.

General Electric Information Services Co. has begun installing IBM 3081 processors to serve its Mark 3000 remote computing service customers. Three of the new processors will be installed over the course of the year, two for production and one as backup. The first 3081 to go in displaced two 3033s; the three-processor installation program began in February.

CRT TERMINAL

Altos Computer Systems has come out with the Altos 1 display terminal, its first offering in the terminal market. A detached keyboard crt terminal with a tiltable, rotating display, the Altos 1 provides an RS232

interface capable of supporting communications at 15 standard data rates ranging from 50bps to 9600bps. The terminal's display format is 24 lines of 80 characters, with two additional lines reserved for messages and function key labels. Editing and cursor control keys are provided, as well as function keys and a 14-key numeric pad. Graphics, in the form of line drawing, and horizontal and vertical split screen with independent scrolling are additional features of the Altos 1. A printer port also is provided. The Altos 1 sells for $995 in singles, with quantity discounts available. ALTOS COMPUTER SYSTEMS, San Jose, Calif.

FOR DATA CIRCLE 301 ON READER CARD

IBM P.C. MEMORY

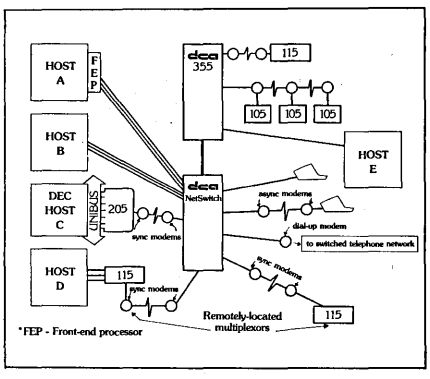
Just as memory makers have created niches for themselves selling additional memory to IBM mainframe users, and others have done the same for various personal computers, Davong Systems has drawn a bead on the IBM Personal Computer add-in memory market. Using 64KB chips, Davong will sell you 64KB, 192KB, or 256KB add-in boards. A 64KB board goes for $395, a 192KB board is $845, and a 256KB board carries a $1,075 price tag. All prices are suggested retail, and the boards currently can be obtained at selected ComputerLand stores. DAVONG SYSTEMS, INC., Mountain View, Calif.

FOR DATA CIRCLE 302 ON READER CARD

NETWORK CONTROL

The NetSwitch allows connection of many local and remote terminals to one or more groups of ports on one or more host systems; connections are provided to users on a first-come, first-served basis. Developed by Digital Communications Associates, the NetSwitch can be used with DCA's multiplexing equipment, including System 105 and System 115 statistical multiplexors, System 205 Unibus interfaces (for PDP-11s), and the larger System 355 master network processor.

Up to 1,376 local and remote multiplexed ports can be supported by the NetSwitch. Additionally, remotely located NetSwitches can be cross-linked. For terminals connected locally, the NetSwitch can handle from 32 to 1,120 ports. The number of optional multiplexed trunk links supported by NetSwitch range from two to eight. Each trunk can handle 32 ports. NetSwitch ports and trunk lines can run to 9600bps. A Synchronous Channel Option

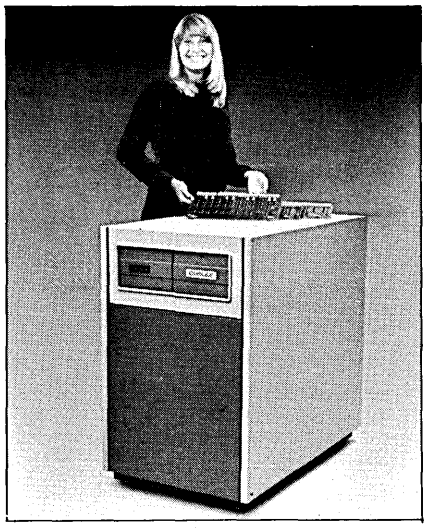


permits mixing asynchronous and synchronous traffic over a single trunk. The entire system is controlled by multiple microprocessors operating in parallel. A network management console allows interactive control of network function, including changing port parameters and routing information. The console also can retrieve information on network traffic levels and switch operation, as well as initiating tests of both local and multiplexed remote ports. The operator can restrict access between specified terminals and ports. RS232 and 20mA current loop interfacing are standard. The NetSwitch can be upgraded in the field to a System 355 master network processor. Base pricing on the NetSwitch starts at $11,595. DIGITAL COMMUNICATIONS ASSOCIATES, INC., Atlanta, Ga.

FOR DATA CIRCLE 303 ON READER CARD

DISK SUBSYSTEM

For users of HP 3000 series computers, Qualex has developed a disk subsystem with cache memory options. The Group 3000

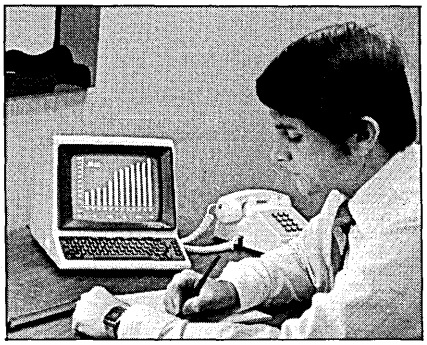


Disk System emulates HP 7925 disks while providing up to a fivefold increase in storage capacity. In a package roughly the size of a 7925, Qualex packs 360MB of Winchester disk; capacity can be upped in 120MB increments to 600MB. Four cache configurations range from 128KB to 4MB, according to a company spokesman. Average access time for the Group 300 is quoted at 20.33msec. The system's controller emulates existing 7925 drives and includes provision to emulate 7935 drives in the future. Qualex says it can attain a cache hit ratio of 80% to 90%, which in turn yields a 200% to 300% improvement in throughput. Dual I/O ports allow connection to two processors. Single unit prices range from $26,500 to $56,000 depending on disk and cache capacity. QUALEX TECHNOLOGY INC., Westlake Village, Calif.

FOR DATA CIRCLE 304 ON READER CARD

CRT TERMINALS

Tymshare now offers a pair of small crt terminals manufactured to its specs by the French electronics giant, Matra. The Scanset series of terminals consists initially of two models, the 410 and the 415. Each occupies only one square foot or so on the user's desk. The model 410 features automatic log-in, while the 415 has an integral 300bps modem, autodialing, and auto log-in. Both can format their displays as either 24 lines of 80 characters or 24 lines of 40 characters. Each comes with the standard



ASCII character set, mosaic graphics, and a supplementary graphics character set. A printer port, capable of operating at 150bps, 300bps, 1200bps, or 2400bps, is provided, while the terminals themselves can communicate at data rates of 75bps, 150bps, 300bps, or 1200bps. An RS232 port is provided for direct connection to a host or external modem. The model 415 can automatically dial up to 36 phone numbers, using either pulse or tone dialing. The first four numbers also can have log-ins defined, making connection to a remote machine a one-button operation. The model 410 sells for $495 and the model 415 is $649. TYMSHARE, INC., Cupertino, Calif.

FOR DATA CIRCLE 305 ON READER CARD

EIGHT-INCH DISK

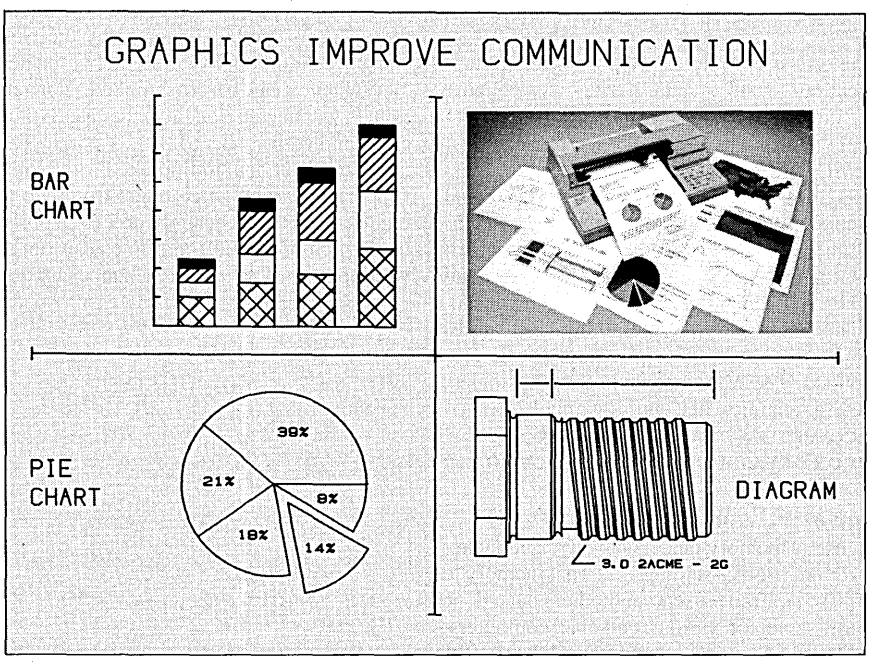
Modcomp has added 8-inch rigid disks to its line of drives for the Classic family of processors. The drives offer 13.5MB of storage, 6.75MB on fixed media, and 6.75MB on removable cartridge media. The drives are packaged for rack mounting; the package

HARDWARE SPOTLIGHT

PERSONAL PLOTTER

Hewlett-Packard has come up with a small format dual-pen plotter for the personal computing market. The $1,550 HP 7470 plotter can be used with HP machines, both large and small, as well as offerings from such personal computer manufacturers as IBM, Apple, and Commodore. Users have the choice of two interfaces: HP-1B or RS232. The plotter uses technology HP has developed for its other plotters, including microgrip paper handling, which simplifies paper loading and ensures consistent positioning, and a pen carrier that holds but one pen at a time, with the other automatically capped and stored in a stable. Since the dual-pen plotter parks the unused pen in its stable, a user can change pens during a plot to achieve plots of more than two colors. The smart, microprocessor-driven 7470 uses HP-GL (Graphics Language), a set of more than 40 two-character commands to offload the host. The plotter also has built-in character generation, including European character sets, vector plotting, and several internally generated line types. Scaling also can be done by the plotter without burdening the host. Resolution is 0.001 inch, and repeatability is 0.025 inch. Plotting speed is 15ips. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 300 ON READER CARD



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PCB MOTHER BOARD	EA	B	1783
LABEL NAME PLATE 920	EA	B	1759
DIODE, RECT 3A 200V,MR502/S3A2	EA	B	1572
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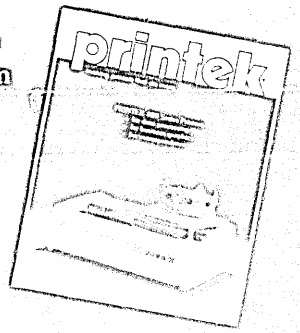

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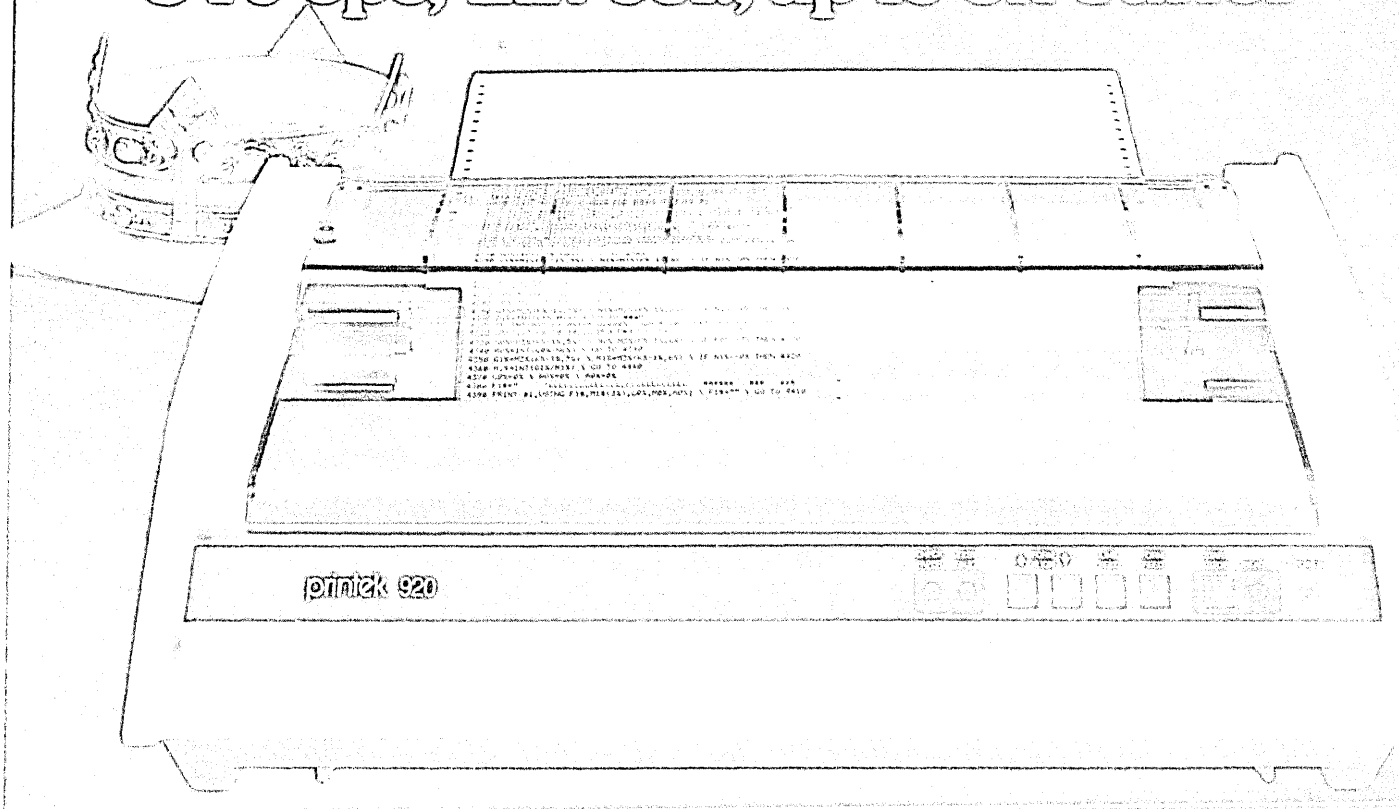

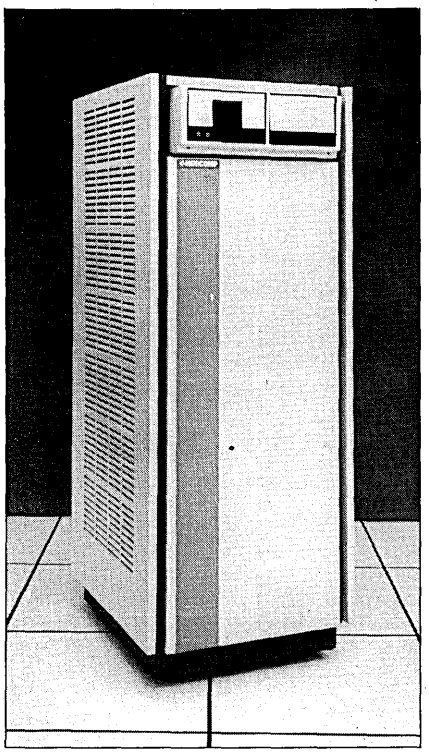

includes drive plus covered storage area for three disk cartridges. The unit's controller can handle up to two drives, either the new 8-inch variety or Modcomp's existing 26MB, 67MB, or 256MB single-ported drives in combination. A 13.5MB disk subsystem, with controller, sells for $11,775; an additional drive is $6,475. Production deliveries are planned for the second quarter. MODULAR COMPUTER SYSTEMS, INC., Ft. Lauderdale, Fla.

