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CIRCLE 170 ON READER CARD

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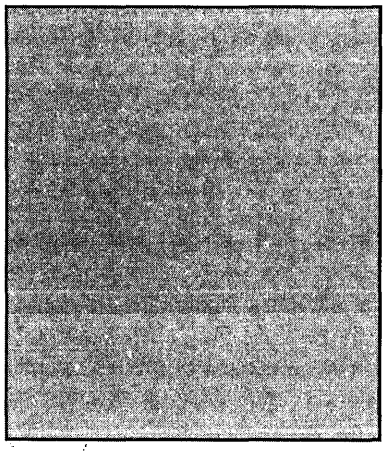

If you're thinking of extending your 3270 network, true blue is a great way to go. Just install IBM's 3270 series controllers, terminals or printers. As many as you need. Or can afford.

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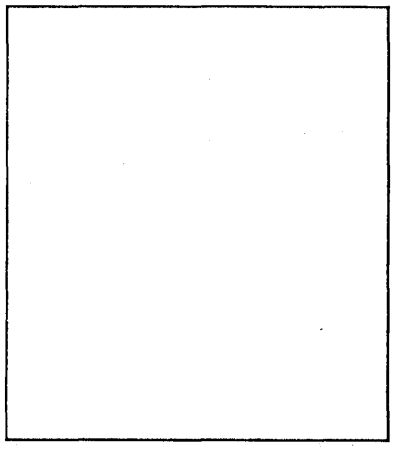

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This issue, 164,532 copies

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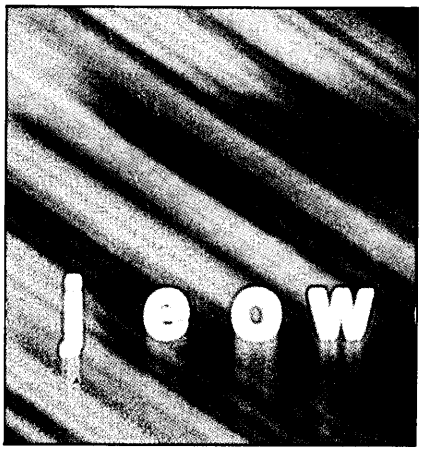

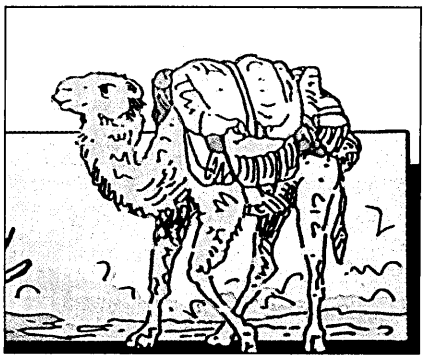

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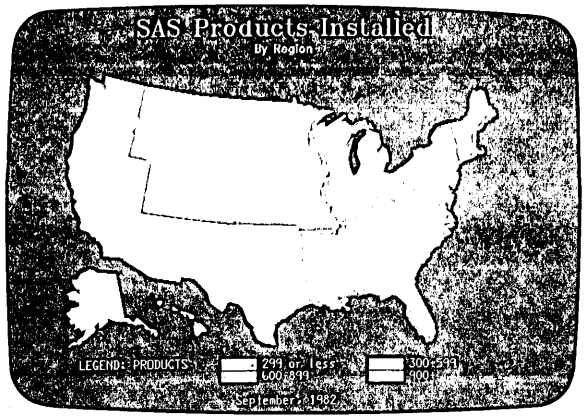

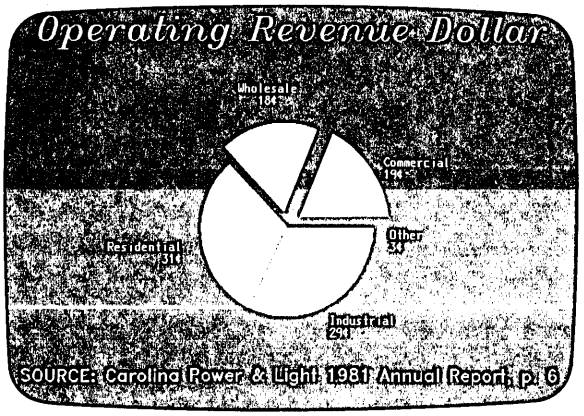

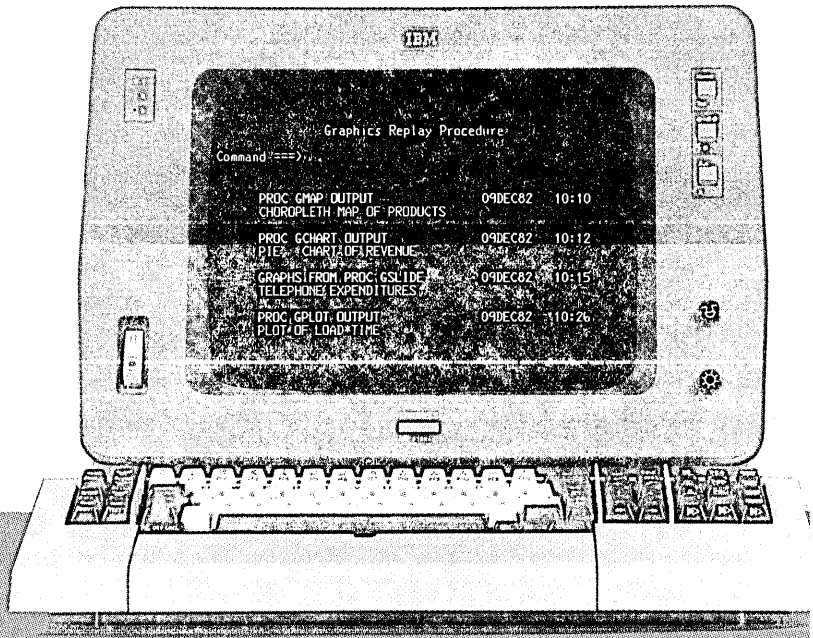

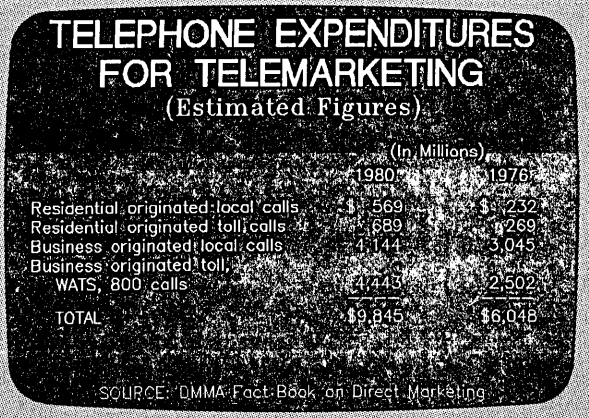

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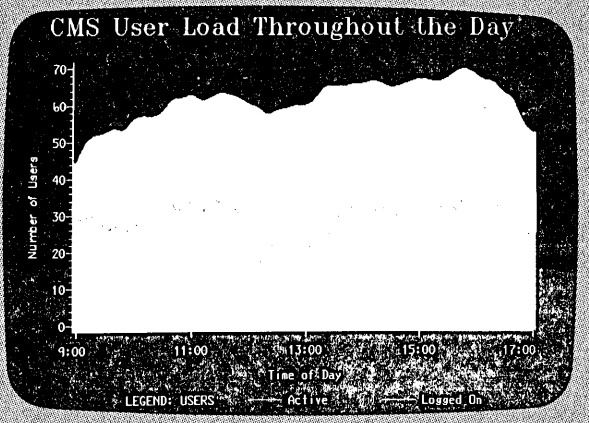

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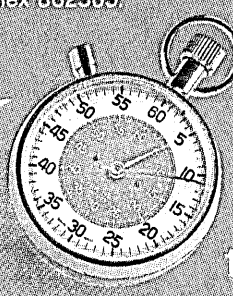

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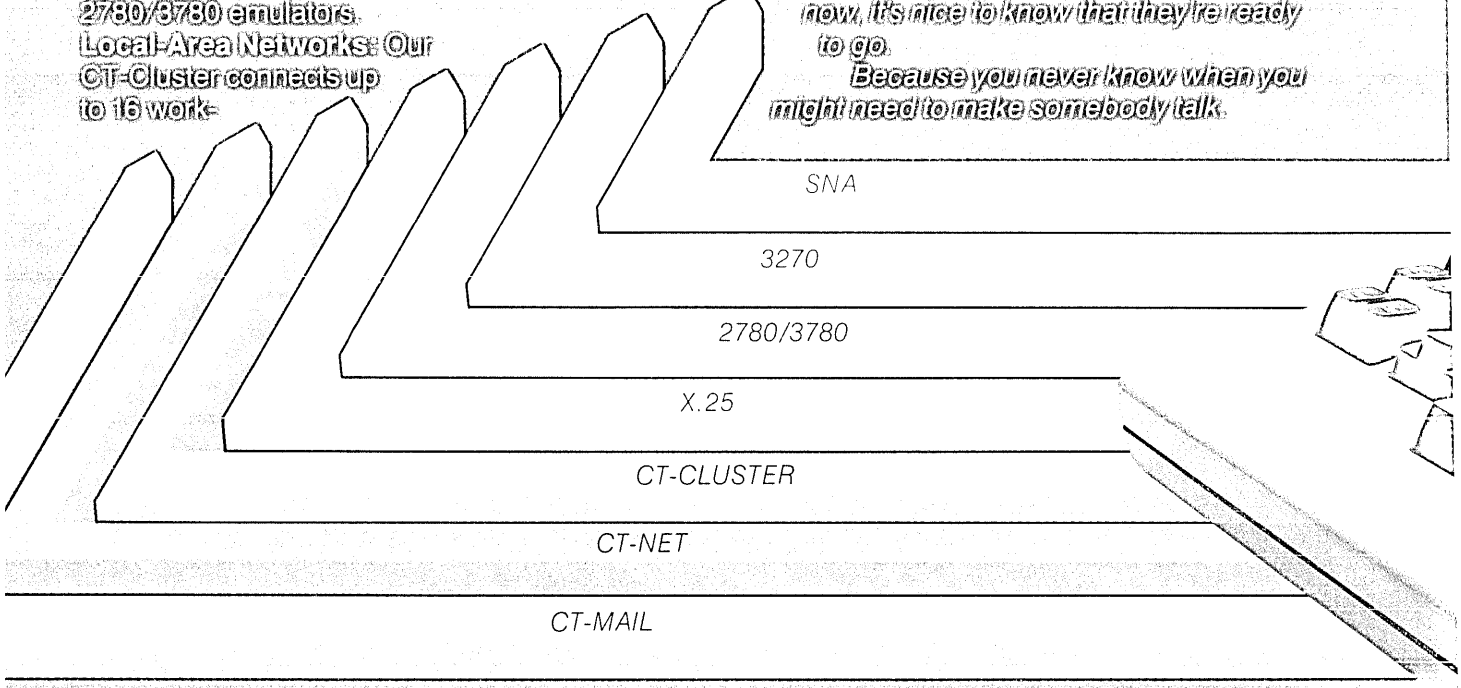

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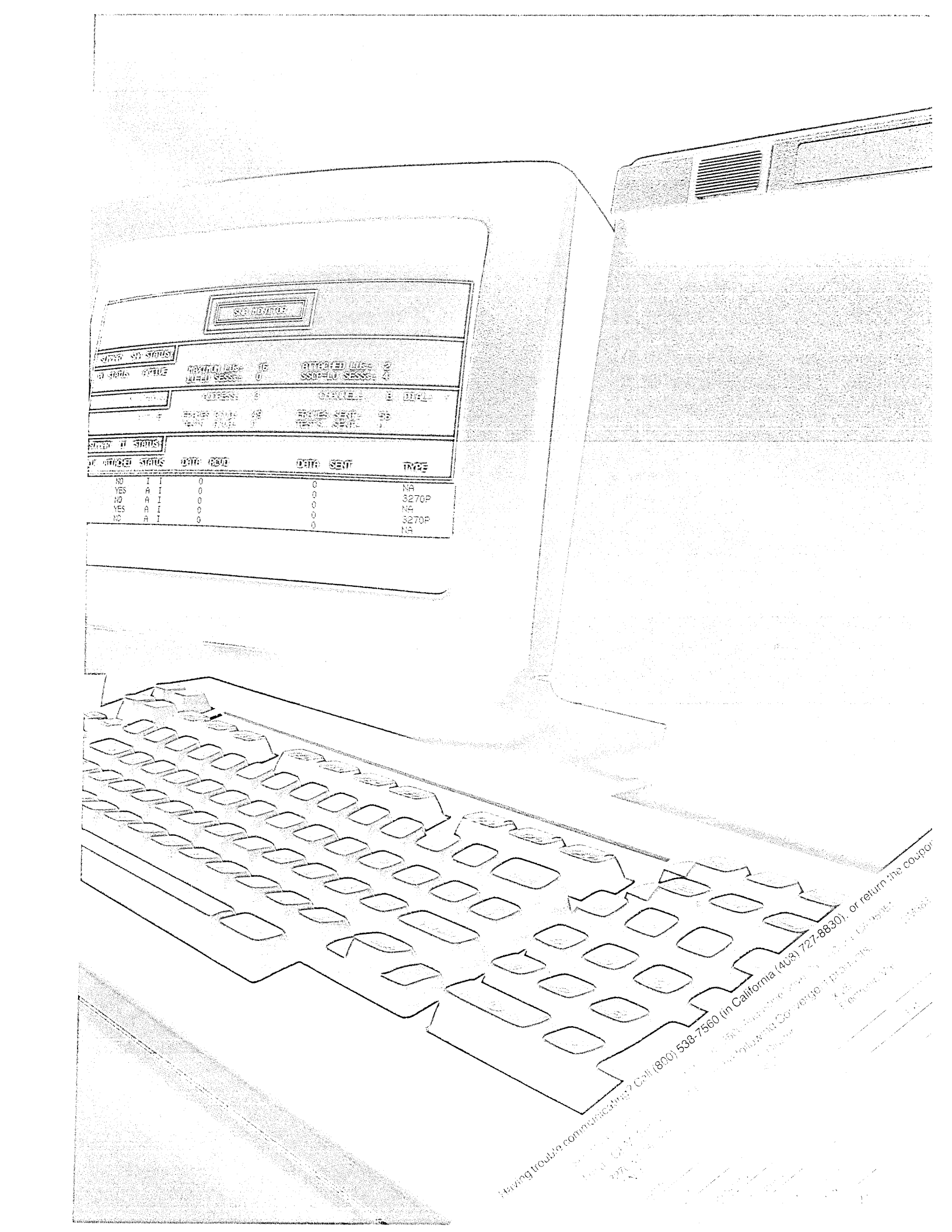
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LOOKING BACK

MAVEN MULLS MEETINGS

March 1963: The overwhelming increase in the number of computer conferences held each year prompted Harold Bergstein, editor of DATAMATION, to pose—and answer—a few questions.

Were the conferences justified by the amount of new information presented at the technical sessions? Apparently not; the waning attendance levels at most technical sessions made for some embarrassing situations.

Did the conferences overemphasize exhibits in view of the limited quantity of new hardware introduced each year? Yes, said Bergstein, but that was probably unavoidable. Although they detracted from the academic dignity of a conference, exhibits brought in money and boosted attendance.

Were the Joint Conferences too software oriented to be of use to hardware registrants? The JCs obviously reflected the staggering growth of the programmer population and the increasing separation of the engineer from a good many computer applications. The engineers, Bergstein noted, were off forming their own societies, which encouraged a better class of hardware papers at their conferences. Members of the Association for Computing Machinery, which was becoming a software-oriented organization, far outnumbered IEEE representatives at the Joint Conferences.

JAPAN REVISITED

March 1973: After a two-year absence, San Francisco bureau manager Ed Yasaki revisited Tokyo and found it to be smoggier, noisier, more congested, and even more expensive than on previous trips. The bustling atmosphere belied the notion that there had been a two-year recession, but the slump did seem to weigh on the minds of the Japanese. People spoke glumly of having to settle for a 10% annual rise in the gross national product for the next few years.

Japanese mainframe manufacturers had increased shipments by 78% in fiscal 1968, 34% in 1969, and 62% in 1970. In fiscal 1971, however, shipments increased by only 4.3%. This was not attributed to market saturation, but rather to users' desire to wait for the 3.5 or 3.75 generation, a status ascribed to IBM 370s.

While the Japanese labor unions had once been just for show ("strikes" took place during lunch hour), their increasing militancy made them partially responsible for the demise of Nippon Software Co., at one time the nation's largest software house.

The programmers chose to strike while on the job at client firms, delaying completion of contracts. This defiance of management in front of customers caused Nippon to lose face—as well as repeat business.

Another reason for Nippon's slide into bankruptcy was the completion of a large-scale computer that had been financed by the government. Most of the software for this project was Nippon's responsibility, and when the computer was completed, Nippon lost about half of its annual revenues.

Japan had long been a checkless society, with very few people having checking accounts. In the metropolitan areas, utility companies sent reels of magnetic tape with customers' charges to the banks for automatic payment. Many companies deposited employees' paychecks directly into their bank accounts. Automated teller machines were just beginning to be installed, making it possible for depositors to withdraw money at any time of the day. Finally, Yasaki lamented the loss of one of the country's last remaining bargains: customers paid 7 yen (less than 3 cents then) for a phone call that used to be unlimited but was now curbed to three minutes and applied only to calls within 18 miles.

—Lauren D'Attilo

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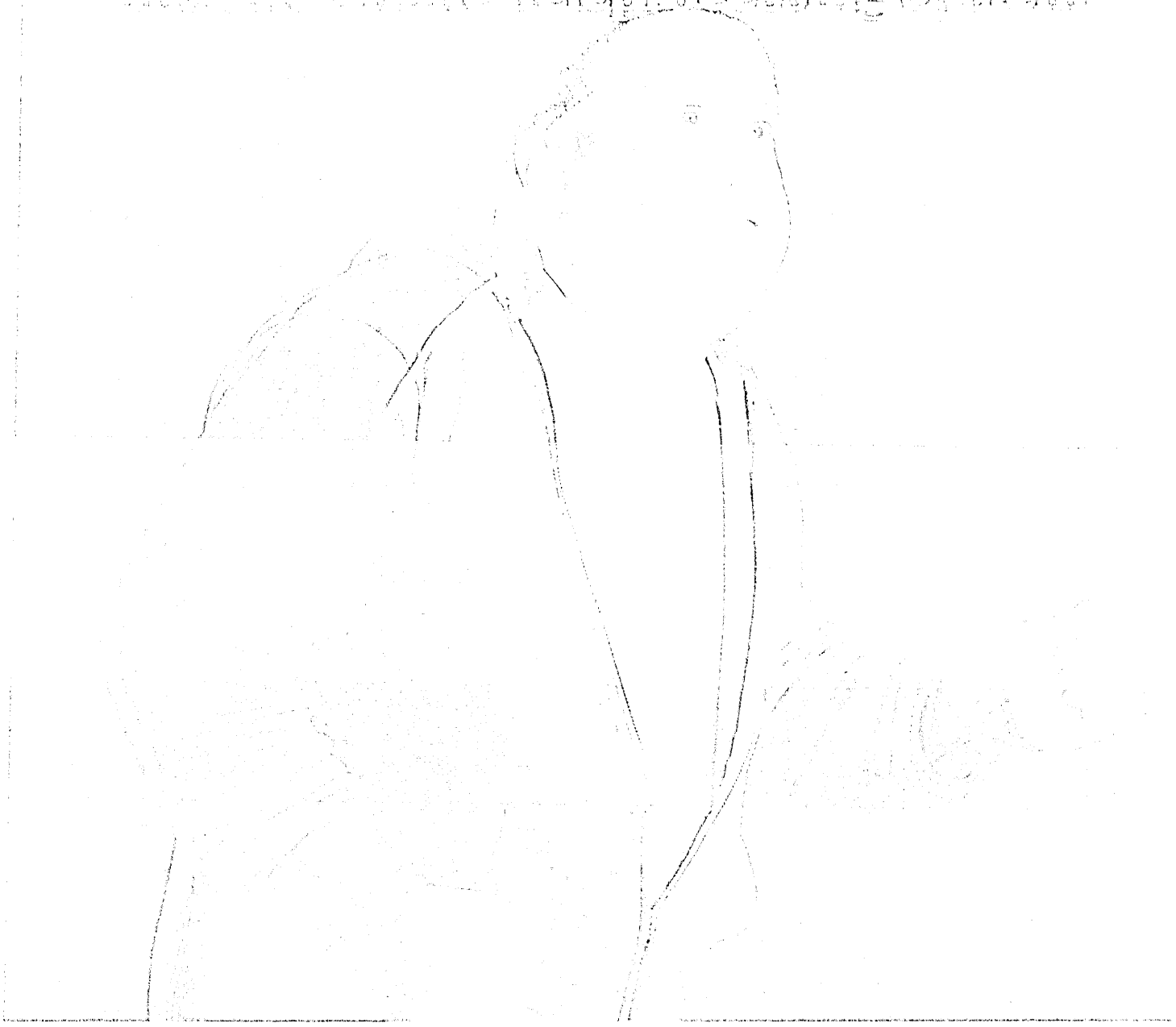

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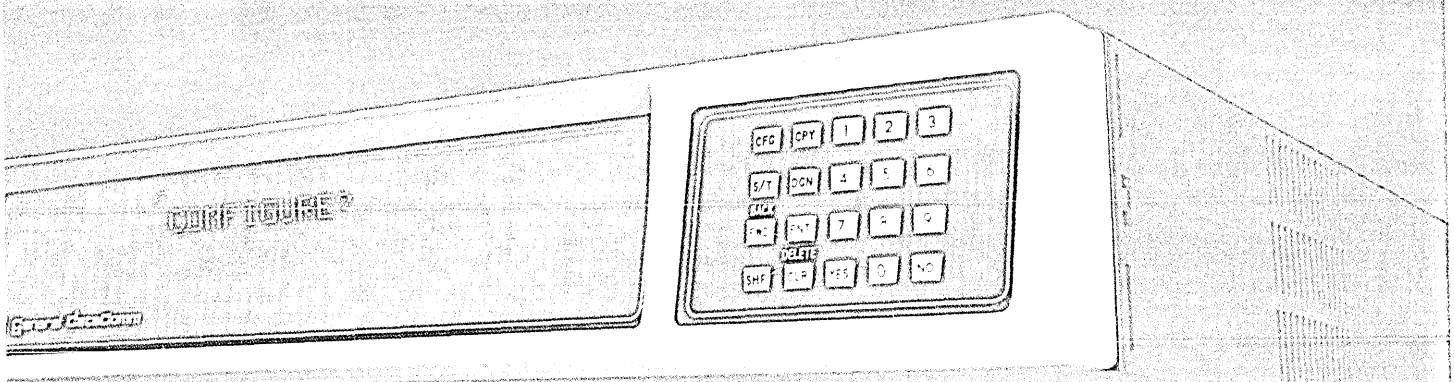

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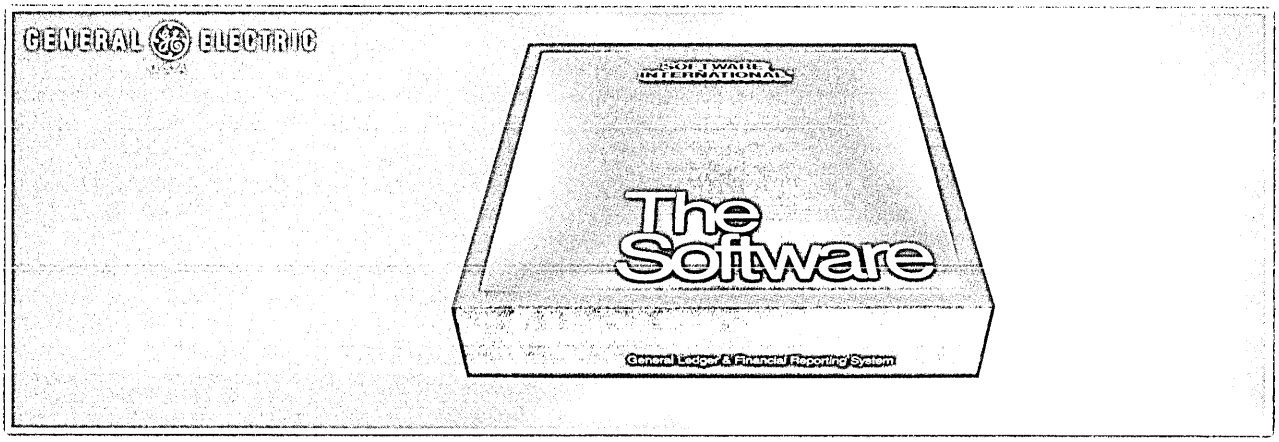

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CIRCLE 13 ON READER CARD

LOOK AHEAD

BRINGING GOOD THINGS TO LIFE?	Could it be that General Electric is about to get back into the mainframe business? Or perhaps the mini market? Reports that the cash-flush company has its acquisitive eyes on Amdahl Corp. and Data General, both likely takeover candidates, have been circulating with increasing force lately. GE left the mainframe business in 1970 but has kept its hand in computing with a large timesharing business, acquisitions of chip maker Intersil and CAD/CAM system supplier Calma, and purchase of several software houses. Some observers see Data General as particularly attractive to GE since it buys large numbers of DG machines, but the Westboro, Mass., mini maker says flatly, "No talks with GE are taking place." DG has been scrambling lately to protect itself from acquisition, instituting a new preferred stock plan and other measures.
CDC ENTERS SOFTWARE BIZ	Watch for Control Data to launch a new software venture structured something like its Magnetic Peripherals Inc. subsidiary. The independent company is to develop software for all types of machines, micros through mainframes. It will also be active in acquiring software packages and, potentially, entire software companies.
DUTCH ANSWER TO ETHERNET	Philips has penciled in March 30 as the date to launch its token-passing local network product. The Dutch giant is staying silent on most details, but the scheme will adhere to the seven-layer ISO model and will eventually support about 80% of other manufacturers' protocols. That gives Philips a chance to break into non-Philips sites, especially IBM and Wang users. Also expected is a wide area network designed to compete with IBM's SNA. That network will use processors built by Philips's French subsidiary TRT.
BREAKING PRICE BARRIERS	Clive Sinclair, the British micro maker who brought home-computer prices down below $100, plans to launch a business machine in the fall. It will have 128K bytes of memory, a flat screen display, microfloppy disks, and functionality comparable to IBM's P.C. U.S. distribution will probably be handled by Timex. Expected price: $500.
ENTREPRENEUR STRIKES AGAIN	Sam Wyly, whose Datran data network went under in 1976 at the hands of Ma Bell (the two compa-

LOOK AHEAD

nies settled out of court in 1980), is getting back into the datacom business. Wyly and partner E. Ray Cotten expect the business climate to be more hospitable this time around since AT&T will be broken up due to its consent decree with the government. No name has been revealed for the new venture, which is to be headquartered in Dallas. That's where Wyly formed Wyly Corp., which runs University Computing Co., a high-flying computing services/software company founded in 1963. Wyly himself has left his namesake for ventures into the restaurant and oil exploration businesses, but hasn't strayed too far from computers. His Sterling Software Inc., in Dallas too, helps smaller software developers market their wares.

EXPERTISE FOR SALE?

It looks like ICL Ltd. the British computer giant that's getting its act together after so many years of red ink, is hot on the artificial intelligence market. ICL is closely tied into Pittsburgh-based Three Rivers Computers Inc., whose Perq computer can run the AI languages of choice: LISP and Prolog. The latter is understood to be a favorite in Japan, while LISP is popular in the U.S. ICL sees the Perq machine as an ideal "delivery vehicle" for AI-based expert systems, such as those being proposed by oil-well drilling companies. ICL and Three Rivers are hard at work now trying to bring down the price of the Perq to around $10,000 from its current mid-20s range. ICL sees steel milling, schools, and even local governments -- all "rule based" activities -- as likely markets for its AI wares. No word yet on when a marketable product will surface.

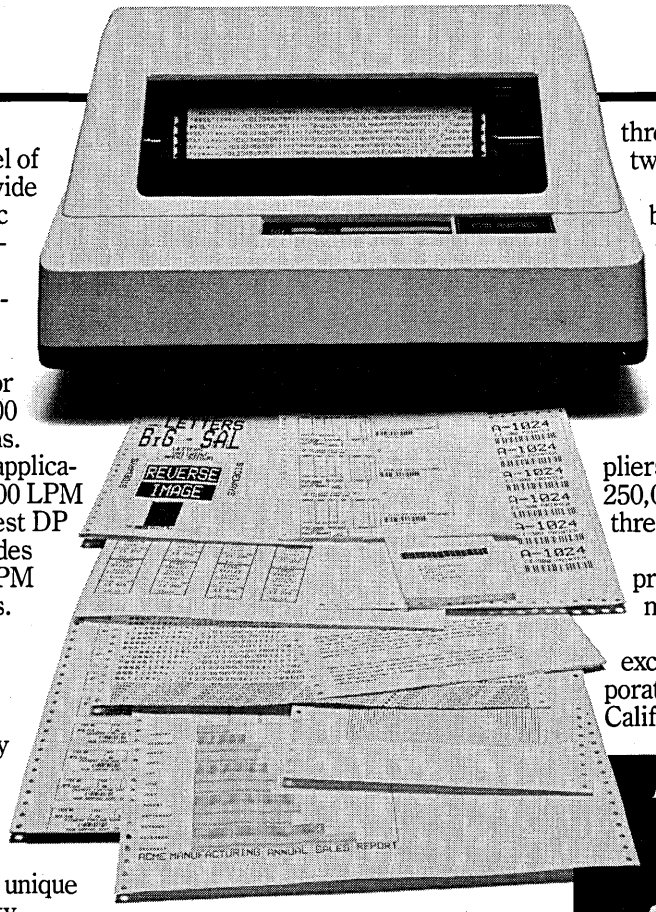
COMING FROM CINCOM

A slew of products is scheduled to be introduced by database software supplier Cincom Systems this year. Among them will be a thoroughly rewritten version of Total, slated to include a directory-driven DBMS, code-named "Queen Anne," and the "Davy Crockett" TP monitor, with interactive mapping and a revamped memory manager. Also coming is Ultra, a database system for Digital Equipment's VAX machine, the first DBMS Cincom developed from scratch for a non-IBM cpu.

RUMORS AND RAW RANDOM DATA

Look for Convergent Technologies to come out soon with a multiprocessing computer designed to act as a host to its workstations and other terminals....Getting ready for next year (hint: 1984)? Besides Orwell's novel, you'll want to read a new paperback from Avon: Sol Yurick's Richard A., a high-tech page turner!

TOP OF THE LINES.



The C. Itoh dot matrix line printers deliver a new level of price/performance for a wide range of business and scientific applications—including a complete selection of graphics.

There's the CI-300, a variable speed line printer that offers 300 LPM print speeds for data processing, 80 LPM for letter quality use and up to 2400 DLPM for graphics applications.

For your highest volume applications, there's our CI-600. Its 600 LPM print speed cuts even the biggest DP jobs down to size. It also provides letter quality printing at 170 LPM and up to 4800 DLPM graphics.

Both models bring bit-addressable graphics and high resolution to Bar Codes, OCR, Form Generation, Labels, and Word Processing. An incredibly small .013" print head diameter in the matrix produces the highest quality output you can find. Resolution is enhanced still further with our unique variable shuttle speed capability.

You get tremendous flexibility too. Thanks to easy user selection of print speed and density, character and line spacing, line feed speed, print control and many functions, including 3 paper loading entry points. In addition, a vast array of download features enable the printers to match many specific computer requirements.

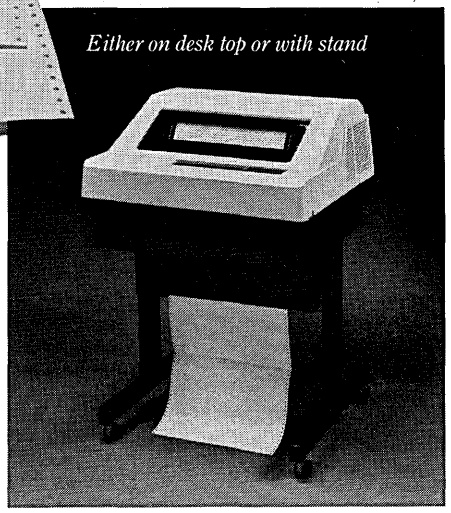
At C. Itoh, we don't think a printer has to look ugly to perform beautifully. That's why both of our line printers are designed to fit right into every office environment. They offer a small footprint, a low profile, and a true office environment noise level.

To satisfy your exact requirements, hundreds of unique character fonts are standard—plus you can design your own characters through the RAM which can be downloaded for special sets. An option board permits you to use macro selection for graphics production. Both printers come with three convenient built-in interfaces: two parallel and one serial.

For exceptional reliability, both printers feature a minimum of moving parts. Each is designed for highest duty-cycle use, making them ideal for all demanding environments, even warehouse and industrial locations. And don't forget, they're supplied by C. Itoh, one of the most experienced printer suppliers in the world with more than 250,000 units delivered in the last three years.

C. Itoh's CI-300 and CI-600 line printers. Top of the line performance—at a very low price.

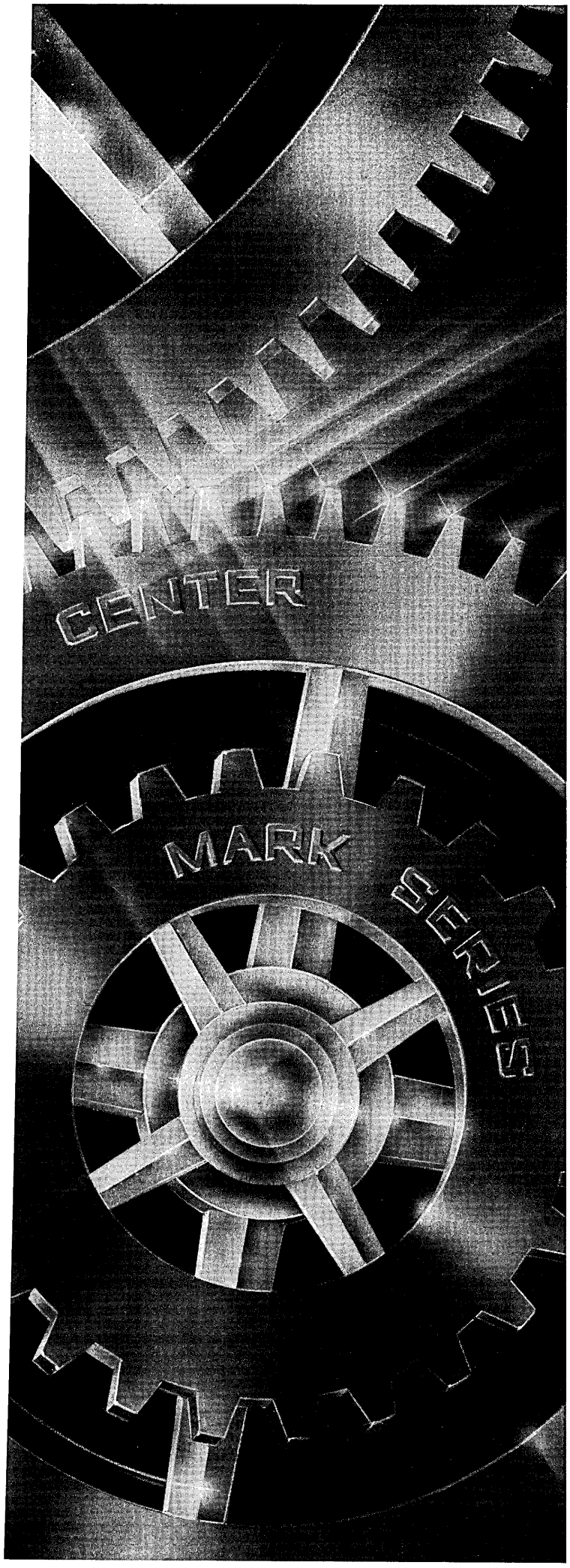
For full details, contact our exclusive representative, Acro Corporation, 2515 McCabe Way, Irvine, California 92713 (714) 557-5118.


Either on desk top or with stand

C. ITOH ELECTRONICS
5301 Beethoven St, Los Angeles, CA 90066 (213) 306-6700

CIRCLE 14 ON READER CARD

INFORMATION
DEVELOPMENT
ANSWER
SERIES



GREAT SOFTWARE ISN'T WRITTEN. IT'S ENGINEERED.

Software engineering means hardnosed quality control. It means extensible architecture. It means strict specifications for reliability and durability.

Each provided through intensive research, a disciplined development process and a commitment to excellence.

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If backlog is jamming your responsiveness to end-users and you want a strategic, dependable solution you can build upon, you need advanced technology software engineering. And that's what you'll get from Informatics® Answer™ Series software products. The Answer Series satisfies just about every information need your end-user can come up with. "Do-it-yourself" tools for them. Control for you.

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Don't compromise your mainstream applications with short term approaches. Longevity, efficiency and reliability are crucial. Engineered software is even more important here. Informatics Mark™ Series application generators make your data processing efforts more effective. They increase application programming productivity from two to five times above current levels. Your entire staff can reach new levels of productivity.

It takes the resources of a company like Informatics to meet the information challenges of the 80s. We will continue to be a dominant force in leading edge IBM installations throughout the world. After all, we've been decreasing backlog, increasing productivity, and engineering great software for over 20 years.

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THE SOFTWARE ENGINEERS

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CIRCLE 15 ON READER CARD

CALENDAR

MARCH

Federal Office Systems Expo.
March 14-17, Washington, D.C., contact: Mary Beth Goulcd, National Trade Productions, 9418 Annapolis Rd., Lanham, MD 20706, (301) 459-8383.