FOR DATA CIRCLE 306 ON READER CARD

SMALL U.P.S.

Gould's Standby Power System (SPS) uses the firm's maintenance-free Gelyte sealed gelled electrolyte lead-acid battery to provide 200 watts of 120 volt 60Hz power to word processors, small computer systems, and the like in the event of a brownout or total blackout; the unit will provide 200 watts for 20 minutes. Sitting between the power outlet and the device(s) being protected, the SPS also functions as a line filter, removing noise spikes. When the power drops below 102 volts, the battery takes over within one cycle. An integral inverter converts the DC from the battery into a 60Hz square wave. If the power comes back before the battery drains, the unit resumes its filtering and recharges the battery. The SPS0200 (200 watts for 20 minutes) sells for $489; another version, the SPS0400, provides 400 watts for 10 minutes at a price of $689. GOULD INC., Portable Battery Div., St. Paul, Minn.

FOR DATA CIRCLE 307 ON READER CARD

IBM-COMPATIBLE SYSTEMS

Nixdorf, which has been keeping its thumb on the pulse of the IBM mainframe market for some time now, has rolled out three systems—processors, peripherals, and operating system software—to compete in the 4331 and 4341 market. Dubbed the Nixdorf 8890 Series, the family consists of models 30, 50, and 70, which the firm says are comparable to IBM's 4331 Group 11, 4331 Group 2, and 4341 Group 10, respectively. The systems all run Nixdorf's NIDOS/VSE, said to be compatible with IBM's DOS/VS and DOS/VSE. According to company president Carle Jansen, "For the first time, the customer seeking an IBM-compatible alternative can turn to a single supplier for his complete hardware, software, services, and support requirements." A large undertaking, but the firm seems to be molding itself into a mini-IBM, allowing users to retain their investment in applications software while at the same time severing all ties with Big Blue. Nixdorf isn't forcing the point, since it states that users desiring to do so can run other IBM SCPs if it suits their purposes.

The 8890s use a multiple-processor architecture comprising a 32-bit microprocessor acting as cpu, a main memory processing unit, an I/O processing subsystem, and a service processing unit. The larger two models, the 50 and the 70, also include an instruction preprocessing unit that speeds commercial applications. The processors use microcode, allowing the inclusion of IBM-type assists and others that may be released by Nixdorf in the future. The memory processing unit can reconfigure memory around partial failures; the I/O subsystem connects dedicated I/O micros to the cpu and Memory Processing Unit. The Service Processor supports remote diagnostics and provides error detection, recovery, and other support activities. Integrated communications controllers provide interactive and networking capabilities, including support for asynchronous, bisynchronous, and SDLC/SNA protocols.

The 8890/30 can have up to 2MB of memory and can support up to eight Nixdorf 8330 or 8350 disks (equivalents of IBM 3330 Model 11 and 3350). It also can attach up to four 8410 or 8420 tape subsystems (IBM 3410 and 3420 equivalents). The Model 30 comes with a byte multiplexor channel interface and a block channel interface for attachment of peripherals from other vendors. The system can also support up to eight communications lines.

Model 50 can be configured with up to 4MB of memory, sixteen 8330 or 8350 disks, and eight tape subsystems. It has two byte multiplexor channel interfaces and two block channel interfaces; up to 16 communications lines can be supported.

The top of the line Model 70 handles 8MB of memory, 24 disks, and 12 tapes. Two byte multiplexor channel interfaces and three block multiplexor interfaces are provided. Thirty-two communications lines are supported. Pricing for the systems, including peripherals, ranges from $90,000 for the smallest Model 30 to $800,000 for a high-end Model 70. Nixdorf estimates that users will wind up paying somewhere between $500 to $1,000 per month for systems software, including its support. NIXDORF COMPUTER CORP., Waltham, Mass.

FOR DATA CIRCLE 309 ON READER CARD

COLOR TERMINAL

Telex has widened its line of 3270-compatible display terminals with the debut of its Model 279 Color Display Station, a plug-compatible alternative to IBM's 3279/2A keyboard display. The 279 reportedly requires no changes to the system or the controller to be able to display alphanumeric data in colored fields. The color displays operate with either Telex's 276 or IBM 3274/3276 controllers; both 279s and monochrome Telex 278 or IBM 3278 displays can operate within the same cluster. The unit can display up to 1,920 characters formed on a 9 × 14 dot matrix. Color display attributes and their associated field formats are: white, protected/intensified; red, unprotected/intensified; blue, protected/nonintensified; and green, both unprotected/nonintensified and status line/message symbols. A switch allows the operator to put the 279 into two-color mode, making it operate as a 3278 equivalent. The 279 sells for $3,500. Leasing plans are offered. TELEX COMPUTER PRODUCTS, INC., Tulsa, Okla.

FOR DATA CIRCLE 308 ON READER CARD

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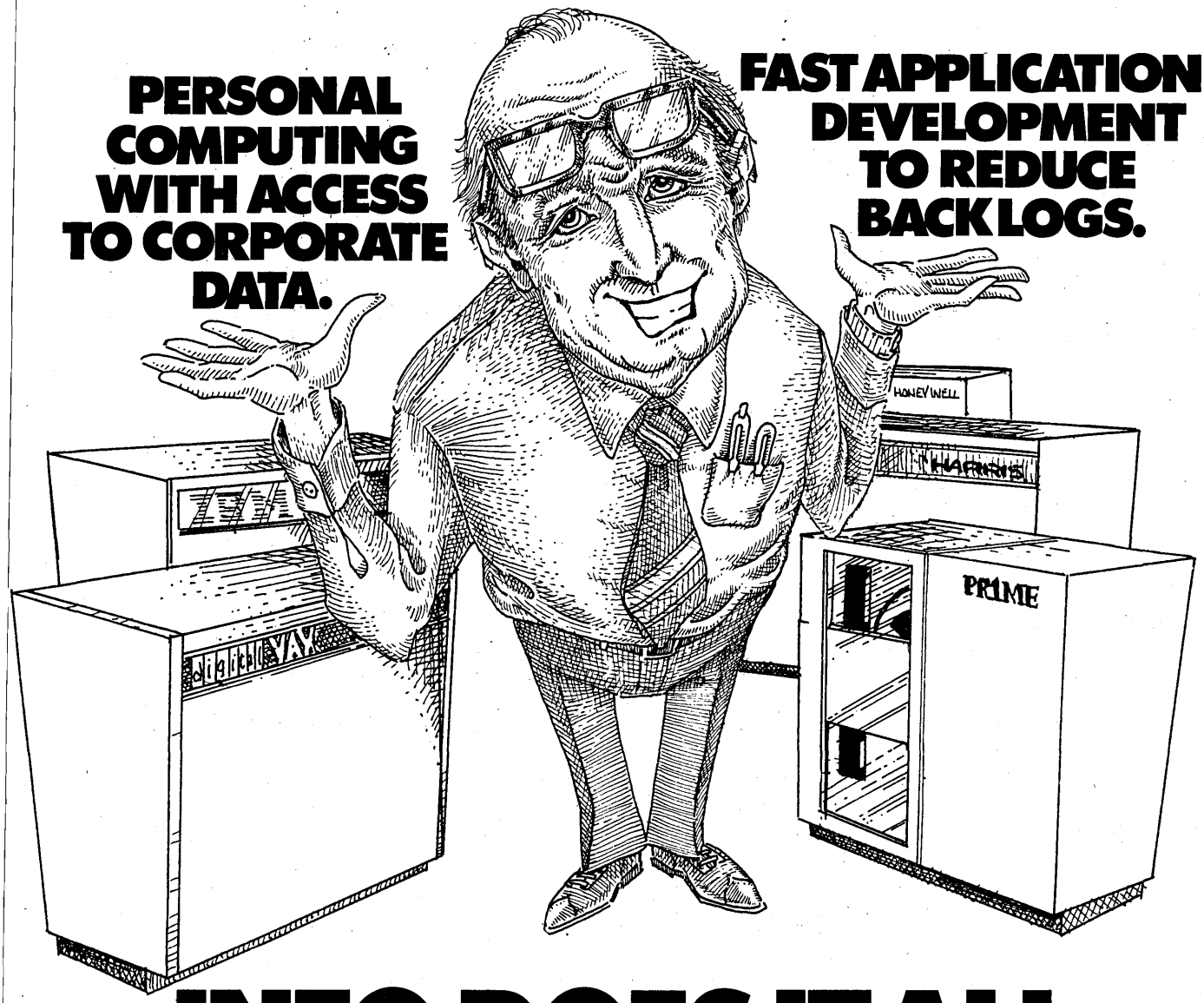

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SOFTWARE AND SERVICES

UPDATES

Atari has made its first $25,000 Star Award to software author Fernando Herrera, of Elmhurst, N.Y., for his educational program, My First Alphabet. The 38-year-old winner started a new career as a computer store manager in December. A native of Colombia trained in architecture and industrial design, Herrera taught himself to program about two years ago. His son, then two years old, inspired him to build a computer alphabet. Starting with E, he first drew the letter in a large format, then added an elephant as an illustration. Later, he added music and animated characters as well as screens for the numbers zero through 10.

The contest winners were picked from programs selected for publication in the Atari Program Exchange (APX) catalog. The eight programs selected for quarterly awards all competed for the 1981 grand prize. Three other authors received Awards of Merit: Sheldon Leemon of Oak Park, Mich., for his graphics package, Instedit; Greg Christensen, Anaheim, Calif., for Caverns of Mars, a game; and Ronald and Lynn Marcuse, of Freehold, N.J., for their Data Management System.

The French have begun hooking incompatible computers into their videotex prototype systems using Multitel, developed by the Cap Gemini Sogeti Software Group. The interconnect capability has allowed France's two largest mail order retailers and a major publisher to make their existing IBM databases available to the 2,500 homes and offices participating in the Télétel 3V trial in the Vélizy area. An IBM Series/1 mini acts as a front-end processor connecting a mainframe to the Télétel Videotex Center via an X.25 network.

STRUT YOUR STUFF

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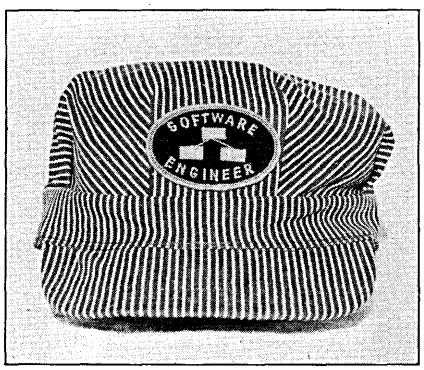

patch. The $6 caps come in adult sizes from small to extra large, and children's sizes from extra small to large. STATION PRODUCTS, Los Angeles, Calif.

FOR DATA CIRCLE 326 ON READER CARD

MVS/SP3 SIMULATOR

National Advanced Systems, attempting to rise like the Phoenix out of the ashes of Itel, has come out with a software offering to extend the productive life of IBM 370 processors. Extend/SP3 is a System/370 Extended Facility Simulator that lets current 370 users exploit IBM's latest MVS/SP3 SCP without waiting for or paying for an IBM hardware upgrade. A transparent simulation of the MVS/SP operating system, Extend/SP replaces the instructions provided by IBM's Extended Facility with native-mode 370 machine code. Available for all uniprocessor, attached processor, and multiprocessor systems, the simulator reportedly can increase system performance by as much as 12% without additional memory, and 20% with extra memory, for systems running MVS/SE or MVS/SP. Extend/SP carries prices ranging from $5,000 to $15,000. NATIONAL ADVANCED SYSTEMS, Mountain View, Calif.