Business-Expo.
March 16-17, Houston, Texas, contact: Business-Expo, 702 East Northland Towers, 15565 Northland Dr., Southfield, MI 48075, (313) 569-8280.

8th West Coast Computer Faire.
March 18-20, San Francisco, Calif., contact: Computer Faire, 345 Swett Rd., Woodside, CA 94062, (415) 851-7077.

Interface '83.
March 21-24, Miami Beach, Fla., contact: The Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

Office Automation Conference and Exposition.
March 22-23, Zurich-Regensdorf, Switzerland, contact: the Foreign Commercial Service, American Embassy, P.O. Box 1065, CH-3001, Bern, Switzerland, 031/437011.

Future Office.
March 29-April 1, Milan, Italy, contact: U.S.I.M.C., Via Gattamelata 5, Milan, Italy, 39-2-469-6451, telex: 330208.

APRIL

Intergraphics '83.
April 11-14, Tokyo, Japan, contact: Japan Management Association, Kyoritsu Bldg., 3-1-22 Shiba Park, Minato-Ku, Tokyo, 105, Japan, telex: Japan 242-3369 Nitino J.

National Micrographics Association Conference and Exposition.
April 11-14, Philadelphia, Pa., contact: National Micrographics Association, 8719 Colesville Rd., Silver Spring, MD 20910, (301) 587-8202.

Hannover Fair '83.
April 13-20, Hannover, West Germany, contact: Hannover Fair Information Center, P.O. Box 338, Whitehouse, NJ 08888, (800) 526-5978.

INFOCOM-83
April 18-21, San Diego, Calif., contact: IEEE Computer Society, P.O. Box 639, Silver Spring, MD 20901, (301) 589-8142.

13th International Symposium on Industrial Robots/Robots 7.
April 18-22, Chicago, Ill., contact: Pat Van Doren, SME Technical Activities, One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

National Material Handling Show.
April 25-28, Chicago, Ill., contact: Material Handling Institute, Inc., 1326 Freeport Rd., Pittsburgh, PA 15238, (412) 782-1624.

Info Manufacturing 83.
April 26-28, Chicago, Ill., contact: Clapp & Poliak, 708 Third Ave., New York, NY 10017, (212) 370-1100.

Comdex Spring.
April 26-29, Atlanta, Ga., contact: The Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

MAY

COMPUTA '83
May 11-15, Singapore, contact: Kallman Associates, 5 Maple Court, Ridgewood NJ 07450, (201) 652-7070.

National Computer Conference.
May 16-19, Anaheim, Calif., contact: AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3624.

Europe Software 1983.
May 17-19, Utrecht, The Netherlands, contact: Royal Netherlands Industries Fair, P.O. Box 8500, 3503 RM Utrecht, The Netherlands, (30) 955 911, telex: 47132.

SICOB and Convention Informatique, Spring.
May 30-June 3, Paris, France, contact: The Secretariat, Spring Convention, 4/6, Place de Valois, F-75001 Paris, France, telex: 212597F.

JUNE

5th Annual National Educational Computing Conference.
June 6-8, Baltimore, Md., contact: Dept. of Math and Computer Science, Towson State University, Baltimore, MD 21204.

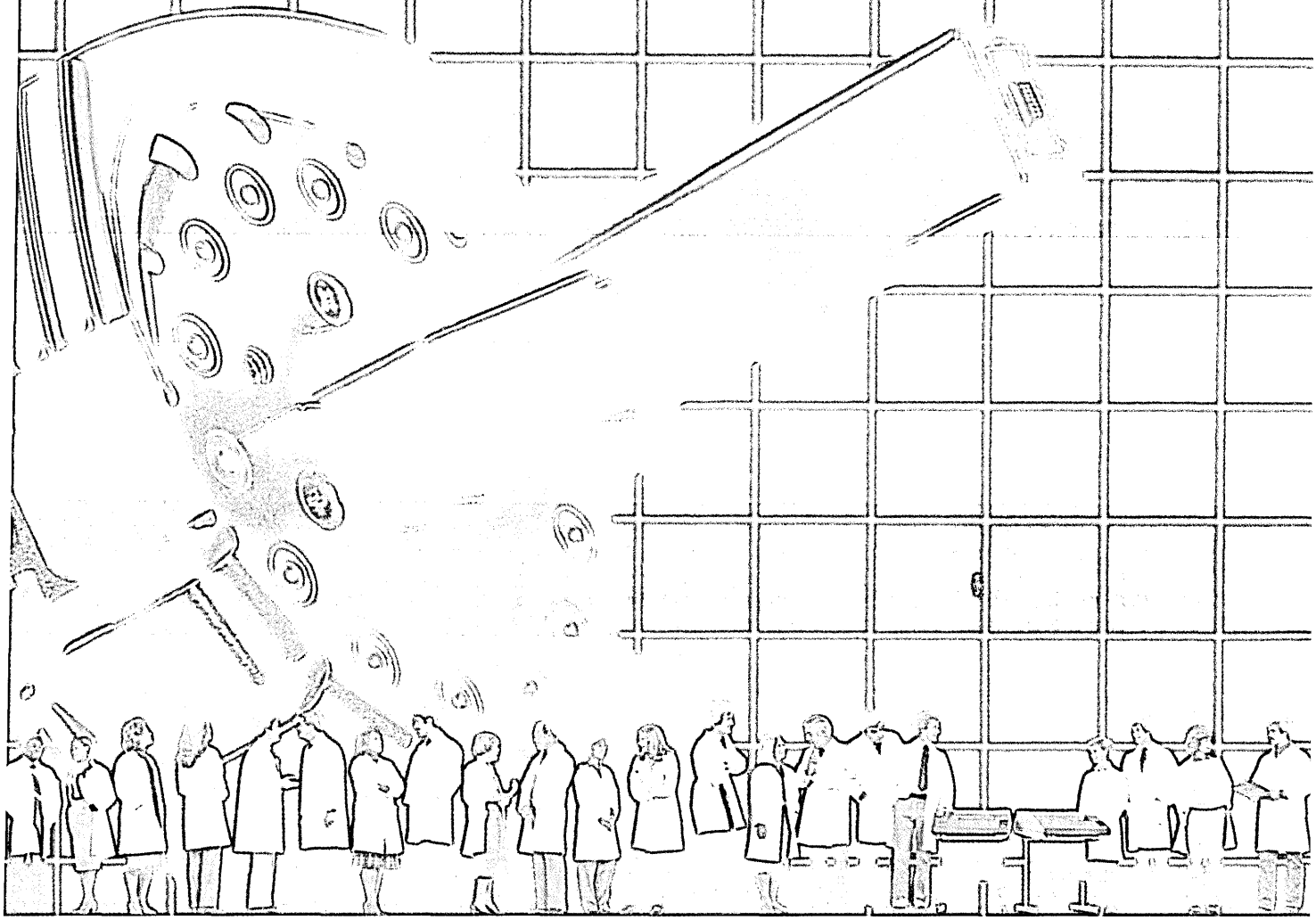
Syntopican XI.
June 13-16, San Francisco, Calif., contact: International Information/Word Processing Association, 1015 North York Rd., Willow Grove, PA 19090, (215) 657-6300.

National Computer Graphics Association '83
June 26-30, Chicago, Ill., contact: Nancy Lefebvre, NCGA, 8401 Arlington Blvd., Fairfax, VA 22031, (703) 698-9600.

Videotex '83.
June 27-29, New York, N.Y., contact: Online Conferences, Ltd., Argyle House, Northwood Hills, Middlesex HA6 1TS, England, 44 9274 28211, telex: 923498.

20th Design Automation Conference.
June 27-29, Miami Beach, Fla., contact: Paul Losleben, DARPA/IPTO, 1400 Wilson Blvd., Arlington, VA 22209, (202) 694-5037.

Dataproducts Design Engineers created a matrix printhead so reliable, we guarantee it for life.



If the printhead on any new M-200 or M-120 matrix printer fails or wears out, Dataproducts will replace it free.

Three years from now or 30 years from now.

We make this remarkable promise because we make a remarkable printhead – a major achievement of Dataproducts Design Engineers.

These men and women are an elite group charged with a singular objective: To make Dataproducts printers the most affordable you can own.

They designed this unique matrix printhead to last. And to stay within specifications for life.

Reliability is engineered into the entire printer. Quality is built in.

That's why the biggest OEMs put their names on Dataproducts printers. (Forty thousand are already proven in the field.) It's why we back every one with a full year warranty.

The M-200 prints up to 340 characters per second. The M-120 prints 180 cps.

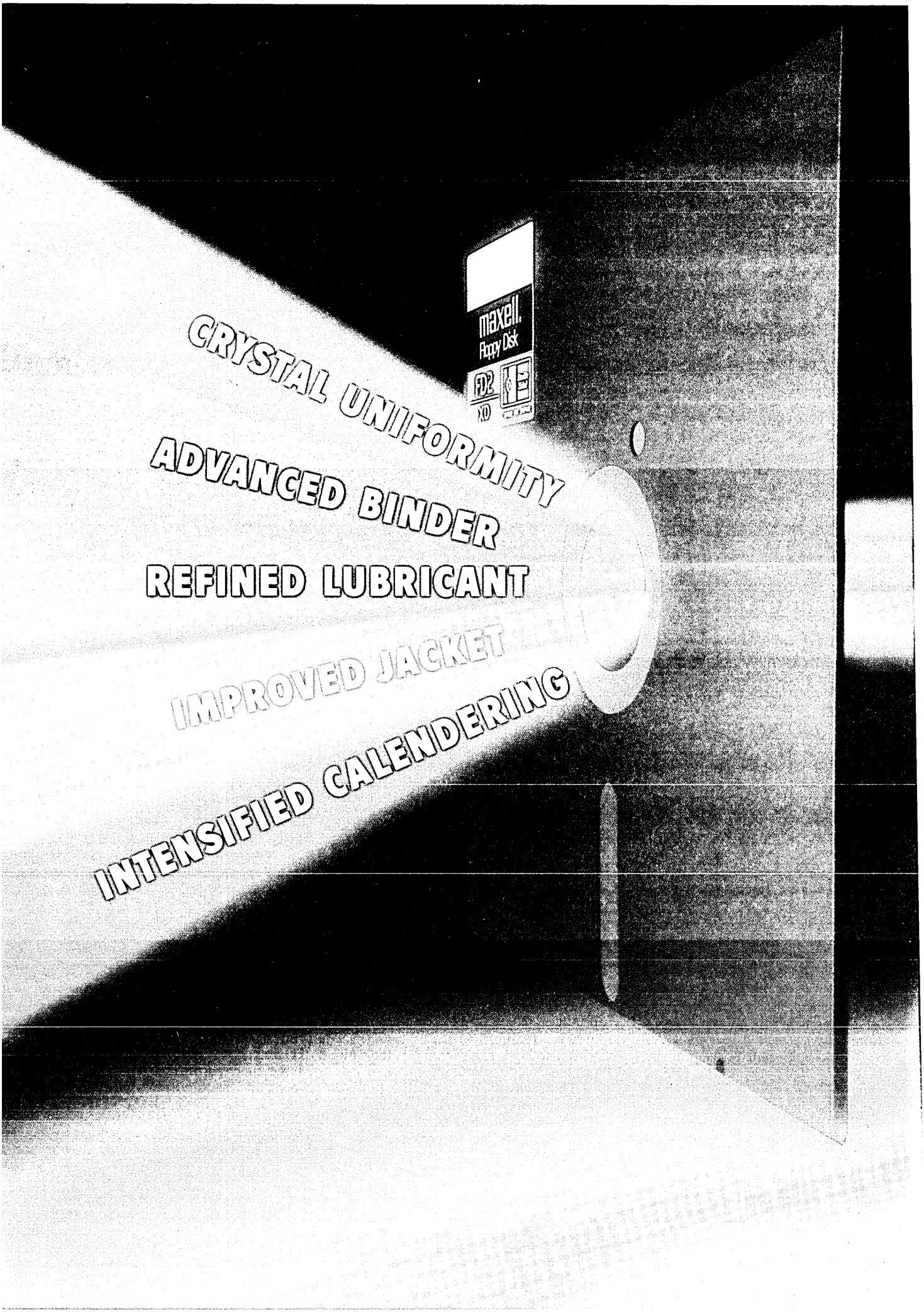
Learn how quality Dataproducts printers can reduce your company's Cost of Ownership. Write Dataproducts Marketing Department, 6200 Canoga Ave., Woodland Hills, CA 91365. Or call (714) 752-7411 (Western); (617) 237-4711 (Northeastern); (305) 788-2124 (Eastern/Southeastern); (214) 231-2240 (Central).

Dataproducts

Dataproducts long-life printers.

Dataproducts M-200 and M-120 are registered trademarks of Dataproducts Corporation.

CIRCLE 16 ON READER CARD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Floppy Disk
FD2
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CRYSTAL UNIFORMITY
ADVANCED BINDER
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IMPROVED JACKET
INTENSIFIED CALENDERING

THE GOLD STANDARD.

You can wait for industry standards to mandate improved performance. Or you can have it now on Maxell. The Gold Standard.

What distinguishes a Maxell floppy disk? Improvements great and small, achieved in a decade of innovation. We developed unique, uniform crystals to assure dense oxide packing. Intensified the calendering process to minimize the need for abrasive burnishing. Created an improved binder and lubricant. And a new jacket design that leaves industry standards in our wake.

It would require photomicrographs to make some of these improvements observable. On the job, the advantages become obvious. Resolution enhanced by 20% creates a cleaner signal output.

And guarantees the read/write accuracy in double-density applications. New jacket construction, heat-resistant to 140°F, extends disk use without risk of mistracking. In effect, durability is redefined. And in accelerated tests against the most respected names in the industry, Maxell sustained the highest and most consistent output over time.

We applaud industry standards that aspire to dropout-free, reliable disk performance. The Gold Standard expresses a higher aim: perfection.

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IT'S WORTH IT.

Computer Products Division, Maxell Corporation of America, 60 Oxford Drive, Moonachie, N.J. 07074 201-440-8020

CIRCLE 51 ON READER CARD

The new COMPAQ Portable Computer. IBM compatibility to go.

Simple, isn't it? The COMPAQ™ Portable Computer can do what the IBM® Personal Computer does. To go.

It runs all the popular programs written for the IBM. It works with the same printers and other peripherals. It even accepts the same optional expansion electronics that give it additional capabilities and functionality.

There's really only one big difference. The COMPAQ Computer is designed to travel.

Carry the COMPAQ Computer from office to office. Carry it home on the weekend. Or take it on business trips.

If you're a consultant, take it to your client's office.

If you use a portable typewriter, you can use the COMPAQ Computer as a portable word processor instead.

If your company already uses the IBM Personal Computer, add the COMPAQ Portable as a mobile unit that can use the same programs, the same data disks, and even the same user manuals.

There are more programs available for the COMPAQ Computer than for any other portable. More, in fact, than for most nonportables. You can buy them in hundreds of computer stores nationwide, and they run as is, right off the shelf.

With most other portables you'd probably need to buy an additional display screen because the built-in screen is too small for certain tasks, like word processing. The COMPAQ Computer's display screen is nine inches diagonally, big enough for any job, and it shows a full 80 characters across. And the built-in display offers high-resolution graphics and text characters on the same screen.

The bottom line is this. The COMPAQ Computer is the first uncompromising portable computer. It delivers all the advantages of portability without trading off any computing power capability.

And what do those advantages cost?

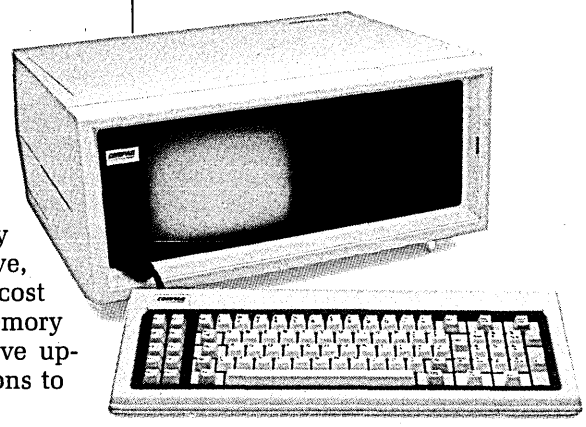
Nothing.

The COMPAQ Portable sells for hundreds less than a comparably equipped IBM or APPLE® III. Standard features include 128K bytes of internal memory and a 320K-byte disk drive, both of which are extra-cost options on the IBM. Memory and additional disk drive upgrades are available options to double those capacities.

In the standard configuration, the COMPAQ Computer has three open slots for functional expansion electronics as your needs and applications grow. It accepts standard network and communications interfaces including ETHERNET™ and OMNINET™.

If you're considering a personal computer, there's a new question you need to ask yourself. Why buy a computer that *isn't* portable?

For more information on the COMPAQ Portable Computer and the location of the Authorized Dealer nearest you, write us. COMPAQ Computer Corporation, 12330 Perry Road, Houston, Texas 77070. Or call 1-800-231-9966.



COMPAQ™

PORTABLE COMPUTER

The most computer you can carry.

LETTERS

A MOST IMPORTANT MATTER

In your Software and Services Updates in the November issue, you chastise Cullinet (formerly Cullinane Database Systems) for touting its integration of applications and Integrated Database Management Systems (IDMS) as "the most important breakthrough ever in software" by lamenting that it "doesn't quite live up to its billing."

Your one-paragraph analysis, however, fails to grasp the concept of three-level integration. Cullinet combines applications and decision support systems in IDMS. The key element of this breakthrough is not the IDMS (one of the newest on the market), but the integration of decision support and applications in a database-driven system.

Now a ceo has, in the boardroom, an up-to-the-minute management information system that has integrated decision support, giving him or her the responsive computer system that the data processing industry has been promising to deliver for the past 20 years. This integration, an industry first, *is* the most important breakthrough ever in software.

JOHN DONNELLY
Cullinet Software
Westwood, Massachusetts

FOR FURTHER DISCUSSION

Your "From Ripoffs to Rewards" editorial (Editor's Readout, December) calls for mutual recognition of needs by developing countries and vendors. Your message to vendors is to be more cognizant of buyer applications and service requirements, not just equipment. In a perfect world no one would take exception to your plea. The reality is, however, that developing countries often approach vendors with definitive shopping lists. Requirements for applications software and much-needed technical services are usually nonexistent or expected for free. Developing countries want to optimize scarce computer budgets by acquiring the maximum amount of equipment that is possible.

Recognizing the above situation and in agreement with your basic point of view, we have been planning for the past year the establishment of an organization that could serve as a forum for developing countries and vendors. Through this forum a dialog could be established for the mutual exchange of views and technical information, ranging from site planning, export licensing, and training program design to systems specifications writing and applications software development. We invite interested readers of DATAMATION to notify us of their desire to participate in such a forum.

JACK C. FENSTERSTOCK
Phoenix Associates Inc.
Bethesda, Maryland

A TOME ON TOMBS

While I always enjoy the Looking Back department in DATAMATION, I was surprised to see the following statement in the December column: "A case in point came from a musty IBM tomb. . ."

I know some IBM manuals and other writings are pretty musty, but have any of them been buried? Perhaps "tome" was the word intended.

WALTER PENNEY
Greenbelt, Maryland

FAR OUT

Contrary to the statement in your article titled "Roman Meets Farsi" (January), Farsi is not the name of the alphabet used by Arabs, Iranians, and other Moslems. Rather, it is the name of the southwestern Iranian dialect spoken in the country of Iran. Similar dialects are called Dari in Afghanistan and Tadzhik in the U.S.S.R.

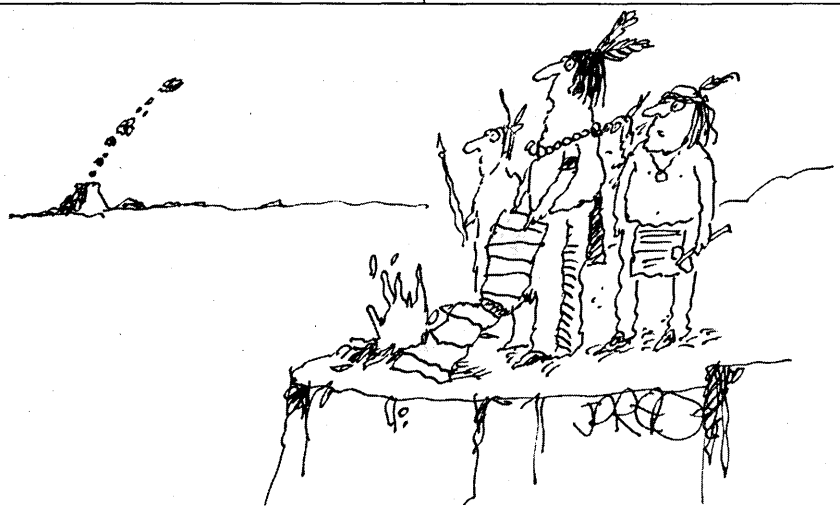
Farsi draws its name from the province of Fars in southwest Iran, long the center of west Iranian culture and nationality. Called in ancient times Pars, it also gave its name to Persia and Persian, which is still an acceptable English term for the language, although not for the nationality.

ROBERT G. SALTER
Alexander Hamilton Institute Inc.
New York, New York

WRITE ON

My thanks (?) to George Boardman of Ampex Corp. (Letters, December) for noticing the error in the "Special Awards" section ("Products of Their Times") of your September issue, which credits National Semiconductor's PR department with creation of the write-only memory.

Mr. Boardman is right. I was responsible for making the WOM public, but I wasn't the creator of the device. It was the brainchild of John G. Curtis, who was manager of MOS product marketing for Signetics at a time in 1973 when almost all of the company's RAM ICs were functional WOMs. The yield of functional RAMs was extremely low, but the yield of fully functional WOMs



"It's the Chief's answering service!"

CARTOON BY JARED P. LEE

LETTERS

was incredibly high. Curtis decided to promote the product that the company could then make with great success, and thus was born the Signetics WOM. (Curtis went on to found his own company, Curtis Electro Devices, Mountain View, Calif.)

Advertising played an important part in bringing the WOM to market. A special promotional program was spearheaded by Paul Hansen, ad manager for Signetics (now ad/promo manager for Tandem in Cupertino, Calif.). Working with him on the agency side was Alan Gabriel, a brilliant conceptualizer. (Gabriel is now heading his own agency, working primarily with Oki Semiconductor).

Your writer wasn't entirely wrong about National Semiconductor's creative capability at the time the WOM was inflicted on the world. I moved to National in 1975, but before I arrived there, the company had issued its answer to the WOM—National's LED Display Group created the DED (darkness-emitting diode)—which was the work of George Learned, who alas is no longer among us.

"Most of the media thought they were kidding, but not every editor," states your article. How true. I'm happy to say that DATAMATION editors enjoyed the joke and devoted a couple of column inches to the WOM late in 1973.

ROY L. TWITTY
Bozell & Jacobs Public Relations
Palo Alto, California

MOTHER KNOWS BEST

My mom used to tell me something about food, which, when taken in a different context, might be useful to Glynnis, the computer addict (Editor's Readout, November). She used to say: "Eat to live, don't live to eat."

As a 1983 computer science graduate looking forward to spending a few decades of my life in the computer industry, your editorial touched on a value I hope never to lose sight of: "Feed computers to people's needs, not people to computer's needs." It's a shame, in this case, that the person's need wasn't filled by people rather than by a daisywheel printer.

FRANK H. MCPHERSON JR.
Taylor University
Upland, Indiana

BOO, HISS

I suggest that it was in Poor taste for you to have allowed Thornton to muddy up the Cray areas in which Amdahl is so obviously informed (December, "Four Expert Opinions").

JOHN S. JENKINS
Chappaqua, New York

OUR APOLOGIES

Whether it was glitches or gremlins, bugs in the system, or a retrograde Mercury . . . whatever the reason, we had more than our share of problems with this year's Systems Software Survey (December 1982). Our apologies to the vendors whose products were mangled or misplaced. Needless to say, Data Decisions, which prepared the survey, and we at DATAMATION have taken steps to ensure that future surveys have fewer problems.

Below are some comments and corrections. . . .—Ed.

Your survey included the product "DEC Datatrieve" under the heading of database management packages. According to the literature issued by Digital Equipment Corp., Datatrieve "allows data to be accessed in VAX-11 RMS files and VAX-11 DBMS database structures. VAX-11 Datatrieve features integrated editing and report writing and graphic output facilities." In other words, Datatrieve is basically a Query subsystem to the VAX-11 DBMS. As such, it should not be included under the heading database management systems.

JIM RUSSELL
President
Computer Services Corp.
Boulder, Colorado

The December survey makes an invalid comparison of two fine Burroughs software products. Burroughs CANDE, entered with a score of 8.0 under "database management packages," has nothing whatsoever to do with DBMS. CANDE stands for command and edit language; it is a high-level text editor.

ODESY is an acronym for on-line data entry system and, while it has report generation capabilities, its major function is for data entry. It therefore should not be categorized as a report writer.

T. ELLETT
Los Angeles, California

In November you asked us to participate in a survey for one of our products, the BWCS Online Banking System. Unfortunately, your survey referenced the product only as "Online Banking System," a label that not only fails to identify us as a company but also fails to fully describe our product. Had BWCS been included, there likely would be no problem.

Further, our customers may have acquired components of the system, such as Online CIF, Universal Teller, ATM, etc., and can be confused when confronted only with the term "Online Banking System," thinking of us instead in terms of the specific component they acquired. Such incompletions can lead to less than adequate responses from the surveyed audience.

ROBERT D. WHITE
President
Bob White Computing & Software, Inc.
Oak Brook, Illinois

I was extremely frustrated and disappointed to see that the systems software survey excluded the most widely used DASD management system in the world—DMS/OS. This is not only a problem for my company, but also for many other companies whose successful, profitable products have been omitted. Don't you think it's time to give your readership what it deserves—a precise presentation of what is available for selection?

HARRIS A. HERMAN
President
Software Module Marketing
Sacramento, California

Your December cover story contained a completely erroneous user rating on our product, OBS Wylbur. OBS Wylbur was assigned a low rating in the service and ease of installation categories and the rating stated that 40% of our users were considering replacement. After researching the matter, Data Decisions discovered that approximately half of the 15 Wylbur respondents were not users of our product at all. These respondents were users of older, unsupported products that were obtained from sources not related to On-Line Business Systems, Inc. Additionally, the rating contained the wrong name of our product, an incorrect telephone number, and was placed in the wrong category.

BARRY HANSON
General Manager
Software Products Division
On-Line Business Systems Inc.
San Francisco, California

We have for the past 10 years been in the business of manufacturing systems software products for IBM mainframe users. The purpose of this letter is to bring to your attention a misprint in your December survey on p. 128 where our DFAST and TFAST survey results appear. The company name is Tower Systems Inc. rather than Tower/Oxford.

GREGORY K. COLLINS
Corporate Director of Marketing/Sales
Tower Systems Inc.
Irvine, California

And a few other errors:

- A few applications packages crept into our systems software ratings. Those packages that should not have been included are Sperry's IMS, Visicorp's VisiCalc, SPSS' Statistical Program for the Social Sciences, and Foresight's Foresight Planning Package.
- The category of packages headed "Database Management Packages" should have read "Data Management Packages."
- The package called IBM Utility should have been a generic entry labeled "IBM utilities."
- The vendor name for Space/Manager, under the "Operating Systems/System Support" category, was incorrectly listed as Altergo; the current distributor is Corodale, Boston, Mass. —Ed. ❋

Why install cables for data when there's a network... right under your nose?

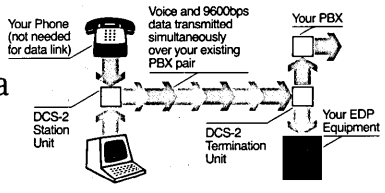
If you're tired of the endless hassle of expanding your local area network—not to mention the expense of installing cable and limited distance modems—Teltone has some very good news for you.

It's called the DCS-2 Data Carrier System, and it lets you use existing PABX wires to carry both voice and data traffic *simultaneously.*

That's right. Up to 9600 BPS of dedicated-channel, full duplex asynchronous data can be transmitted or received by any ASCII terminal in your system—and the data won't interrupt phone service.

With the DCS-2 your PABX becomes a common communications network, where making a computer hookup is as easy as plugging in a phone. It's fast, FCC Part 68 registered, and it won't cost you the roof over your head.

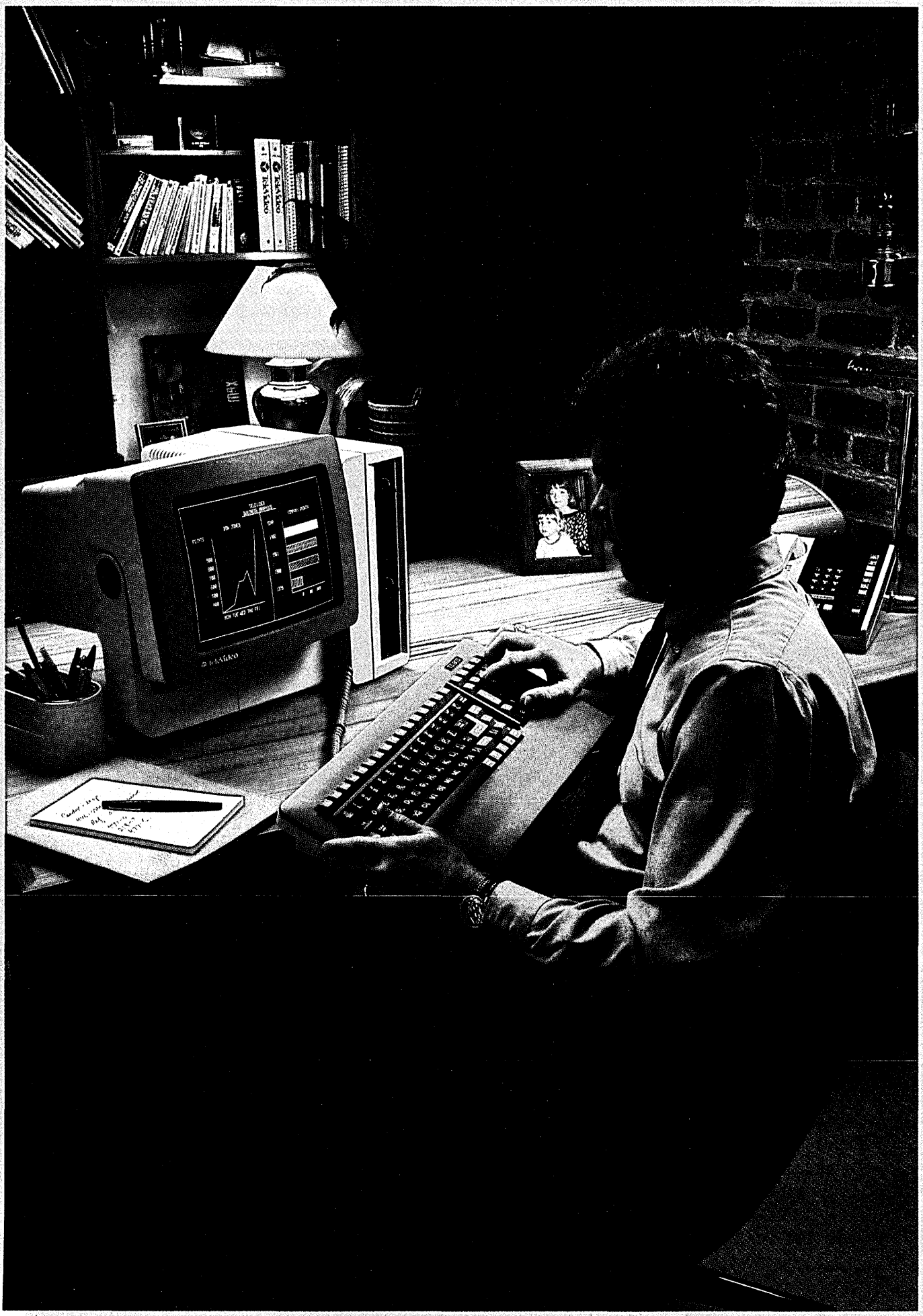
So before you make another equipment move, find out how Teltone can help you keep it simple. Just call our toll-free hotline at 1-800-227-3800 Ext. 1122 (in California 1-800-792-0990 Ext. 1122) or write Teltone Corporation, PO Box 657, Kirkland, WA 98033. In Canada call (416) 475-0837 or write 91 Telson Road, Markham, Ontario L3R 1E4.



TELTONE®

For users of DEC, Prime, Data General, Tandem, IBM Series/1, H-P and other asynchronous computers.

CIRCLE 19 ON READER CARD



The TeleVideo Personal Computer. Not the first. Just the best.

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CIRCLE 21 ON READER CARD

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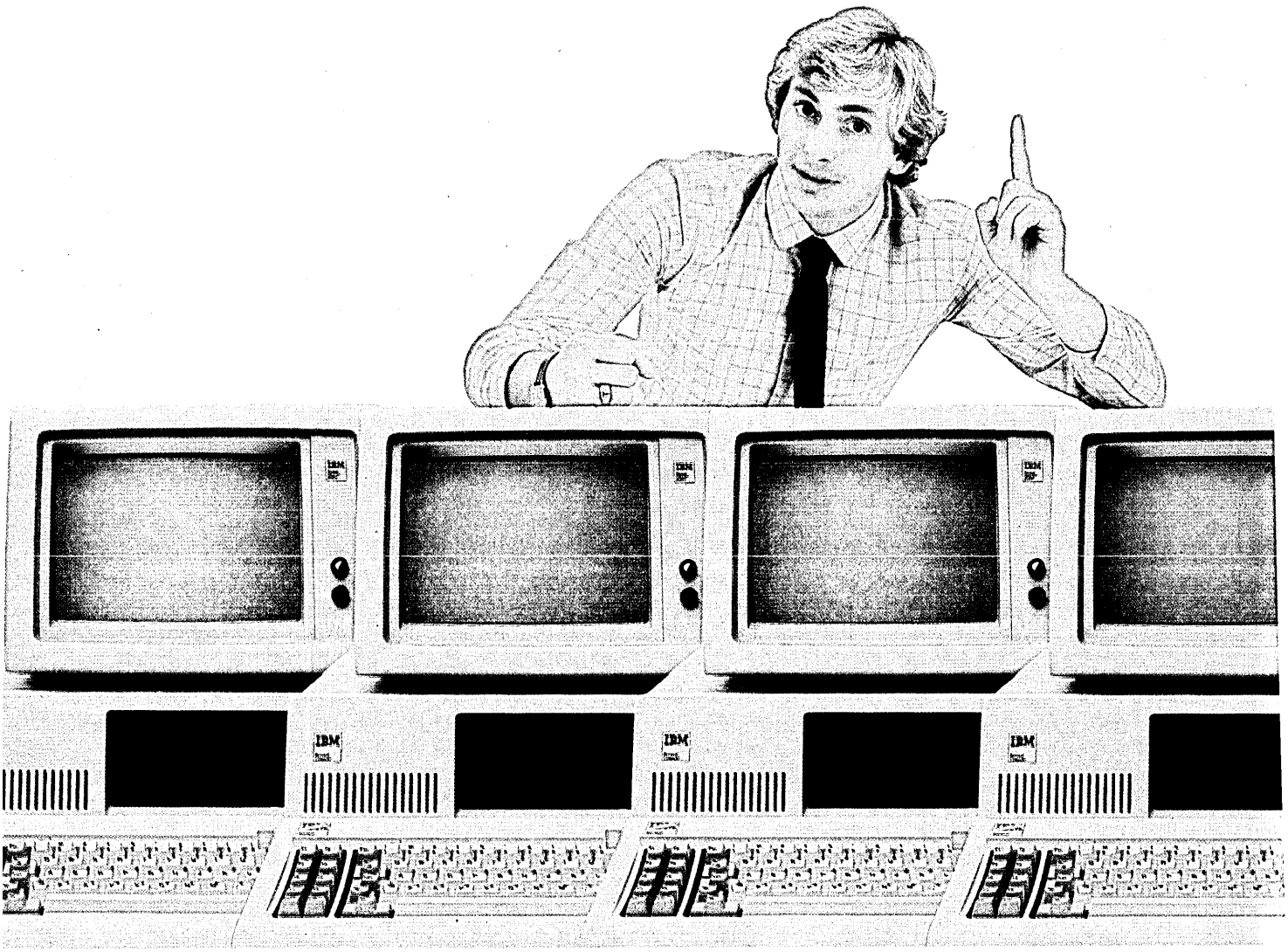

John L. Kirkley, Editor

EDITORIAL

OUR INDUSTRY COULD LEAD A LIBERAL ARTS RENAISSANCE

The universities and industry are engaging in a courtship that is fundamentally altering their relationship. Once standoffish colleges are now actively wooing business and are offering their research and development labs, computer science departments, graduate students, and faculty as dowry.

As Laton McCartney's article on p. 116 points out, industry is just as eager to consummate the union. The issue is not romance; the motive on both sides is money. For example, one half of Carnegie-Mellon Robotics Institute's $5 million annual budget comes from corporations. Stanford University has received a major chunk of the $20 million funding for its new Center for Integrated Systems from Xerox, TI, Honeywell, HP, DEC, and IBM.

In turn, industry expects a substantial ROI in the form of new ideas, technological breakthroughs, and a competitive edge in the world's marketplace.

Obviously there are many dangers as well as opportunities here. They are clearly spelled out in the article and we need not belabor them. But, upon reading the story and doing a little research, we discovered, not surprisingly, that most of this money was going to engineering and computer science departments for research into CAD/CAM, robotics, computer graphics, telecommunications, semiconductors, and the like.

At that point we had to stop and ask what at first may sound like an absurd question: why isn't industry pouring equal amounts of money into the liberal arts colleges? A ridiculous question? Perhaps not.

ILLUSTRATION BY DORIS ETTLINGER

A few thoughts: many of the successful people we know in the computer industry come from a background far removed from the "hard" sciences. (For example, we lunched the other day with a philosophy major who is now president of a high-flying software firm.) Consider, as well, that our future ability to compete in world markets and our much needed rise in productivity is dependent, in the long run, on people skills, not things. Further, we maintain that it is time to rid ourselves of an artificial division, a world view that is the legacy of the thinking of Bacon, Descartes, Newton, and Darwin; a reductionist view that preaches specialization, and, in education, has separated the humanities and sciences to the detriment of both.

In the perspective of the new physics, a holistic view that sees the interconnectedness of all things, there is a great need for people who can translate this "systems view"—as Fritjof Capra terms it in his landmark book *The Turning Point*—into everyday reality, including the reality of the technological marketplace.

There is a model for this kind of program that could be adapted to the liberal arts colleges. The Feb. 2 issue of the *New York Times* reported a unique experiment begun at the Polytechnic Institute of New York, a school known for its engineering program. Funded partly by the Mellon Foundation, the program, which leads to a bachelor of science, requires 33 or more hours in liberal arts—English, psychology, history, philosophy, etc. The institute's unique contribution is to require 48 hours of a liberal arts core requirement that includes such courses as Mathematics; Introduction to Computers; Technology, Science, and the Contemporary World; Information, Values, and Society; and finally, in the senior year, The Making of Connections, and Fundamental Issues—a Quest for Solutions.

The reunification of the sciences and the humanities is essential as we move into the Information Age. Private industry must look to the long run—we need both short-term technological solutions and long-term systems solutions; we need generalists who are equally at home in the sciences and humanities as well as narrowly focused technical specialists.

We would like to see industry, especially the computer industry, which is at the forefront of today's technology, take the lead. We urge our industry to work with the liberal arts colleges to develop courses of study that combine the humanities and the sciences. A merging of these artificially separated disciplines could be a powerful tonic for both our colleges and our corporations. ✲

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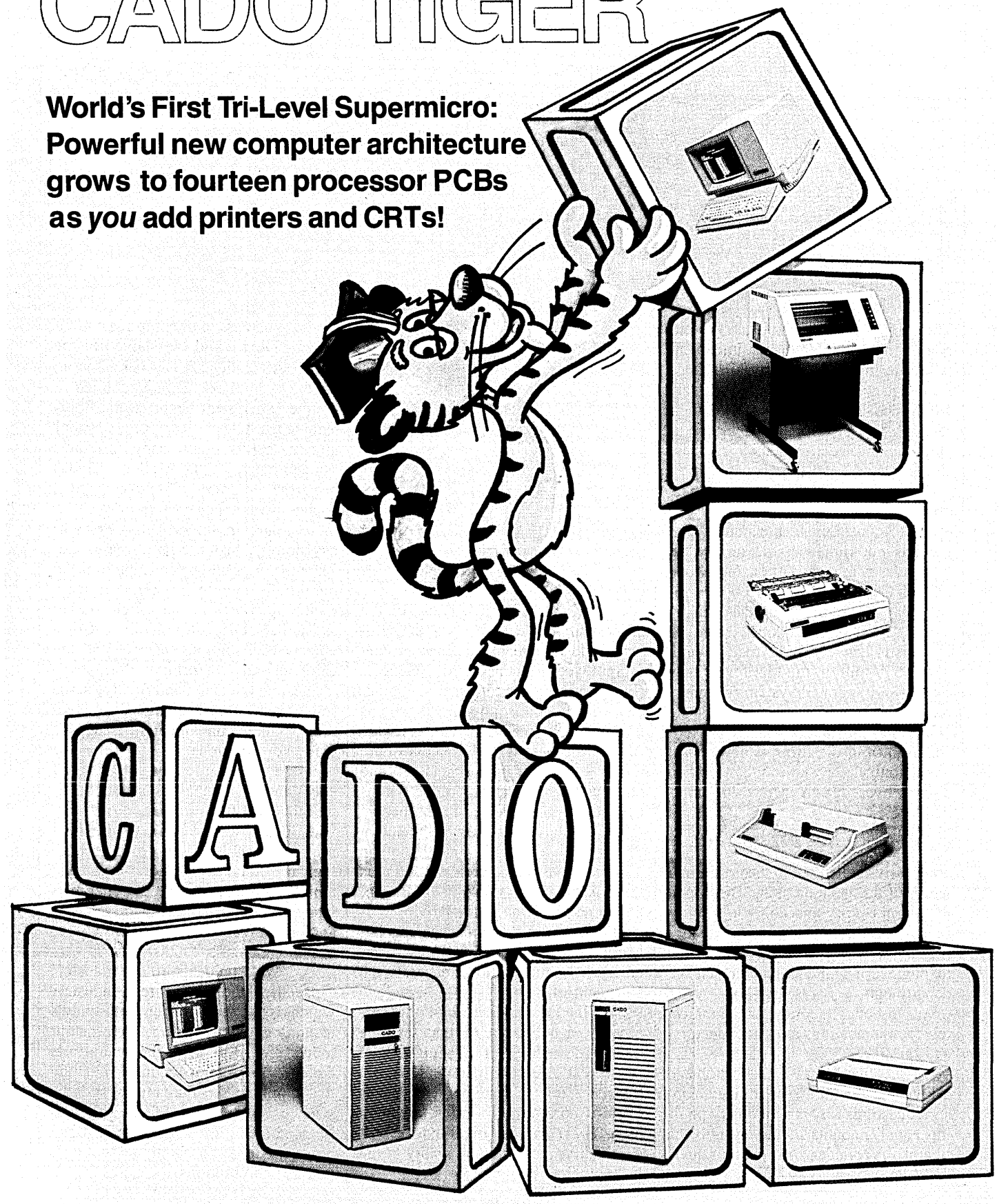

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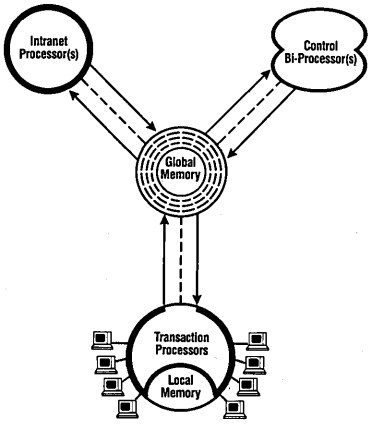

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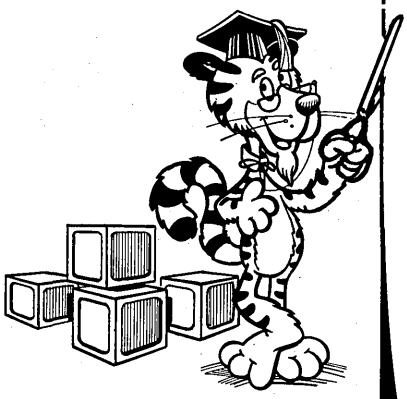
So before you decide on your next computer, call your local CADO Distributor. Ask him to tell you more about the CADO TIGER—a technological breakthrough that just made all other business computers obsolete.



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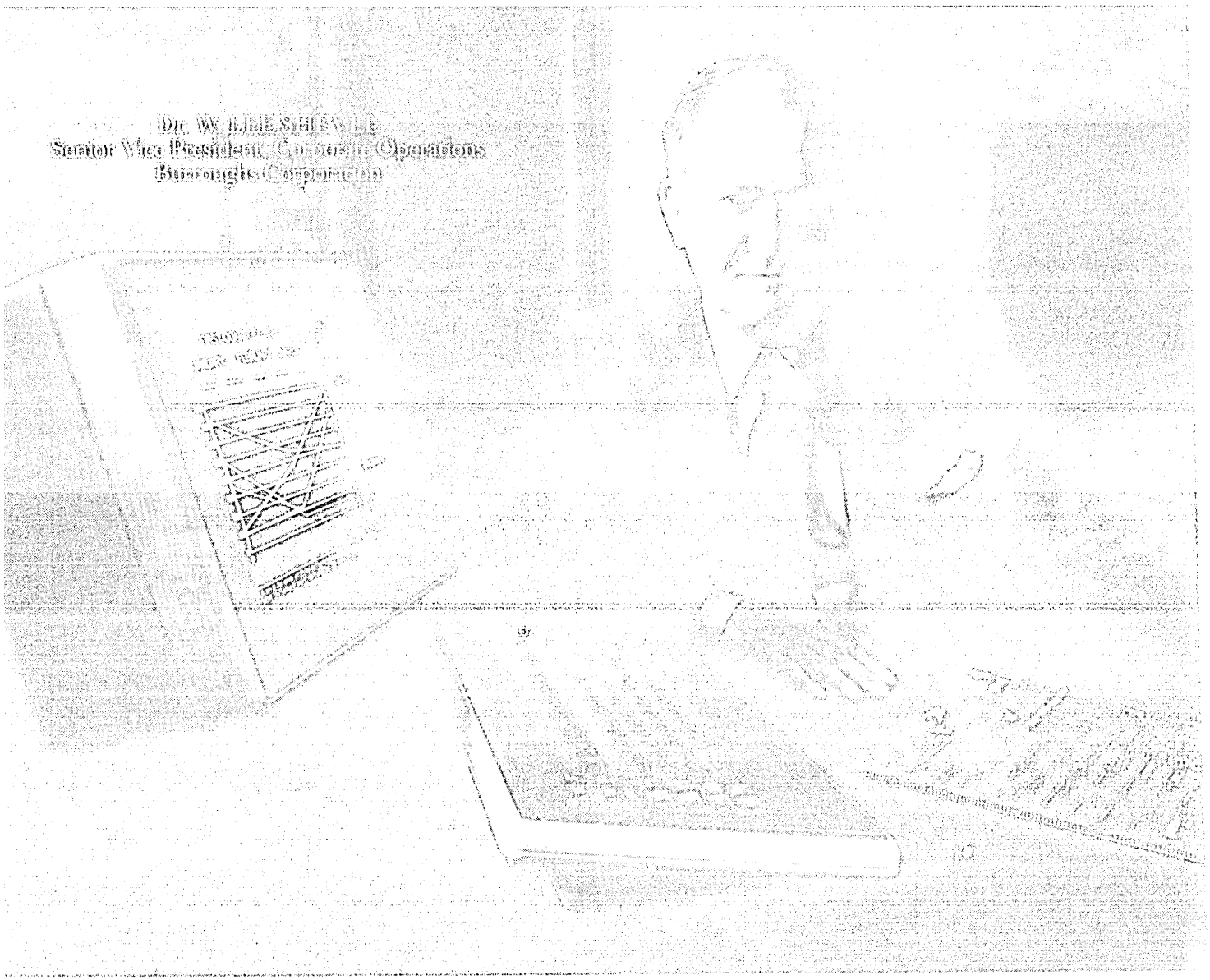
A TESTIMONIAL FOR THE BURROUGHS B20 FROM SOMEONE WHO SPENT 17 YEARS AT IBM.



Some people think that because IBM is bigger than Burroughs, they're better than Burroughs. After working for many years at IBM, I can tell you that bigger doesn't necessarily mean better.

Take small computers: the Burroughs B20 and IBM's Datamaster.

The B20 Series can offer up to five times more memory capacity, can store twice as much data, can have more work stations, offer more kinds of printers, and has a 25% bigger screen (to display more data).

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More importantly, the B20 can be networked with other B20's (while sharing the same data base, printer, or mainframe communications), so everyone is always working with the latest, up-to-date information.

And because the B20 supports all four industry-standard languages (COBOL, FORTRAN, Pascal and BASIC), users can select the language best suited to their individual needs. With IBM's Datamaster, you have one choice—BASIC.

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If there are any questions, just call the Burroughs hot line. Trained Burroughs computer specialists will help with any problem that arises. (90% of all questions are answered in the first call.) We also have service depots in 19 cities throughout the U.S., or you can choose on-site servicing.

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IN FOCUS

FIFTH AVENUE GENESIS

IBM's world-recognized image was conceived on a famous New York street.

by W. David Gardner

It is the early 1950s—the Ice Age of the computer. In fact, computers are still popularly called "Giant Brains," and the few Giant Brains already constructed are unattractive. Likewise, the International Business Machines Corp. is of uninspired and uncoordinated design. These are the days when Remington Rand's Univac Division leads IBM in computers, but IBM, with an overwhelming edge in tabulating machines, punched card equipment, and typewriters, is driving hard to catch up.

The responsibility for catching up falls largely on the shoulders of a tall, prematurely graying man who, on a particular night in the early 1950s, is walking along New York's Fifth Avenue. The man is, of course, Thomas J. Watson Jr., IBM's young president, still in his thirties at the time. As he walks along Fifth Avenue that night, his attention is caught by a striking window display labeled "Olivetti." Watson finds the colorful and attractive Olivetti office equipment and furniture possesses "a kind of collectiveness." Maybe something similar, he mused, could be done at IBM. "I thought," said Watson years later, "you ought to be able to look at an IBM factory, at an IBM product, even at an IBM curtain, and say it's IBM."

If today's world-recognized IBM image had a moment of conception, it was in Watson's head that night on Fifth Avenue. In a way, Watson became a kind of Louis IV of corporate high technology and his company became his Versailles. While Watson, of course, couldn't build a Versailles of design and concept in one place, he was able to build little Versailles around the world. Today if you look at the firm's facilities in Armonk, Vancouver, Sindelfingen, La Gaude, or Buenos Aires, you know it is IBM, whether it is a building, a computer, a typewriter, a brochure, or even a memo pad. It may have its own individuality, but it's still IBM. That random walk along Fifth Avenue by Thomas Watson 30 years ago led to all that.

"I went to Italy and met Mr. Adriano Olivetti, one of the great industrial leaders of Italy," Watson recalled in a speech he gave in the mid-1970s. "He had a completely organized design program that included company buildings for employee housing—which was popular in Italy at the time—as well as Olivetti offices, products, colors, brochures, and advertisements."

Watson thought some more about the subject and soon the inevitable IBM think-in at a mountain resort in Pennsylvania followed. Said Watson: "We took all the top-level people in the IBM company to a hotel in the Pocono Mountains, where we considered IBM design in contrast with that of Olivetti and a number of other companies. We wanted to improve IBM design, not only in architecture and typography, but color, interiors—the whole spectrum."

The key man in the IBM image equation was architect-designer Eliot Noyes, whom Watson had known during their Air Force days in World War II. It was Noyes who convinced IBM to adopt a corporate image and design that embraced the best in modern design. (Noyes died in 1980 after a long, illustrious career.) Thus, at IBM there would be no dogs listening to masters' voices, no stars of stage, screen, or sport endorsing IBM products.

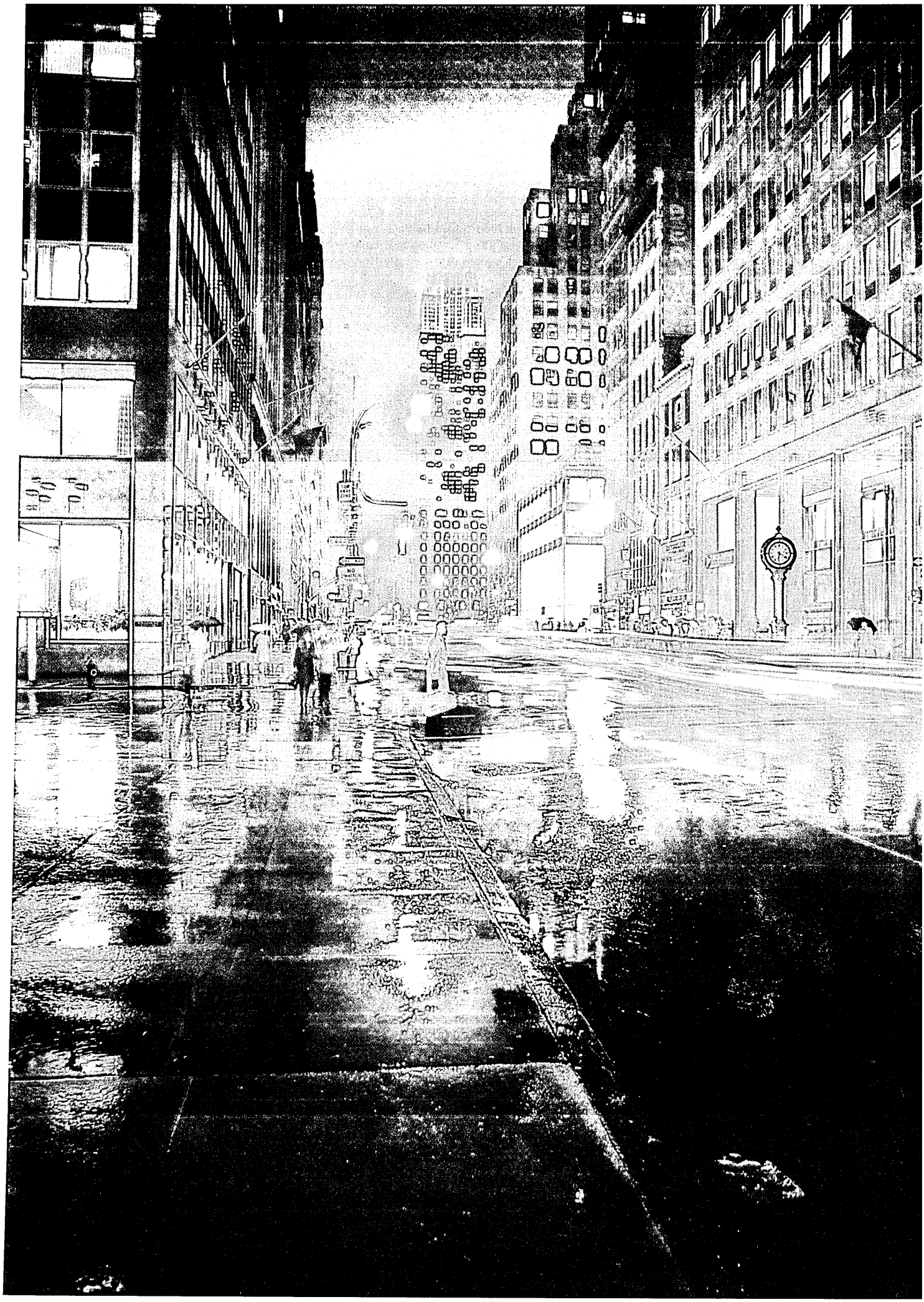
But computers as beauty? That was a novel idea indeed, particularly in those days of the unwieldy early electronic computing mastodons. But from the start of IBM's efforts in computers, Watson as inspiration and Noyes as catalyst often viewed electronics technology as possessing physical beauty. The early IBM computers and components were celebrated in striking color photography in company publications. In the belief that the actual mechanisms within computers were attractive, Noyes convinced IBM to put safety glass in its early computer covers to show off the electronics componentry.

IBM brought classy, dramatic, and artistic presentations to American tv sets.

IBM's renaissance thinking spilled over into its architecture. In the company's most manic period of building—1956 to 1971—IBM built more than 150 plants worldwide, and its architects were a veritable who's who of architecture. Eero Saarinen built the stunning and elaborate research center at Yorktown Heights, N.Y., and the stark but comfortable plant at Rochester, Minn. Mies Van Der Rohe's last work was for IBM—the company's Chicago skyscraper. Marcel Breuer designed IBM's futuristic plant in Boca Raton, Fla. A leading American architectural company, Skidmore Owings and Merrill, did the corporate headquarters in Armonk. The multinational lineup of architects of IBM plants also included Egon Eiermann of Germany, Jacques Schader of Switzerland, Jorgan Bo of Denmark, Shoji Hayashi of Japan, and Henrique Mindlin of Brazil.

The Armonk headquarters has widely acclaimed Japanese gardens designed by Isamu Noguchi. There is even an antiseptic touch that no other company but

PHOTOGRAPH BY J. DiMAGGIO/J. KALISH/THE IMAGE BANK



IBM could have dreamed up—the apple trees in the old Armonk orchard have been chemically treated so the trees blossom but bear no fruit. Rotten apples are forbidden fruit at world headquarters.

IBM has also attempted to put its best foot forward through its advertising. Until the company's recent splurge with its Personal Computer, IBM had been noted for its low-key advertising that tends to stress an overall image of benevolence. Antitrust problems have been a factor here as might be expected, since the firm has traditionally been 800% larger than its nearest competitor. Documents turned up in the U.S. government's antitrust case against IBM state that before the suit was filed in 1969, IBM's corporate advertising campaign was "aimed at countering antitrust charges by building up the competitiveness, ease of entry, innovative capabilities, etc. of our industry." After the action was filed, IBM ads stressed the firm's dedication in helping to meet the "challenges facing our beleaguered society," words used in a memorandum to Thomas Watson.

IBM's longtime advertising manager, Dean R. McKay, became alarmed from time to time at RCA's heavy product advertising, but IBM's marketing chiefs still held product advertising budgets in rein. Even so, all of RCA's huffing and puffing only resulted in RCA's blowing its own house down: the company left the computer business in 1971.

When Jane Cahill Pfeiffer became IBM's director of communications in the early 1970s, the firm's advertising budget was dramatically increased due in part to the adverse publicity generated by various antitrust suits against IBM. In a $6 million IBM television presentation of the Sleeping Beauty ballet in 1973, for instance, it was estimated that IBM reached more than 100 million people.

Whatever the reasons for IBM's corporate television advertising over the years, no one would claim that the shows it sponsored were anything but first-rate. While many of its rivals were sponsoring the mindless kitsch that is the staple of U.S. network television. IBM brought classy, dramatic, and artistic presentations to the country's television sets. And these class presentations helped polish IBM's image.

All that was not lost upon RCA management, which eventually hired Pfeiffer to run its NBC Broadcasting operation, and, in the process, made her the highest paid corporate woman in America. Pfeiffer immediately set out to upgrade NBC's programming. At the time, she said: "Just as a little show business goes a long way at IBM, a little IBM seems to go a long way in show business." But she quickly became a victim, losing her job in less than two years. In the end, the pressures of the television ratings game in the U.S. did her in.

The architects of some 150 IBM plants were a veritable who's who of architecture.

In another area, IBM's image has always been helped along by its skillful handling of the press. The firm has always hired experienced journalists and paid them well. Internally, they have put out fine in-house publications like *Think*, the company's slick magazine. Externally, they work the general and business press like skilled politicians work crowds.

The importance of the press to IBM is illustrated by the U.S. media companies themselves, many of which share directors with the mighty multinational. IBM directors are also directors of the New York Times, Time Inc., the Washington Post, and CBS. Other IBM directors shuttle back and forth between IBM and the major media outlets. While no one has ever accused IBM of directly influencing any of those media outlets, the company is always assured of easy access to top management.

But in the last analysis, it is the people of IBM—or of any organization—who set its public image. IBM has always had a particular respect for its employees as individuals—and in fact, IBM top management has always spent more of its time on the subject than on any other. ("It's almost a fixation," Thomas Watson Jr. once said.) The overwhelming majority of IBM employees consider IBM a good place to work. In return, the employees have served IBM well. The company's don't-fold-spindle-or-mutilate mentality is highly conformist, and it's never been too difficult to spot an IBM man in a crowd.

Take IBM's dress code, for instance. The stiff, starched high collars are gone now, but IBM men still sport white shirts, conservative business suits, and closely cropped hair, a throwback to the days when Thomas Watson Sr. insisted that nonconservative dress might distract a potential sales prospect. Officially, there is no dress code at IBM, but those white shirts still predominate, and along with them, IBM's conservative image. In the early 1970s, Thomas Watson was still firing off dress code memos addressed to all IBMers, and while he didn't specify white shirts as the IBM uniform of the day, his employees got the message and rushed out and bought new supplies of white shirts.

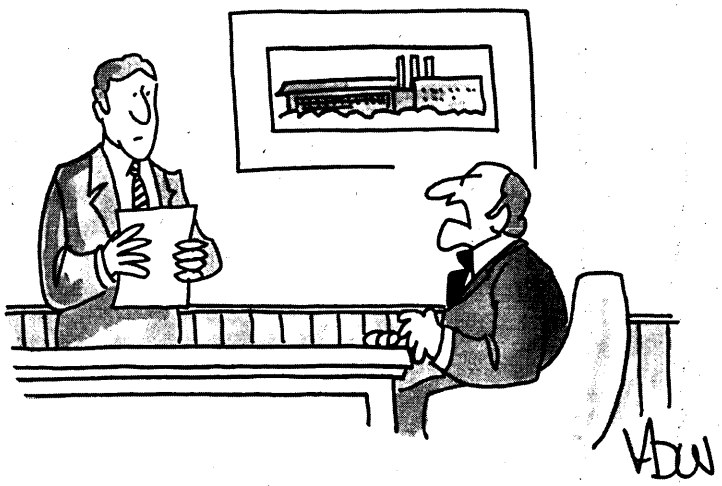
IBMers obey orders. Watson once speculated what would happen if he deviated in his own dress. "I often wonder what would happen if I wore a pink shirt to work one day," he once remarked. "Would I see a thousand pink shirts the next day?"

No doubt he would have.

People, of course, can enhance a company's image by bringing glory to it, and Watson often fretted that IBM's huge research commitment never produced a Nobel prizewinner. Watson was envious of AT&T's Nobel prizewinners at Bell Labs, where no less than seven scientists have captured the coveted award.

In 1973 the Nobel prize in physics was finally awarded to an IBM man—Dr. Leo Esaki of IBM's Thomas J. Watson Research Center in Yorktown Heights. Dr. Esaki received the prize for his brilliant work which led to the discovery of the tunnel diode. However, it wasn't a clearcut IBM victory. First of all, Dr. Esaki is from Japan, a country IBM sometimes regards as a collective and fierce competitor. Secondly, Dr. Esaki didn't do his prizewinning work while he was at IBM but while he was in Japan at Sony, which has found that its image has likewise been enhanced by the Nobel prize. *

A former editor of DATAMATION, Dave Gardner frequently contributes articles on computer industry subjects to this magazine.



"You don't come barging in here with your problems! You filter them through the five echelons that separate us!"

CARTOON BY CHUCK VADUN

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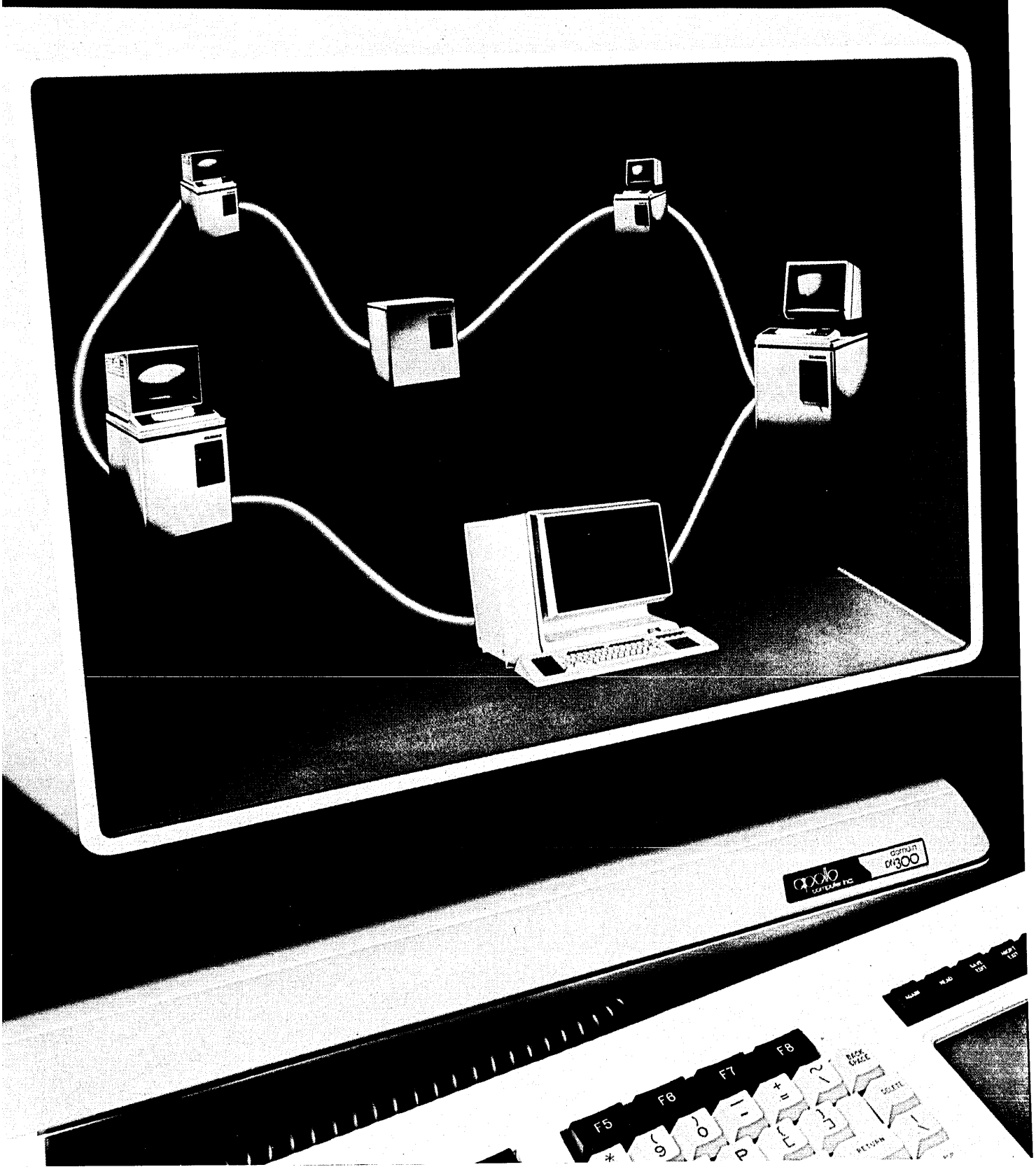
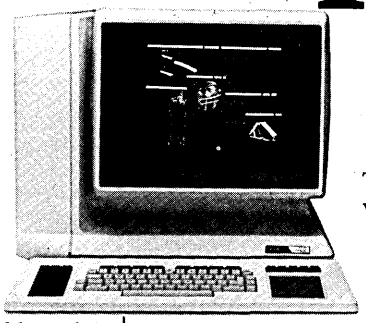


the $10,000 desktop mainframe.



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The DN300, latest in the family of DOMAIN processing nodes, supports up to 1.5 million bytes of main memory and 15 concurrent processes of 16 million bytes each, so you can execute large programs. Its 17-inch 1024 x 800 pixel landscape display provides the high-resolution graphics you need for technical applications. The 12 million bit-per-second high speed token-passing network lets you access data anywhere in the network without sacrificing performance.

The DN300 is fully compatible with Apollo's DN400, 420, and 600 and supports multiprogramming environment, large virtual address space, network communications, multi-window display management, and extensive command library.

SOFTWARE YOU NEVER THOUGHT YOU'D SEE ON YOUR DESKTOP.

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USA price $9,933, system builder, quantity 35 DN300 with .5Mb memory, 17-inch graphics display, network interface, and AEGIS operating system.

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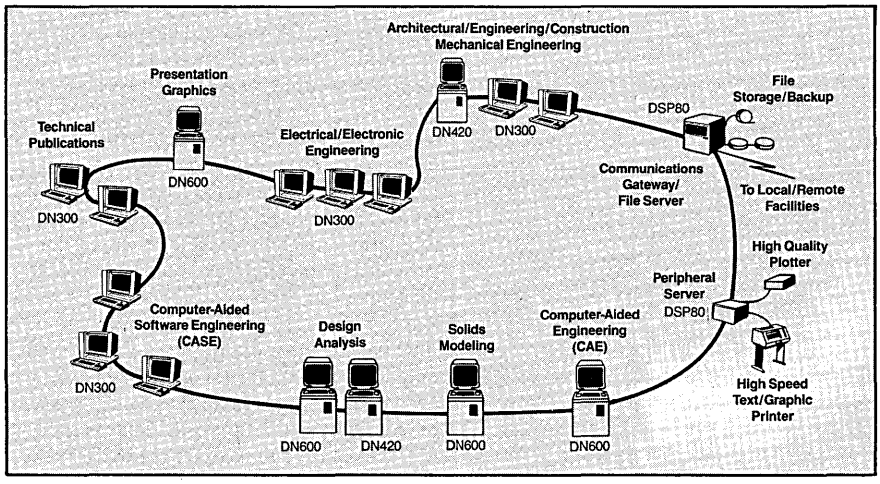

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Domain: The Next Generation

CIRCLE 25 ON READER CARD

NEWS IN PERSPECTIVE

MINICOMPUTERS

WHAT HAPPENED AT DG?

The Westboro, Mass., minicomputer maker is down—but not out.

For the past two years the industry has enjoyed playing a game called "What went wrong with Data General?" Legions of analysts and observers have sifted through the negatives as the minimaker's stock searched for a bottom. Little optimism was ever expressed. Offered instead was the smug glee often felt when the rich and successful are in trouble. Rather than offer constructive analysis, some observers seemed more interested in the fact that DG president Edson de Castro's "paper fortune" had dived from $27 million to $9 million in one sustained burst of selling last March. Or that the company suffered a $216 million loss in market value that same month.

"But be warned," says noted DG watcher John W. Adams, "that when a large, liquid, profitable company loses half of its market value in the course of a week, a catastrophe is implicit. However," adds the analyst with Adams, Harkness and Hill in Boston, "if the catastrophe fails to materialize, the fraternity of professional investor is going to look very foolish."

Following Data General's announcement this month in New York of its creation of a new technology curve for superminis and the promise of further breakthroughs by year-end, Adams says egg is appearing on faces everywhere.

According to Adams, DG's new 2.2 MIPS MV/10000 and its three earlier 32-bit superminis are some of the early fruits of a long-term investment program that stockholders and analysts alike have preferred to ignore. "They seem locked into a quarter-to-quarter mentality; they're more concerned with maximizing short-term profits than investing in the future," he says.

Declares Adams, "We all at some time have been guilty of putting little or no emphasis on R&D spending when analyzing a company's performance." One reason, he confides, is that it is a difficult variable to track and requires some extra effort.

The figures can nevertheless be gleaned from annual reports. During the five years between 1977 and 1981, for example, Data General spent an average 10.2% of its sales revenues on R&D—a percentage well in excess of major competitors DEC (7.8%), Prime (7.6%), and Wang (5.6%). Even the industry leader, IBM, recorded only 6%. Data General points out that if it had cared to shuffle the difference between its R&D spending and Wang's in 1981, a difference of $30 million, it could have boosted its pretax profits to over $130 million.

Adams's point is that the market—and the investment analysts—has attached little value to these R&D efforts. During the same five-year period, DG's market value as a percentage of sales was a meager 43%. Wang soared at 200%; Prime at 190%; IBM, 136%; and DEC, 129%. The relation between the two sets of figures is known by analysts as the R&D multiple.

The figures raise certain questions, according to the thinking of Data General's managment. Did Wang, for example, spend its R&D money eight times more effectively than DG? Or did Prime spend its money six times more effectively? Last August, when DG's market value slumped to $259 million (or 3.2 times R&D), Wang and Prime were selling at 20 to 25 times their R&D spending. Are they worth this?

Based on performance figures revealed by Data General this month in New York, the company's new top-of-the-line Eclipse MV/10000 has more than doubled the performance of the current DEC and Prime line toppers—and at substantially less cost. In essence, the company has created a new technology curve with its MV/4000 and 10000 models, and, for the present, is the only train running on the new track. Both the MV/6000 and MV/4000 have also exceeded the performance of Prime's 550-11 and 2250 machines. So, once again, the question of the R&D multiple comes up.

Between 1977 and 1981 Data General spent an average 10.2% of its sales revenues on R&D.

It could be that DG's technical pride has been more than a little wounded in the past by such comparisons, "but they might have created the resistance the Westboro, Mass., concern needed," according to one former employee, now with a new venture.

"Both Prime and DEC got into the 32-bit computer business a long time before DG," he recounts, "and our [DG's] technical image took quite a battering." DG's inadequacies were made even more apparent by the phenomenal success of DEC's first VAX system, the 11/780, which was announced late in 1977. DG's heroic efforts to catch up with DEC were the subject of Tracy Kidder's best-selling *Soul of a New Machine*. Data General says that when the subject of that book, the "Eagle" or MV/8000, was announced, it was 31 months behind the market (i.e., behind DEC). DG's next challenge, the MV/6000, a subset of the MV/8000, was announced in September 1981—some 11 months after DEC's VAX 11/750.

ILLUSTRATION BY DAVID FEBLAND

By the time the MV/4000 was announced last November, the gap had been closed to seven months vis-à-vis DEC's 11/730. But this time, DG claimed a noticeable price/performance edge.

With the new MV/10000—known throughout its internal development as "Widgeon"—DG has finally moved in front of its archrival. In only 53 hectic months the company has progressed from a technical joke to the leading edge in 32-bit superminis. DG's director of engineering in the Technical Products Division, Tom West (who was immortalized in Kidder's book), says that the company aimed for—and achieved—"five cents per instruction" with the MV/10000.

In a recent interview with Edson de Castro, it was clear the 44-year-old driving force of the company was in no mood to gloat over DG's achievements or to chide investors. But it was equally clear that the subject of R&D multiples, and the market's response to long-term investment, is a touchy one with him. "It's the biggest problem of American corporate life . . . our tendency to optimize only the short term. Our companies are great at creating new technologies and markets," he reflected, "but there's no generational carry-over. There are few encores."