FOR DATA CIRCLE 327 ON READER CARD

TAX PLANNING

Ah, it's April, and that means the taxman cometh. This could be an appropriate occasion for owners of Apple II or Western Digital Microengines to try out Aardvark Software's tax planning package, Personal Tax Plan.

Written in UCSD Pascal, Personal Tax Plan is a planning tool, not a tax preparation program. Developed by CPAs, the package allows taxpayers to calculate their tax liabilities under a number of assumptions: should you income average, or, if married, file separately or jointly? The program follows the format of the Fed's infamous 1040, and contains the latest tax laws for the years 1981-1984. The package includes instructions illustrated with two sample cases, "HELP" screens to aid the user entering tax data, and the ability to computerize multiple projections so the user can find the most advantageous method for computing tax liability. Results can be printed or displayed on a crt screen, and data can be saved on diskette for later review or modification. According to an evaluation conducted by the accounting firm of Touche Ross & Co., the initial release of the package performs as described in its documentation, and complies with the tax laws as of the date of evaluation. Although the accountancy could not perform an exhaustive test of the program, "a substantial variety of combinations of factors" using both valid and invalid data turned up no errors.

Touche Ross adds: "Satisfactory results, of course, are dependent upon the person using the system electing the proper alternatives, providing accurate data, and having an appropriate understanding of the tax laws." Personal Tax Plan sells for $130. AARDVARK SOFTWARE, INC., Milwaukee, Wis.

FOR DATA CIRCLE 328 ON READER CARD

REAL-TIME PASCAL

Designed from the ground up as a high-level language for implementing real-time applications on DEC's 11-series of processors—from the Falcon SBC-11/21 up to the

PDP-11 range—Parallel Pascal is an extended Pascal compiler that generates Macro-11 source code for subsequent assembly into machine code. Interactive Technology, Inc., developers of the compiler, says that code generated will be efficient enough to handle interrupts and other real-time requirements. While the compiler includes extensions for interrupt handling and direct addressing memory and processor registers, it also has provisions for calling assembly language subroutines. Currently, the compiler works under RT-11, with RSX-11 and other microprocessor operating systems targeted for later implementations.

Parallel Pascal derives its name from its ability to create and synchronize an unlimited number of concurrent tasks. The core language remains compliant with the second draft ISO standard for Pascal (as published in *Pascal News*, December 1980), allowing compilation of existing Pascal programs written to comply with the standard. The compiler uses multiple passes to create optimized object code. Its parallel features are derived from Modula, another programming language developed by Pascal's implementor, Niklaus Wirth. The overall intent of combining concurrency with Pascal is to provide a single high-level language for applications, including time-sensitive interrupt servicing, and I/O handling. The compiler, with three months' support, carries a $950 per cpu license fee; a demo package, priced at $25, includes two executable parallel screen display programs, an interactive version of John Horton Conway's "Life" game, and the Parallel Pascal compiler, stripped of its code generator (allowing potential users to experience compilation of programs using the language and its extensions, but barring execution of any such programs—a slick way of demonstrating a compiler). INTERACTIVE TECHNOLOGY, INC., Portland, Ore.

FOR DATA CIRCLE 329 ON READER CARD

DATABASE AUDIT TOOLS

Coopers & Lybrand's Computer Audit Assistance Group has released three of the software tools it uses when auditing applications that use IBM's IMS database management system. Ironically, the thorniest aspect of auditing a DBMS is probably the most attractive feature a DBMS offers application programmers and users: maintaining a central store of data that are used by many applications. Since many users access the same data, ensuring integrity becomes increasingly difficult. The three programs provide descriptions of the contents and structure of each database, as well as identifying the on-line programs that can access each, the transactions each program processes, the transactions and commands a given terminal can issue, and the transactions and commands a password authorizes.

The IMS PSB/DBD Analyzer pulls information from the Data Base Description control block and the Program Specification Block to provide a description of each database in an IMS environment and a global view of each, along with the view and manipulations possible from each program accessing the database. The IMS DC Analyzer helps the auditor sort out what transactions access databases. It also identifies transactions that can send messages to other terminals or trigger transactions within another program. To verify the security of IMS databases, the IMS DC Security Analyzer is run as a standard application—if it can complete without special authorization, the system is not adequately protected. All three programs can be licensed for $10,000, plus $2,000 per year maintenance after the first year. The PSB/DBD Analyzer and DC Analyzer are each priced at $5,000 ($1,000 per year maintenance), and the Security Analyzer is $2,500 ($500 per year maintenance). COOPERS & LYBRAND, New York, N.Y.

FOR DATA CIRCLE 330 ON READER CARD

REAL-TIME OPERATING SYSTEM

Data General has pared back the AOS/VS operating system used on its 32-bit Eclipse MV/8000 and MV/6000 processors, producing AOS/RT32—an operating system designed for real-time, high throughput dedicated applications. Applications are developed under AOS/VS in any of three languages—FORTRAN 77, PL/1, or DG/L—and executed in the AOS/RT32 environment. A strict subset of the full AOS/VS operating system, AOS/RT32 can support up to 64 parallel processes, each with as many as 32 tasks. Well-defined system routes are provided for internal coordination and communication between tasks. Process management, memory management, task management, file system, block I/O, character I/O, and peripheral management are provided by separate, independent subsystems. Under AOS/VS, the user can generate an AOS/RT32 system comprising only those features required for the application at hand. The real-time system can manipulate disks formatted for AOS/VS; additionally, it can handle unstructured disks because of its ability to control I/O operations. System calls allow a process to manipulate its full 512MB ad-

SOFTWARE SPOTLIGHT

COBOL MAINTENANCE

Micro Focus, developers of the portable CIS COBOL and Level II COBOL compilers, has a new maintenance tool, the COBOL Animator. Designed to let programmers interactively debug COBOL programs at the source code level, the Animator displays a COBOL program as it executes. At any point the programmer can pause to examine, and possibly change, the value of variables; a paused program can be restarted where it was interrupted, or at any location the user desires.

In addition to helping get the bugs out of a new application, the Animator can help maintenance programmers develop an understanding of applications written by others. Instead of walking through an unfamiliar program, the maintenance tool will let the user "drive through" (if you'll pardon us for coining yet another phrase). The Animator's ability to inspect and alter the values of variables, coupled with its facilities to execute the application in whatever sequence the user desires, offers the user a means to explore various logic paths, much as a vacationing motorist might take interesting looking detours.

Animator can—at the user's discretion—display information in virtually any level of detail. The user can ask for the execution of a single COBOL statement, continuous execution at whatever speed is most comprehensible, execution to the next IF statement, or rapid execution displaying only those screens seen by the application user (without showing the source code flyby). It also lets the user split the screen into two variable-sized windows showing segments of code that may be widely separated in the program. Regardless of the level of detail being displayed, execution will halt when the programmer presses the space bar, when a user-set breakpoint is encountered, or when a run-time error occurs. If the program is halted, the user can inspect any desired section of source code, check the value of variables, alter variable values, and resume execution at any desired statement. Variables can be monitored continuously, with their value displayed at the bottom of the screen. The Animator will follow the path of CALLed programs; if they are already considered correct, the user can instruct Animator to suspend animation when these programs are entered. Similarly, the user can tell Animator how deeply nested PERFORMS should be animated.

Animator runs on a variety of microcomputers of both the 8- and 16-bit persuasion. It requires either of the Micro Focus COBOL compilers, although the program to be animated can be written for any COBOL compiler that meets the ANSI 1974 standard. This allows programs written for mainframes to be debugged on a micro. For micros running the CIS compiler, the operating environment must be CP/M; the Level II compiler requires CP/M-86. Support for other environments, such as PDP-11s, Motorola 68000s, and the IBM Personal Computer, is expected.

Initially, Micro Focus targets the large dp shop as its primary market; oems are also sought. A site license for the Animator goes for $1,000 per month, payable at the end of each month (that's a built-in, 30-day trial period). MICRO FOCUS INC., Santa Clara, Calif.

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CIRCLE 159 ON READER CARD

dress space, consisting of 2KB pages (pages can be shred between processes or held privately by a single process). The minimal hardware configuration required to run AOS/RT32 includes a 32-bit Eclipse processor with at least 256KB of memory, a Dasher console device, and a system mag tape boot device. An initial license for the real-time operating system goes for $5,000, and subsequent licenses are $3,000; adding support for disk drives adds $500 to the above prices. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 331 ON READER CARD

DATABASE INTERFACE

The Generalized Data Base Interface (GDBI) is Informatics' latest option for its Mark IV Implementation System. With GDBI, applications programmers gain transparent access capabilities to virtually any DBMS. The option allows Mark IV to be used for batch processing of any type of file or database. The interface lets programmers use the same Mark IV code to process standard files, as well as databases maintained by such systems as ADABAS, IDMS, Total, System 2000, IMS, and others. User-written mapping requests define database access call sequences, strategies, and techniques; this approach provides both transparency and insulation from problems caused by future enhancements and changes to the database management system. Selective record and segment processing is said to reduce processing time and I/O overhead by letting applications manipulate an entire record, a single path of a record, or a single segment. Selective data mapping within the mapping request ensures system security by supporting operating system password protection facilities and Mark IV passwords. GDBI runs on IBM and compatible mainframes operating under OS/VS, DOS/VS, DOS/VSE, or CMS. Base price for an OS/VS version of GDBI with Mark IV is $10,000; GDBI can also work with the Answer/2 report writer OS/VS (base priced at $6,500 with GDBI). INFORMATICS INC., Canoga Park, Calif.

FOR DATA CIRCLE 332 ON READER CARD

UTILIZATION MONITOR

Both cpu and real memory utilization within NCR mainframes running under the Virtual Resource Executive (VRX) can be graphically displayed on a crt screen using VRX-Stats. The package comprises two programs—Memstat and Cpustat—and can run on any V-8000 series system with at least one NCR 796-201 or 796-401 display terminal with graphics capabilities. Memstat periodically samples real memory usage, displaying the resulting sampled data in any of four formats. A Specific Job Display shows the last 15 samples of real memory used by a given job; an All Job Display shows memory use by each active job; a Memory Map Display shows the total real memory used within the system during the previous 15 sample periods; and an Available Real Memory Display gives the last 15 samples of free memory. Cpustat offers six displays of cpu utilization. An All Jobs Display shows cpu use by each active job, kernel satellite, and available processing capacity. The same information, displayed as actual cpu time in seconds as opposed to percentages, is available from the All Time Display. The remaining displays cover the previous 15 sample periods, including the activity of a given job, unused capacity, and total cpu usage. The VRX-Stats package carries a one-time license fee of $300. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 333 ON READER CARD

OPTIMIZING FORTRAN COMPILER

FORTRAN VII Z is dubbed a "universal" optimizing compiler for FORTRAN-77 programs written for the Perkin-Elmer Series 3200 line of computers. The company contrasts universal optimization to global optimization, stating that its new compiler optimizes across modules, gaining whatever speed is possible when subroutines are called. The company says that global optimization, as performed by many compilers including PE's FORTRAN VII O, misses possi-

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	TI Insight 10 Terminal	695	67	37	25
	TI785 Portable KSR, 120 CPS	2,395	230	128	86
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NEC SPINWRITER	Letter Quality, 7715 RO	2,895	278	154	104
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EPSON	MX-80 F/T Printer	745	71	42	27
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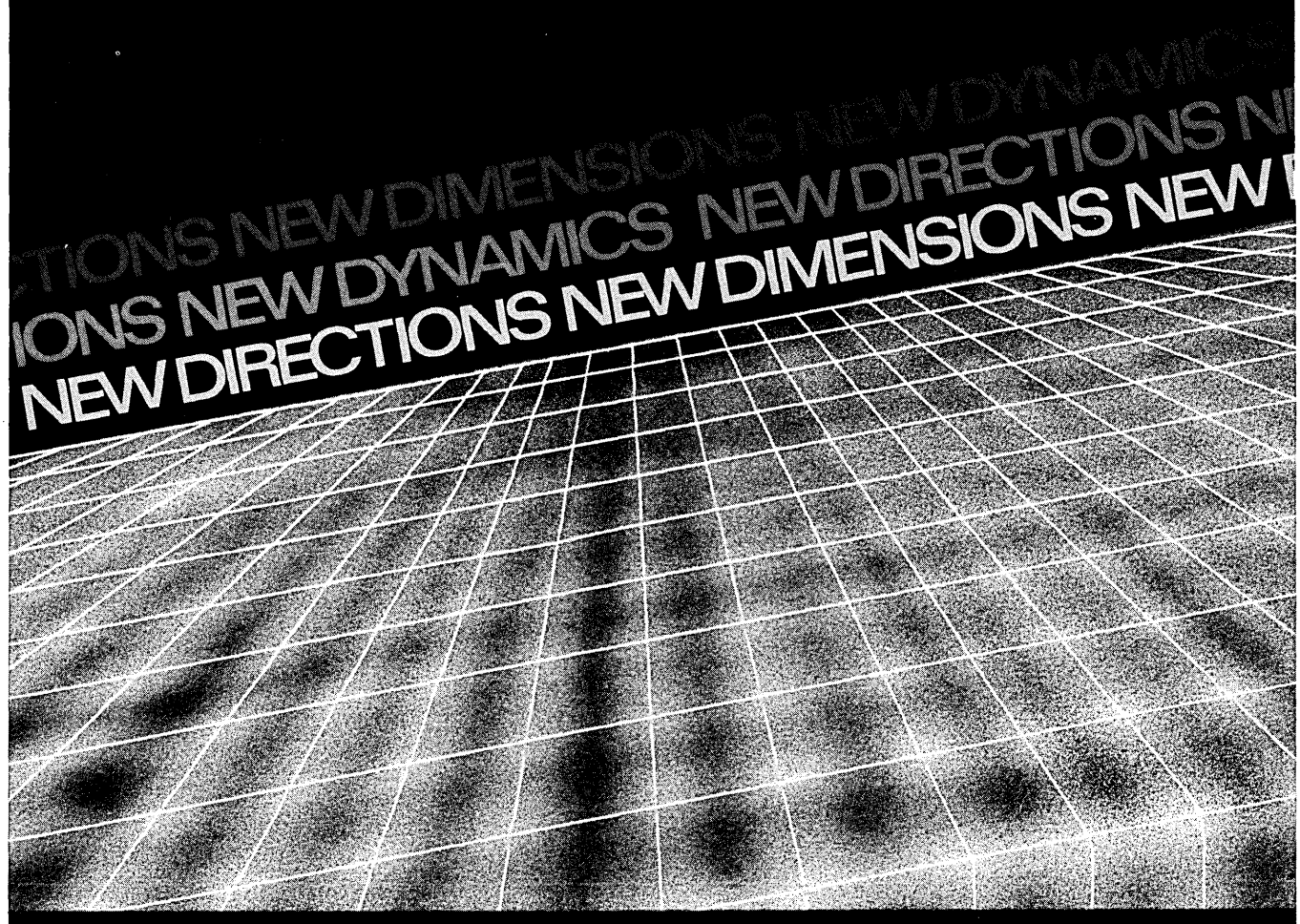