He pointed out that most of the "encores" these days—in autos, tvs, consumer electronics, ships, etc.—seem to be coming from the Japanese. "The only way to overcome this problem is for American companies to balance long-term goals among a number of technology products and markets."

Adams is optimistic about this happening. "I see something of a rebirth from such giants as General Electric and United Technologies," he enthused. "There's also something of the kind coming from IBM with its more open and cordial approach to the industry."

With the new MV/10000, DG has finally moved in front of archrival DEC.

One suspects that de Castro is also yearning for a more cordial approach from investors. But seemingly this won't happen for a while because they are still stunned by the enormity and the trauma of DG's transition over the past two years (July 1981, p. 34).

All subtleties aside, the answer to the question of what went wrong at Data General appears to be *everything*. Says Adams: "The product line became obsolete, the organizational structure became obsolete, and the company's macho culture—its very essence—became inappropriate for the new directions in which it decided to head."

Adams notes that everything had to be changed, "and just as everything was in the process of change, along came a severe recession."

For the first 12 years of its life DG's product line consisted of the hardware, or "iron," that it peddled to technical and scientific oems and systems houses. The expectations of these users changed as their "boxes" evolved into more complex systems. De Castro is the first to admit that his company didn't move fast enough to meet that challenge.

"We were aware of a need to change our products and culture over five years ago," he explained. "But we couldn't break out of our small-company mentality—even though we were getting so damned big."

If de Castro had begun his transition in 1978 when the first stains on the company's clean white profit sheet began to emerge, he might have been spared some of the agonies of trying to change his company

almost overnight. How could a man so keen on foresight and so totally opposed to short-term thinking have made such a blunder? "Well, part of it," he replied, "was the fear that too much structure would stifle the entrepreneurial spirit we shared."

The other part, according to former DG managers, seems to be the subject of some dispute. Some say that de Castro wanted to reorganize the company back in the 1970s, but couldn't get a consensus out of his management about how it should be tackled. Others, less favorably disposed to de Castro, claim that his one-man pyramid style of management made change a near impossibility. De Castro, needless to say, doesn't see things that way and stresses that DG's management has always been a team process.

In any event, by the time de Castro finally took the bull by the horns in the latter part of 1980 by instituting a more professional organization, the company had already missed the boat on the 32-bit business. He said that under the older organization, decisions about project funding were made informally "usually sitting around the lunch table." De Castro added that everything was "sort of averaged out" and distributed across the product groups. Because of this, he concedes, the 32-bit development didn't at first get the extra priority focus it deserved. But de Castro had another problem. The 32-bit system was to spearhead DG's first challenge in the lucrative end-user sectors, but a quality marketing and support organization wasn't yet in place to receive the new Eclipse family. De Castro also claimed that early problems with DG's ambitious $30 million-plus Sunnyvale, Calif., semiconductor facility further delayed development of the new superminis.

Other standard complaints about DG's products are that its Nova 16-bit line is obsolete; that the company failed in its efforts to address the low-end desktop computer market with its Enterprise system because of a lack of third-party software; and that the company failed to position itself in such attractive, high-growth areas as CAD/CAM and continuous processors.

Peter T.T. Lieu, an analyst with Furman, Selz, Mager, Dietz & Birney Inc., says that much has been made of these rather "visible" difficulties, but that the company has accomplished a lot more in the past two years than it is given credit for. He says that after years of "sputtering," DG's semiconductor operation is now getting on track. Lieu, another close follower of DG, said that the company scored an industry first for a minicomputer company by incorporating a 16-bit minicomputer (its Eclipse) onto a single chip. The microEclipse has been incorporated in two commercial systems, the CS 100 and CS 200 series. Lieu predicts that DG will also score another industry first by year-end when it offers its more complex 32-bit MV series architecture on a chip. He pointed out that with such a system, DG would enjoy a hardware advantage over DEC and a software edge over the semiconductor companies like Motorola and Intel.

De Castro confirmed the existence of the project, but added that he couldn't talk about time frames. DG's president also confirmed rumors that new personal computers would be forthcoming, and that Enterprise would be revamped with modified hardware and more applications software.

One can't talk about a DG recovery without quantifying its "rescue act" in superminis. After its first full year of shipments (1981), the MV/8000 alone racked up some 10% of all DG's product sales, according to insiders. Last year the MV/8000 and subset MV/6000 combined to account for 20% of all product sales. And this year, sources predict that 32-bit systems will account for over 33% of the company's product revenues.

But de Castro's real pride and joy is an as yet little-known office automation system called CEO. Adams explains that this line was announced some months after similar offerings from Prime, Hewlett-Packard, and DEC, "thus qualifying in most people's minds as a "me too' item.

"We couldn't break out of our small-company mentality—even though we were getting so damned big."

"But," he continues, "those same people would be shocked to learn that whereas the competition's complete capabilities have yet to reach the market, DG shipped an estimated $25 million in CEO-based systems during the last five months of 1982."

What has pleased de Castro so much about this accomplishment is that the customer (a commercial end user), the average system price ($400,000), and the software content (25%) all represent new departures for Data General.

Adams suggests, "If they can be so successful so quickly in a business that is so ardently desired by so many, namely office automation, it has to make you think."

Early user reaction to CEO has been positive. All those users contacted by DATAMATION praised the software's user friendliness. "Noncomputer people can be using the system's menu-driven functions, such as electronic mail and calendars, in about half an hour," says Maria Vinall, project manager of advanced office systems at Penn Mutual in Philadelphia.

Another insurance user, Life of Virginia in Richmond, said CEO's main strength is its integration. "You can push through documents and text and other materials without reformatting," notes project manager Dick Moschler. Users all said they

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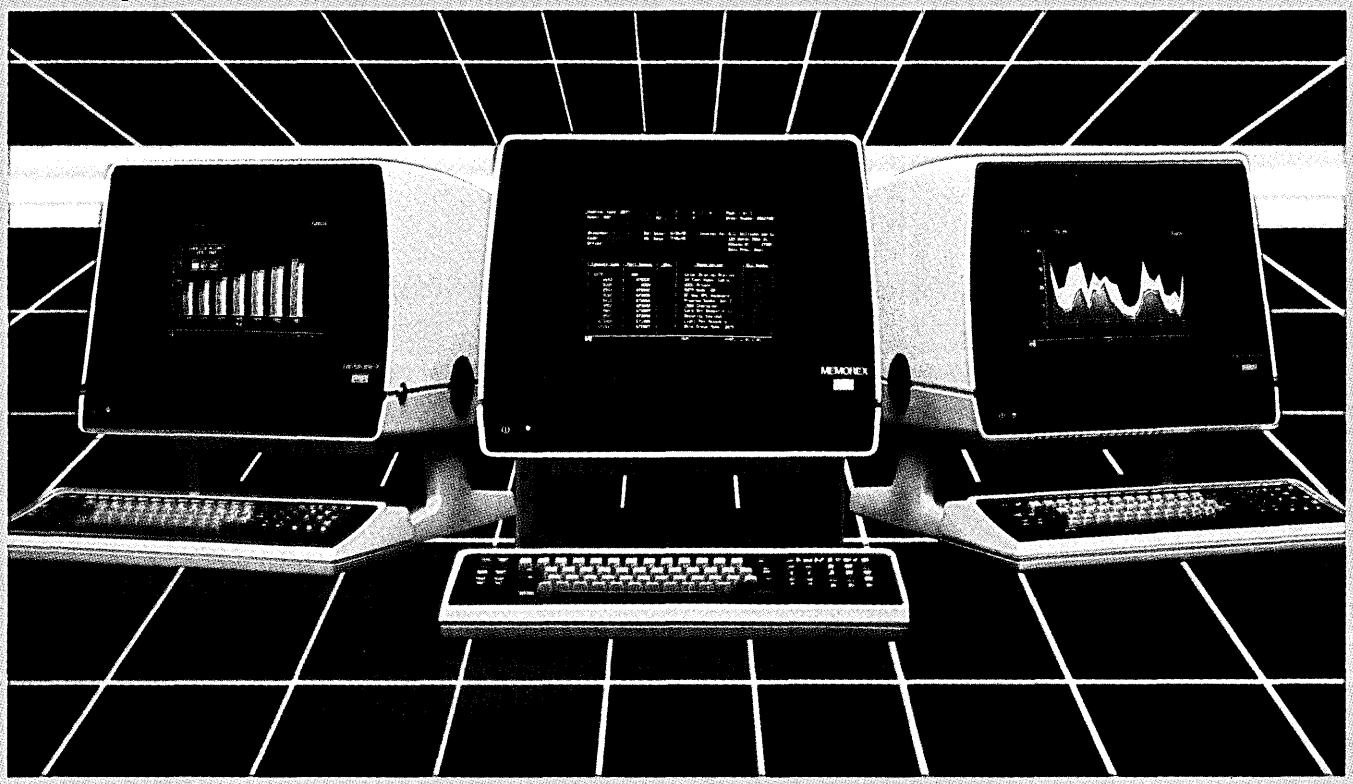

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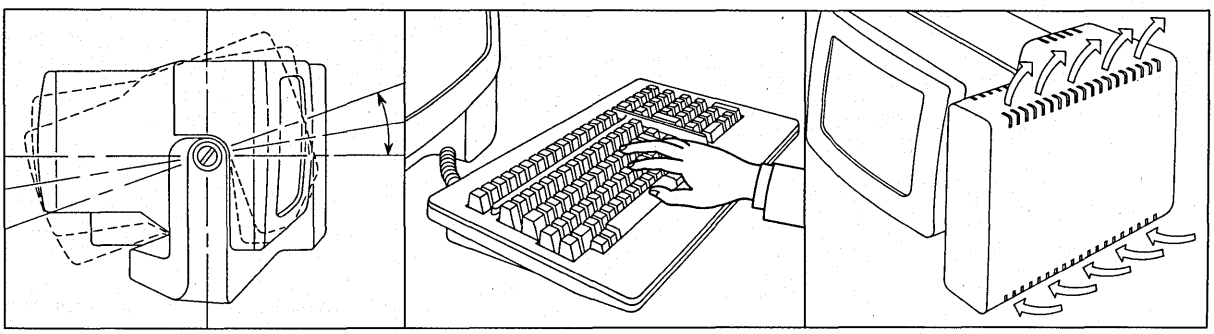

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CIRCLE 32 ON READER CARD

would like to see DG accelerate its planned announcement over the next two years of further word processing packages. They all agreed that support will be the company's toughest test if it wants to maintain its early progress. All the users talked to had obtained guarantees of continuing commitments in this respect because of DG's lack of experience with end users. They said that DG's early efforts at handholding had been good.

CEO's early success has definitely buoyed de Castro, who has positioned DG for growth in communications-oriented, network-driven environments of the 1980s. So far DG is the only minicomputer company committed to full support for both X.25 and IBM SNA networks. The company has paid a high price for its former oem posture and its high degree of vertical integration, because both approaches are heavily affected in times of recession. Experts stress that with the company's shift to end-user domains, DG will suffer less cyclic exposure to economic downturns in the future. In addition, the outpouring of new technology from the minimaker leaves it well placed to greet new stimulus in the economy in the latter part of this year.

Much will depend on the company's new marketing structure, now in the hands of former IBMer Robert Miller, as well as other key functions in the hands of ex-IBM employees—manufacturing under David Chapman and field engineering under Frank Silkman. Though the management merry-go-round that saw the sudden departure of six vice presidents seems to have slowed for the present, the jury is still out on whether DG's new divisional structure has knitted yet.

De Castro seems intent on building an enduring "but not monolithic or bureaucratic" culture. He says that nothing the company is trying has not been done before by such companies as IBM, DEC, GE, and GM, as well as the Japanese.

'We're looking for a synthesis that is right for us," he said. "And as usual, we'll learn from our mistakes and keep investing in the future."

Usually when a high-tech company slips as badly as Data General did, it tends to fall behind rapidly because of the light-speed changes of the markets. But, as Adams concludes, "Any technology company that, a year after it slips, is still pushing the state of the art and paying its future-related dues has got to be a better than average bet to make it all the way back."

—Ralph Emmett

TERMINALS

BRAEGEN GOES FOR GLORY

A company that has languished in relative obscurity is seeking the limelight with new management and products.

Braegen. In Old English it means brain. In computers it has been the name of a relatively obscure company whose line of 3270-type terminals, DEC-compatible peripherals, and automatic tape libraries brought in revenues of close to $30 million last year but nary a penny of profit. Now, however, Braegen Corp. is out to make some money for itself.

The company, based in Cupertino, Calif., has a new leader, Paul L. Klein, president and chief executive, who made his name as chief of Memorex's communications group. Klein plans to pump enough dollars into R&D to make the firm's products competitive, and establish the kind of marketing savvy Braegen has so sorely lacked since its formation 10 years ago.

"This company has really been a

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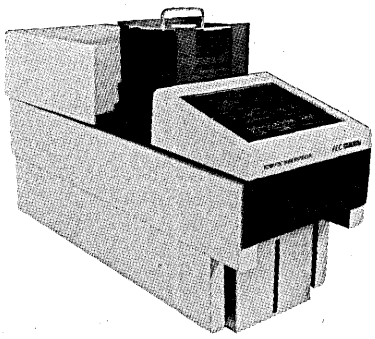

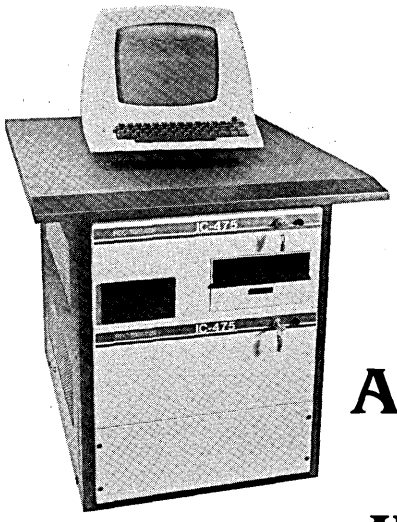

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sin," says Klein. "It's truly baffling why it hasn't been more successful. The salespeople have been there, but they've only sold. They've never marketed."

The company started selling what at the time was a distinguished line of interactive terminals designed to hook into IBM mainframes. They were designed to communicate with up to eight host machines at once, thus supporting multiple applications, and to communicate at much longer distances than those available from IBM.

"Our thrust is not to be a price leader. We want to deliver high quality. That's our heritage."

"Many of the features our terminals had are only now available from the competition," Klein states. "Our products, however, have lost their leading edge."

The youthful looking executive hopes to change that, doubling Braegen's R&D budget this year and scheduling a second quarter introduction of a redesigned line of terminals. He declines to specify exactly what the new machines will offer, but hints that a certain degree of local processing will be available, making the units competitive with what many believe IBM will eventually introduce: a personal computing option for its 3270 line of terminals.

"We will certainly bring our costs down, but our thrust is not to be a price leader. We want to deliver high quality. That's our heritage," Klein says, noting that Braegen's terminal products have long appealed to sophisticated users trying to solve complex communications problems. "We're not going to get into price wars with people."

Currently, the company has more than 300 terminal systems installed, each with as many as 32 terminals attached, says George Everhart, vice president of marketing. He boasts that the Braegen controller has processing power equivalent to an IBM 370/155, giving it a great deal of capacity to handle applications that would otherwise require the use of a costly and complex IBM 3705 front-end communications controller. "Our terminal is remote but looks as if it's running locally to the mainframe. The user gains from not having to deal with as much software as he would using a 3705."

In the DEC-compatible arena, the firm sells disk subsystems consisting of a disk controller and one or more disk drives. Braegen competes against Systems Industries, Emulex, Plessey, and, of course, DEC itself. Says Klein: "DEC users are getting more sophisticated in their use of computers and choice of peripherals. DEC itself is getting more aggressive in the peripherals area, making its own disks and trying to sell more peripherals to its users."

That increased competititon has made the DEC peripherals business a "dirty" one, Klein adds, noting that profits are hard to come by without adding a great deal of value to what are otherwise fairly undistinguished products. DEC's pricing and availability pressures have squeezed much of the profit out of the business, but Braegen thinks it has an ace up its sleeve: its IBM-compatible terminals.

Since many DEC users, particularly in the VAX class, are demanding "IBM quality" service and support, Braegen hopes to sell those users its terminals, which will be able to communicate with DEC and IBM mainframes concurrently. One of Braegen's strongest advantages in the market, says Everhart, is the 170-man field service force, which can provide the kind of support DEC and IBM users are demanding.

The automatic tape library has been installed at about 90 places, selling primarily to financial, insurance, and government sites.

Braegen's DEC-compatible peripherals business came to it from California Computer Products, which several years ago sold off its ailing disk businesses to Braegen, Billings Computer, and Xerox

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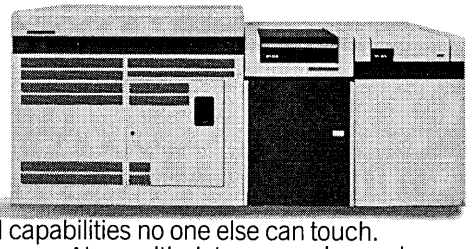

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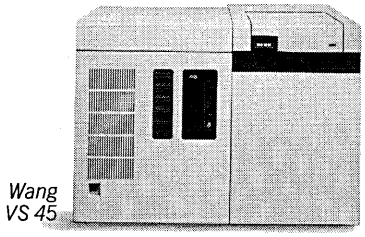

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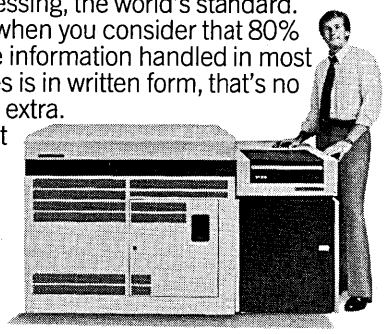

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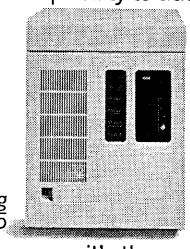

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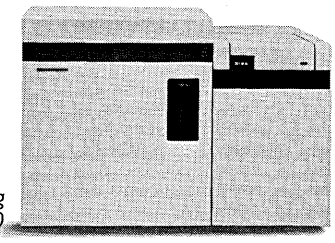

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The Office Automation Computer Company

CIRCLE 37 ON READER CARD

Corp. Along with the miniperipherals operation, Braegen also acquired from CalComp marketing and manufacturing rights to an automatic tape library, a large system that manages and loads rolls of standard tape in mainframe data centers. Klein sees the ATL, as the system is commonly known, as offering several potentially lucrative spin-offs, as well as being a substantial business itself.

In the software area, the ATL's programming represents a tape management system that could be sold separately in competition with products such as University Computing's UCC 1. Secondly, the ATL's "robotic" mechanism may lend itself to handling libraries of video and optical disk volumes. Klein says the firm is actively pursuing both product approaches.

"We're a small company and we can make decisions fast. That will help a lot in this market."

Braegen, like much of the industry, is waiting patiently for IBM to finally introduce its next generation tape drive. Understood to use higher recording and track densities than any IBM drive before it, the new drive has apparently been held up for marketing reasons, but Braegen is confident that its ATL, with certain modifications, would be suitable for handling reels of tape for the IBM product.

So far, some 90 ATLs have been installed, primarily at insurance, financial, and large computing services data centers. Klein estimates further sales of the ATL will be made this year.

One arena Braegen has paid little attention to is the international market. Klein expects the company's ATL system and terminals will sell well in Europe. An international marketing executive is to handle the new effort beginning this year, he adds.

Another change Klein plans to implement is to make Braegen's marketing more purchase oriented, as opposed to the lease orientation that has predominated in the past. "This is just an example of our previous lack of financial selling skills," he notes.

If nothing else, Klein has brought in a new team of marketing people who will give the company a chance at finally achieving the success he believes it has deserved for so long. "We're a small company, still entrepreneurial, and we can make decisions fast. That will help a lot in this market."

—John W. Verity

WORKSTATIONS

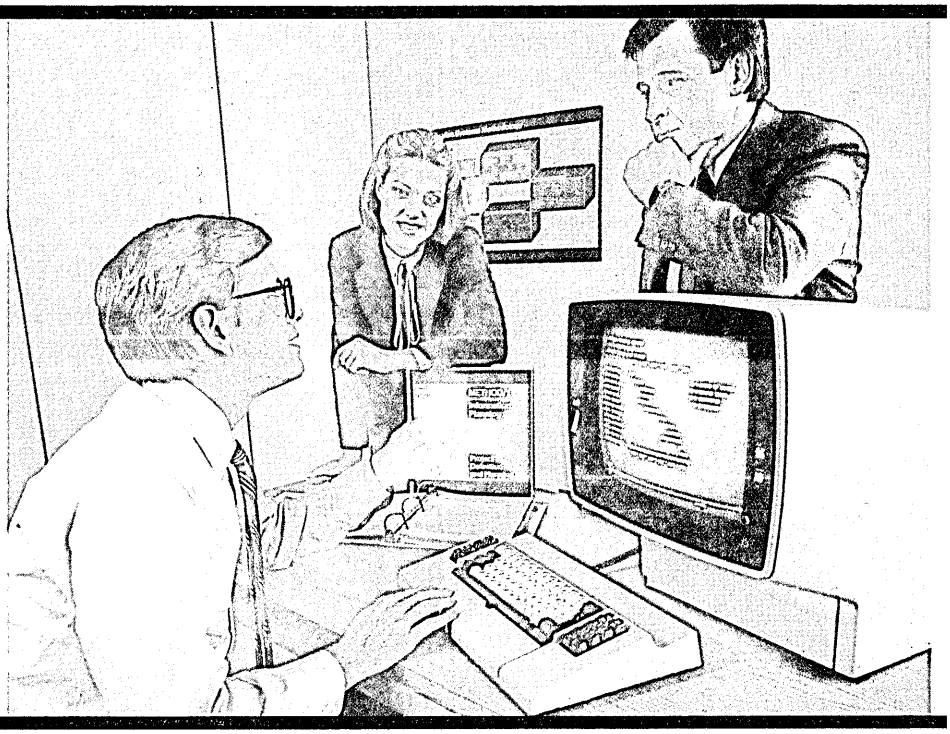
A STAR FOR ALL NATIONS

The new multilingual capabilities on Xerox's Star should make the system especially attractive to U.S. multinationals.

A multilingual capability on the Star computer system, including Japanese language processing, has been developed by the Xerox Office Systems Div. and is about to be made available in the U.S. Other languages available are French, German, Italian, Russian, Spanish, and Swedish, and Chinese is said to be forthcoming.

Considering the other capabilities of the Star, such as graphics, document preparation and handling, networking, and resource sharing, the language features should make the Star especially attractive to multinational corporations in the U.S. Full national systems are also available for users

METHOD/1: A Blueprint for Building Systems Success



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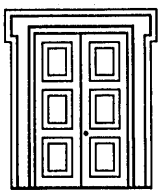
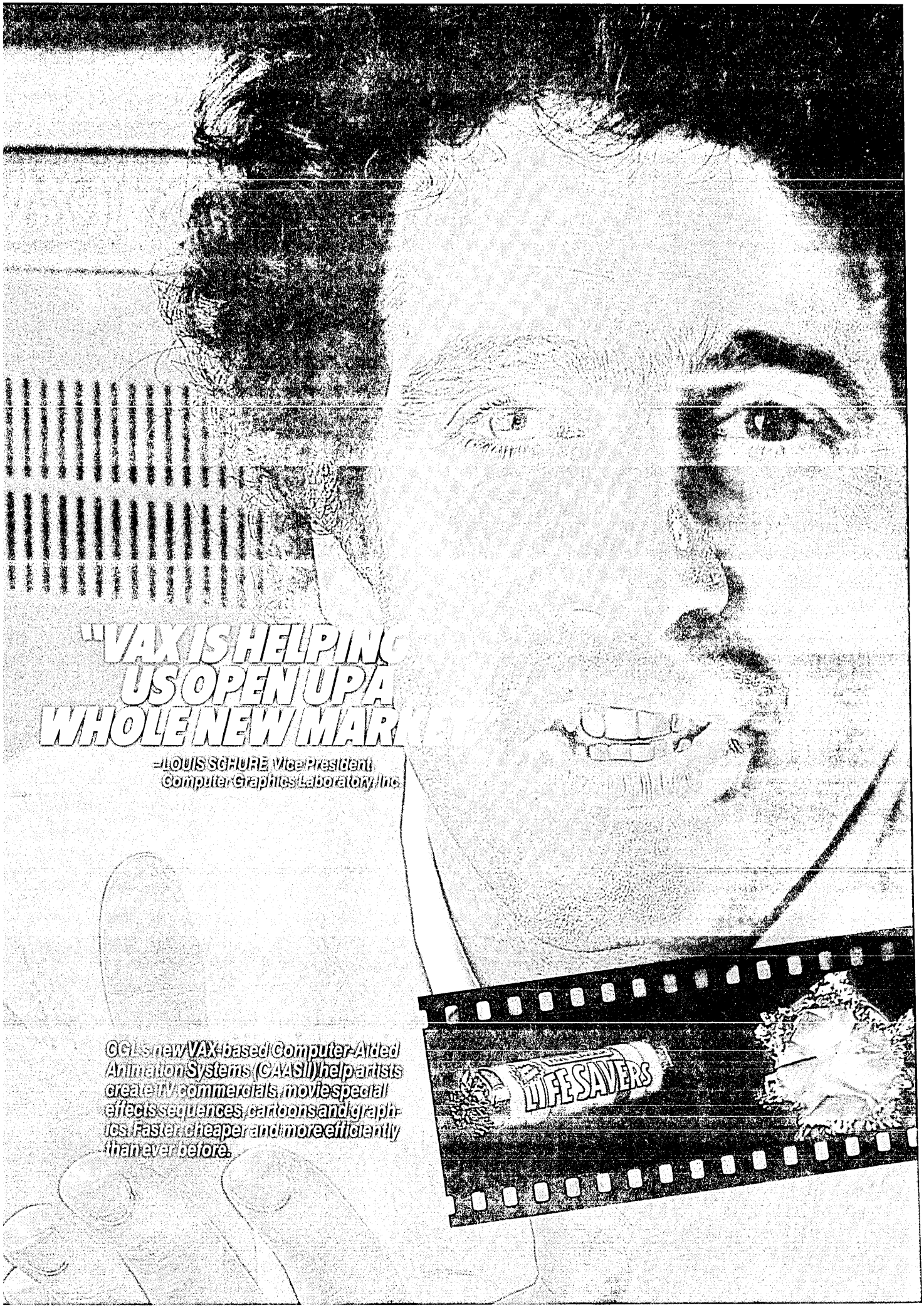


CIRCLE 39 ON READER CARD


"VAX IS HELPIN
US OPEN UP A
WHOLE NEW MAR
—LOUIS SCHURE, Vice President
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Animation Systems (CAASI) help artists
create TV commercials, movie special
effects sequences, cartoons and graph-
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LIFE SAVERS

VAX

"It takes three things to make a computer useful to an artist," says Louis Schure. "Enough power to capture the exact idea he has in mind. Enough speed for realtime playback at every step in the creative process. And easy interfacing with the rather strange peripherals we use in this business. VAX™ systems gave us all three—and at a price that gave us a wide open market.

"The fact that VAX is a family of products with consistent operating and application code environments has also been very important. We sell VAX-11/780s for 3D modeling. VAX-11/750s for animation. And we'll have the new VAX-11/730s for our smaller systems. These products make us one of the leading OEMs in computer art and technology. With Digital's service and support around the world there's almost no limit to our market.

"With 32-bit addressability and virtual storage, VAX can create images you simply can't tell are computer-generated," he says. "The artist can use an infinite number of brush strokes. Millions of colors. Any number of overlays. Each frame can be flopped, enlarged or reduced, zoomed, panned or erased in realtime."

For the artist, VAX performance means freedom. Freedom from drudgery and repetition. Freedom to spend more time thinking creatively.

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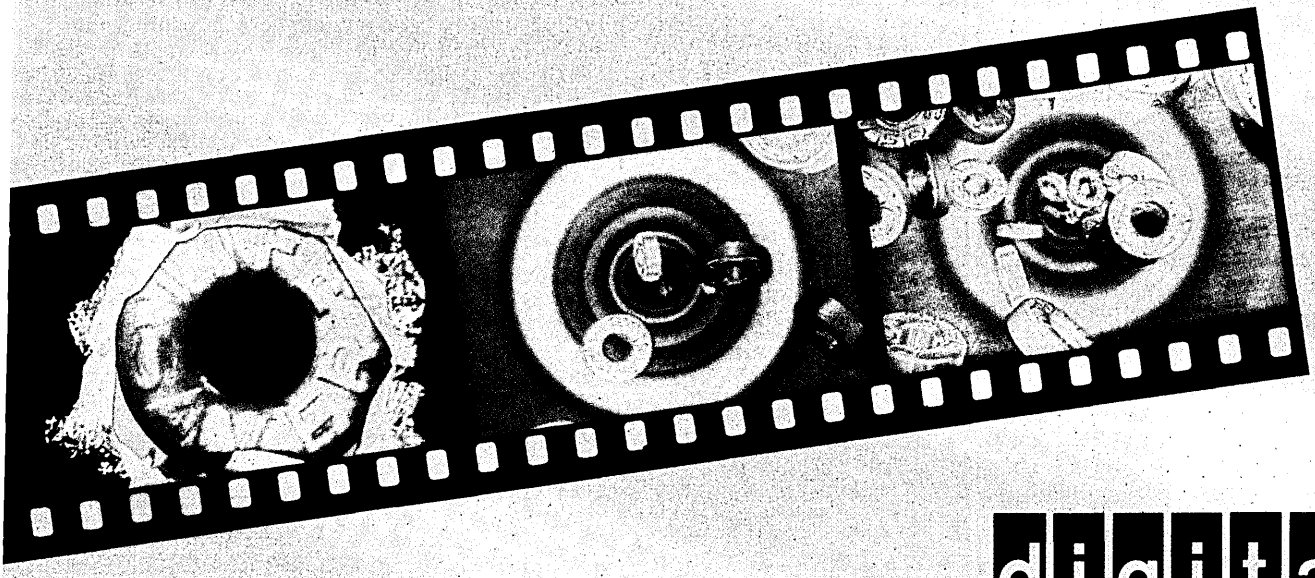

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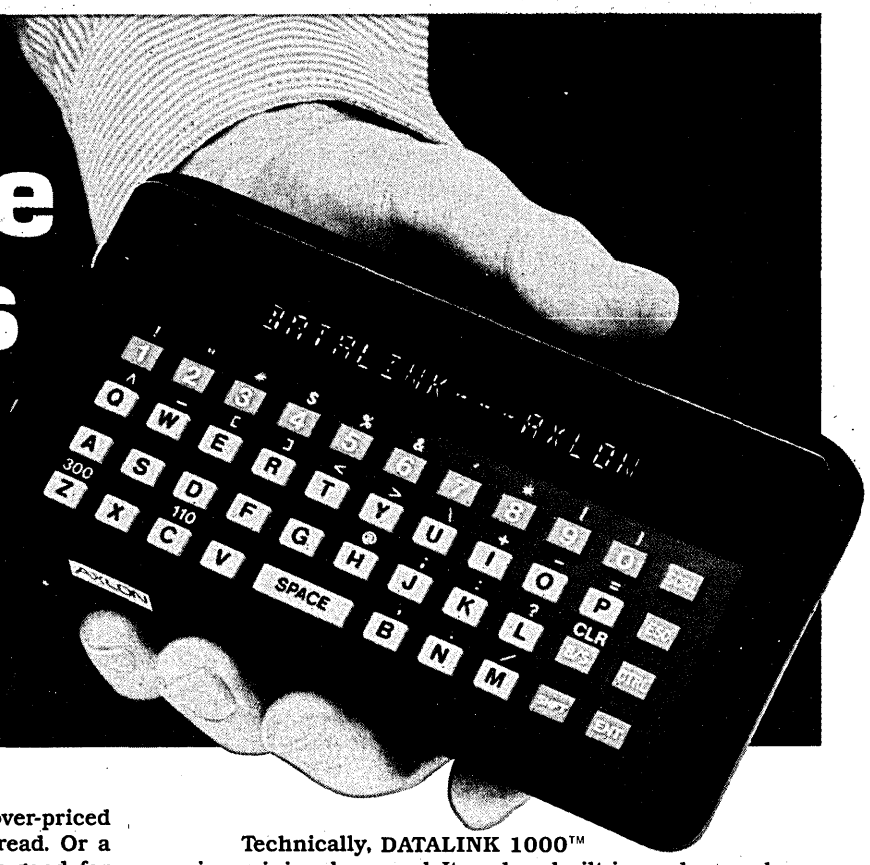

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CIRCLE 45 ON READER CARD

in Sweden, Germany, France, the U.K., and Japan, featuring special keyboards, hardware that conforms to local requirements, and hardware and software support.

The Japanese capabilities, developed over a period of six years by people at the Xerox Palo Alto Research Center in California and Fuji Xerox in Japan, were first demonstrated at a computer show in Tokyo in the fall of 1981 and were announced as a product a year later at that same show. It was the first language to be tackled by researchers at PARC, where the machine in use was the Alto, predecessor of the Star. The Alto had a 16-bit processor, bit-mapped display, a mouse, and Ethernet, and it handled ASCII characters.

In the research environment at PARC, separate groups produced numerous and disparate software systems for Alto. Two of the team members, Joseph D. Becker and William K. English, wanted to produce a Japanese word processing system. To gain the knowledge necessary, the two went to Japan for two years, changing places with Japanese engineers from Fuji Xerox, who came to PARC.

At the latter facility, meanwhile, the decision was made in the late '70s to transform Alto into a commercial product. Design of new hardware was undertaken. The best software systems for implementation on the hardware were selected, requiring that they be rewritten to achieve a commonality. Work also proceeded on the development of a simple, integrated command interface that was to be presented to the user. This agglomeration of software became Star.

The capability to handle the Japanese language required a full 16 bits per character.

When Becker and English returned from Japan, however, it was clear to them that the capability to handle the Japanese language required a full 16 bits per character. In addition, the Japanese language has some 6,600 Chinese ideograms called kanji, plus the kana characters, a significant step up from the 128 characters in the ASCII set.

"Once you logically accept that you need a character set of more than 128 characters, there isn't any reason not to grasp all of the world's characters," says Becker. "There's no stopping place in between." Fortunately, the design of Star had not been frozen when the decision was made to add the multilingual capability. And so Star, which had been ASCII-based up to that point in 1979, underwent a change in architecture to use logical 16-bit characters throughout.

"Now Star has at its base a multinational capability," Becker adds. It is not a standalone Japanese word processor, but rather is a Star, with all that that means, ". . . and, by the way, has as one of its features multinational text." He continues,

The highest level query language is one you already know...

ENGLISH

I WONDER HOW ACTUAL SALES FOR LAST MONTH COMPARED TO THE FORECASTS FOR PEOPLE UNDER QUOTA IN NEW ENGLAND.