Sponsored by the Association for Computing Machinery Special Interest Group on Computer Graphics in cooperation with the IEEE Technical Committee on Computer Graphics, Eurographics, Harvard Graphics Week, and the Summer Institute of Media Arts.

ble shortcuts in subroutine calls because the compilers can't recognize the context of the CALL. The new compiler also has a development mode that compiles code at a rate in excess of 3,000 lines per minute. FORTRAN VII programs can run under the OS/32 MTM timesharing monitor, or directly under OS/32 in real time or number crunching applications. The programs also can run in the Reliance transaction processing environment. A licensed product scheduled for May availability, the FORTRAN VII Z compiler carries a $24,950 price tag. PERKIN-ELMER CORP., Computer Operations, Oceanport, N.J.

FOR DATA CIRCLE 334 ON READER CARD

SCHEDULING

VisiCorp (that's the new name adopted by Personal Software) has released its ninth program in the Visi series of interrelated packages for the Apple II personal computer. The new offering, VisiSchedule, lets the user create an on-screen schedule of projects and tasks; like VisiCalc, the scheduling program performs immediate updating, changing the schedule it is working on when new information causes changes. The program incorporates all relevant information, including scheduling constraints, costs, manpower, and resource leveling. The package provides time charts and other reports to assist the user in planning projects and managing resources.

As many as 160 tasks can be charted in a calendar format showing start and stop dates for each task and reflecting holidays and deadlines. A number of reports can be produced showing such important information as critical path, project milestones, cost estimates, slack time, manpower levels, prerequisites, etc. The program's resource leveling feature will reschedule tasks in slack times, if possible, so a hastily drawn schedule calling for eight workers one week and two the next will wind up using five workers over two weeks. VisiSchedule also estimates material and labor costs. The $300 package requires at least 48KB of memory on an Apple II or II Plus. A 50-task project will fit in a 48KB machine; adding either the Apple Language System or Microsoft RAMcard increases the capacity to 160 tasks. VISICORP, San Jose, Calif.

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APPLICATIONS

For its customer base of Series 80 computer users, Sperry Univac has adapted a basic general accounting system and a wholesale management application, both originally written for the BC/7 computer. The Accounting Management System, AMS 80, consists of four modules: accounts receivable, accounts payable, general ledger, and payroll.

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Order entry and billing handles the user's order processing requirements. The credit return function updates the sales, inventory, and customer accounts receivable files when credits are applied. Expanded sales analysis produces a comprehensive set of sales analysis reports. WAMS 80 licenses for $425 per month. SPERRY UNIVAC, Blue Bell, Pa.

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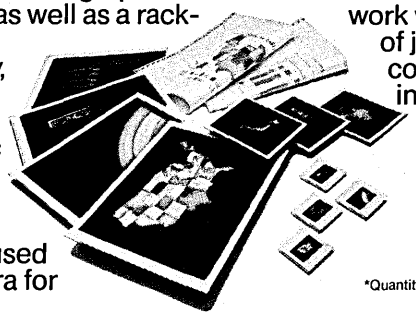

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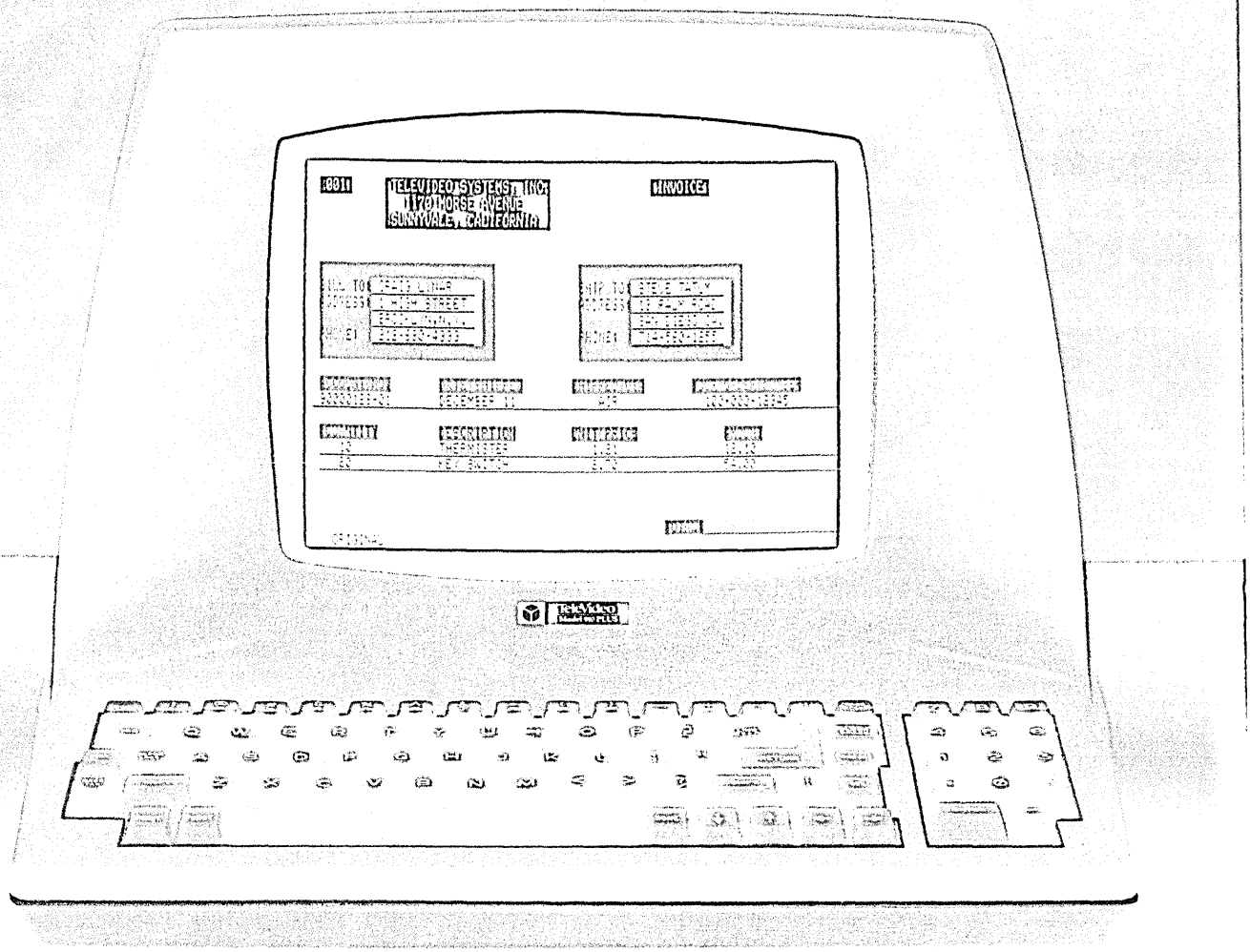

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CIRCLE 166 ON READER CARD

SOURCE DATA

BOOKS

HISTORY OF BINARY AND OTHER NONDECIMAL NUMERATION

by Anton Glaser

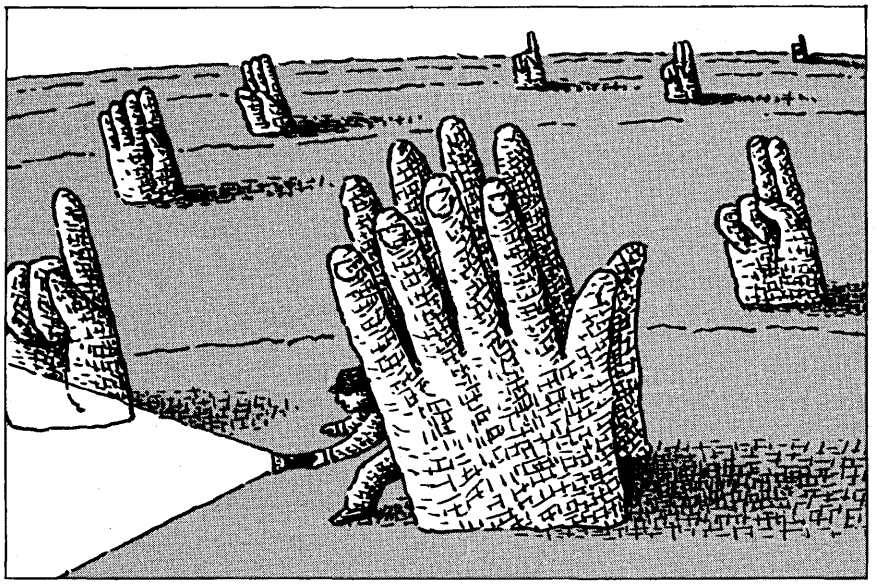

ILLUSTRATION BY DAVID FISHER

Pity the poor mathematician, for whom 10-fingered man looms an unfortunate coincidence and who sees on all sides the uncontested tyranny of 10. Indeed, there were times in Professor Glaser's book when I found myself wishing for 12 fingers and toes, instead of my customary complement.

But if humankind chose the number at hand, so to speak, it was not merely because all other choices were untenable. The history of what might have been is an intriguing one, and Glaser narrates it with enthusiasm and skill. He takes us on a mathematician's tour from the first stirrings of nondecimal computation in ancient times clear through to the modern era, punctuated with engaging side trips that examine sundry foiled attempts at replacing our familiar base 10.

The importance of the story, however, derives from the surge of interest in binary numeration brought about by the computer age. Among other offshoots, this helped spawn the "new math," which attempted to inculcate youthful minds with the realization that counting by 10 was essentially an arbitrary process.

Not surprisingly, the doctrinal hold of base 10 in everyday life was hardly loosened by this, and one of the more rewarding bits of data to surface in Glaser's book is that the new math was hardly new. Leibniz, in 1703, related a binary method of numeration ascribed to venerable King Fohy of China some 4,000 years ago.

Leibniz holds an important place in Glaser's pantheon of nondecimal protagonists as a mathematician who brought his penetrating if somewhat fanciful insight to bear on nondecimal numeration with startling results—not least of which is his binary proof of the existence of God. (QED) Glaser notes, however, that Leibniz's hope that his "new arithmetic" would provide a key to further theoretical advances was never realized.

These early years were studded with imaginative, sometimes comic attempts at casting off old habits. Counting in threes held the advantage of mirroring the Trinity, whereas counting in 12s (the most popular alternative overall) commended itself in light of the number of months, apostles, tribes of Israel, etc.

But the corker has to have been the suggestion of King Charles XII of Sweden, which Glaser elaborates in no small detail, that the number 64—composed of cubes and squares—offered the ideal base for counting. The resultant problem of memorizing 54 more characters, he felt, merely enhanced the scheme's attractiveness. Mercifully, this possibility was cut short by the same cannonball that ended his life.

The French Revolution toyed briefly with duodecimal, but opted to lop off some more heads instead and remain metric. Nystrom, writing in the next century, deplored the metric system precisely because it *was* French (not unreasonable), while Taylor (in 1887) asserted that base 10 was natural "in the same sense that ignorance was."

Throughout the book and more especially in its cogent summary of the drawn-out historical dialectic as to "which base is best," Professor Glaser sorts through the theories and proposals in an orderly fashion. His prose is lucid and relatively nontechnical, though it presupposes a modicum of mathematical knowledge in his reader, and a mathophile's love of games.

Beneath the surface of these games, however, one can discern the origins of many practical, even basic, computational aids. For example, modern error-correcting codes have their obvious precursors in the game of NIM (ca. 1901), which in turn harks back to Leibniz's analysis of columnar periods in binary notation.

An unflagging fecundity of invention in creating new symbols emerges from Glaser's text. One of my favorites is the scheme by Cauchy (ca. 1840), who suggested $\bar{4}, \bar{3}, \bar{2}, \bar{1}, 0, 1, 2, 3, 4$, and 5 in place of the usual ten digits, where $6 = 1\bar{4}$, $7 = 1\bar{3}$, $8 = 1\bar{2}$, and $9 = 1\bar{1}$. This in turn leads to $1\bar{1}^2 = 1\bar{2}1$, $1\bar{2}^2 = 1\bar{4}4$, $1\bar{3}^2 = 1\bar{6}9$; 1/11 becomes $0.1\bar{1}1\bar{1}1\bar{1}\ldots$

SOURCE DATA

Benjamin Peirce (1816) fabricated a nomenclature composed of tetrads of dots and dashes very much resembling Morse code stood on its side. Peano (1899) conceived a system of remarkable compactness, consisting of an eight-petaled daisy whose every leaf represents a power of two, e.g., ✳ = 11111111_2 and \ = 00000001_2.

Other passages range further afield. Arthur Earle, one of the many modern writers whose work Glaser briefly surveys, postulates that the numerational system of the Old Testament is really base seven. This shrinks biblical life spans somewhat, thereby aligning them more creditably with conventional reckoning.

Glaser injects a healthy dose of theorems, definitions, and postulates into his text, some of which, in true pedagogic fashion, provide foundations for subsequent development, while others serve as diverting morsels to garnish his narrative.

One fairly simple and especially enjoyable one is Stein's (1826) comparison of the complexity of various numerational systems, which argues that the number of concepts in any system for a given base, where one limits numbers to the size of β^x, can be described by $[\log (\beta^x)/\log \beta] + \beta - 2$. Using this formula as a yardstick, base 10 proves to be—wonder of wonders—not so bad after all, requiring only 15 concepts to express numbers up to 10^6.

Broadly speaking, Glaser's book is aimed at two different groups. The first consists of teachers, many of whom could probably benefit from a historical perspective on nondecimal numeration, especially as it is now an integral part of most junior high school curricula. The second (and much larger) group includes all those possessing an interest in other bases, some historical curiosity, and a dash of arithmetical acumen.

For the teacher and the budding scholar, he has incorporated an immense bibliography (probably the best available on the subject), a chronology, and an appendix detailing a number of schema outlined in the book. He also includes, for its historical significance, a facsimile of Fontenelle's article, "Nouvelle Arithmétique Binaire," in its original French.

As to the raison d'etre for his treatise, one may quote Glaser quoting Friedrich Unger: "He who wants to become master in his field should study its history. Without historic foundation all knowledge remains incomplete and the judgment about appearances of the present unsure and immature."

Tomash Publishers, Los Angeles (Revised ed., 1981, 218 pp., $25).

—E.E. Brooking

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CARTOON BY SIDNEY HARRIS

BOOK BRIEF

UP THE EDP PYRAMID: THE COMPLETE JOB HUNTING MANUAL FOR COMPUTER PROFESSIONALS
by Jack French

"The day of the gold watch is over," announces Jack French in this book. The next decade looks promising for computer people, he says, but there won't be many shortcuts to the top, and competition will be hot and heavy. His book offers advice on career planning, acquiring experience, and learning company tactics. For those who already have a good job, there's counsel on staying on top and making the most of dp's future developments. One chapter is devoted to "creating your own future," and covers such basics as career objectives, resume writing, and the job hunt. The author has included appendices that list the names of dp organizations, hardware and software suppliers, datacom carriers, and minicomputer and service companies. Most company listings include the city and state where the firms are located. Wiley-Interscience, John Wiley & Sons, Inc., New York (1981, 188 pp., $19.95).

REPORTS & REFERENCES

QUEST FOR CONTROL

"Designing Controls into Computerized Systems," by Jerry FitzGerald was written for dp quality assurance personnel, programmers, dp auditors, systems analysts who design computerized systems, and user personnel who are involved with the design of computerized systems. FitzGerald delineates a methodology for designing controls into new systems, systems that are being enhanced, and systems undergoing major maintenance changes. He claims the methodology fits with "any system development life cycle process." The six chapters are: Introduction to the System Development Control Review Methodology; Risk Ranking Systems under Development; Categories of Control; Identifying, Documenting, and Evaluating Controls during New System Development; Control Lists Organized by Threat Areas; and Control Lists Organized by Component Parts. Chapters 5 and 6 comprise 125 pages of specific controls (101 lists altogether) broken down into tiny categories that can be considered a thorough list of the dos and don'ts of control. The book costs $16.95 prepaid; write Jerry FitzGerald & Associates, 506 Barkentine Lane, Redwood City, CA 94065.

SLACK FUTURE

A wealth of research on consumer attitudes toward the information age is available from The SubGenius Foundation, a marketing think tank in Dallas. Their new multiclient study predicts a forthcoming slack in

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consumer demand for personal information products and services because of "multiple chain reactions spanning the socio-economic strata of Western culture." The Japanese, however, may do much better in stimulating demand. A lively text and superb graphics make a strong argument for the notion that consumers will eagerly pay to know what they really think. A detailed brochure is available for $2 from the Foundation at P.O. Box 140306, Dallas, TX 75214.

GRAPHIC DETAIL

The computer graphics market is booming. To keep the graphics novice up on current events, the Harvard University Laboratory for Computer Graphics is publishing *The Harvard Newsletter for Computer Graphics*. The newsletter covers market action, public offerings, entrepreneurship, and mergers and acquisitions in the graphics area. Copies are free; just send a self-addressed, stamped envelope (37¢ in the U.S., $1.20 elsewhere) to Markets CG Guide, c/o *The Harvard Newsletter for Computer Graphics*, Service Dept., P.O. Box 89, Sudbury, MA 01776.

IRM MADE SIMPLE

Forest Woody Horton, Jr., is no stranger to the subject of information resources management. During the '70s and '80s he authored and coauthored seven books on IRM. His latest achievement, "The Information Management Workbook, IRM Made Simple," was released by the Information Management Press (IMP) earlier this year. The book is packaged in a school days, three-ring binder format, and describes itself as "a practical, step-by-step guide that explains how to translate information management concepts into practice, and make them work for your company, government agency, hospital, college, association, society, or other enterprise." After an introduction and several pages of definitions, Horton offers five chapters—Inventorying, Costing, Pricing, Analysis, and Synthesis of Resources—containing text, charts, and workbook "fill-in" pages. These are followed by checklists, bibliographies, and appendices. Horton leaves space at the back of the book to include the *Information Management Newsletter* (published by IMP), which purchasers of the workbook automatically receive. Descriptive brochures are available from IMP. The report costs $295; contact the Information Management Press, P.O. Box 19166, Washington, DC 20036.

WATCHDOG REPORT

Cerberus, according to Greek mythology, is a three-headed dog that guards the entrance to Hades. Like a watchdog, the report closely examines all activity in its territory—mergers, acquisitions, venture development, and investment opportunities in the computing and information processing industries. The *Cerberus Report* began publication this year with its January-February issue. The first issue contains articles on the billion-dollar business of claims processing, office automation in the insurance industry, trends in acquisitions and mergers, and why databanks are worth their weight in gold. There is also a news section composed of briefs and "microbriefs," and a market research page that comments on recently released reports and the companies that publish them. One year's subscription (six issues) goes for $500 in the U.S. and Canada, and $750 overseas. Cerberus Publishing, an operating unit of The Cerberus Group, Inc., P.O. Box 470, Frenchtown, NJ 08825.

TELECOM HANDBOOK

Economics and Technology, Inc.'s "Handbook of Intercity Telecommunications Rates and Services" answers almost every question concerning alternate intercity services; rates, specs, and availability of intercity services; plus evaluation and interpretation of service tariffs and price lists. It is divided into three categories, according to service: private line (or full time), measured use, and intrastate. Because the telecom in-

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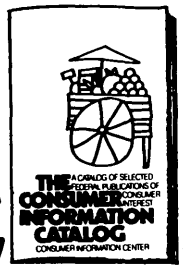

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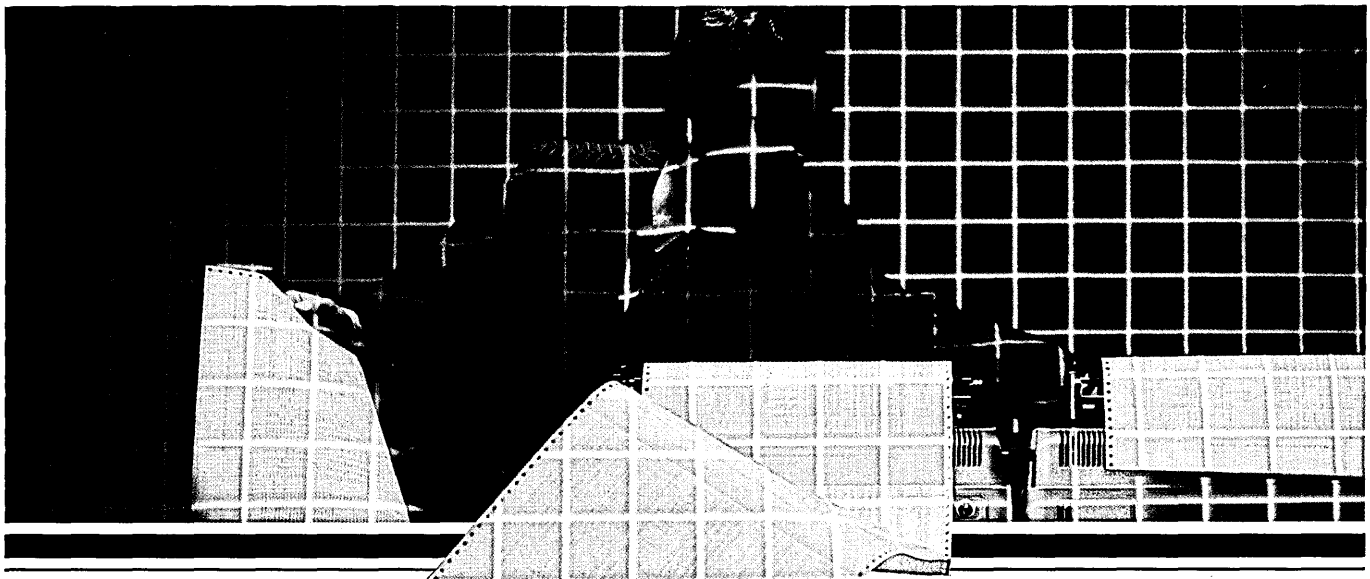

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SEMINARS

ADVANCED AUDITING

The Data Processing and Systems Analysis Institute of New York University's School of Continuing Education is introducing a diploma program in information systems auditing this spring. The program was developed in conjunction with the Computer Audit Assistant Group of Cooper & Lybrand, and provides the concepts and techniques necessary for successful dp auditing. It also prepares prospective candidates for examinations leading to the designation of Certified Information Systems Auditor, offered by the EDP Auditors Foundation. This is an advanced program, appropriate for those with strong academic backgrounds and experience in accounting, data processing, or systems analysis. For more information, contact Stuart Fink, Director, Data Processing and Systems Analysis Institute, New York University, 126 Shimkin Hall, Washington Square, New York, NY 10003, (212) 598-7771.

DBMS SYMPOSIUM

The National Data Base Management Systems Symposium will be offered three times in 1982: April 26-29, Washington; May 17-20, Chicago; and June 21-24, Los Angeles. The symposium's classroom activities focus on how database fits into the new world of data management with user-oriented query languages and application generators. The conference section of the symposium features 30 presentations on the major DBMS packages presently available, as well as a number of newer and innovative designs in the relational DBMS area. Information on conference registration is available from Digital Consulting Associates, Inc., 5 Kimberly Terrace, Lynnfield, MA 01940, (617) 334-5755.

TEACHING THE TEACHERS

This summer, Clarke College, Dubuque, Iowa, will offer an MA program in Computer Applications in Education. The program will prepare elementary and secondary school teachers to use computer technology in the classroom. After considerable research, the college concluded that 1) teachers are generally not prepared to use computer technology in their classrooms, 2) teachers would take courses and pursue degrees in this field, if offered, and 3) principals and superintendents want to hire teachers who are capable of using computers in the classroom. The most important finding made by the college is that teacher preparation is the area of greatest need in student use of computers. For more information on Clarke's program, contact the Graduate Division, Clarke College, Dubuque, IA 52001, (319) 588-6331.

MUMPS INVADE DENVER

More specifically, the 11th annual meeting of the MUMPS Users' Group will be held in Denver, Colo., on June 7-11. Originally developed for medical applications, MUMPS (Mash general hospital Utility Multi-Programming System) has branched out to the business, scientific, and academic realms as well. The conference will include, among many other MUMPS-related topics, presentations on MUMPS in medical and business applications, MUMPS implementations and technical issues, and new areas of opportunity for MUMPS. To learn more about MUMPS or its annual meeting, contact the User's Group, P.O. Box 37247, Washington, DC 20013, (301) 779-6555.