NAME	1982 SEPTEMBER SALES	1982 SEPTEMBER ESTIMATED SALES	CHANGE	% CHANGE
SMITH	$52,570	$55,064	2,494-	4.53-
JONES	$83,596	$85,360	1,764-	2.07-
ALEXANDER	$52,546	$55,483	2,937-	5.29-
ADAMS	$53,837	$56,357	2,520-	4.47-
McNEIL	$95,760	$96,929	1,169-	1.21-
McKAY	$36,448	$39,694	3,246-	8.18-
BERGER	$85,691	$90,515	4,824-	5.33-
COLONDER	$75,762	$77,448	1,686-	2.18-

With Intellect,™ all you do is type a simple question—any way you want

```
PRINT  LNAME, 82-SEP-ACT-SALES, 82-SEP-EST-SALES,
       82-SEP-ACT-SALES - 82-SEP-EST-SALES,
       (82-SEP-ACT-SALES - 82-SEP-EST-SALES) / 82-SEP-ACT-SALES

IF     REGION = 'NEW ENGLAND' AND
       82-YTD-ACT-SALES < 82-QUOTA
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Intellect's ability to understand English is so unique that leading software companies have arranged to integrate it into their product lines. Intellect is marketed by Cullinane Database Systems under the name "On-Line English". Management Decision Systems offers Intellect as "ELI—English Language Interface". Information Sciences markets Intellect with their human resources package as "GRS Executive". Intellect also interfaces directly to ADABAS, IDMS and VSAM, as well as dealing with sequential files.

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Richard Bibaud, Vice President of AVCO Corporation's Systems Division, was immediately able to use Intellect's plain English capability to retrieve information from his company's computer.

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CIRCLE 47 ON READER CARD

"Japanese was the driving force, because it's the most complicated language." When that was accomplished, European languages were added, this time with the help of engineers at Rank Xerox in the U.K. and Siemens in West Germany. "We had no fear after Japanese."

European languages, however, have alphabets that fit on a typewriter keyboard. What do you do with a language with thousands of characters? Systems developed by Japanese vendors, which began appearing on the market about two years ago, typically use the 51-character kana syllabary for input, the system then converting that kana to kanji. The people at Xerox, however, perhaps with an eye on sales outside Japan, chose to have users spell out Japanese words phonetically, using alpha characters on an English keyboard, a system called Romaji. Besides, it is argued, Japanese secretaries have gone to school and learned to use the English typewriter for international correspondence, and the last thing they want to have to learn now is a kana keyboard.

In a demonstration of this input method, Becker keys in Shimbashi, the

Xerox chose to have users spell out Japanese words phonetically, using alpha characters on an English keyboard, a system called Romaji.

name of a neighborhood in Tokyo, and the correct set of kanji appears on the screen. He also spells it Sinbasi, a new style of Romanization, and gets the same kanji. It is also possible to get the system to generate one kanji at a time, allowing the user to see whether the correct character is displayed; if not, alternatives can be called up until the system gets it right. The user, too, can change the sequence to suit business requirements. Becker shows the kanji for Fuji, the mountain, and for a flower called fuji, to show how someone in the florist business might prefer that the kanji for the flower come up before the one for the revered volcano.

"If I wrote an English document on the Japanese version of Star, it would be bit for bit the same as if I wrote it on the English Star," he explains. "That's not easy to achieve when you have a logical 16-bit architecture that nevertheless is ASCII-compatible. There was a lot of design to get to that point." The original design had a 16-bit version for Japanese and an 8-bit version for English, and they were not compatible. That just didn't wash. "You can't live on a network with incompatible document formats." So they went through the effort to achieve a system that could handle English as ASCII code but Japanese as 16-bit characters. As a result, the Japanese Star system can type Russian, provided you place the

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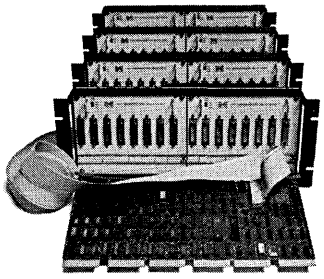
CS11/H (PDP-11) $7560 for 48 lines*
CS11/U (VAX-11) $7884 for 48 lines*



Up to 64 DH11 channels from one board.

DH11-compatible MUX lets you mix RS-232 & current loop interfaces in 8-line groups. Built-in DM11-compatible modem control. DMA output eliminates host interrupts. Self-test capabilities. Transparent to PDP-11 software. Emulex' own software on VAX.

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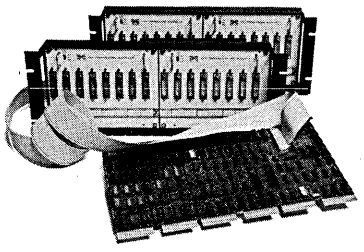

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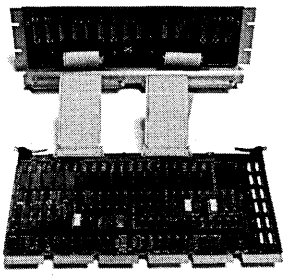

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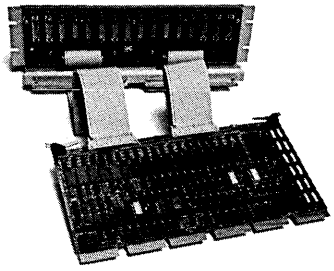

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CIRCLE 49 ON READER CARD

NEWS IN PERSPECTIVE

Russian font inside and get a Russian keyboard.

In anticipation of wide international usage of the system, some redesign of the Star continues. Along the right-hand edge of the screen, for example, are two symbols that allow the user to call up a display of the previous page of a document or the next page. In an early version, these were the letters P (for previous) and N (for next). This was replaced by arrows, one pointing up and one down. Now, in the latest version, the symbols are a plus and a minus.

A problem also exists with keyboards. A native German uses a keyboard with the letters QWERTZ across the top. But, says Becker, "when I type German I want QWERTY plus the German characters, and that's what I've got." So Xerox has a keyboard for Americans who want to type German, plus the national variant. Optionally, too, the firm offers the Dvorak keyboard; when you hit the ASDFG keys you get instead the vowels AOEUI.

—Edward K. Yasaki

BANKING SYSTEMS

FELLER SELLS TELLERS

Can A.C. Rice and $7.7 million help Imperial Automation make it in the banking automation market?

Eyeing what it says will be a $700 million a year market for the next 10 years, Imperial Automation Inc. could be compared to a child who just got its allowance and has been set loose in a pinball parlor. At least that's the impression his high-rolling chairman, Al Rice, makes in describing the company he just took over.

"We've identified 1,500 potential customers within just 75 miles of our six sales offices," he says, white wine in hand at the company's debut at 21 Club. "We're terribly excited."

Imperial Automation supplies bank systems. Until Jan. 6, it was a captive subsidiary of Imperial Bank in Los Angeles. Early that day, the bank disclosed that Rice had resigned as its chairman and then, at 21 Club, Rice told how he and a group of venture capitalists had put up $7.7 million to purchase the systems company.

"We're glad to be out from under the Fed's banking rules," Rice comments, referring to the strict marketing restrictions that had apparently hampered the automation company's plans ever since it was incorporated in 1981. Since then it has done

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Sailing is demanding. So is managing today's multiple CPU environment. Both require systems with special qualities: advanced technology, speed, flexibility, reliability, and ease of operation. It is this combination of qualities that provide the *winning edge*—Total Control of an unforgiving environment. The Data Switch Philosophy of Control is the industry standard for configuration management of the multiple CPU complex. See us at Interface. We'll show you why.

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CIRCLE 17 ON READER CARD

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But the breakthrough features of this operating system are going to make stringent demands on the computer.

The microcomputer developed specifically for the UNIX operating system more than two years before its commercial distribution is called ONYX.™

ONYX will live up to every demand and expectation.

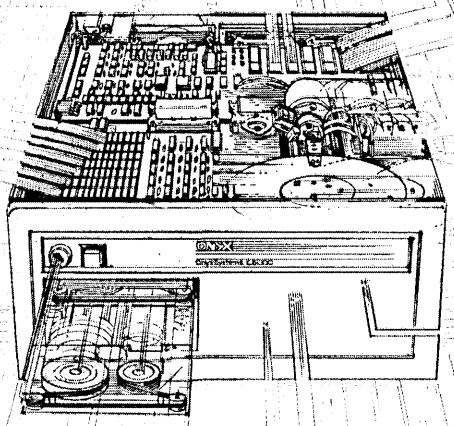
To achieve the ultimate flexibility, simplicity, efficiency and productivity, the UNIX operating system will incorporate a file system of highly uniform sets and sub-sets of directories, arranged in a tree-like hierarchical structure.

And flexible directory and file protection modes, allowing all combinations of *"read," "write,"* and *"execute"* access, independently for each file or directory, or for a group of users.

But these advantages will require intensive disk access, and superior memory management. In simple language, disk access must be as fast as possible, and the disk must have an unusual capacity to maintain complex file systems on-line at all times.

Floppy disks with their low capacities and high access times won't do.

Winchester disk drives that utilize slow-moving stepper motor head positioning devices won't do.

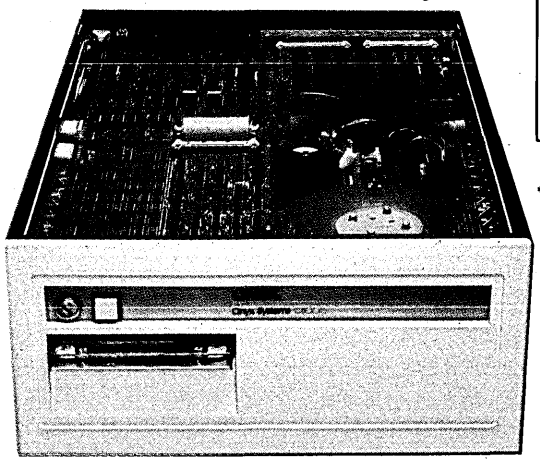


ONYX's IMI Winchester disk storage system, with its servo-driven voice coil head positioning, is more than twice as fast!

So, obviously the ONYX C8002 *will* do.

And, as developed, the ONYX C8002 features expandable memory up to 1 Mbyte, and disk storage up to 160 Mbytes on-line. Its cartridge tape backup offers cyclical redundancy checking on every backup. Both the Winchester disk storage system and the cartridge tape backup are *internal.*

In the UNIX operating system environment, the disk becomes an extension of main memory. *"Swapping"* programs between the disk and main memory increases the number of operations that can run concurrently. ONYX's memory management system utilizes *"scatter"* instead of *"contiguous"* allocation, and the more efficient swapping minimizes demand on the disk channel. That's why ONYX assures a highly efficient environment for the UNIX operating system.



Now it's 1982. The UNIX system's preeminence among 16-bit operating systems is established. And ONYX is the only company that has significant production experience with UNIX systems.

ONYX has installed over 1500 UNIX systems.

Today there are a lot of systems being developed to operate UNIX (and *"look-alike"*) operating systems. But there are many reasons why you should consider ONYX and the UNIX operating system as inseparable.

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CIRCLE 52 ON READER CARD

only $6 million in business, but Rice, chairman since April 1981, predicts three times that in revenue for the first year of independence. "We'll be profitable in the first quarter, most likely."

Rice looks more banker than system salesman but he is no stranger to computer ventures, having served on the boards of

The company doesn't build its own hardware but integrates devices from GEAC, Informer, and Convergent Technologies.

Memorex, Tandem, and Fairchild Camera & Instrument. His recent tenure as chairman of Imperial Bank ended as some of the bank's California real estate loans soured, according to those familiar with the situation, but Rice denies that those troubles had anything to do with his leaving the bank. "I was not asked to step aside," he says flatly.

In any case, he has, with William E. Butler, once marketing vice president at Exxon's Periphonics subsidiary, gained control of a company that will do battle with such heavyweights as IBM, NCR, and Burroughs. Each is after the banking market in a big way.

"Our advantage is that we have a real-time system," says Butler. "All our customer information is kept in a single database so that when a transaction is received it is processed at once, with all accounts updated immediately."

This differs, he says, from the systems sold by competitors, many of which are dependent on batch-oriented mainframes. Imperial's system is based on the GEAC minicomputer, built in Toronto, and terminals from Informer Inc. Imperial has no plans to get into the automated teller business, but it can "interface" to those machines, says Butler.

"We can automate the teller station, helping banks provide better customer service," he adds. "Soon we'll be able to give the bank officer himself a terminal for better decision making."

To that end, Imperial will introduce a system built for it by Convergent Technologies, which, coincidentally, provides small computers to NCR and Burroughs. Those systems will be given software to provide what Butler calls "platform automation."

"Management information will help those banks that have it to survive the coming shake-out," warns Rice. "Our main thrust will be to banks and S&Ls that are currently using a service bureau. We can help them reduce costs substantially. We want to be a sole source supplier."

The company's first customer was Century Bank of Los Angeles, which Butler claims had had its mind set on Honeywell Incoterm terminals before it switched to Imperial. All told, Imperial claims it has six complete banking systems installed, seven banks using its teller systems alone, and a pair of field test sites for its new, unintroduced system. Sales offices are in Atlanta, Chicago, Costa Mesa, Dallas, Los Angeles, and Seattle.

Marketing its systems as part of Imperial Bank was nothing but a chore, recalls Rice. "Each time we tried to open another sales office the federal banking regulations made us go through months of paperwork, as if we were trying to open a banking branch. And even though $3,300 worth of our $4,000 terminal was software, the Feds treated it as a bank selling hardware."

The venture capitalists involved are Institutional Venture Partners, Technical Venture Partners, Interwest Partners, and U.S. Venture Investors. Rice says the firm may be ready to go public in two and a half years. "A little less than $5 million" of the total investment went into purchasing the company from Imperial Bank while the rest will fund future growth, he adds.

—John W. Verity

APPLICATIONS

PLAYING BY THE SYSTEM

College and pro sports teams are adding computer power to their arsenals.

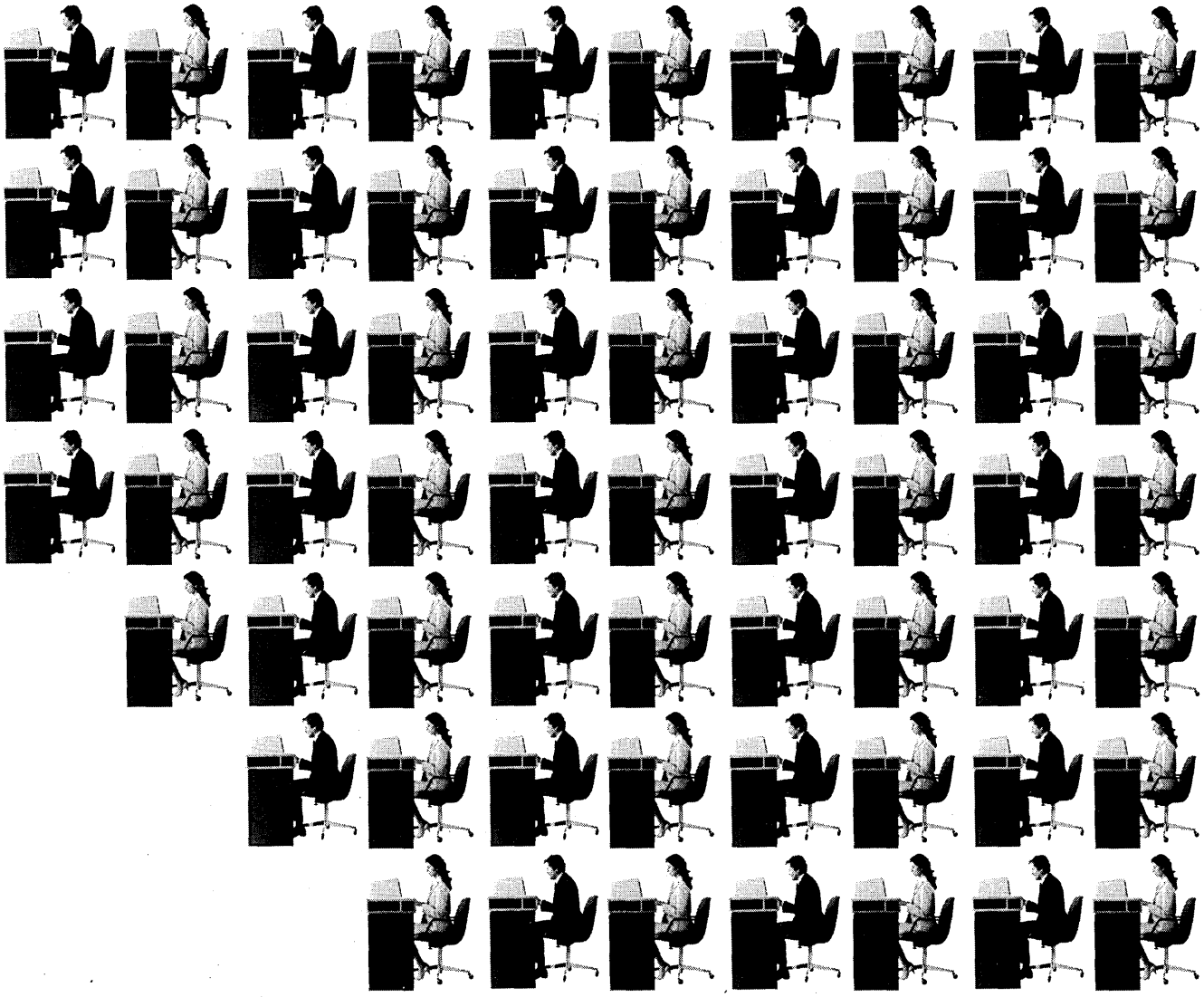
When the Washington Redskins and the Miami Dolphins ran onto the field at Pasadena's Rose Bowl on Super Bowl Sunday, they shared a common teammate—a computer system.

The system, called SportsPac, from MDS Qantel, Cupertino, Calif., had little to do with the Redskins' 27-17 win but it could, in the opinion of its developer, Burt Gilner, have had something to do with both teams being there.

In fact, the 1983 Super Bowl was the second in which two SportsPac users clashed. In 1982, Super Bowl XVI's principals, the Cincinnati Bengals and the San Francisco Forty Niners, were SportsPac users. (The Forty Niners pulled out a close one.)

Other National Football League users of SportsPac are the Tampa Bay Buccaneers, the Los Angeles Rams, the Los Angeles Raiders, the San Diego Chargers, the Houston Oilers, the Cleveland Browns, and the Philadelphia Eagles.

How and why did Qantel, long a producer of small business computer systems, get into the sports business? "The '80s is the decade of applications software," said president Dallas Talley. "Our



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3. AM-1042 (winchester)	32MB	2.4GB	512KB	3MB	2	26	A	B	AMOS*
4. AM-1062 (winchester)	60MB	2.4GB	512KB	8MB	2	68	A	B	AMOS*

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CIRCLE 54 ON READER CARD

acquisitions of software in the sports and manufacturing areas are just the beginning." He said there were skeptics who wondered why he acquired a package for the National Football League, a small if not wealthy market.

It's not as small as it would appear at first blush. In January, Qantel announced a SportsPac version for college football,

The 1983 Super Bowl was the second in which two SportsPac users clashed.

which pushes the market into the hundreds, and it is developing versions for other sports, both pro and collegiate, that expand the market exponentially.

SportsPac began with Gilner, who characterizes himself as a football nut, back in 1978. He was working with a small software house, MTD Project Services in Seminole, Fla. When nearby Tampa Bay got a professional football team (the Buccaneers) along with a coach (John McKay) from Gilner's alma mater, the University of Southern California, it was a combination he couldn't resist.

He approached the Buccaneers and began working with them, first on a standard financial system that included player payroll. "I never knew people could get paid so many different ways." He explained that some players get paid once a year, some as they feel like it, and others on a regular basis, according to their individual contracts. "This is compounded by the training camp period during which the union requires everybody to be paid on a regular basis."

After financials, Gilner tackled ticketing. Then he asked the team public relations people if he could help with things like mailing lists. Next he began working with the coaching staff on such extras as game analysis, scouting, college scouting in preparation for the draft, and what-if games.

"Then I took off my programmer's hat and put on my marketing hat," said Gilner. It's a hat he's still wearing. MDS Qantel acquired Gilner, SportsPac, and MTD Project Services in February 1982. Pennsylvania State was the first college to sign up for SportsPac.

In February, Gilner said he was at the contract signing stage with Louisiana State and was negotiating with two other colleges. And, he had signed up a soccer team, the Fort Lauderdale Strikers, and was on the verge of signing up a National Basketball Association team and a National Hockey League team, both on the West Coast. The basic system Qantel offers for all sports includes a Qantel System 40 with 256K of memory and a 150 megabyte disk.

Gilner said the college version of SportsPac has no payroll but does have all the rest of the financial software used by the pros. He said the collegiate scouting system is much more complex than that used by the pros. "The pros can zero in on a college senior in preparation for the draft and if they draft him, he has no choice. A high school senior has a lot of choices [about which school he wants to go to]."

The pro scouting system includes such data on players as moves, injuries, vitals, and free agents for the last five years. It enables coaches, said Gilner, to ask via a terminal such questions as, "Give me all wide receivers who are free agents, who can run the 40 in less than 4 min. 7 sec., are between 6 ft. and 6 ft. 4 in., and weigh between this and this."

With the college scouting system, the database has been enlarged to include

The collegiate scouting system is much more complex than the professional one.

such information as "detailed background on the kid and his family, where he lives, and if he's native born or a transplant, his likes and dislikes, and his brothers and sisters, and even who is the most influential person in the kid's life."

Computer use is not new to colle-

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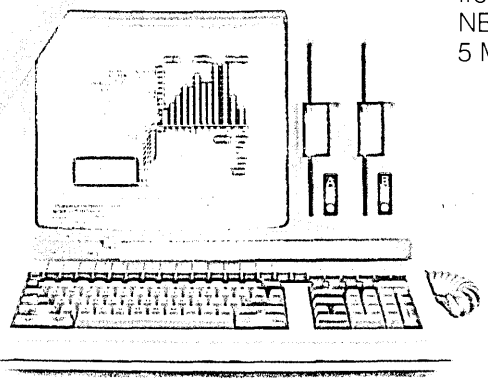

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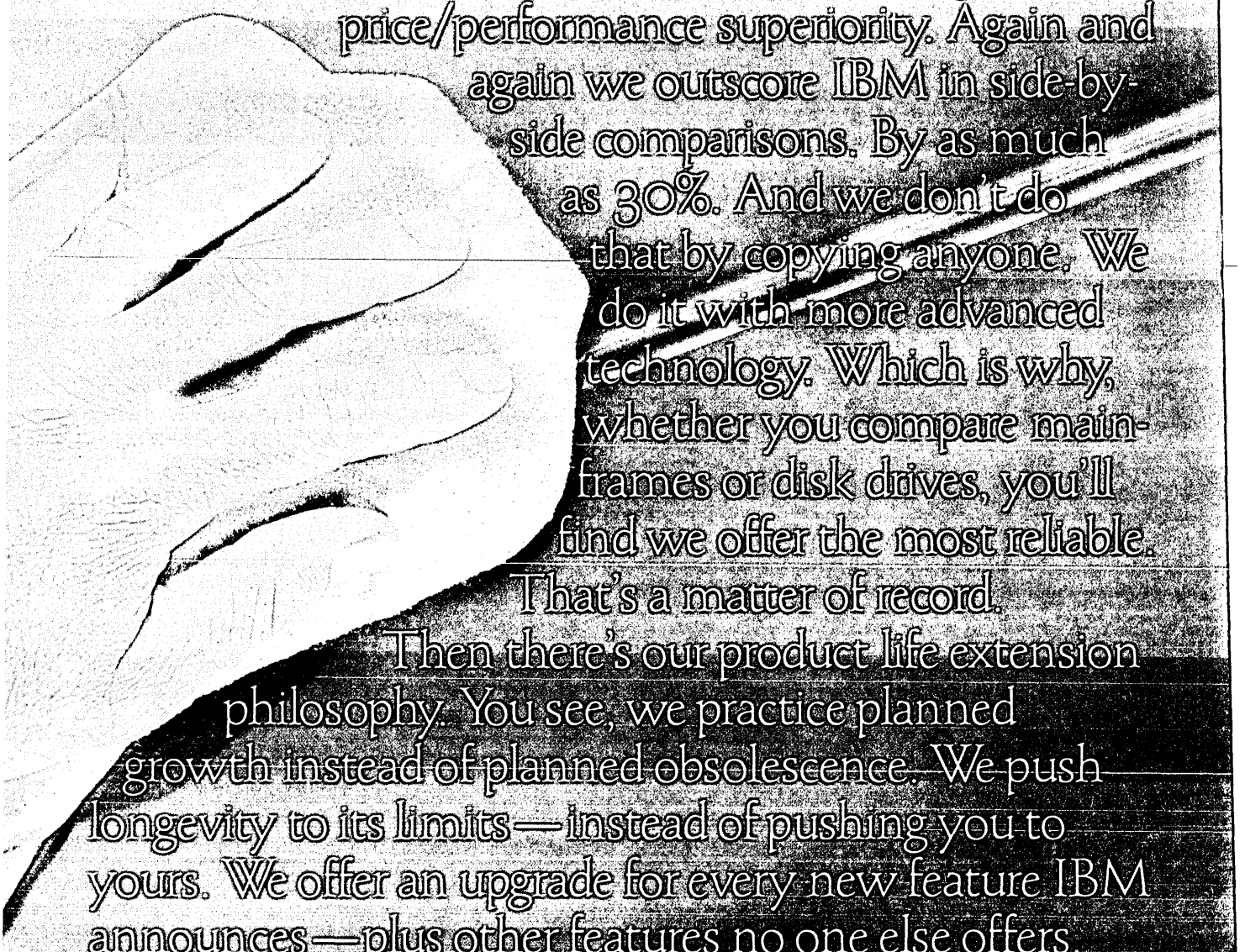

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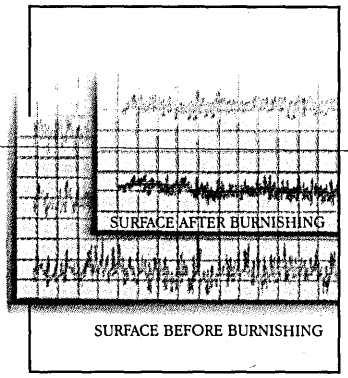

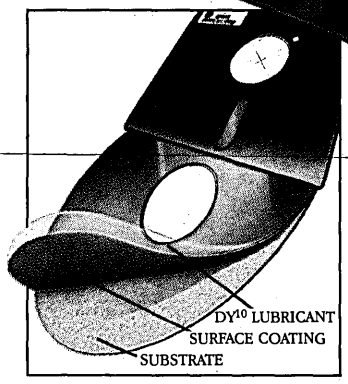

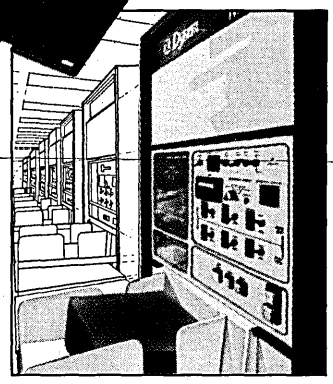

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giate sports. Hank Stram, one-time coach of the Kansas City Chiefs and now a sportscaster and a consultant to Qantel, said he got interested in using computers for keeping track of a team's tendencies when he was on the coaching staff of Purdue University back in 1948. He used campus Xerox equipment and a system patterned on one already in use at Princeton.

The National Collegiate Athletic Association (NCAA) has been using computers for years to compile its statistics. Since 1977, the Kansas City-headquartered NCAA has been working with United Telecom's United Information Services (UIS) on football statistics.

The NCAA provides football statistics for 189 colleges that play 1,096 games between Sept. 1 and Dec. 4, generally generating data on some 90,000 football players for consumption by the schools, football conferences, and mass media.

Data are fed to the system as games are completed on Saturday afternoons. Programs produce reports on national rankings, trends, single game highs, and conference reports. Statistics are distributed by computer linkup to the *New York Times*, ABC and NBC, *Sporting News* and *Sports Illustrated* magazines, and AP and UPI.

Until this past season, schools received their reports through the mail, but now NCAA has an electronic mail system that can be accessed by both member schools and the media. Schools that don't have terminals in their athletic departments are being encouraged to use campus computer centers.

"Eventually," says NCAA's Jack Waters, "member colleges will enter their game statistics at their own terminals and transmit them directly to the UIS computer." Now the data are phoned in and entered by NCAA employees.

Waters said the NCAA began to use the same process for both men's and women's basketball in the 1981-82 season. It also uses data processing for both football and basketball scheduling and eventually hopes to use it to compile a history of college football over the last 25 years.

Another UIS sports customer is the Calgary Flames Hockey Club of Calgary, Alberta, Canada. The Flames began computerizing their operation about two years ago when a former UIS employee developed a computer program Flames scouts could use in assessing amateur, college, and high school players. During the spring amateur draft, the Flames are ready with printouts of data on 400 to 500 amateur players.

"We have scouting data on players down to 15 or 16 years of age."

Another computer-using hockey club is the Minnesota North Stars, which has been up and running on a Microdata Reality system for about two and a half years. Controller Bill Pisarra, who formerly worked for Microdata, said the team uses standard business packages acquired from Microdata and modified, and a scouting system written in-house.

The scouting system ranks candidate players on the usual variables and was re-created from a system written by University of Minnesota students and run on the university's Control Data Cyber machine before the North Stars' acquisition of the Reality.

Another NHL team, the Buffalo Sabres, has been doing its scouting via Wang equipment for the last two years. The Sabres' Bob Pickel, who developed the scouting system, said, "The hardware's fantastic. We have scouting data on players down to 15 or 16 years of age." He was reluctant to talk about the kinds of data they collect. "We wouldn't want the other teams to know our secrets."

The National Hockey League itself, headquartered in Montreal, is a heavy user of computer technology. It has an IBM System/34 in Montreal (soon to be upgraded to a System/38) for which it recently acquired a "black box" from a Scarsborough, Ontario, firm that enables it to communicate

Cullinane's last ad.

14 years ago there was a small group of people with a very concise approach to software and how it might be applied to the freshly-minted concept of database management.

An esoteric pursuit, but one that they followed with no less than 100% conviction. Their steadfastness, the precise way in which they presented their ideas and, of course, the promise their first products held for data processing managers delivered them a following. Not a big following, but a loyal one.

These were the first days of Cullinane Database Systems.

Their first products were revolutionary in the sense that they brought the data processing world to a new way of thinking about the staggering amount of information they processed daily. Products such as IDMS recognized that data was a very dynamic entity – not something you stored away or carried about in voluminous paper print-outs.

Enhancements led to new techniques in data management. Programming aids made it possible to develop products uniquely tailored to individual requirements. Thorough documentation, testing, support and service made them a leader in the database world.

And thus, their small and loyal following became

a large and loyal one.

But in the minds of the small group of people who first proposed a rational approach to the database, the challenge hadn't been met. If anything, it had grown more diverse.

So the decision was made to put the Cullinane Database Systems name behind them. And replace it with a name that reflected a broader and fresher approach not only to database management but to the thorough integration of data throughout the entire corporation. The name is Cullinet.

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Cullinet. In many ways it's the same company. In many more ways, it's a better one.

So you can look at this as Cullinane's last ad.
Or as Cullinet's first one.

Cullinet

with a Control Data computer in Cleveland. The NHL performs statistics collection, scheduling, and general business applications. Data processing manager Mario Carangi looks forward to being tied to all league teams via electronic mail and maybe even to press and public relations people, "but that might create security and confidentiality problems."

One of the earliest applications of computers to professional and collegiate sports was in predictions by the media and sports buffs who would collect game statistics and figure gambling odds.

Potentially, one of the newest applications is in training. Sports Research Center, a nonprofit organization working out of Coto de Caya College in Trabuco Canyon, Calif., is using a Megatek-based graphics system to study body movements and such things as distribution of weight and thrust. They store and study data on the most successful athletes. "Other athletes go there to have their movements compared against the best," said Jim Greenlee of Megatek, San Diego, Calif.

So far it's been mainly tennis players and golfers, but a whole volleyball team was sent there, and the technique apparently has potential for any sport.

"They work from high-speed pictures projected in slow motion, digitizing the images and projecting to a data tablet, creating stick figures," explained Greenlee. The same digitization is done for the expert and the trainee and the two are compared.

Presumably when an athlete knows how his movements are different from those of the expert, he can train himself to change and become just as good.

Now, if only someone could come up with a computer program that could figure out whether the NFL's Raiders belong in Oakland or Los Angeles.

—Edith Myers

SOFTWARE

GOLDEN STATE'S APPEAL

Foreign software developers find California an attractive point of entry to U.S. markets.

California is becoming a popular entry point to U.S. markets for purveyors of software developed in other countries.

When Holland Automation, a European supplier of micro software, moved into U.S. markets last year, it settled into headquarters in Costa Mesa, Calif. Chairman Tom van der Loo said the choice was made because of the size of the California market, but he conceded climate had something to do with it as well.

John Forge, president of United Software Systems & Services Corp. (U.3.S), which represents a consortium of six (soon to be seven) French software houses in the U.S., said his company elected to settle in Los Angeles "because what we're selling is an advanced product and West Coast companies are not afraid to be first on it. We'll succeed on the West Coast, then will move into East Coast markets."

What U.3.S is selling is a database management system called Clio, named for the Greek goddess of memory. Forge describes Clio as a highly sophisticated system that is totally integrated and can handle any type of data structure including hierarchies, networks, and relational and inverted files.

The firm has six beta test-site installations, all in Los Angeles, and in mid-February a first contract was imminent. A northern California office will be its second U.S. location, and after that a move into the Midwest is planned.

"People have a hard time understanding that so many different things can be done with one [database] product," said Forge. "But customers here are more open-minded than in Europe."

Geoffrey Mann, president of Progeni Systems Inc., which sells New Zealand-developed software programming aids for the Burroughs mainframe market from headquarters in Glendale, Calif., said he finds an "existing inertia in the East. Detroit is a prime example. Their technology is 20 years behind the times."

The Glendale firm is a subsidiary of Progeni Systems Ltd. in New Zealand. The parent company was founded in 1968. The U.S. firm has been in business for four years. It sells what are called Progeni tools: Progeni-M for maintenance, Progeni-D for development, and Progeni-E for systems engineering. Progeni-M reduces maintenance cost by making programs easier to read. Progeni-D, available for either COBOL or FORTRAN, reduces the time required to construct programs through use of prewritten, pretested blocks of code called "functions."

Progeni-E, Mann said, is for sophisticated installations that want to build their own software tools. It provides a language that allows creativity and manipulation of variables within functions. Mann said it allows a user to create isolatable, testable pieces of code that can be used in any COBOL program.

Delta Software Services was established late last year in City of Industry, Calif., to begin U.S. marketing of the Delta system, a program for improved change control and change integration of software running on IBM 370-compatible computers. Haavard Husum of System Software Services in Oslo, developers of the system, and a partner in Delta Software Services, said the application as used in Norway was based on MVS on an Amdahl 470 processor. An interface package for CICS developed in Sweden was used for all the on-line functions and Cincom's Total DBMS was used for the database.

In early 1980 the terminal-oriented factoring package was licensed to Crocker National Bank in California, which required environmental changes that were made by the bank working with the Norwegian supplier. The result, including a number of upgrades, became the Delta system. Husum's partner in Delta Software Services was at that time director of data processing for Crocker Commercial Services.

Husum wonders why change control hasn't been more important to software to date. "In the hardware segment of the industry, change control and strictly controlled integration of engineering changes have always been mandatory."

The choice was made because of the size of the California market, but the climate had something to do with it as well.

The Delta system now is in use in the Carnation Co. in Los Angeles and at ITT Cannon Electric, Fountain Valley, Calif.

As the Norwegian package had to be modified to create the Delta system, so does most software developed abroad have to be adapted for U.S. use.

Van der Loo of Holland Automation said programmers in his company's six European offices spent three months converting packages to run with CP/M. He said making his software CP/M compatible made it less efficient in some cases, but studies had told him he couldn't do well in this market if he didn't do it.

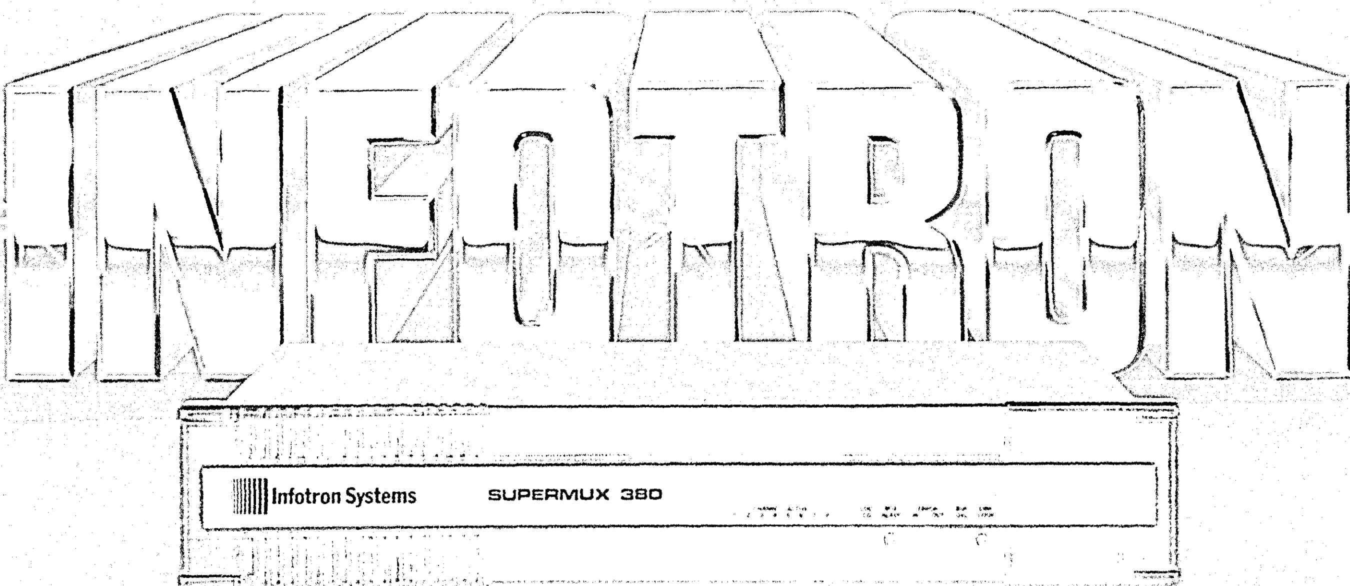
Kim Irvine, regional chief executive of American Integrity Systems, Santa Ana, Calif., which brought Australian-developed software to the U.S. in July 1981, had his products "fine tuned" for the U.S. market by the CPA firm Ernst & Whinney.

Irvine is happy with results of his U.S. efforts although they're not exactly his dreams come true. "I dreamed I'd come here and become a millionaire overnight and that hasn't quite happened. But I'm happy with the way things have gone and we're here to stay."

AIS has six people in its Santa Ana office and a small dealer base in Los Angeles that it is working to expand. They sell the Management Accounting Series, a package of general accounting software for accounts payable, accounts receivable, general ledger, inventory control, sales order entry, and word processing.

Irvine said the packages are espe-

What's Behind the Supermux 380 Multiplexer?



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5 Reasons to Move Up With CCI's POWER™ 5

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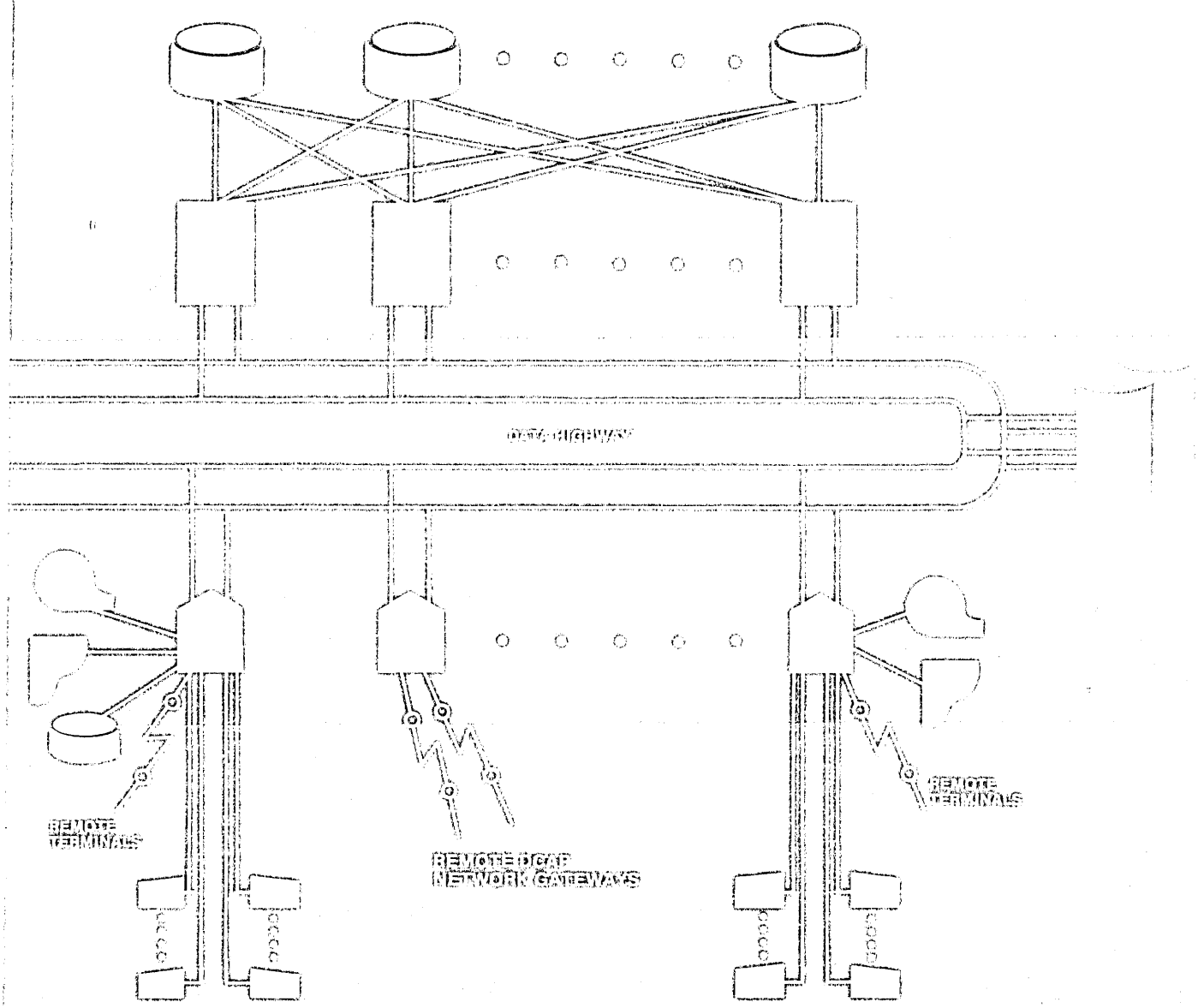

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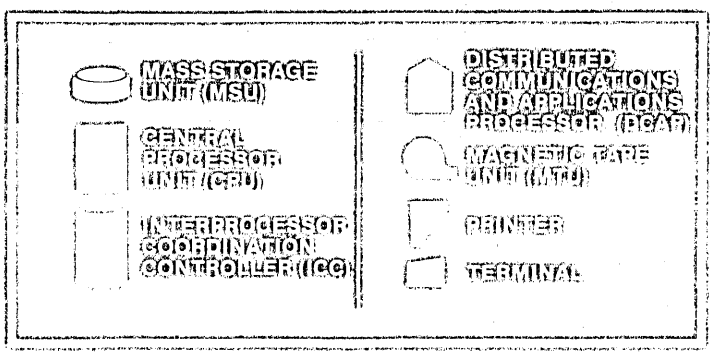

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cially reliable because they were developed for the Australian market. "Australia is geographically the same size as the U.S. but has only 15 million people. It's a long call to your next-door neighbor."

MAS software is designed for users of microcomputers running under CP/M, CP/M86, MP/M 11, Turbo-DOS, Cromix, and N/Star operating systems. The programs are written in CBASIC, CBASIC 86, and CB 80.

Key elements in the AIS strategy in the U.S. are a registration/distribution system that gives the dealer "production facilities" for the product so that he can deliver the software immediately upon sale, and a control key that will unlock the software after it has been installed. This key also activates a date clock, which allows a dealer to have control of an installation after the software has been registered.

U.3.S' Forge said his company had to learn that U.S. customers don't think at all the way the French do. "In France we explain what the concepts are and why the concepts work. Here we have to say 'this will save you money. This will do it better.' They don't care about the what or the why, just about the how."

He said they also had to translate all documentation and some command words, but the latter, he said, was minimal because his system is highly parameterized.

Progeni, in addition to its New Zealand-developed tools, has brought still another country's product to U.S. markets. Its DPS, developed in England by Datalog Management Systems Ltd., is an on-line tool while the Progeni products are batch. Progeni's Mann first saw DPS demonstrated at a CUBE (Burroughs user group) meeting in late 1981. He said the product has been "taking off like a rocket" and is complementary to the Progeni tools. "Tools pick up where DPS leaves off."

—Edith Myers

STRATEGIES

APOLLO'S RIGHT ON SCHEDULE

Everything seems to be going like clockwork for the three-year-old Chelmsford, Mass., company.

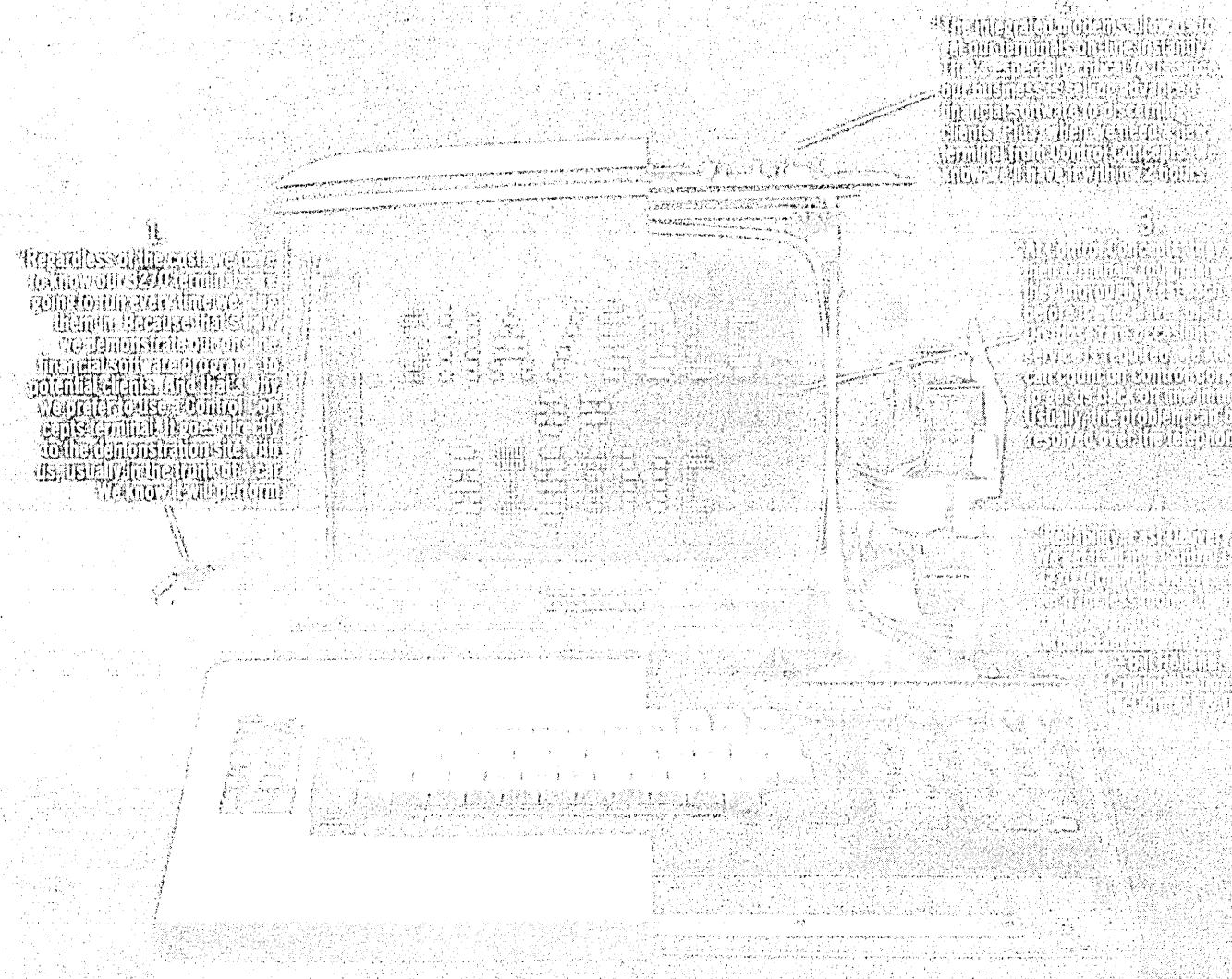
When it's all over, it will have been one of the classic imaging jobs by a new computer venture. "Tiny" Apollo Computer in Chelmsford, Mass., will have crowned a three-year buildup with its first public offering: 3 million shares of common stock at $15 to $18 each.

"A company that has just completed its first full year of production [with some $18 million in sales]," says one venture community source, "will have been transformed almost overnight into a Wall Street Cinderella, with a market value of some $300 million to $360 million."

Barring any unforeseen catastrophe, the public's response to Apollo's current offering should be favorable, according to venture expert Stanley E. Pratt, who is responsible for the industry's bible, *Guide to Venture Capital Sources*. "December was a great month for new issues, and the trend has continued into the new year on the back of a hot stock market," he says. "This could be the perfect time."

The new stock issue will be a triumph for the venture companies that have pumped some $17.4 million into young Apollo over four rounds of financing. According to Pratt, the list of investors reads like a who's who in the venture business. A director of one of these investors, G.S Grumman/Cowen Institutional Services, Boston, says there won't be much profit taking at this time. "We're not selling, and we understand that only one third of the shares reaching the public are from existing

McCormack & Dodge can't find any VT220 compatible terminal. Why would they choose the least expensive Control Concepts?



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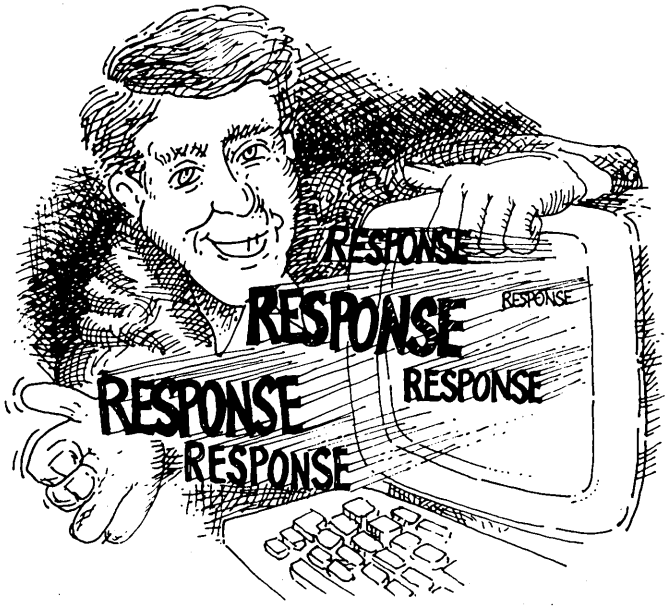

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stockholders," said Barry Rosenberg.

Pratt pointed out that stockholders should be elated because most venture companies are having to face a full 10-year investment cycle before they can reap their profits.

Also purring with satisfaction are the company's seven founders (one has since left). Chief among these is the company's chairman and former cofounder of Prime Computer, Bill Poduska. In line with other stockholders, Poduska and his team will pass over the possibility of instant wealth for the present. He says that less than 5% of the stock being sold comes from officers of the company.

If the public offering is claimed as a triumph for Apollo founders and investors

Like other new ventures, Apollo has entered the business with a Unix-like operating system married to the Motorola 68000 family.

alike, it is also something more. "It's really the triumph of an idea," says marketing director Ed Zander. Put simply, the company's idea was to design a powerful yet compact virtual computer that could be used by a professional at his desk. In the past, if this professional used a computer at all, he probably made use of timesharing, and his terminal was just one of a bunch sharing a single large computer and getting a slice of its time. Zander says that this arrangement smacks of one computer using a lot of people rather than one person using one computer. Not surprisingly, then, the notion put forward by the Apollo founding fathers in their 1980 business plan was that timesharing is obsolete; the time has come to give each professional his own computer, his own workstation.

One would have to be naive to believe that the same notion didn't also occur to IBM, DEC, and dozens of other companies. "But it wasn't possible for them to introduce such systems in the past decade because the technology didn't exist," says Poduska. "The technology had to go through another 'step function' to make a virtual workstation possible. When it did, we were ready."

The ingredients of this step are now becoming familiar to us: low-cost, high-density RAM, and 32-bit VLSI processors; high-resolution graphics; raster keyboards and bit-map interfaces; Winchester hard disks; and portable, high-level languages and operating systems.

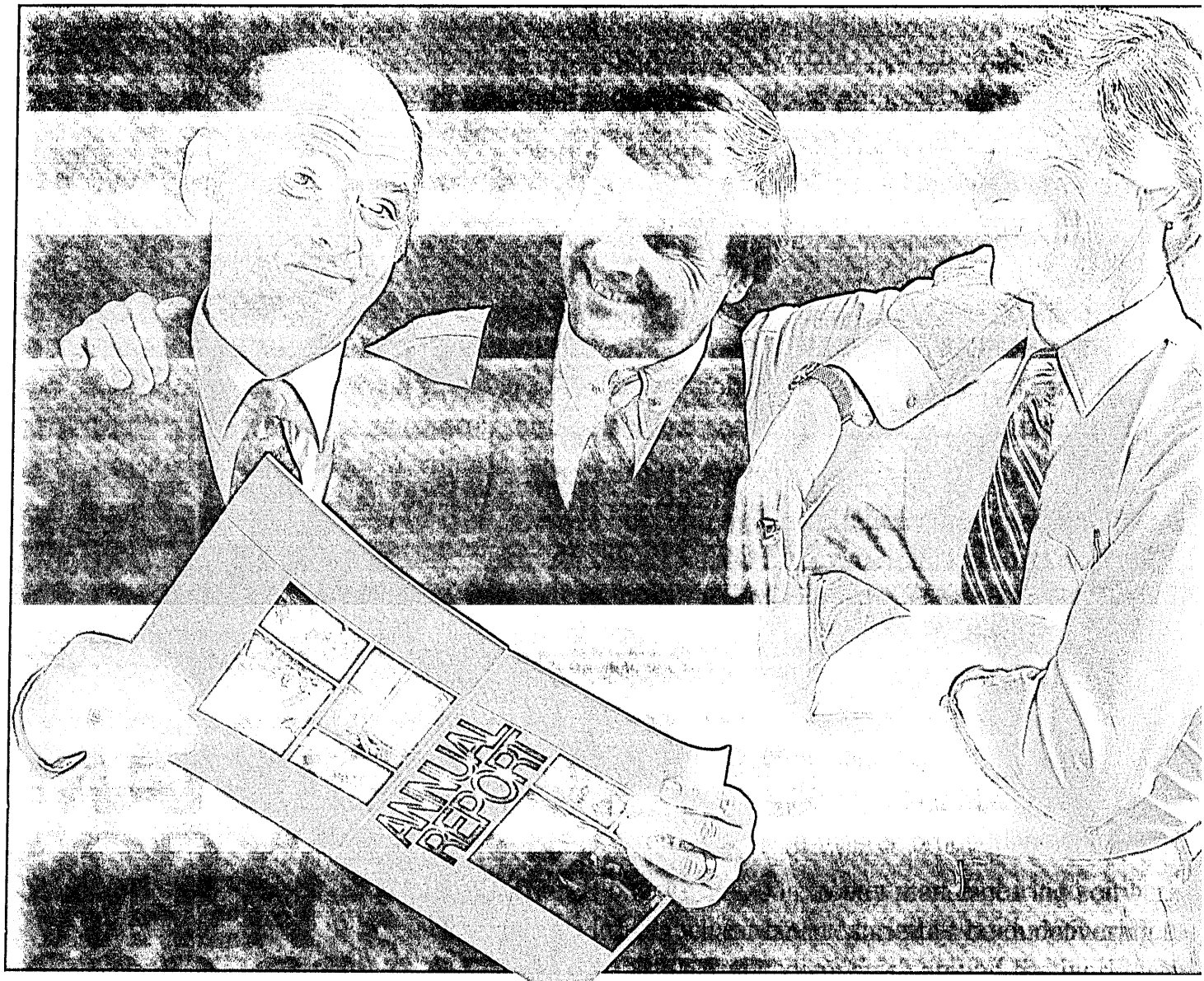
A key assumption in the Apollo strategy is that market leaders such as IBM and DEC are so locked into rigid timesharing architectures that they can't take advantage of the new step-function technology now that it is coming along. "Anything they may want to incorporate has to be made compatible with their existing timesharing software," says Zander, "and this takes the edge off their price and performance. If you want an example of this rigidity and lack of flexibility, you only have to look at the failure by IBM and DEC to respond to the con-

The company's idea was to design a powerful yet compact virtual computer that could be used by a professional at his desk.

tinuous processing systems from Tandem and its imitators."

In line with the backgrounds of its founders, Apollo has focused its strategy on DEC and Prime customers—particularly the giant VAX machine population that Digital has built up since 1979. "Rather than trying to embrace all classes of workstation demand," says Zander, "we've concentrated on the ones we know best of all—scientific and engineering professionals." Venture insiders also point out that this objective is more in line with Apollo's current intent—$50 million in sales this year.

All of the new hardware in the world wouldn't provide an effective way into DEC's base if the step wasn't built on a



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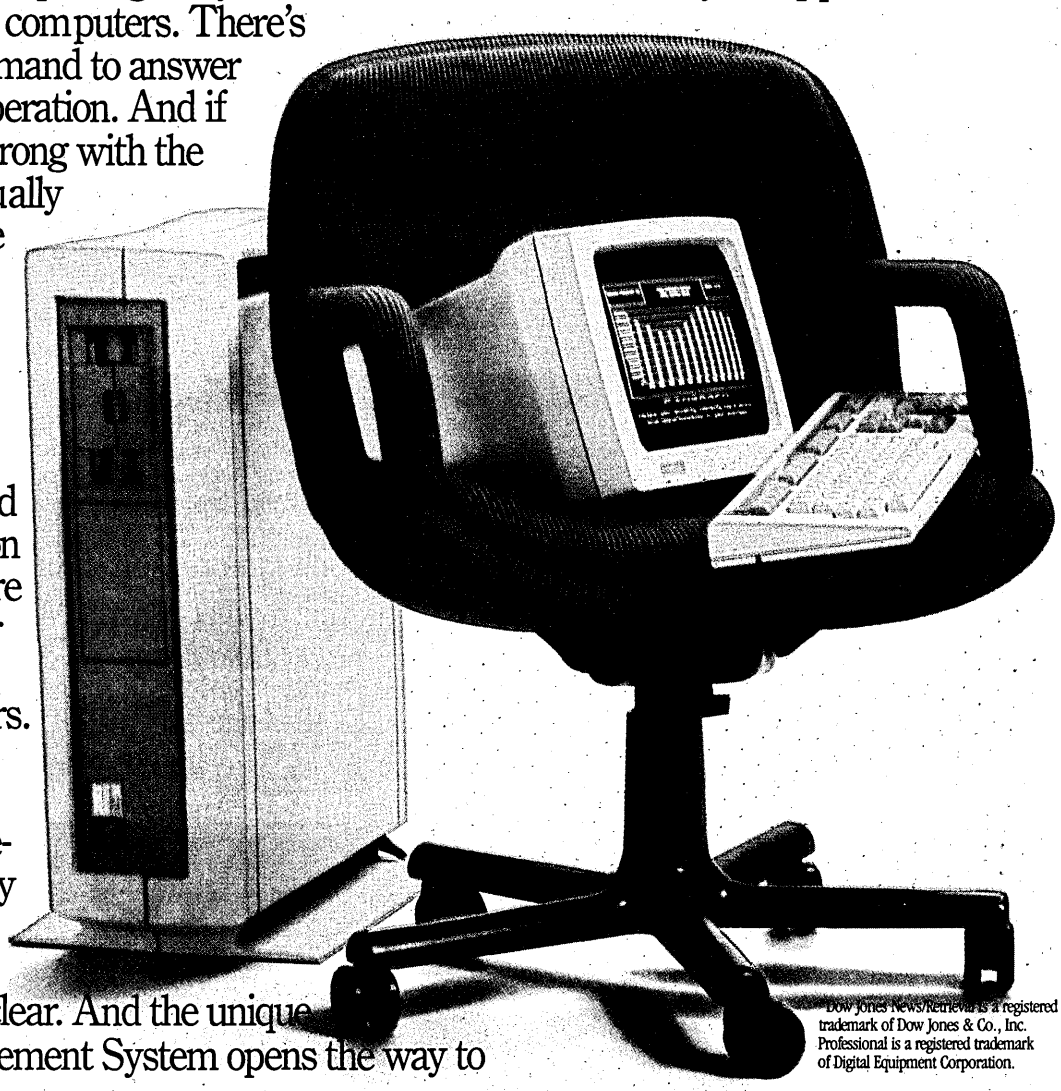

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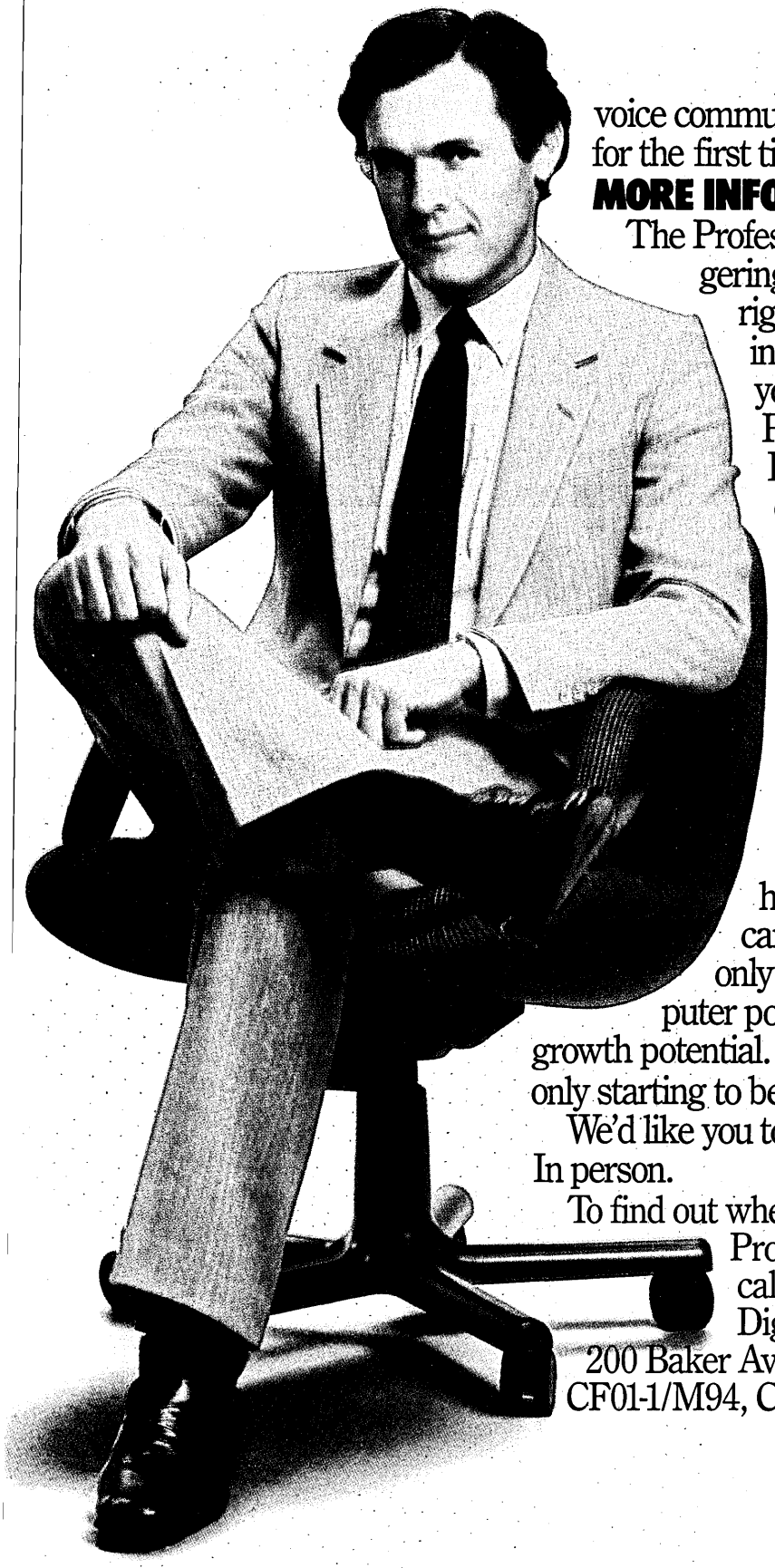

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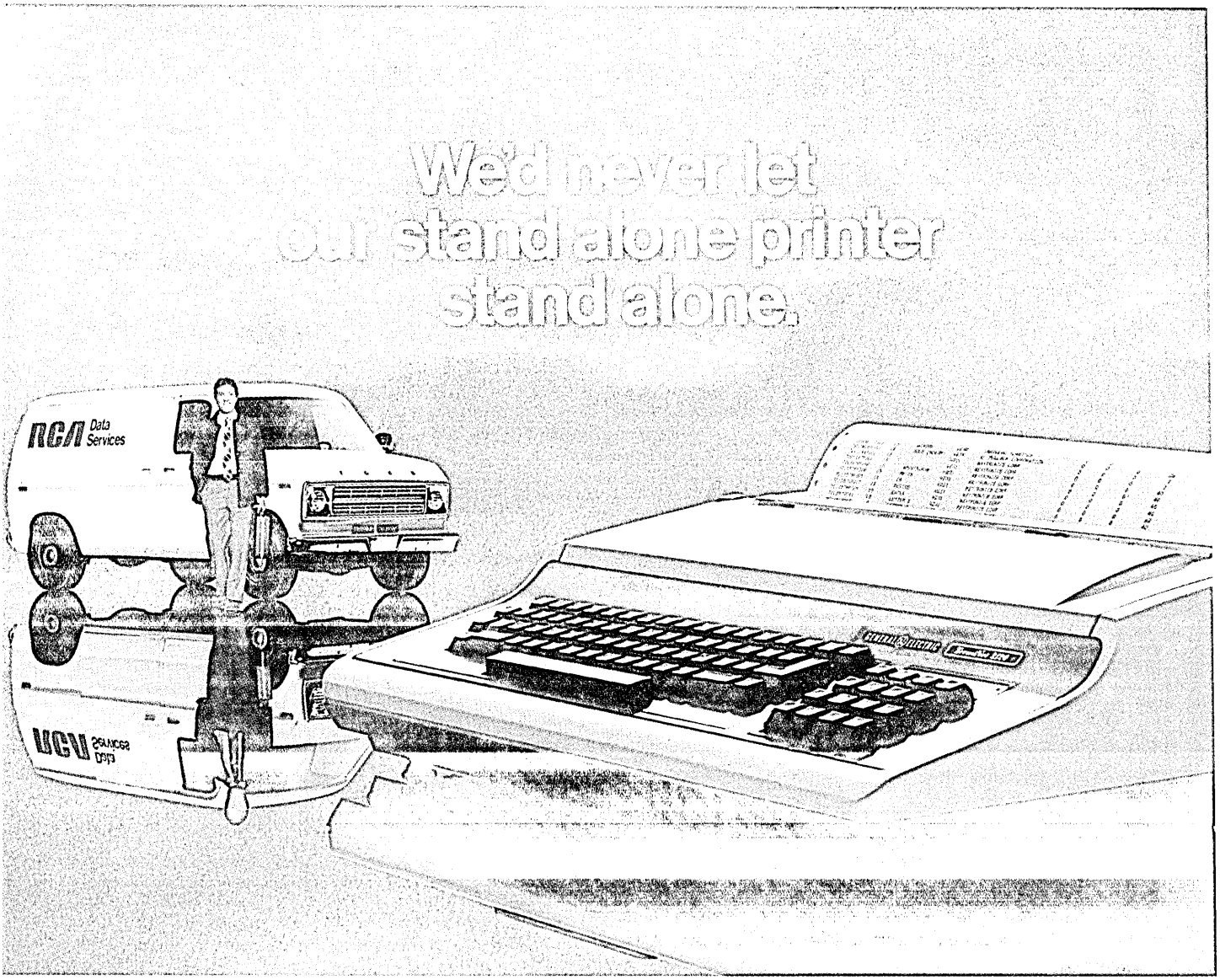

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new software thrust, observers point out. Many new ventures have discovered such a spearhead in Unix, a network operating system designed by Bell Labs for use with DEC minicomputers. The software, whether licensed or imitated, has provided a fast way into the business for a whole new wave of ventures—particularly in DEC oem markets. Says one industry wag, "The new venture uniform of Unix and the Motorola 32-bit 68000 is getting as fashionable as IBM's blue and white stripes."

Like these ventures, Apollo has entered the business with a Unix-like operating system married to the 68000 family. But Apollo cringes at the comparison with these companies. "We're not just a fast box seller," stresses Zander. "We offer complex and increasingly bundled systems."

The company explained that its Aegis operating system had been written in the high-level language Pascal, and could be used with a large array of third-party software packages for engineering applications. The company also plays down its use of the 68000, saying that Aegis is processor independent and can easily be switched to other cpus.

"But more than anything," Zander explains, "Aegis is unique in the way that it has integrated high-resolution graphics and local networking into its orbit."

The upshot of all this for engineering professionals has been what Apollo calls "a virtual machine VAX on a desk that works in networks at disk speeds—12 megabits/sec." For those more familiar with IBM systems, Apollo's Domain 400 and 300 computers pack the wallop of a virtual .75 MIPS 370/158 on a desk.

So far, Apollo has resisted developing its own applications software and program generators, relying instead on third-party software.

Apollo's January announcements drove the price-performance curve down even further by offering half-megabyte DN 300s for $10,000 each in quantities of 50. The single unit price ranges from $18,000 to $28,000, depending on storage, Poduska explained at the announcement.

Apollo, in its early imaging, has also been anxious to distance itself from the perception of new Unix/68000 ventures in other ways. Many of these companies have little or no investment in software or customer handholding, thus raising the question of long-term commitment to users.

"Unlike other ventures," says Poduska, "we offer full marketing and field support to our users. In addition, our investment in the future is reflected in our R&D spending [a higher than average 11% to 13% of sales]."

Another concern of users is the long-term commitment of management to a new venture. "During the first five years of a startup's life," says California-based consultant Howard Bromberg, "it's not unusual for the company to go through three types of chief executive officer. Type one is the entrepreneurial ideas guy who gets together the venture capital and articulates the company's message. He's followed," Bromberg continued, "by the strong manager, more people oriented, with knowledge of building long-term management teams. Type three would add an extra marketing dimension to management experience.

"This seems to be the nature of the business," said Bromberg, who could be the first U.S. consultant to have worked with Japanese customers of Apollo. "So it could happen with Poduska."

All told, four of the seven Apollo founders are repeaters, that is, they previously formed another venture. This is taken in some quarters as an indication that these men are more interested in the intellectual stimulus and excitement of venturing than in a more settled long-term commitment to one company. Apollo, for its part, quickly scotched such suggestions by stressing that none of its principals had ex-

pressed any intentions of leaving.

One possible source of embarrassment to the company could come from Poduska's association with the Boston-based Eastech venture partnership. Poduska is one of a list of 35 partners, each of whom has invested between $150,000 and $500,000. Many of them are high-tech entrepreneurs themselves: Marty Allen of Computervision, Jesse Aweida of Storage Technology, and Patrick de Cavaignac of Vydec and Telesis are some of the other luminaries. Possibly all these men will end up investing in their competition, thus compromising their own company's position.

Apollo's original business plan called for launch in '80, sales in '81, profits in '82, and public offering in '83, and it's right on schedule.

For the present, at least, everything seems to be going like clockwork for young Apollo. According to Zander, the original business plan called for launch in 1980, sales in '81, profits in '82, and a public offering in '83 — right on schedule. Sources in the investment community claim that Apollo geared up to go public last year, but a combination of poor first-half sales and a lame stock market scuttled the plan. Apollo admits it has looked at the possibility of going public, but denies it made any preparations for a 1982 issue.

Despite the likely infusion of $30 million to $36 million into the company's coffers, the pressure on the young venture has only just begun. Hewlett-Packard recently announced a new family of workstations for engineering professionals, and Apple's new Lisa features many of the same graphics concepts seen on the Domain series. Local networking solutions from DEC and from IBM (aimed at DEC's base) aren't far down the road, and insiders say that professional workstations will be bundled in. "In addition," says one source, "IBM and DEC can use superior service organizations to lever a better price for the whole package."

So far, Apollo has resisted developing its own applications software and program generators, relying instead on third-party software. Poduska said his company has no plans to offer its own applications software at this time, but company insiders say it will have to come in time, both to intensify the commitment to users and to maximize future revenues in an increasingly software-oriented world.

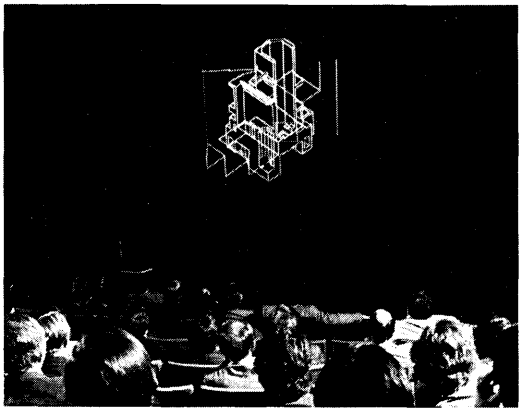
"The money will help us try and stay ahead of the pack," says Zander. "We don't underestimate the difficulties ahead. We just take each new day as it comes."

—Ralph Emmett

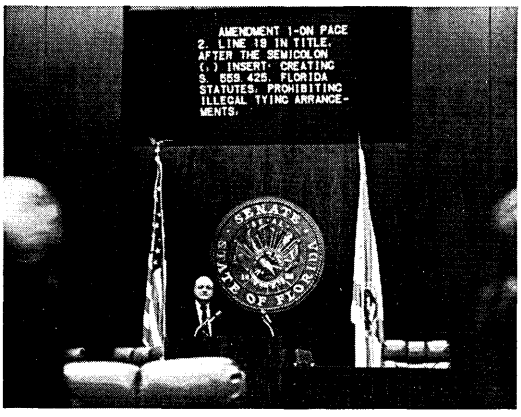
BENCHMARKS

R&D STANCE: The Micro Electronics & Computer Technology Corp., a joint venture among 15 corporations, has been launched to help U.S. industry do battle with Japan's so-called fifth generation computer project. Led by Control Data, whose feisty chairman and founder William Norris has been one of the most outspoken critics of U.S. industrial policy (or the lack thereof), the company expects to enjoy a $50 million to $100 million a year budget, doing research into systems engineering, software production, integrated circuit packaging and design, and computer aided manufacturing of digital equipment. The joint venture has obtained a tacit go-ahead from the Justice Department, which said it will not challenge the corporation's formation as a violation of antitrust law. The department is, however, keeping its eye on the venture's activities. So far, those committed include Advanced Micro Devices Corp., Control Data, Harris Corp., Digital Equipment Corp., Honeywell Inc., Motorola Inc., NCR Corp., National Semiconductor Corp., RCA Corp., and Sperry Corp. Others on the steering committee include Burroughs Corp., Signetics Corp., Westinghouse Electric Corp., Xerox Corp., and Mostek Corp.

(Continued on p. 95)



COMPUTER-AIDED DESIGN displayed by General Electric projector is viewed by Engineering Society of Detroit.



WORDS "PUNCHED UP" by clerk of Florida State Senate are inspected carefully before a vote.

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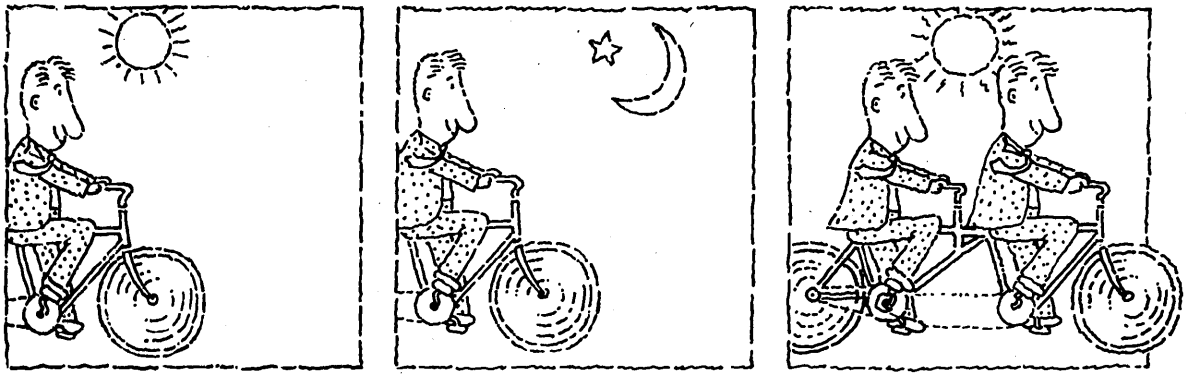

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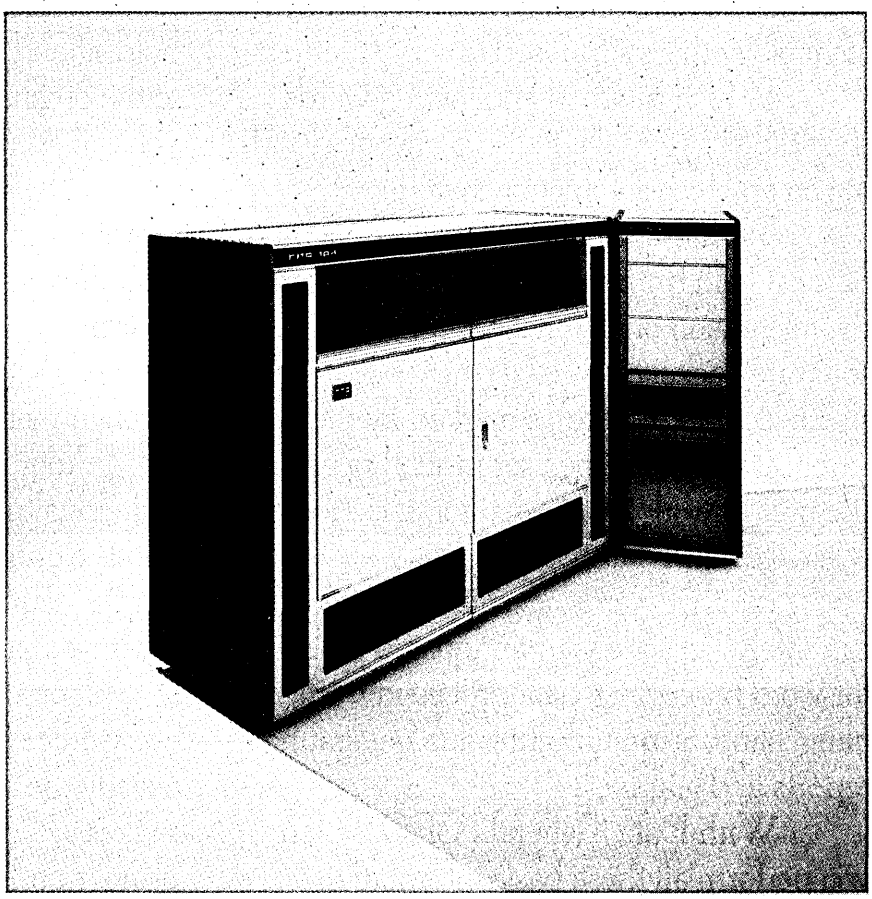
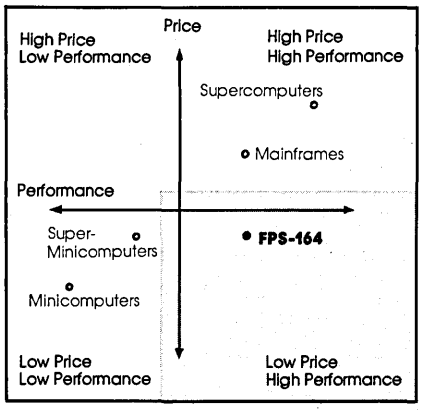
Compare the price/performance of the FPS-164 to other options for scientific computing.



It offers up to 12-million floating-point computations per second (MEGAFLOPS), gives you 15 decimal digits of precision, and up to 7.25 Megawords (58 Megabytes) of memory for prices starting at $300,000 (U.S.).



Solutions Using Sparse Matrices

$$\begin{bmatrix} c_1 & d_1 & 0 & e_1 & & & & \\ b_2 & c_2 & d_2 & 0 & e_2 & & & 0 \\ 0 & b_3 & \cdot & \cdot & \cdot & \cdot & & \\ a_4 & 0 & \cdot & \cdot & \cdot & \cdot & \cdot & \\ & a_5 & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ & & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & e_{n-3} \\ & & & \cdot & \cdot & \cdot & \cdot & \cdot & 0 \\ 0 & & & & \cdot & \cdot & \cdot & \cdot & d_{n-1} \\ & & & & & a_n & 0 & b_n & c_n \end{bmatrix}$$

Many scientific and engineering applications use sparse matrix methods in their problem solving. The FPS-164 is especially suited for these operations which can account for up to 95% of the CPU time.

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For example, a FORTRAN program performing a common sparse matrix operation ran 6 times faster on the FPS-164 than on a popular scientific super-minicomputer. When the program was modified to take advantage of the FPS-164 architecture, the sparse matrix operation ran over 14 times faster than on the super-minicomputer.

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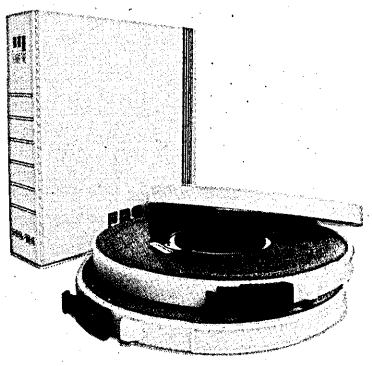
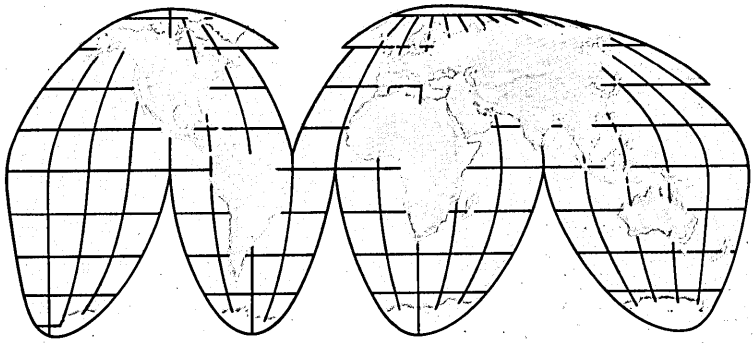
For software development, Floating Point Systems offers development tools for getting maximum use from the FPS-164, including the FORTRAN 77 Optimizing Compiler, and an Overlay Linker.



A Math Library with over 410 FORTRAN callable subroutines is also available.



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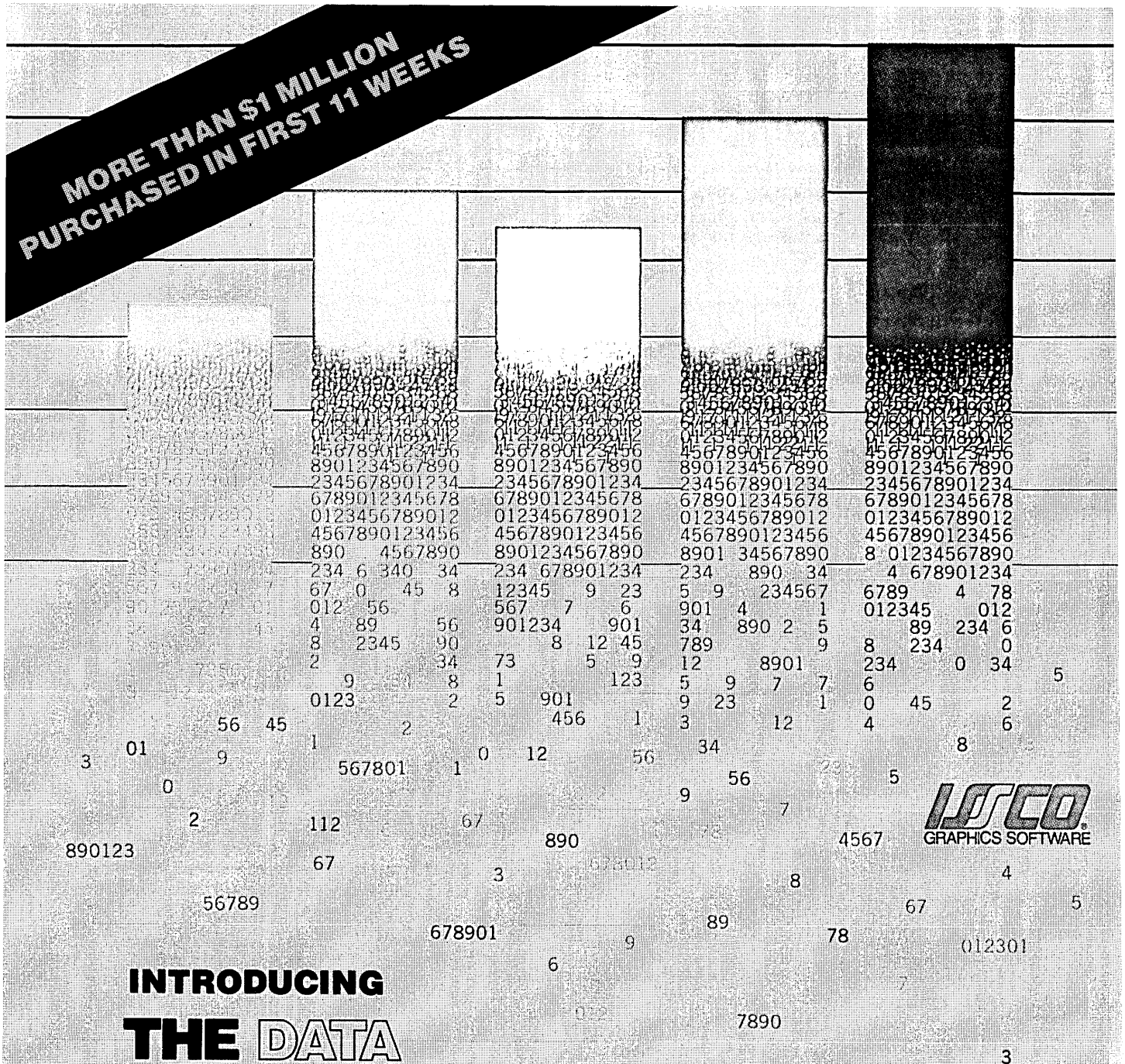

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CIRCLE 82 ON READER CARD

NEWS IN PERSPECTIVE

BIG BUY: Sperry beat out Burroughs in winning a $476 million Air Force computer contract, the largest commercial computer award ever let. The so-called Phase 4 program calls for Sperry to supply 153 computers, mainly its model 1100/60 machines, as well as some 7,000 terminals, to replace 277 Univac 1050 II and Burroughs 3500 and 4600 systems in place in Air Force bases worldwide. No word was given as to how much Burroughs bid on the contract, which was in negotiation for several years and ended in a so-called test-off between the two companies. Burroughs's loss is seen as especially painful because the company's Federal and Special Systems division had devoted much effort to the Phase 4 bid. Indeed, Burroughs's purchase of Systems Development Corp. three years ago was seen as an attempt to bolster the company's standing in government and military markets. Computer Sciences stands to gain from the Sperry win since it has been subcontracted to do much of the software conversion work. Burroughs had teamed up with Planning Research Corp. The contract extends for eight years and includes service and support, hardware, and software.

GIVING BAD HDA: Storage Technology admitted to shipping a large number of faulty head-disk assemblies (HDA) to customers and then having to spend $17 million fixing the equipment in the field. It seems the problems arose from particulate matter on disk surfaces in the company's 8650 drive, designed to mimic IBM's 3350 machine. STC declined to say how many HDAs were affected but said the faulty drives were sequentially numbered. No identification was given for the disk platter supplier. STC said the expenditures for fixing the faulty equipment would help cut fourth quarter 1982 profits as much as 78% and 1982 profits by up to 22.8%. Fourth quarter earnings were said to be between $7 million and $8 million on revenues of $280 million. Earnings for 1982 were estimated to be between $63.6 million and $65.6 million, compared with 1981's net of $82.4 million. Meanwhile, the company has withdrawn its 8370 disk drive, which is designed to mimic IBM's 3370.

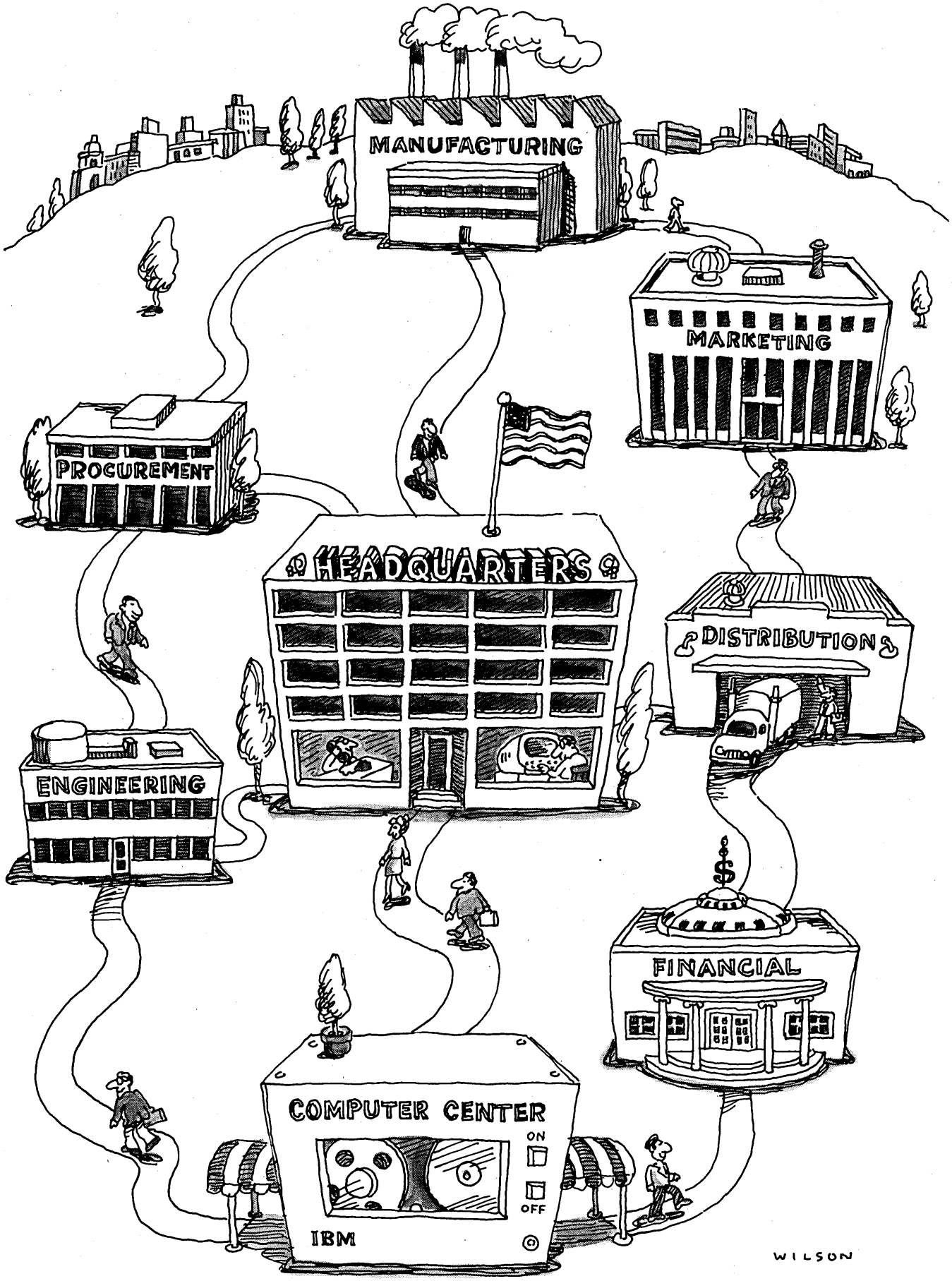