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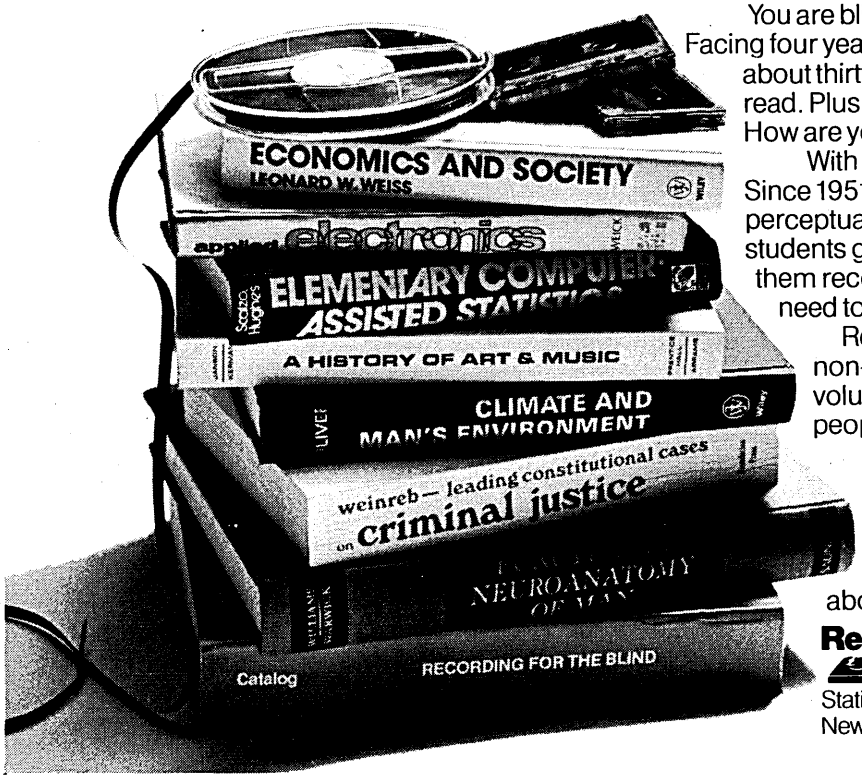

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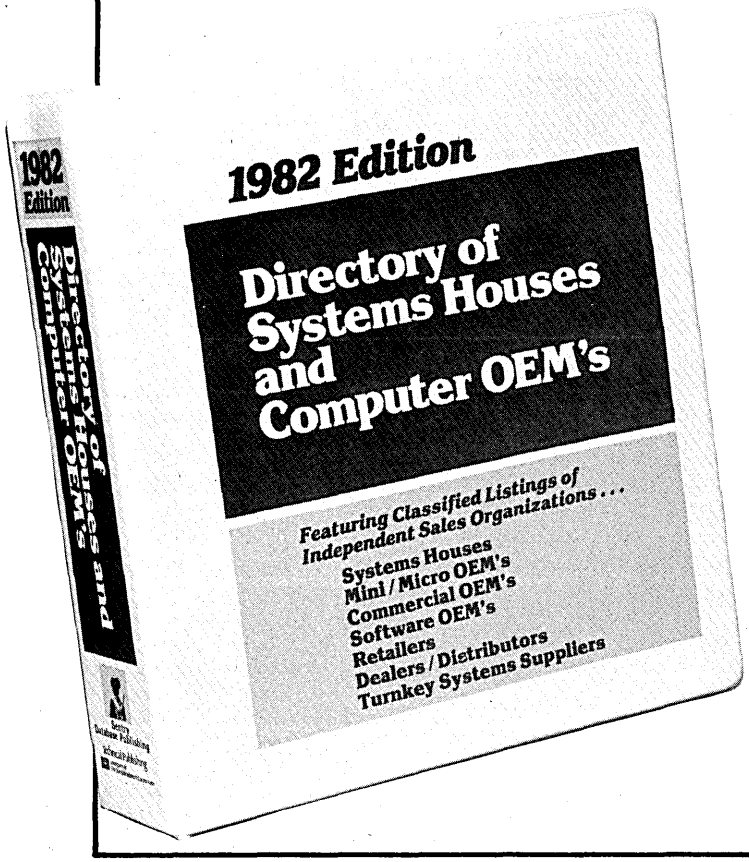

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conference presented by the National Institute for Management Research (NIMR) in Chicago, April 21-23; New York, June 9-11; Washington, July 28-30; and Los Angeles, September 22-24. The conference concentrates on the application of new computer equipment, software, communication approaches, and management techniques for the new integrated financial information and management systems. The latest innovations, methods, and some successful case studies will be examined. Brochures are available from the Department of Public Relations, NIMR Seminars, P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

VENDOR LITERATURE

SE HABLA INGLES

The UDAC II, called the "user's digital and analog controller," is microbased and can be programmed in English. The six-page brochure describes and illustrates UDAC II's external and internal features, operating characteristics, user benefits, and specs. RELIANCE ELECTRIC CO., Worthington, Ohio.

FOR DATA CIRCLE 351 ON READER CARD

MODEL BROCHURES

Northern Telecom knows how to produce attractive brochures. Not only are they nice to look at, but they also contain descriptions of the vendor's products: the Model 290 on-line processor (IBM 3270 compatible) and the Model 585 office information system (data processing and word processing can be performed simultaneously). NORTHERN TELECOM, ELECTRONIC OFFICE SYSTEMS, Minneapolis, Minn.

FOR DATA CIRCLE 350 ON READER CARD

CATALOG

Halcyon's three lines of data communications and telecommunications equipment are discussed in the company's six-page product catalog summary. HALCYON, San Jose, Calif.

FOR DATA CIRCLE 352 ON READER CARD

DISPLAY TERMINAL

Two four-color pages describe the vendor's Concept APL 8 series of APL display terminals. Product specs of the APL display and keyboard hardware are given, as are the standard functions, operating modes, and options. HUMAN DESIGNED SYSTEMS, INC., Philadelphia, Pa.

FOR DATA CIRCLE 353 ON READER CARD

SOFTLETTER

Informatics, Inc., is offering a free newsletter that covers a variety of software topics of interest to dp professionals and end users. It is basically about Informatics—a recent issue included Informatics product information, user group activities, and training course updates. INFORMATICS, INC., Woodland Hills, Calif.

FOR DATA CIRCLE 354 ON READER CARD

MIMS-MFG

What, you ask, is that? MIMS-MFG is General Electric Information Services Co.'s version of a manufacturing planning and control software package. The company is offering two free brochures; one explains the MIMS system, the other concentrates on MIMS-MFG. GENERAL ELECTRIC INFORMATION SERVICES CO., Rockville, Md.

FOR DATA CIRCLE 355 ON READER CARD

INTELLIGENT CONTROL

Xebec's S1410 Intelligent Disk Control is described in the vendor's two-page fact sheet. Capabilities, features, and specifications are listed. XEBEC, AN MSC CO., Sunnyvale, Calif.

FOR DATA CIRCLE 356 ON READER CARD

DE MODEM MERRIER

The LITEcat fiber optic data modem features "high performance and low error rates," says INTEQ, in its four-page brochure. Also discussed are LITEcat's applications, specs, and options. INTEQ, Fairfax, Va.

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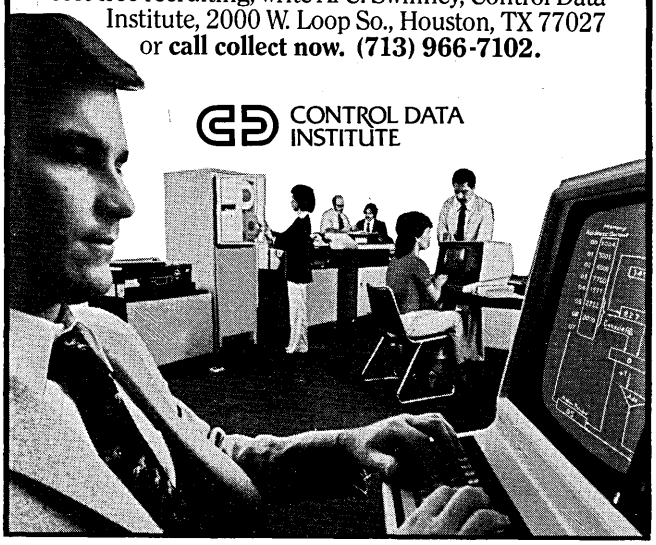

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(1-07744-5) approx. 248 pp.
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(1-08114-0) 286 pp. 1980 $30.50

IEEE STANDARD ATLAS TEST LANGUAGE 1981
Institute of Electrical and Electronics Engineers

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(1-86201-0) 416 pp. 1981 $25.00

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An essential guide for the manager implementing computer graphics, and for the user and programmer who work with it. This non-mathematical overview explains the applications now available, the equipment you'll need—including graphics support—and the performance you can expect.
(1-05773-8) 255 pp. 1981 $24.95 cloth
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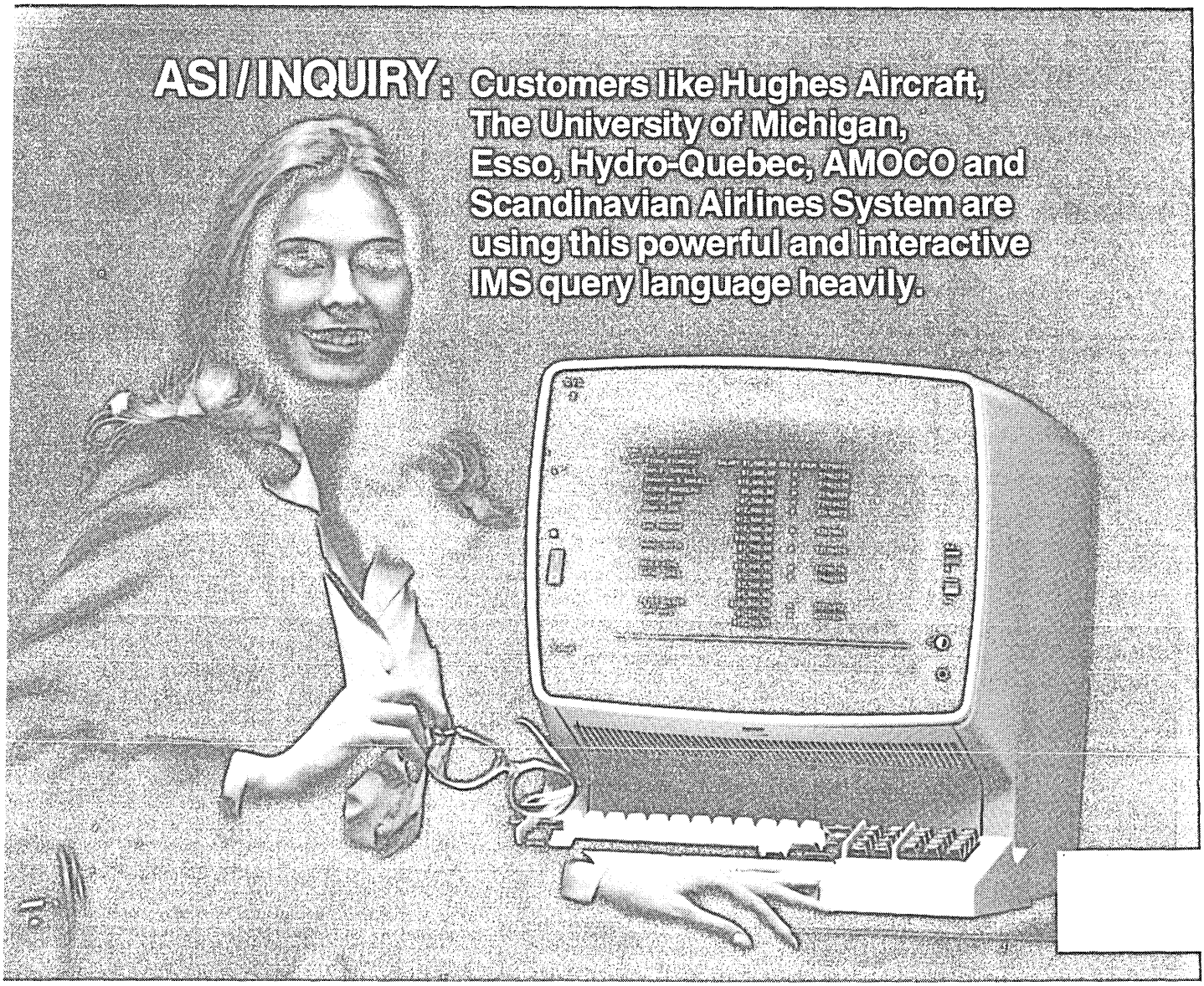

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READERS' FORUM

WHAT TERMINALS?

A few weeks ago, one of my employees came into my office with a problem. We had recently converted one of our database applications from IBM to Hewlett-Packard equipment, and with checkout being complete, it was time to send back our no-longer-needed IBM terminals. What could be easier? Call the movers and have them come and get 'em.

Well, that, it seemed, was the problem. The movers didn't have any record of our terminals, and consequently couldn't possibly move something we didn't have. Never mind the telephone line, modem, controller, and six crts that stared at us with unblinking square green eyes; the movers said we didn't have them, so therefore we didn't. (Did you ever try to prove you were born without a birth certificate?) Naturally, our records, not to mention our monthly bills, said we did have them. Since both the movers' and our records were contained in the same computer, how could this be?

And so the search was on. My employee, hereafter referred to as SHERLOCK (Self-Hunting Employee, Records LOokup and ChecKing), began to trace billing records in an attempt to locate the corresponding inventory records. As SHERLOCK soon found out, this was possible but tedious. Our computerized inventory records had been designed to generate bills, but the billing records had never been considered as input for an inventory printout.

After much time, SHERLOCK finally located the inventory records corresponding to our IBM terminals. Cursory examination showed that all of the fields describing the equipment were in order but one: the equipment location field. It seems that when we moved from one side of our building to the other about two years ago, the field containing the location of the equipment was never updated. Since the movers only knew that we had asked them to move the terminals away from our current location, it immediately became apparent why they said we didn't have the equipment.

Though this revelation showed us the path we had to follow in order to have our IBM terminals moved out, SHERLOCK couldn't help but comment on the fact that the equipment location field of the inventory system was not accurate. In the first place, the very same movers we were contacting this time were the folks who had moved our terminals from one side of the building to the other. Secondly, all of our computer equipment was physically inventoried by serial number at least once a year. How could it be, asked SHERLOCK, that the location of our terminals had been lost by the inventory program?

The answer to this question was intriguing, to say the least. Whenever the movers relocated equipment, they completed an inventory update form stating what equipment had been moved and to where. This form was then passed on to the inventory organization, which in turn filed it. That's right, filed it. The inventory organization's operating procedures assumed that the movers had updated the equipment location field in the inventory system. Of course the movers' operating procedures were based on the assumption that the inventory organization would do the updating.

The results of the annual physical inventory process turned out to be equally ineffective. In this case, the personnel conducting the inventory only reported whether or not they could find the equipment, not whether it was actually located where it was supposed to be. In our case, since the IBM terminals were only a few hundred feet from their purported location, no flags were ever raised.