GO-AHEAD: Computer Sciences Corp. has lost an appeal to the Supreme Court and will have to face the charges of fraud and false claims it had resisted. The El Segundo, Calif., firm is expected to go to court soon in connection with a 57-count indictment filed in October 1980 that charged the company with bilking the government on a $100 million teleprocessing services contract. The company is charged with using inside information to win the award, which covered services delivered between 1972 and 1977, and inflating costs. The company had appealed to the Supreme Court to reverse a ruling by an appeals court last June that had reinstated fraud and false claims charges thrown out by a lower federal court. The appeals court at that time had dismissed charges of racketeering and bribery against Computer Sciences but let the racketeering charges remain against certain current and former Computer Sciences employees. A bribery charge is still pending against John W. Luke, former president of the company's Infonet division.

EYE ON THE SKY: With hopes of boosting its attractiveness to the information industry and maintaining competitiveness for local companies, a group of Columbus, Ohio, concerns are planning to set up a locally shared satellite antenna station. A spokesman for the Columbus Teleport Corp., which was incorporated last October, says it could be "on the air" as early as the first quarter of 1984 with an antenna system providing video, audio, and data communications to other such facilities throughout the country. The four main investors in the venture are Ohio State University, CompuServe Inc., Chemical Abstracts Service division of the American Chemical Society, and M&R Companies, a real-estate partnership of the Ruscilli Construction Co. Currently, a questionnaire is being circulated throughout the local industry in order to gauge the need for such a teleport. When the survey is completed this spring, equipment contracts will be let, perhaps as soon as the coming summer, according to George Minot, senior vice president of CompuServe, a computing services supplier. Similar efforts are under way in the New York metropolitan area (July, p. 36) and in Denver, Houston, and on the West Coast.

AND THEY'RE OFF: Control Data took the lead among pcms by being the first to install an IBM 3380-compatible disk drive. The stakes in the 3380 market are large since customer demand for on-line storage grows by as much as 45% a year, far outstripping that for processor power. CDC has promised for many months to make a first quarter 1983 delivery of its 33800 disk. The initial evaluation unit went to Commonwealth Edison Co., a Chicago utility. Meanwhile, Storage Tech maintained that it too would ship its first evaluation unit of a 3380 look-alike product in the first quarter, as would Burroughs subsidiary Memorex. The 3380 has presented even IBM with problems in manufacturing, primarily in the area of thin-film read/write heads used to obtain extraordinarily high recording densities. Startup Ibis Systems, Duarte, Calif., flush with a third round of venture capital financing, said it will be able to ship its first 3380-type product in the second quarter of this year. First shipments don't count for much, say industry observers, who say the real test for the pcms will be achieving volume production as fast as possible in order to take market share away from IBM. Last year IBM was believed to have shipped upwards of 4,000 spindles of 3380 disk, and in late 1982 cut prices by 15% while offering volume discounts for the first time. CDC responded in February, cutting purchase price 10% and upping lease charges 15%.

IRISH SOFTWARE: An effort to get U.S. and other software companies to establish software development facilities in Ireland appears to be paying off with the January announcement that IBM will locate a new software unit in Dublin. The Industrial Development Authority of Ireland said the IBM facility will initially be located at the firm's current Dublin premises, where marketing and support activities already take place, but will eventually move to a new IDA business park in Leopardstown, County Dublin. IBM is the fourth major software company to set up shop in Ireland, following Informatics General, Altergo, and Cincom Systems. The IDA expects the IBM software operation, which is expected to employ some 100 persons, will enhance the country's attractiveness to international computing services suppliers. The country has made special efforts in recent years to lure foreign manufacturers into setting up factories on Irish soil but is putting particular emphasis on service operations. IBM Ireland, with 1981 annual revenues of $30 million, currently has offices in Dublin, Cork, Limerick, Galway, Sligo, and Waterford. Part of the new IBM software development plan includes an IBM personnel training program supported by cash grants from the IDA, a spokesman said.

DISKS FOR IBM P.C.: The lack of a hard disk from IBM for its Personal Computer is apparently soon to be no more as the company lines up suppliers for 5¼-inch Winchester drives. Early bets were on Seagate Technology, which has long led the 5¼-inch market, but another California company, Miniscribe, is understood to be supplying IBM with drives for the P.C. IBM has introduced the popular computer in the United Kingdom and other foreign countries where it already has a large following, thanks to what is understood to be a burgeoning "gray market" of machines imported from the U.S. With upwards of 300,000 machines installed in the U.S. and foreign markets opening up, IBM was seen as hard pressed to keep up with demand. Reportedly it experienced an unexpected year-end demand for the computer and was unable to supply its dealers with all the machines they sought. Meanwhile, the company has reportedly gone to a third floppy disk supplier, Micro Peripherals Inc., in order to have enough of those devices for its customers. Already supplying floppies for the P.C. are primary source Tandon Corp. and backup Control Data. ❁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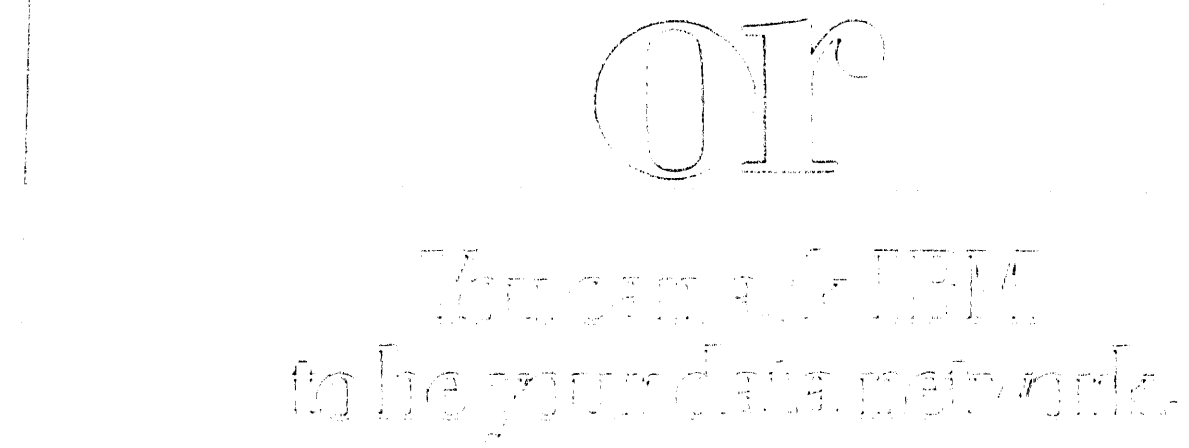

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First of a four-part series on the digital PBX—an important new tool for local data communications.

IS THERE A PBX IN YOUR FUTURE?

by Ed Yasaki

Until fairly recently, the PBX or private branch exchange served only to switch voice traffic. But newly developed PBXs can switch voice and data simultaneously, making it practical to use them as local switches for slow to medium (less than 56Kbps) speed data devices. In some cases, today's PBXs were designed with this ability, while in others it is achieved by means of hardware and software additions to what had been a voice switch. But whatever path the manufacturers choose to take, the inevitable fact is that more and more PBXs will acquire the ability to handle more and more voice and data traffic simultaneously, and the number of users of such dual-personality switches is certain to expand.

In this issue, DATAMATION begins a series of four consecutive articles on the PBX. These articles are designed to introduce readers on the data processing side of the house to an important technology on the communications side, hopefully helping bring together previously separate corporate activities that no longer can operate in isolation. This month, we're looking at the things a PBX can do to connect data devices while not sacrificing its traditional voice communications functions. In April, we'll consider the telephonic functions performed by a PBX.

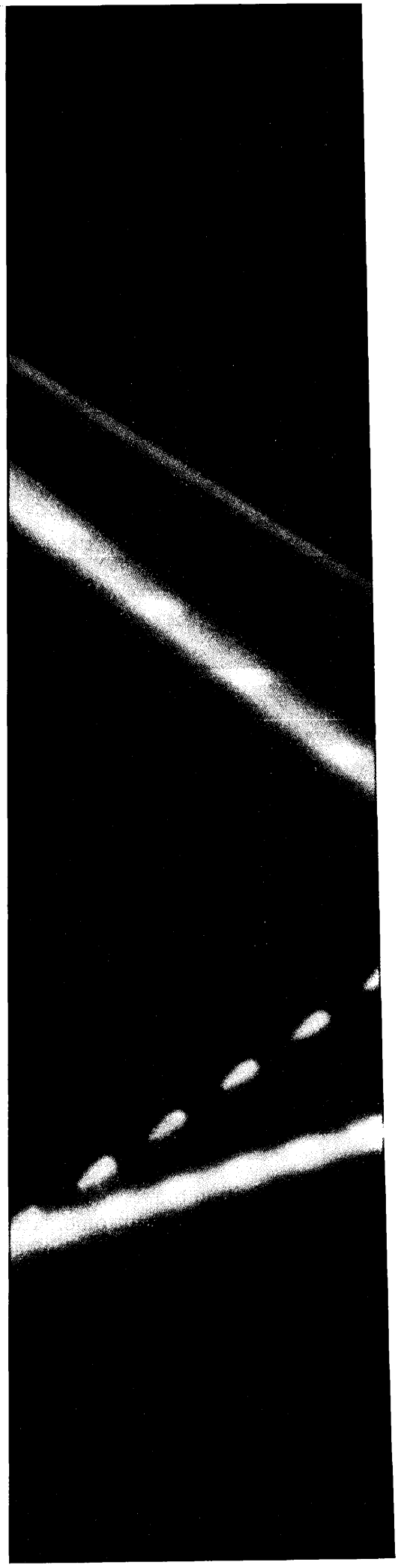
Why are more and more people beginning to view the PBX as the hub of office communications? One reason is the predominantly local nature of business communications, both voice and data. About 60% of an organization's communications take place within one building or campus, and another 22% go no further than 50 miles. Additionally, the trend in communications is away from analog and toward digital. Some 60% of short-haul calls handled by Ma Bell go digital over the so-called T1 lines, and such all-digital trunks are being made available to the public on a limited basis. Although the voice is an analog signal, there are advantages to converting it to a digital form for transmission, then reconverting it to analog form at the listener's end.

Historically, PBXs were analog, switching analog with analog control. Only in the 1970s did there emerge an analog switch with digital control. Now on the market are PBXs with digital control that also switch in digital, which some observers say is the only way to go. With a digital switch, of course, modems are not needed for internal data communications. The price trend is also favoring digital, the market segment where major advances are being made by integrated circuit makers. Prices of digital ICs continue to drop, and as demand for digital PBXs rises their prices will also fall.

It is not certain how important the price of a digital switch is. A recent study of users by MSRA Inc. of New York City showed that of 133 telecommunications and office managers surveyed, 70% favored the digital switch, only 15% the analog (15% weren't sure). When asked if they were willing to pay more for a digital PBX, 54% responded in the affirmative, 25% in the negative. Further, 73% of them said they were willing to pay up to 10% more for a digital switch.

Of course, no one is saying that the PBX obviates the need for other networks, local or otherwise. For one thing, the bandwidth of a PBX is inadequate to handle the high data rates in a mainframe-to-mainframe link, which could be measured in the tens of megabits per second, or the bit stream involved in real-time video conferencing. Additionally there could be dedicated-application networks that function very well without going through a PBX. And there will always be those users at terminals who would best gain access to a computer through a pure data switch, a so-called port selector unit, and bypass the PBX.

In recognition of these factors, PBX makers are developing gateways to various external communications facilities. An X.25 gateway, for example, provides access to public data networks such as Telenet and Tymnet, and others will get you to other LANs and even, if required, to a hyperchannel. Access to Bell's T1 all-digital transmission link provides a bandwidth of 1.544 megabits per second that can be divided into a number



Makers of PBXs claim to be more successful than computer systems makers in addressing the issue of reliability.

of channels, but it also provides a way to interface to satellites, to microwave and fiber optics, as well as twisted pair.

WHY A DIGITAL SWITCH?

But perhaps the question to address initially is why? Advocates usually begin by pointing out that we all have phones and the wiring in the walls that supports them. If that phone on a desktop sits alongside, say, a computer—why should you go through the trouble and expense of laying additional cabling so that they can talk to one another or to a host mainframe? You've already paid for the network overhead and justified it for voice. For those devices, then, the twisted-pair wire that serves the phone could also transmit data signals. (Indeed, why not get rid of one of those devices from your cluttered desk by buying a workstation that integrates the phone?)

The economics of such a scheme are also attractive, what with costs of laying co-axial cable being quoted at from $1 to $4 a foot. That's to be contrasted with the use of existing twisted-pair wiring, which comes free or can be redone at lower cost. With the use of one of the newer digital PBXs, of course, all internal communications can remain digital. To get to the outside world, the use of modem pools and the concept of resource sharing can reduce significantly one's initial outlay for hardware. Not to be overlooked is a so-called least-cost routing facility, the ability of a switch to select the cheapest way to get a voice or data signal to its destination in the outside world.

Just as modems of specified speed can be added to and deleted from a modem pool, there's also a modular growth capability in a switch. Users can add voice and data capacities of any mix within reason. On the market are PBXs with capacities of upwards of 20,000 voice lines. Put a terminal on one of those lines, however, and it tends to stay on that line all day; with some architectures, too many such users would monopolize the switch and diminish its capacity to handle the voice traffic. This can be a concern.

The people at Rolm Corp. get around this by dividing the bandwidth of one voice channel and multiplexing a number of data connections onto that one channel. It sets aside 96,000 bits per second (bps) of bandwidth on one voice line and can apportion that to twenty 4800bps devices, for example, or ten 9600bps devices or five 19.2Kbps devices. In its so-called submultiplexing scheme, it can also allow five 56Kbps devices to share the equivalent of three voice connections. Other vendors take different approaches.

Makers of PBXs claim to be more successful than computer systems makers in addressing the issue of reliability. They say users seem willing to accept a computer going down for a couple of hours now and then, recognizing that there's downtime associated with such hardware. But a phone system is usually the lifeline of a business, and consequently has to deliver uptime on the order of 99.9%. PBX makers claim to offer computer users this kind of availability as well.

To achieve this, of course, vendors have gone to extensive redundancy and, in larger systems, to distributed processing—the ability to link PBX nodes in a way that provides for more than one path from one node to another. Such an architecture also facilitates the expansion of capacity as one's needs grow.

Finally, in answering the question why, there's the issue of network management. As the PBX evolved from its use of electromechanical switches to solid-state electronics to being computer-based, it also acquired the ability to provide management with valuable information on telephone usage. Not only can it tell you who has been calling whom at what time of day and for how long, but it can also measure traffic along specific routes and warn when capacities are about to be reached. Such usage patterns that allow for charge-back for services apply not only to voice but also to data traffic and allow a good level of systems administration.

The computer-based design of modern PBXs, not surprisingly, offers a number of advantages. Moves and changes, for example, are a snap. When someone moves his office, he can take his phone and data device with him; the wiring is already in place. Someone merely goes to the system administrator's console of the PBX and records this change with a simple entry at the keyboard.

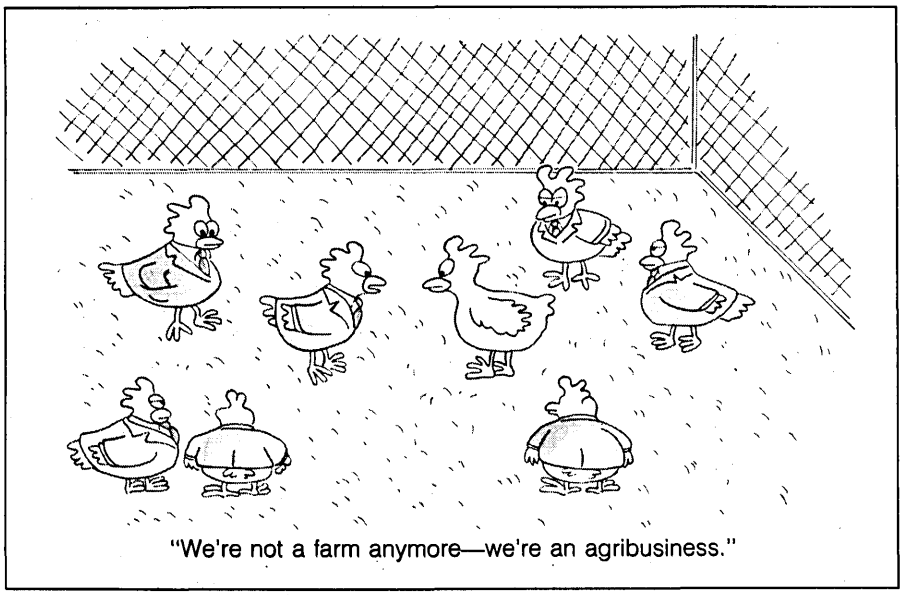
SUITED TO HANDLING VOICE

It is argued, then, that the PBX and the circuit-switching function it performs make it suited to handling voice communication. It does, after all, provide good sustained throughput with no delay. In some applications, such as voice store and forward, there's a place also for packet-switching techniques, but even here the PBX and the telephone continue to be the ideal local level distribution media. There's thus room for both packet and circuit switching.

In local terminal-to-computer communications, where the requirement is for low bandwidth and minimal delays, the alternative to the PBX is a co-ax-based, packet-switched medium like Ethernet. Here, there tend to be many devices connected to the system and little tolerance for delays. The traffic tends to be a character at a time, it is argued, resulting in overhead to be paid when transmitted through a packet-switched medium. A better alternative, it is said, is the PBX, which can support large numbers of devices, produces little delay, and is completely transparent to the user.

The economics of the situation change, however, when one looks at long-haul communications, where packet switching is more appropriate, even for a terminal-to-computer link. While this continues to be character-at-a-time traffic, the packet assembler and disassembler function in the X.25 recommendations could serve to mitigate this problem, allowing packets to handle communications in the outside world and leaving it to something like the PBX to handle the local distribution.

There may be a place for the PBX, too, in handling the traffic from personal computers, smart terminals, and word processing systems. Here again, packet switching seems applicable in interconnecting such buffered



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CIRCLE 85 ON READER CARD

The PBX can support large numbers of devices and is completely transparent to the user.

devices. But PBX vendors, with an eye on the growing market, are moving to support transmissions up to 56Kbps, a bandwidth that can be made available on an uninterrupted basis. The appeal again is the low entry cost for those with a modern PBX and the wiring in place. At the same time, there is no denying that the PBX lacks the bandwidth to handle any device operating in a very high burst mode.

Similarly it is thought that 56Kbps is adequate to handle facsimile transmissions, perhaps even slow-scan real-time video. But full-motion video is better left to broadband co-ax nets. Still, it is thought that PBX makers in the future will support greater bandwidths and perhaps will find a way to handle full-motion video, as well.

It's difficult to discuss future capabilities and facilities, for what might be one vendor's promise for tomorrow could well be another's product offering today. An example of this is support of asynchronous and synchronous data device transmission through the switch. If your favorite neighborhood vendor hasn't announced either of these yet, it's a cinch that he will be forced to do so soon by competition.

Similarly, one might want the PBX to perform protocol conversions, and this has begun to appear, initially with two or three of the more popular algorithms. The very advanced IBX switch from InteCom Inc. offers not only protocol conversion but also speed and format conversion.

In time, the vendors might develop a better gateway than X.25 to provide access to co-ax LANs like Ethernet or IBM's proposed token ring. To facilitate the reliable exchange of messages, it is thought that a PBX should be made to look like a node or a connection on the other network. To achieve this may require that some very friendly level of coexistence be attained between network and PBX vendors.

MORE FUNCTIONS POSSIBLE

Then, too, since the PBX has the communications capability for both voice and data, why shouldn't the vendor continue the trend toward distributed processing by also placing applications or server functions on the switch? An example of this is voice store and forward, which is an electronic/voice mail system. Why not also text messaging, thus establishing a common mail system throughout a department or company, encompassing both voice and text mail? Beyond that, it should be possible to generate and transmit compound documents that combine text with a voice-over message—textual documents annotated with a voice message instead of comments scribbled in the margin. Finally, there's a directory service on the PBX, replacing the heavy and usually out-of-date printed directory. The system, after finding the correct number for you, might also dial it.

Although the automated office remains more fable than fact, equipment manufacturers retain corporate strategies based on their notions of offices with workstations and file servers linked in a communications network, perhaps also to a host mainframe somewhere. In such an environment, a PBX and the twisted-pair wiring associated with it can, indeed, serve to link the kinds of data devices found on one's desk. Whether it can do so more effectively and economically than a coaxial cable-based local area network will depend on whether your needs exceed the 56Kbps limit. Your requirements will determine whether a PBX can meet your communications needs at little incremental cost. *

SCIENCE/SCOPE

Fusion energy machines that would turn sea water into electricity, though still 20 years away, are a step closer to fulfilling their promise of satisfying much of the world's energy needs. In plasma-heating experiments, Hughes Aircraft Company researchers have demonstrated a gyrotron with the highest performance yet reported. It produced 285 kilowatts at 60 gigahertz at 45% efficiency under pulsed conditions. The short-range goal of this research program is to generate 200 KW at 60 GHz with long pulses in excess of 100 milliseconds. The long-range goal is to generate 1 megawatt at 100 GHz. The Oak Ridge National Laboratory sponsors the program for the U.S. Department of Energy.

Technologies of laser holography and diffraction optics have led to an experimental visor for protecting military pilots from potentially blinding laser beams. The visor reflects light at wavelengths used for lasers without significantly reducing visibility. It would replace devices employing dyes, which produce distracting discolorations, absorb light, and cut visibility. Designed by Hughes for the U.S. Navy, the visor could be adapted for ground troops.

An Advanced Medium-Range Air-to-Air Missile has intercepted a drone target, showing its ability to find low-flying targets amid high clutter caused by the missile's radar returns reflecting from the ground. The prototype AMRAAM was fired from an F-15 fighter from an altitude of 16,000 feet and a range of about 13 miles. The remotely controlled target flew toward the F-15 only 400 feet above the ground and operated an electronic countermeasures pod in an effort to jam the missile's seeker. Hughes is producing AMRAAM under a full-scale development contract for the U.S. Air Force and Navy.

A cleanroom believed to be the world's largest serves as the birthplace for such military electro-optical devices as laser rangefinders, laser designators, and infrared night vision systems. The new Hughes complex spans 60,000 square feet. It is environmentally controlled to be free of contaminants because even one particle of dirt barely visible to the naked eye could ruin sensititive optics. Although the electro-optical components themselves are delicate and require meticulous assembly, a completed device is hermetically sealed and built to withstand rugged use in the field.

A building-block family of electronic warfare equipment, which can be tailored for any class of Navy ship, automatically and instantly reacts to any threat of attack. The modular electronic warfare system (MEWS) offers electronic support measures (ESM), independent automated electronic countermeasures (ECM), or fully integrated ESM/ECM. MEWS tracks missiles and launching platforms, and provides jamming, high-powered deception, surveillance, and direction finding. Join our high-tech EW team. Send your resume to Hughes Ground Systems Group Employment, Dept. SE, P.O. Box 4275, Fullerton, CA 92634. Equal opportunity employer.

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"Why did Lanier decide to support SNA?"

"Simple. Because SNA is IBM's existing standard, in use today by hundreds of companies. By selecting a widely used architecture philosophy, we have eliminated the biggest problem in establishing an office automation network—compatibility. So our systems act as just another node in your existing communications network. You can forget about communications and just configure the best systems for your company's applications."

"How does Lanier connect to my IBM mainframe?"

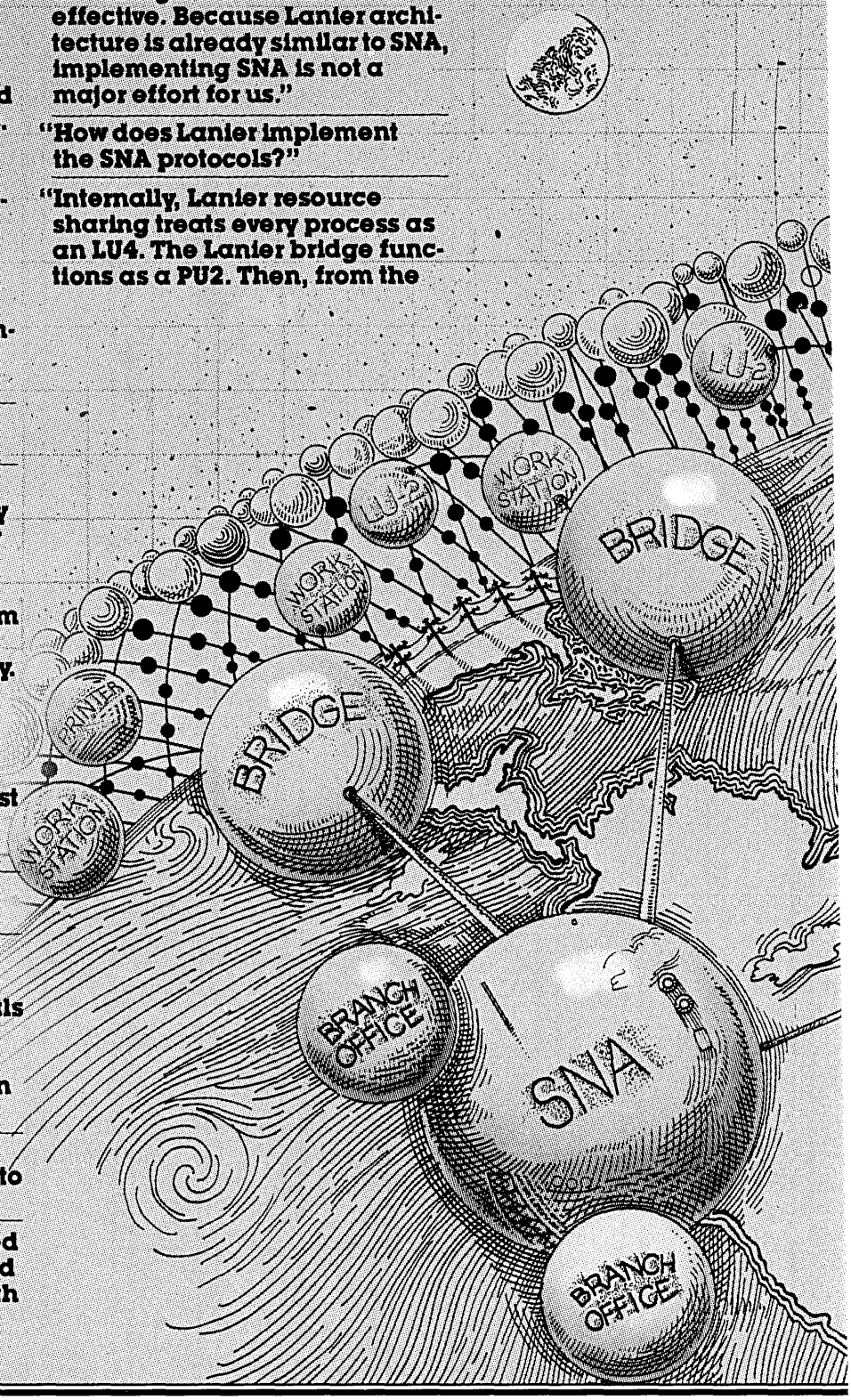
"With 'bridges.' Inexpensive interfaces connect Lanier system elements, such as terminals and printers, to each other. These interfaces lead to a 'bridge.' The Lanier bridge can talk to an SNA system."

"But isn't SNA compatibility difficult and time-consuming to implement?"

"Not for Lanier. We use a layered architecture that we developed for distributed processing. With this layered architecture, the bridges to your IBM mainframe are straightforward and cost-effective. Because Lanier architecture is already similar to SNA, implementing SNA is not a major effort for us."

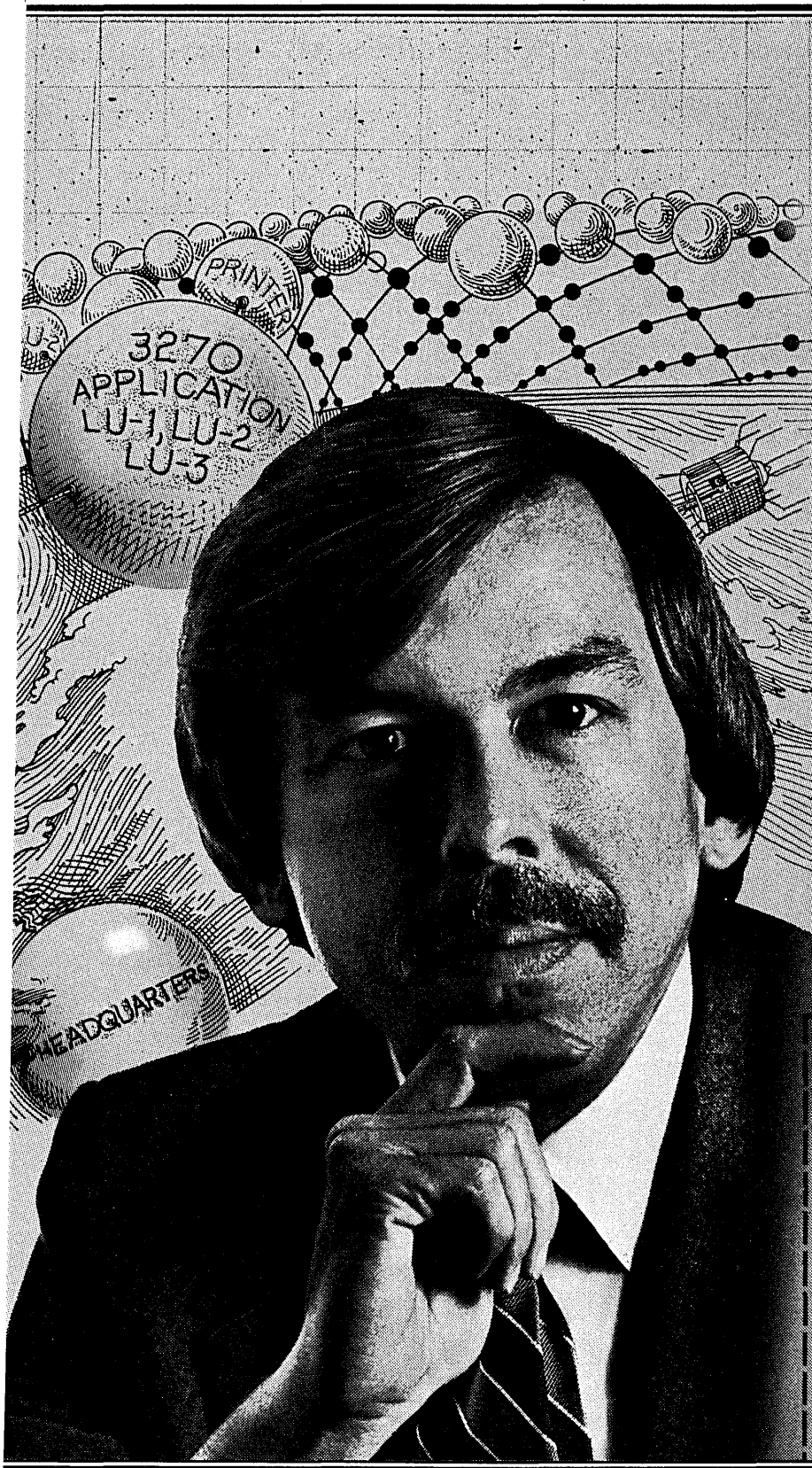
"How does Lanier implement the SNA protocols?"

"Internally, Lanier resource sharing treats every process as an LU4. The Lanier bridge functions as a PU2. Then, from the



"As compatible as equivalent IBM systems."

Marvin Gaines, Director, Data Communications, Electronic Office Systems Division



host computer's point of view, your Lanier terminals are LU2s and the printers are LU1s or LU3s."

"What about 3270 compatibility?"

"No problem. You can also choose to treat the Lanier bridge as a PU2 running 3270 sessions. With Lanier's layered architecture, the bridge can easily transmit Lanier data streams as 3270 data streams or as SNA data streams, whichever you prefer."

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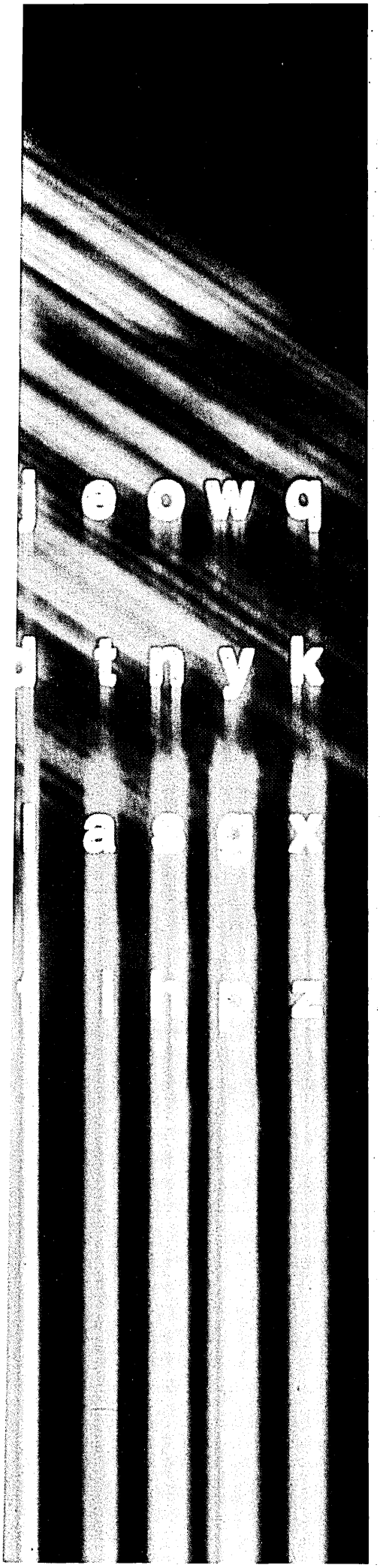


How the University of Chicago uses three digital PBXs for campus-wide communications.

NEW NICHES FOR SWITCHES

by Fred H. Harris, Frederick L. Sweeney Jr., and Robert H. Vonderohe

The University of Chicago is now in the final phase of installing an integrated, PBX-based, digital telecommunications system. We now have approximately a year's experience with third generation private branch exchanges—PBXs that are fully digital, load independent, and have fully integrated voice and data. The system greatly enhances voice services and also provides the campus with a ubiquitous, high-speed data network. Moreover, compared to the continued use of a Centrex system with traditional voice services only, this pioneering installation will pay for itself and save the university an equal amount within a decade.

The University of Chicago is a private institution with an undergraduate college, four graduate divisions, six graduate professional schools, an extension division, and a major medical center with 12 hospitals. From its opening in 1892 the university has emphasized both research and teaching, and it is predominantly a graduate institution. Today there are approximately 1,000 faculty members, over 8,500 full-time employees, and approximately 8,000 students, of whom about 5,500 are in graduate and professional programs.