The moral of this tale is really simple. It is not enough to merely establish a computerized database and load it with initial values; comprehensive data gathering, reporting, and updating procedures must be developed, implemented, and managed. Without such procedures, the information in the database is steadily reduced to meaningless, outdated alphanumeric strings. Many data processing professionals tend to lose sight of this in their zeal to design and implement a computerized database.

This kind of oversight is understandable. After all, once a database is operational, those of us in the computer centers usually don't have much to do with our original customers or their day-to-day use of it. Instead, we are generally busy constructing software for our next customer, while the first customer is busy running his now-computerized business.

Unfortunately, it is we computer professionals who are most apt to understand the moral of this tale. Regardless of how sophisticated many of us have become, the vast majority of our customers still have only a minimal understanding of what a computer can and cannot do. Thus, it is our responsibility to work with our customers not only to design and implement appropriate databases, but to review and routinely monitor customer usage procedures.

We never did get rid of our IBM terminals. Neither the movers nor the inventory organization felt it was their responsibility to alter their long-standing procedures. Even our offer to update the equipment location data was rebuffed as being "not part of your job description." Finally, we gave up and moved the terminals ourselves. Now those unblinking square green eyes watch for daylight from the dark corner of a storage room.

—David A. Feinberg
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CIRCLE 181 ON READER CARD

THE BOSS IN THE BATHTUB

The doom of mythological King Tantalus of Lydia was to stand forever in a pool of water, only to have the waters recede at each attempt to drink. The history of computer systems implementation seems to parallel his fate. Despite all the advances in hardware, software, and project methodology, the goal of routinely completing large-scale computer systems without delays or other major problems continues to elude us.

On a daily basis we hear of decreasing hardware costs, dramatic increases in computer capacity and speed, new programmerless languages and database products, and "foolproof" design and implementation techniques. The pages surrounding this article probably announce several new products that promise to unlock the pent-up powers of the computer instantly, inexpensively, and effortlessly. All this progress is a little like running in place: you sweat a lot, but not much distance gets covered. Given the frequency and visibility of the failures that still occur, it would be difficult to convince an objective observer that any progress has been made since the early days of computing. Implementation problems and delays are so prevalent that they have become an accepted part of the process itself. Computer professionals expect trouble when working with large systems, and actually spend a great deal of time at the beginning of each project informing management of the probable pitfalls. Imagine how few people would ever enter a hospital or an airplane if our failure rates were applied to the medical and engineering professions. The key to routine success seems to elude us despite all the attention we direct toward the problem. In fact, so much research and attention are being invested in making computer systems usable that it's more natural to ask: "How do we still manage to fail at this?" than "How do we manage to succeed?"

Perhaps it is the complexity, number of people and tasks, and length of time involved in large system projects that tend to obscure the underlying reasons for success or failure. The picture is so large that the tendency is to focus on just one piece at a time. Indeed, most design and implementation management methods force this piecemeal approach in order to accommodate our limitations in grasping and dealing with information. This works fine for

"Gentlemen: After spending 30 minutes this morning in a futile attempt to work out the puzzle on your cereal box, I detected a misprint in the instructions."

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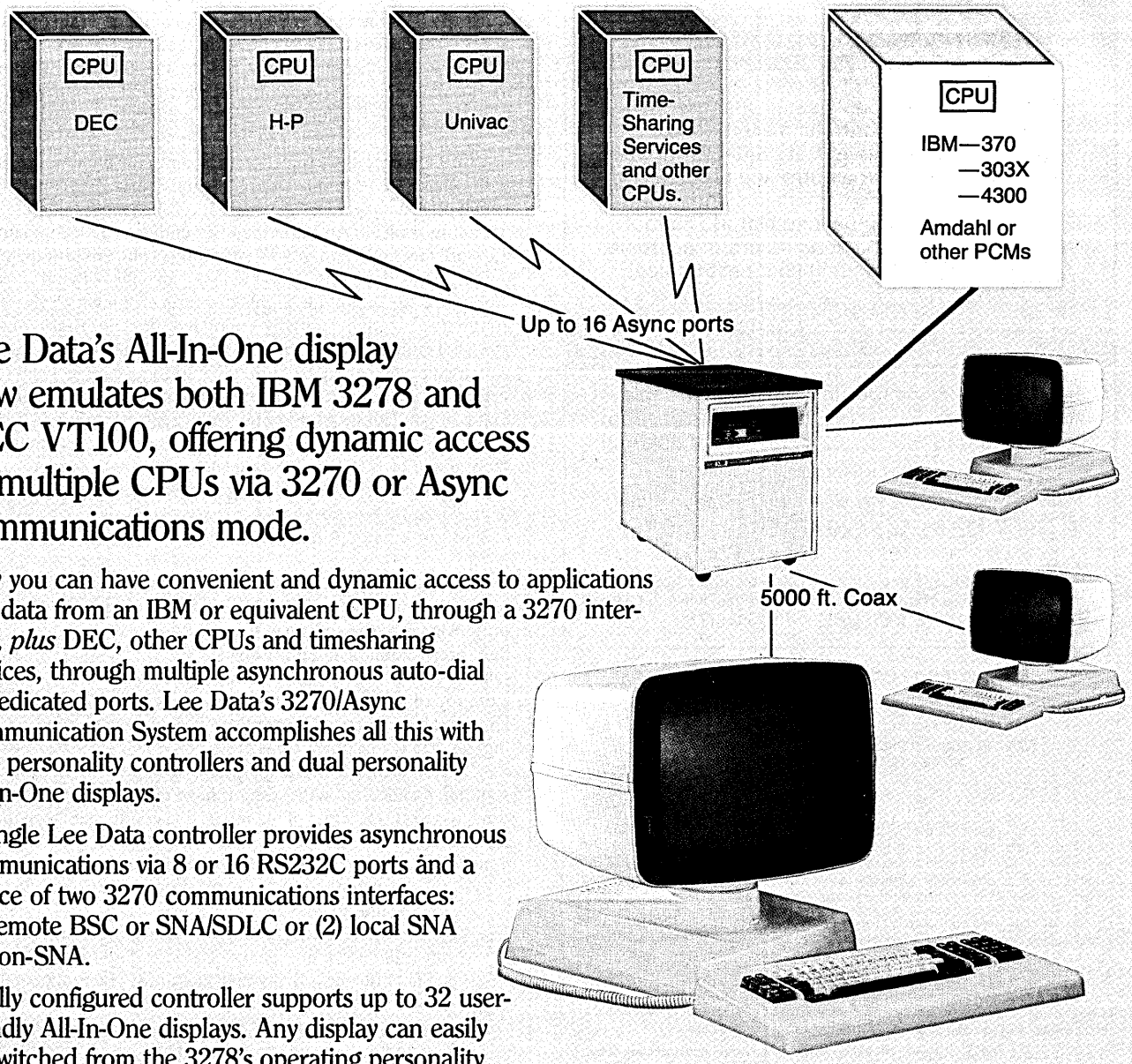

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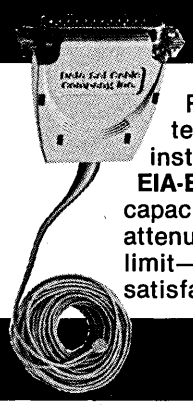

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CIRCLE 172 ON READER CARD

READERS' FORUM

project management but it is an ineffective investigative method. Therefore, while we continue to use the "divide and conquer" approach to perform the implementation, we must take a broader look for the underlying factors that make a difference in all aspects of a project and that can tip the scales towards success.

Part of the answer is a classic one that is often overlooked: Successful projects have continuous and well-informed involvement by top management—not just the involvement of immediate users and middle and project management, but the active participation of key decision-makers who set policies and priorities for the company. This may appear to be axiomatic, but consider the usual pattern of a project. Project leaders and consultants are familiar with what can be termed the "bathtub curve" of involvement, which plots management's participation and level of interest during the entire project. An initial burst of enthusiasm accompanies the kick-off meetings and vendor selections, but this dissipates very quickly as work begins. Those who do not believe that this happens are invited to recount the number of projects on which the steering committee meetings actually continued after the first month.

Traditional theory holds that the later upswing in the curve, which completes the "bathtub," naturally occurs as technical development ends and management introduces the completed system to the organization. All too often, this genteel activity is displaced by the familiar pattern of panic, restructuring, rescheduling, and recrimination. "Better late than never" is not always true. Renewed interest after so many quiescent months (or years) often devolves into second-guessing, hasty analysis, and ill-founded changes in direction that only lead to another cycle of the whole process.

More and more is said about the assimilation of information processing into the ranks of other, more common business functions. Computer-based systems are no longer playthings. Instead, they are becoming integral tools of the trade, much like market planning, production control, and capital budgeting. The transition from toy to tool will be impossible, however, unless management applies the same energy, attention, and rigor to systems undertakings as it does to other areas.

Some of the most oppressive technical barriers to understanding and dealing with systems have now been removed, so it is time to reexamine some of the myths that continue to keep management apart from the process. A debate with management follows:

Mgmt.: We cannot get involved. The technology is moving too fast to keep up with, and the whole process is too complicated to understand anyway.

Rebuttal: Of course the technology is volatile, but so are interest rates, the economy, energy costs, and all the other components of business that you deal with. If you think computers present a technical maze, read the federal tax regulations someday. It is worth the investment of time to keep up with developments in all areas that affect you. (We professionals in the field are not blameless either—less use of "computerese" would benefit everyone.)

Mgmt.: We should not get involved. Our time is taken up with running the business.

Rebuttal: Increasingly, the system *is* the business. It is either part of the product itself or an integral part of the production process. Presumably, the importance of the system was the basic reason for starting work on it in the first place. As with a critical piece of machinery, preventive maintenance applied to the project is less expensive and disruptive than responding only to breakdowns.

Mgmt.: We do not need to get involved. That is what we hire data processing management and consultants for.

Rebuttal: No it isn't. At least not if you would like the project to succeed and the end product to be what you intended. Although surrogate decision-makers are often what we end up being, this is not the proper role for either operational management or outside consultants. Specifications and conceptual overviews are incomplete methods of capturing all the

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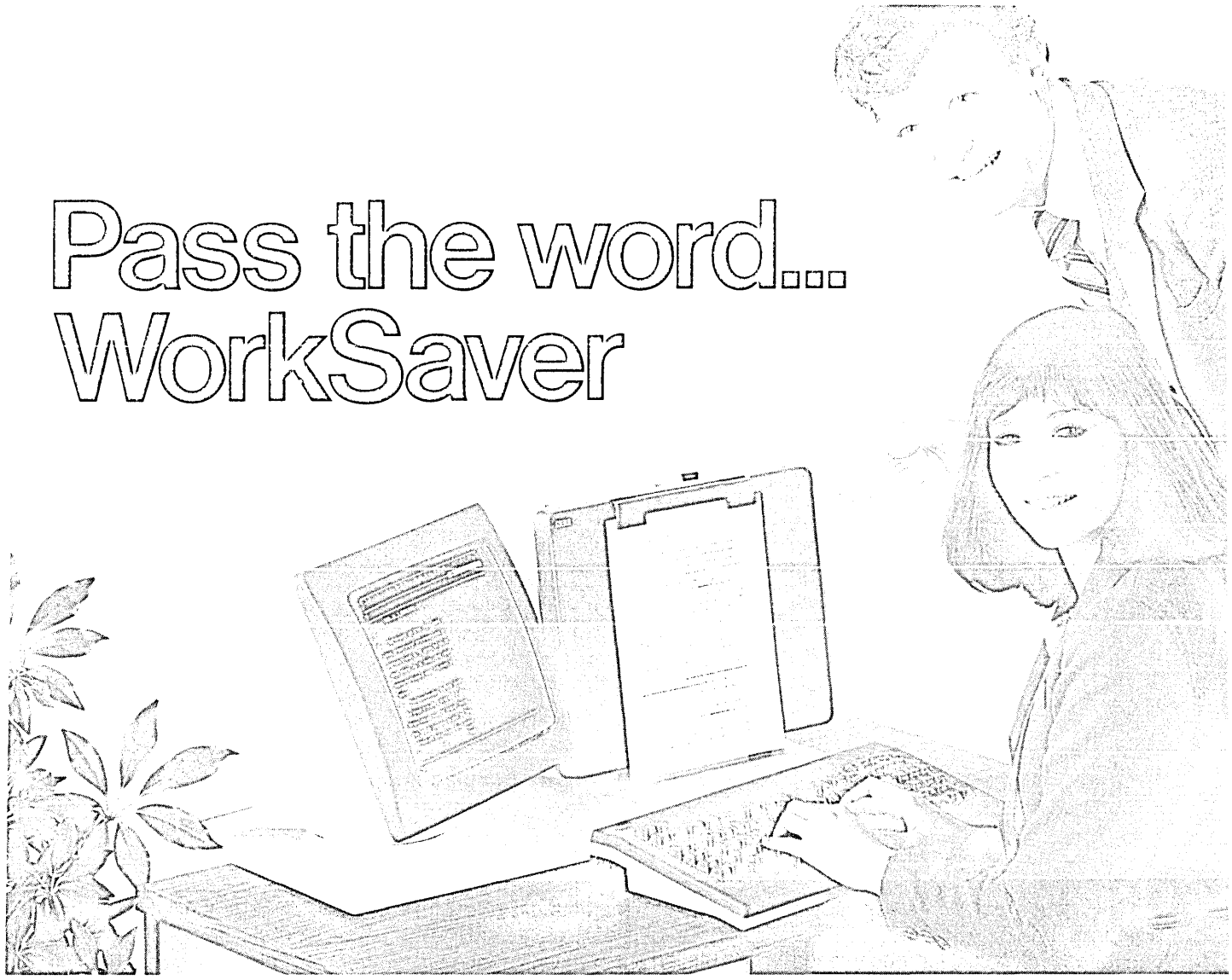

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nuances of a complex business or answering all the questions that arise during development and installation. In a vacuum, data processing management and the consultants will indeed step in and set the priorities and policies as embodied in the system. Any resemblance, however, between the direction intended and that taken will be coincidental. Unless you are content to let other people run the company in this manner, get involved.

The demand for executive involvement is really the same as for other, noncomputer-related undertakings. It is analogous to building a house. You use realtors, architects, contractors, and other specialists—each member of the team brings expertise to the overall job. Even with so many skilled people working together (or perhaps precisely because there are so many), you wouldn't consider leaving town right after the plans were drawn up, only to return on moving day. No process is that smooth and unambiguous. The choice is clear: participate in the tasks or be resigned to living with a series of defaults based on the (perhaps) well-intentioned decisions of others.

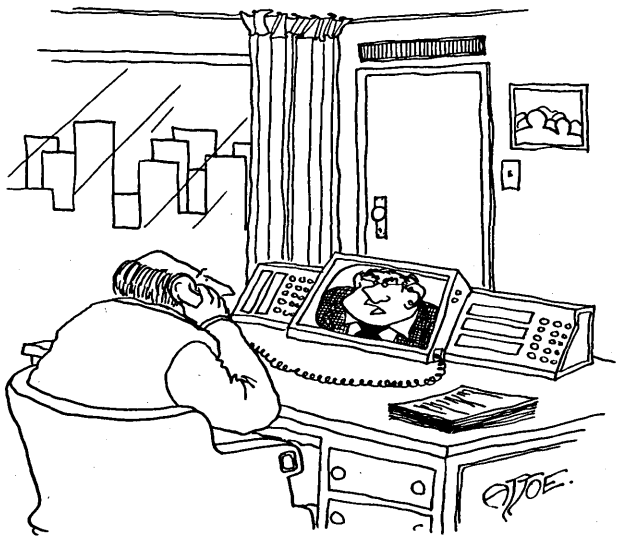
Getting involved with the details should not be construed as a loss of stature, although it sometimes is in organizations that equate being a member of upper management with the right to delegate everything to subordinates. One of the fundamental principles of Japanese management is the blending of strategy and operations, brought about by educating and involving executives even at rarefied levels. It works there, and it can work here, too.

The specific forms that executive involvement will take are shaped by the personalities of the managers and organization, and by the actual needs of the project. Notwithstanding this tailoring, some general suggestions to management follow.

1. Learn the terms and concepts. A detailed knowledge is not necessary, but background reading builds a foundation to work on and attaches meaning to the jargon. At the very least, it keeps the technicians honest.

2. Examine, understand, and clearly define the business objectives of any new system. They are the reasons for the system's existence. Communicate them to the project leadership and personally ensure that these objectives are actually served by the system. Make sure that the system will be a solution to a problem instead of a technical adventure.

3. Participate in the early technical decisions. Many of the apparently harmless decisions made in the earliest stages of the project can have a profound and lasting effect on how you will do business once the system is running. Choices of vendors, architec-



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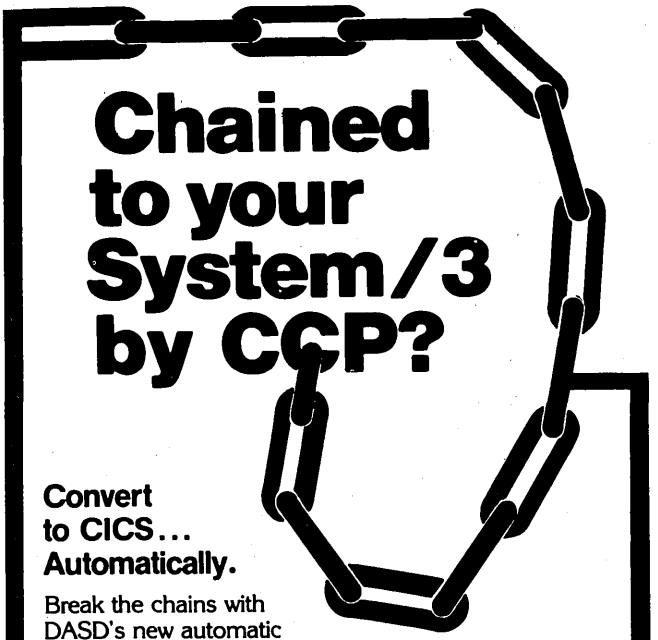

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READERS' FORUM

tures, and methodologies are all important factors that can restrict later choices.

4. Remain visible and available, Development may be tedious, but do not fade away. It may be necessary to shift schedules, priorities, or personnel, or to apply midcourse corrections to the direction that the project is taking. Probe to ensure that the original policy decisions and objectives do not get lost as work progresses.

5. Keep communications flowing. Systems development is an aerobic process. Information circulating into the project tailors the system to the specific needs of the organization. Information flowing out reduces user apprehension and prepares the organization to adjust procedures and accept the system.

6. Finally, keep your sense of humor. If the reason for this is not already apparent, it will become so once you dig in.

The roles played by outside consultants must also change to support the involved management approach to systems implementation. Consultants will continue to provide technical expertise in project management because, at the operational level of implementation, there is no substitute for the experience of having done it all many times before. However, the traditional role of "hired gun," brought in to be a temporary substitute for management resources that are too busy or disinterested, should not continue. More value is added when consultants are used as educators for, and additions to, existing internal personnel.

You do get what you pay for. Time, attention, and energy are often more scarce than money. We have tried to purchase our way to success through money invested in over 20 years of hardware and software advances. It is time now to return to the basics.

—Irwin L. Goverman
Los Angeles, California

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Would you like to convert a calendar date mentally without the use of a pen or pencil? This method converts a calendar date to a Julian date without the use of a table lookup technique. Instead, a simple formula is applied, involving the use of the constant 30 as the average number of days in a month. An adjustment factor is also used in the formula to determine the exact number of days.

The formula is: JUL = 30 * (MON − 1) + DAY + ADJ − 1. For example, July 4, 1982 (820704) converts to 82185; 185 = 30 (7 − 1) + 4 + 2 − 1. The adjustment factors (ADJ) for the 12 months are 1, 2, 0, 1, 1, 2, 2, 3, 4, 4, 5, 5, which may be memorized or derived from the month (MON). Of course, leap year must be taken into account.

This method, which I call the adjustment method, has been automated. Its processing time, however, has not been compared to that of other methods. It would appear that the calculations involved in the adjustment method require more computer time than that of other methods.

The adjustment method has been developed independently by the author, but it is probable that the method has also been derived by other persons. Nevertheless, the author wishes to share this method with others who may have need of one that can be memorized and applied mentally.

Converting dates in the opposite direction can also be done without the use of a table lookup. The constant 30 and the adjustment factors have been used to convert Julian dates to calendar dates.

—Karl J. Lensler
Bowie, Maryland

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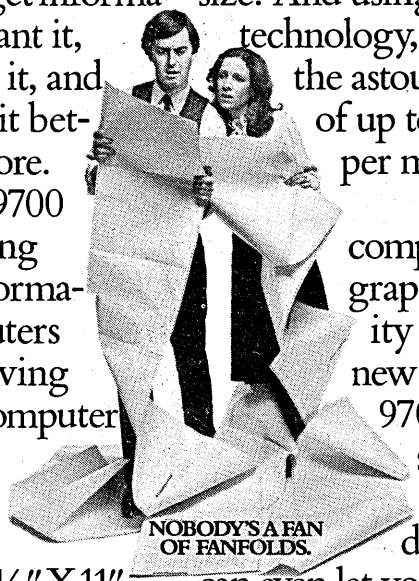

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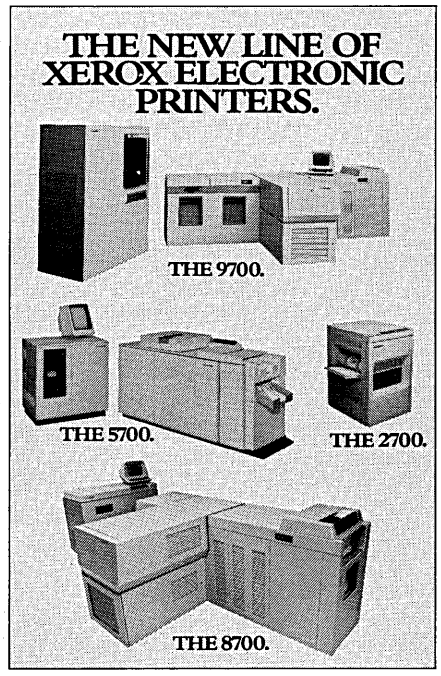

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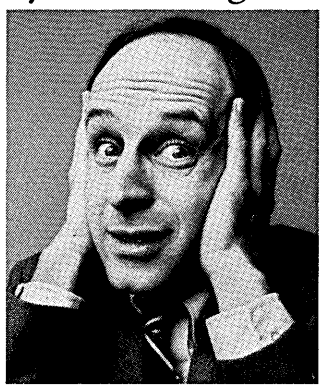

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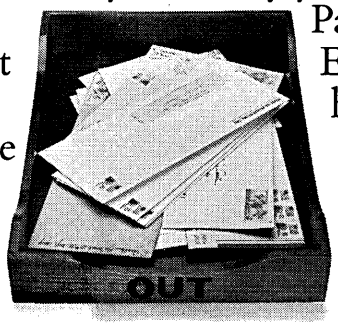

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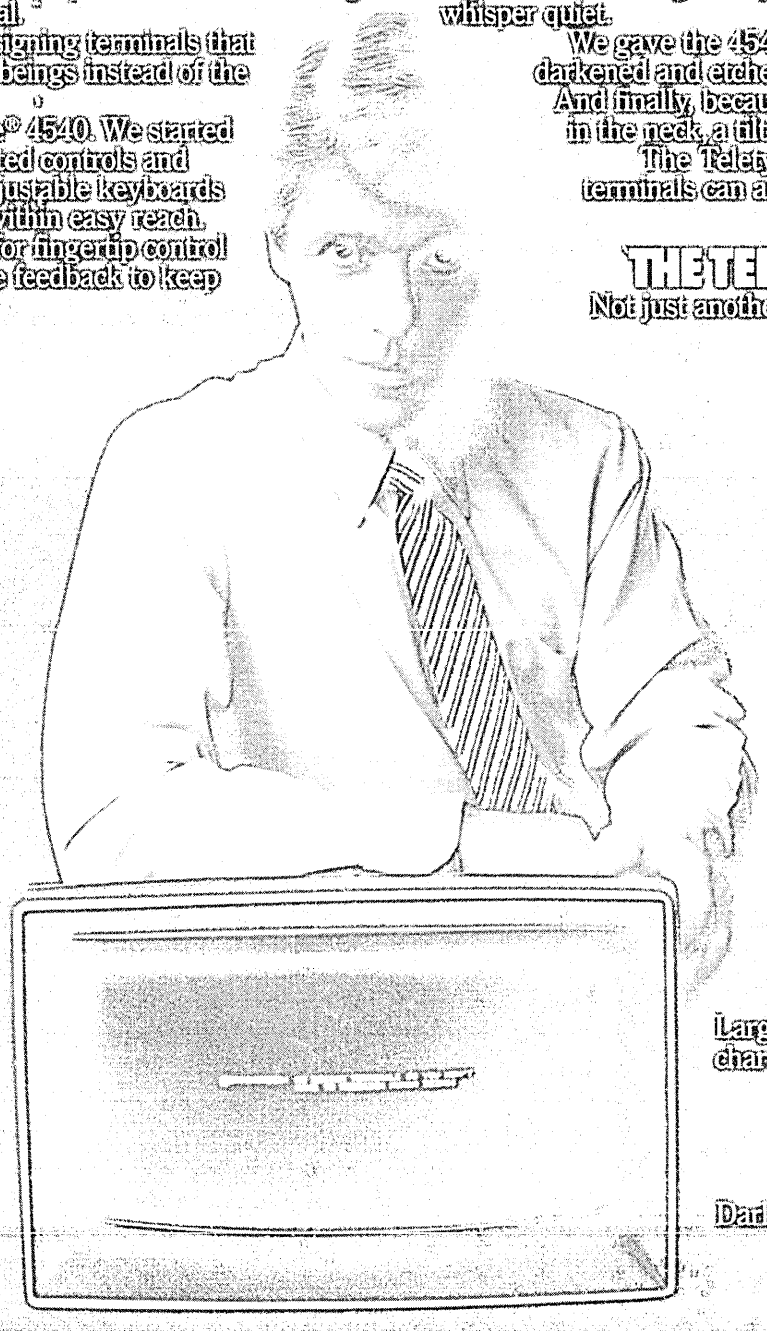

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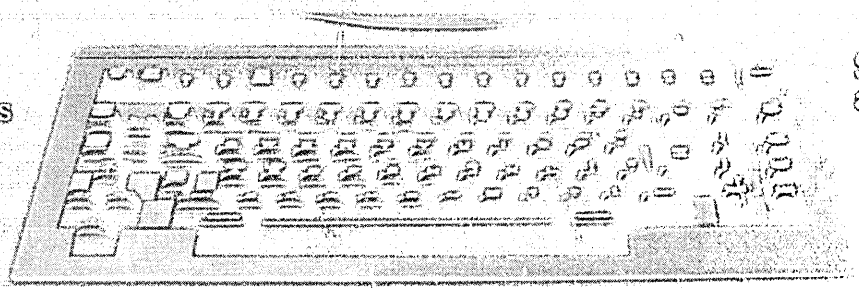

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