The university is located seven miles south of Chicago's Loop and housed in 102 buildings spread over approximately one square mile. There is a central steam plant on the southeast edge of the campus and a network of steam tunnels with easements and rights-of-way that provide fairly convenient access to almost all buildings.

In the winter of 1979, the Computation Center joined forces with the Office of Telecommunications, which is responsible for voice communications and related support services, to investigate the state of voice and data transmission facilities at the university and determine their future. The group anticipated several developments, including deregulation of traditional communication services, functional and economic gains from increased use of digital technology, and a proliferation of data and communicating data devices.

We were interested in cost savings and cost avoidance by means of the new technology becoming available and in achieving further management control. There were, moreover, growing difficulties with cabling and structural problems.

The new campus telecommunications system consists of three interconnected integrated business exchanges (IBXs) from InteCom Inc. (an Exxon affiliate), and each will service approximately one third of the university. University users in off-campus buildings continue to use Centrex service, and Illinois Bell remains the university's principal source of many special circuits, pay phones, and the various off-campus communications services. When completely installed, by the summer of 1983, the system will contain about 8,500 stations with about 15% initially equipped for simultaneous voice and data. The use of simultaneous voice and data is expected to increase to 30% within two years and 50% within five. Indeed, it is this level of data support that, to us, dictated that data services be as ubiquitous as voice.

A schematic diagram of the university's telecommunications system, including the microwave link for direct inward dialing (DID) service, appears in Fig. 1. The heart of each IBX, schematically illustrated in Fig. 2, is its central switch or master control unit (MCU). Inside the MCU, switching is performed by one of two totally redundant computers, master processor A or master processor B (MPA or MPB). These computers have databases containing information about each of the IBX's stations or phones—its numbers, the service features selected for it, the call group it's in, etc. Note that the master processors MPA and MPB do not share the workload; one is the reserve unit called into service only if the other should fail. Moreover, such backup is characteristic of every system component whose failure could imperil service for more than 16 ports.

Also part of the MCU are 16 switching networks (SNs). Each mediates communications between the master processor and an

PHOTOGRAPH BY MITCHELL FUNK

interface multiplexor (IM) located at a remote site on campus. Each IM has 256 ports, each of which can be wired to:

- a universal connection block (UCB)—a two-slot wall jack for connecting a user's phone that may include computer terminal communications as well as voice;
- data access boards (DABs) for connecting to computer ports;
- an Illinois Bell trunk line for incoming (off-campus) calls;
- an Illinois Bell trunk for local outgoing (off-campus) calls;
- the university long distance network consisting of WATS, MCI, and other circuits for outgoing long distance calls.

Cabling between any phone and its respective IM consists of two twisted pairs of wires. These twisted pairs always are of the same type for all such connections throughout the system. The advantages of such modest cabling requirements become obvious when the 150-wire cable of a traditional call director phone is compared with the four-wire cable of the electronic telephone that functionally replaces and surpasses it.

Each interface multiplexor is connected to its respective switching network at the master control unit by coaxial or optical fiber cables. On either the coaxial or optical fiber cables, voice and data from the 256 ports in an IM are transmitted simultaneously at a combined speed of 44 MBps. Optical fiber is more economical for longer distances and has been used without problems from the outset.

BASIC TERMINAL EQUIPMENT

While the cabling between any phone and its respective IM is identical, there is a fundamental difference in how the two basic telephone instruments communicate. A piece of standard telephone equipment (STE) may be any industry-compatible push-button dual-tone multifrequency (DTMF) phone. This type of device communicates in standard analog voice fashion, through the twisted pairs to its interface card in the IM. The STE interface card digitizes the voice information and transmits on the 64Kbps portion of the 128Kbps allocated to that IM port. Of the remaining 64Kbps allocated for data and signaling, only the 8Kbps for signaling is used (switchhook flashing, etc.). Because STEs communicate back to the IM using the analog signals of standard telephony, users who have a dial-up modem or an acoustic coupler can use them just as they have in the past. Note that the flexibility to do so is important both for those with existing equipment who remain content with analog-level service and also for ease of transition to new digital transmission services.

The basic electronic phones available with the system, called integrated terminal equipment (ITE), have both the touch pad and 12 feature/function buttons. These buttons can be set via the system database to activate any feature or perform any function of the system. Other ITE models are available with additional feature/function buttons and with light-emitting diode displays to provide "to-from" calling information. Moreover, with an ITE there is a much greater range of data handling capabilities. Unlike the STE, the electronic phone uses the full 128Kbps allocated for the port to which it is attached. Since digitization takes place within the instrument, only digital signals are present on the two twisted pairs connecting it to the IM. This precludes the use of standard analog modems with an ITE, except for acoustic couplers. Instead of connecting a terminal to a modem, it is connected directly to an ITE containing a data option board (DOB).

The DOB, installed within the base of the ITE, provides a standard 25-pin RS232 EIA connector for the terminal connection. For intracampus calls to digital equipment the DOB replaces the need for modems since the transmissions are entirely digital. Further,

FIG. 1

UNIVERSITY OF CHICAGO TELECOMMUNICATIONS SYSTEM

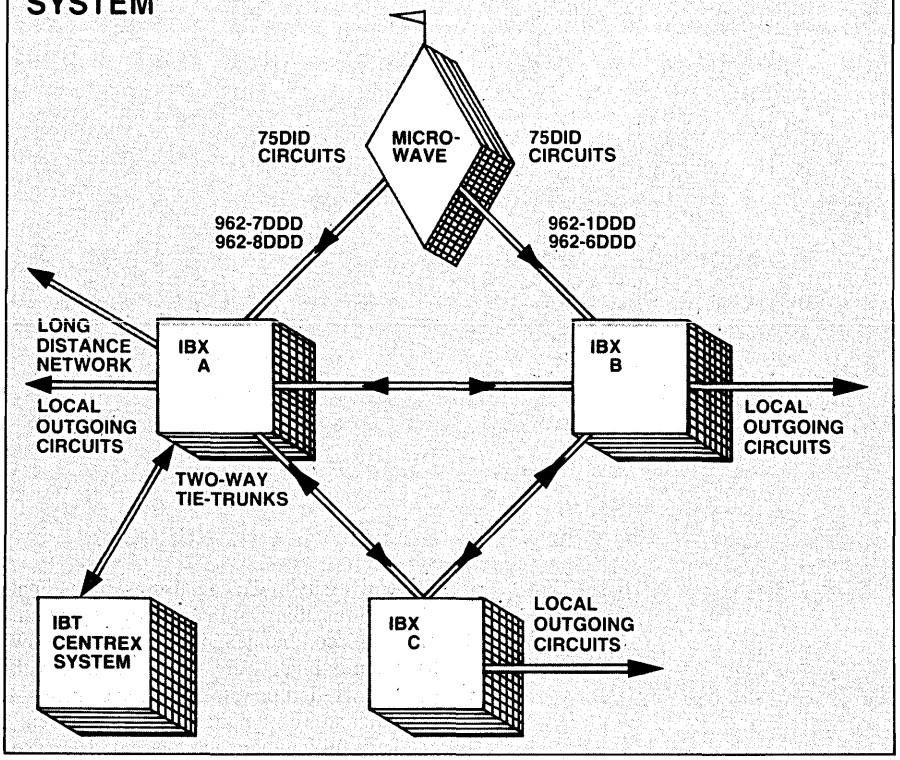
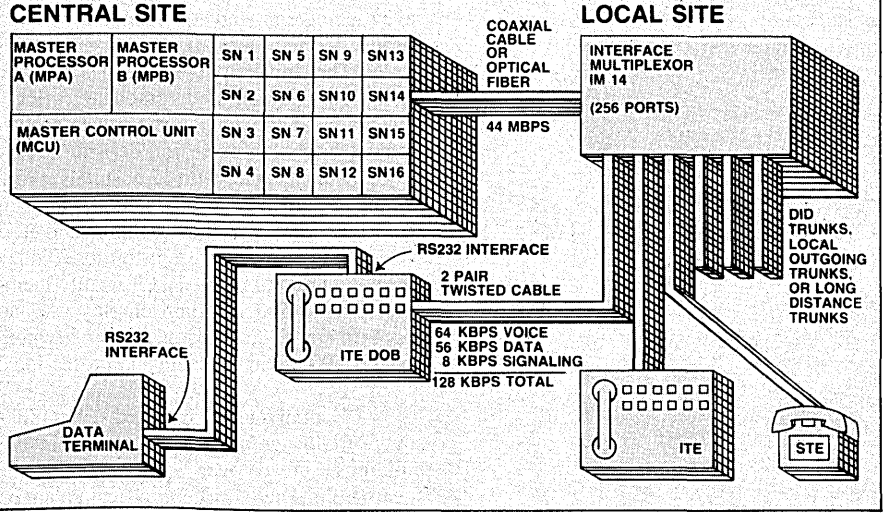


FIG. 2

IBX SWITCH SCHEMATIC



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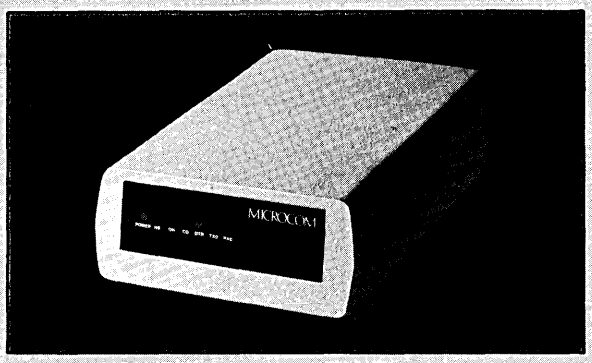

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D383

CIRCLE 89 ON READER CARD

Within five years, half of the system's stations will be equipped for simultaneous voice and data.

because of the preallocated bandwidth for both voice and data, an ITE, in which a DOB has been installed, continues to be available for voice calls while that DOB is being used on a data call.

Data option boards currently exist in two forms, with a third form announced for market. The DOB1 is an asynchronous device with various speeds up to and including 19,200 baud. The DOB2 is a synchronous communications device with the same operational speeds as the DOB1, while the DOB3 is intended to provide synchronous communication to 56,000 baud. In areas where a high concentration of data connections is required, such as with pools of computer ports, a data access board (DAB) can be used. The DAB, which comes in two varieties (DAB1 for async as above, and DAB2 for all synchronous speeds), is rack-mounted in a data cabinet similar to the IM card configurations supporting ITEs and STEs. By design, however, the DAB uses both the voice and data bandwidth of a port for data, permitting two independent computer connections to a single IBX port.

The Computation Center's two main computers, the DEC-20 and Amdahl, are connected to the IBX system by DAB1s as are the DEC-20 in the Graduate School of Business and the Microdata Sequel in the Registrar's Office. The IBX down-line loads the characteristics (e.g., speed) of the originating device (DOB1) to the answering device (DAB1) as the data call is initiated, thereby allowing maximum pooling of DAB1s associated with a given computer.

Although a DOB1 can send asynchronous data at rates as high as 19,200 baud, one is still limited by the communication speed of the device at the other end of the line. To accommodate the increased data handling capability of the IBX, the Computation Center now supports higher port speeds than in the past. Pools of 4,800 baud ports are now available, and pressure for 9,600 baud ports is increasing on the DEC-20 and on the Amdahl. In both cases, the ports are at fixed speeds and not speed selectable, as are current DEC-20 and on the Amdahl. In both cases, the ports are at fixed speeds and not speed selectable, as are current DEC-20 300/1200 ports.

The center has installed and is now successfully using several synchronous DOB2s with "nailed" connections to replace leased Bell circuits that support high-speed RJE printers and terminal cluster multiplexors. Because these connections have proven to be "protocol transparent," we will be expanding synchronous data support to include controller communications for 3270s.

The Computation Center has installed a pool of modems to interface the digital transmission system with analog communication devices. For on- and off-campus calls from analog modems, the pool provides answer capability, thereby eliminating the need for separate analog modems. For calls from ITE-DOB1s to off-campus, the pool provides originate capability. Maximum transmission speed when using this modem pool is 1,200 baud. Terminals connecting to this pool via ITE/DOB1s must be set to match the characteristics of the answering device. Plans call for migrating toward a single modem pool capable of handling Bell 103 protocol at 300 baud, Bell 212A at 1,200 baud, and Vadic 3400 series at 1,200 baud for both originate and answer.

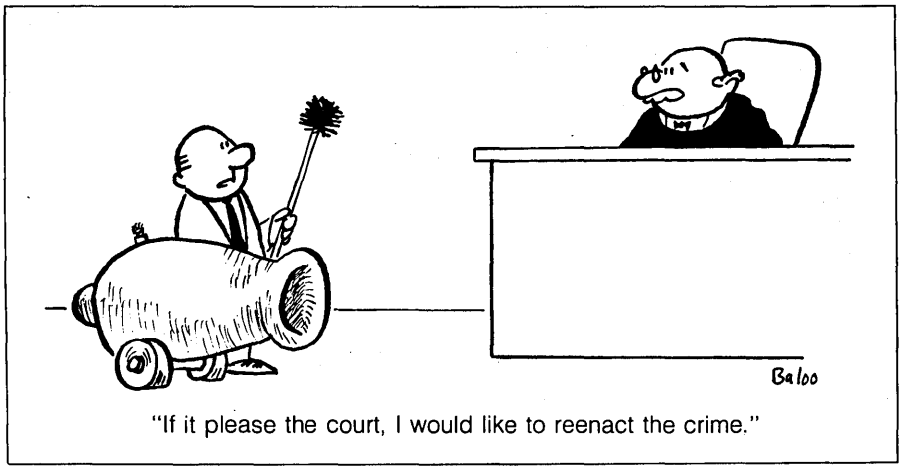
To implement modem pooling, the manufacturer has developed a modem interface card (MIC) that performs the analog equivalent of a data access board by allowing two analog paths into a single IBX port. Working in conjunction with a DAB, a MIC-DAB pair will support two analog modems. The modem connections consist of the standard modular cable to the MIC and the standard RS232 cable to the DAB. Data communication is totally digital on the DAB switch side and analog on the MIC switch side.

In addition, InteCom also offers Intenet packet controllers (IPCs) that can be added to the switch to provide additional data-related support. The keyboard option IPC allows one to originate data calls from a terminal keyboard, the 3270 IPC provides 3270 emulation support for ASCII terminals, and the X.25 IPC is a gateway to public (or private) data networks supporting the X.25 protocol. We are evaluating the technical specifications for these to determine their applicability in our environment.

The majority of users will not be using the data capabilities of the IBX for the next few years. To them, the IBX is simply another telephone system, albeit one with extensive voice features. Those features include call forwarding, call conferencing, abbreviated dial, and numerous others. Users tell us that these features have increased office efficiency, especially when used to compensate for employee absences.

Among the users who have been using the IBX for data transmission for many months now, the consensus is that placing data calls through the IBX is as convenient as having a hardwired terminal. The data call can be placed with a few keystrokes on an ITE/DOB1. Also, when necessary, changing the transmission speed from the speed indicated in the database requires only two additional keystrokes.

There have been occasional periods of instability during which data transmission has dropped in midsession. Moreover, because there are so many points at which the problem could be occurring (the terminal, the phone, the IBX computer, the Gandalf PACX—private automated computer exchange—or the Amdahl or DEC), it has not always been possible to determine the exact source of the problem. The traditional multivendor coordination problems exist. When transmission is dropped by the IBX, however, now an infrequent occurrence, it is normally sufficient to place the call again.



"If it please the court, I would like to reenact the crime."

CARTOON BY REX MAY

SYSTEM USERS SCATTERED

As anticipated in our original analysis, the use of the data capability is geographically scattered. A number of faculty and students at the Graduate School of Business are using the system to communicate with their DEC-20. Many individuals in the physical sciences and throughout the administrative departments are using the new network to communicate with the university's DEC-20 and the Amdahl, both of which are housed in the Computation Center. In addition, both the Graduate School of Business, the university library, and the college use the new network to obtain information from the student information system on the microdata sequel in the Office of the Registrar. Each week brings a new usage in an unexpected location, and the value of convenient ubiquitous access is substantiated.

While the hardware installation has been relatively problem free, such has not

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To accommodate the increased data handling capability of the IBX, the center now supports higher port speeds.

been the case with the systems software or with interconnect services from the local operating company. The software presented us with two different problems, one of which was anticipated: the bugs that come with any computer system. Being an early user of the IBX system and the only extensive data user to date, we apparently uncovered most of the latent bugs in the software. In addition, a number of enhancements were made to the system as a result of our experiences or at our request.

Corrections and enhancements have taken the two traditional forms, patches and new releases. Each of these forms has exhibited instabilities related to the manufacturer's inability to adequately test prior to implementation. These instabilities, though annoying, should not have been unexpected in a large complex distributed digital network. Because ours is a unique installation (both the largest and most heavily data oriented), no adequate environment existed in which to test extensively the corrections and enhancements. Indeed, even several days after installation, some problems did not occur until the appropriate circumstances appeared in coincidence. In this regard, our experience has been similar to that of installations using second or third generation digital communication switches of other manufacturers.

Moves and changes of equipment are not difficult. There are no wiring changes required for a situation where station wiring already exists, regardless of the type of change made. All moves and changes require database changes which in many cases are as simple as changing the port assignment by means of a keyboard entry. Where the analog standard telephone equipment is substituted for the digital integrated terminal equipment (or vice versa) a simple cross-connect is required at the main distribution frame located at the IM-site. This process is performed by a trained technician in five or 10 minutes.

The integrated digital data switch and transmission network is working well with respect to those data capabilities that have been installed. We are very pleased with asynchronous support, and can tell you from personal experience that once you've been to 4,800 baud for everyday, routine interactive terminal use, you will not want to go back to 300 (or even 1,200). And now, as stated earlier, pressure is mounting for 9,600 baud service on the Computation Center's computers. Indeed, the bottleneck has now shifted to the availability of higher speed computer ports.

We are equally satisfied with the effectiveness of synchronous data support. Using nailed connections with software-defined, fixed-end points, service has proven to be totally transparent to the protocol of the end-connected devices. In addition, moves and changes, in most cases, require little or no lead time and minimal, if any, cost. Similarly, additions are treated as normal voice additions with the inclusion of database additions for the data line.

DRAWBACKS OF BEING A PIONEER

Unfortunately, all enhanced data services are not yet available, though we were led to believe they would be by now; this is one of the drawbacks of being a pioneer. Paramount in this category are the services related to interswitch activity. (In this regard, being the first multiswitch installation has not been beneficial.) As a result of the manufacturer's emphasis on single switch development, InteCom's T-1 equivalent, called IXL (interswitch communication link), with its inherent interswitch transparency of data and some voice features, has not been delivered. Because of this we have had to devote a great deal of effort to providing interim interswitch data capabilities. In addition, some of the interswitch voice features, (e.g., LED display information), do not exist across switch boundaries.

The capital cost for the project with installation is approximately $1,100 per station equipped with standard telephone equipment. This compares quite favorably with the costs of alternative tariffed service from Bell operating companies. In the same vein, the incremental cost of an ITE compares quite favorably with the alternative tariffs for multibutton sets, call directors, etc. Indeed, when combined with the reduced operational costs for moves and changes, the savings in a decade in net present value terms—with payment of all capital and operating costs included—now exceeds the capital costs of the system and its installation. The incremental costs of a DOB1 with asynchronous range to 19,200 baud is comparable to 1,200 baud modems. Thus, there are no penalties or greater costs required to invoke use of the network for data.

While the university was not the first InteCom installation, it was the first multiswitch site, the first with extensive data requirements, and the first in a complex dispersed building environment. To our knowledge, there were no prior installations of a comparable nature or, for that matter, any fully integrated digital system. We were plowing fresh ground, for example, with the microwave linkage and with inter-master-control unit connections, and the soil has been rocky in places.

Nevertheless, suggestions for improvements and enhancements have been well received because of the nature of the system architecture and the relative youth of the vendor and its market. We have fewer fears today than at the outset about obsolescence because the supplier has now demonstrated an ability to extend the system and to stay at or ahead of the leading edge.

The risks that we did not fully appreciate or enumerate at the outset are those associated with being a new user in a new industry—the interconnect industry. Our environment at the University of Chicago is strongly decentralized, and organizing to be an operating company has taken more attention and more time than we anticipated. Also, the interconnect industry is rapidly changing as deregulation movements take place. There are few skilled people with relevant experience in dealing with multiple vendors and new technology.

Finally, the projected savings (in addition to enhanced features and functions being obtained) made our selection process simple once we persuaded key people that our analysis was conservative and that the savings were not derived by sleight of hand. Since our first estimate of almost two years ago, the savings are even more substantial than originally anticipated, and the figure is growing with each new tariffed rate increase.

We now have a better appreciation of both the magnitude and complexity of installing an integrated campus telecommunications system. Nothing to date causes us to question the decision to do so. Had we to do it over, we would; but given our current, sometimes hard-learned knowledge, we would do it "smarter." ❋

Fred H. Harris is director of the Computation Center at the University of Chicago. He has degrees in physics from the University of North Carolina and Rice University and an MBA from the University of Chicago. He has over 20 years of experience in computing and data processing services.

Frederick L. Sweeney Jr. is director of operations for the University of Chicago. He has a BS in electrical engineering and a BA in economics from Tufts University, and an MBA from the University of Chicago. He has 20 years' experience in the use of digital computers for management information systems.

Robert H. Vonderohe is manager of communications services for the Computation Center at the University of Chicago. He has BS and MS degrees in electrical engineering from the University of Illinois. His background includes computer systems engineering and design, project management for hierarchical minicomputer network development.

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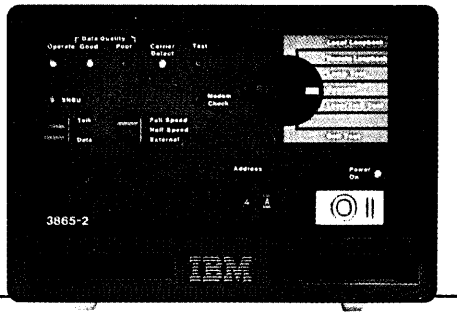

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CIRCLE 96 ON READER CARD

Industry is pouring large amounts of cash into university research, raising some tough questions of ethics, values, and responsibilities.

ACADEMIA INC.

by Laton McCartney

A faculty member in a college computer science department moonlights as research director for a local software company. Much of the thinking that goes into the company's product development stems from the professor's work at the college. Is he selling something that by rights isn't his, or is it perfectly acceptable for the faculty member and his company to capitalize on academic research?

A corporation agrees to give a university's electrical engineering department a multimillion-dollar grant on condition that the department reorient its curriculum to help the research and development objectives of the corporation. Should the department agree to accept the money under these conditions?

A West Coast university develops a computer workstation as part of a research project funded by a major oil company. The workstation is brought into the market and looks as though it is going to be highly successful. Who owns the product, the oil company or the university? Or both?

While these may sound like questions posed as a springboard for debate in a Business Ethics 101 class, they are actual situations that are becoming increasingly commonplace today. The reason? Faced wtih soaring operational expenditures and sharp cutbacks in federal and state aid, universities and colleges are increasingly turning to the private sector for financial aid. Conversely, in order to maintain pace in the fast lane of high-tech product development, stave off foreign competition, and bolster sagging productivity, industry is tapping the resources of university engineering and computer science departments with ever greater frequency to supplement corporate R&D efforts. In the course of these developments, industrial money earmarked for high-tech academic research has increased enormously over the past few years and now represents about 12%* of all funds raised by U.S. universities, with a number of technically oriented institutions drawing more than 20% of their total funding from the private sector.

This unprecedented level of support has given rise to a newly emerging institutional hybrid that is neither wholly academic fish nor corporate fowl, but was born out of the converging interests of both communities. At Academia Inc., as some might call it, research is a high-stakes game played with a specific, bottom-line payout in mind. Here an academic who comes up with a hot new software package or a breakthrough in personal computer design can become the proverbial overnight millionaire. Many of the old guidelines regarding basic academic values, conflicts of interest, and academic impartiality have become blurred or are viewed as no longer relevant, and academe and industry are both tending to play it as it lays.

"There is no single right or wrong in these relationships," asserts George M. Low, president of Rensselaer Polytechnic Institute, Troy, N.Y., speaking of industry-university ties. "It is a time to experiment, to address problems when they arise, to be flexible in the details of their solution, and to do this without endangering the interests of either partner."

The academic community, of course, has had long-standing ties with industry, but it wasn't until the late '70s, with a succession of extraordinary breakthroughs in genetic engineering, that the relationship blossomed into big business and the current ethical concerns arose. During this frantic period, several giant pharmaceutical corporations rushed in to capitalize on these developments, pouring millions into university coffers to underwrite research, and academics in the forefront of DNA research started potentially lucrative ventures by the dozen.

EXTENSIVE INDUSTRY TIES

With the subsequent explosion in microelectronics, CAD/CAM, robotics, and artificial intelligence, the focus shifted to ties with companies concentrating in these areas. Both the dollar amounts being bandied about and the magnitude of the project undertaken point up how extensive these ties have become. Witness:

• At Carnegie-Mellon University in Pittsburgh, faculty and students work with smart, sensor-based robots on a variety of industrial applications such as inserting components into circuit boards. Their research is being carried out on factory floor rather than in a CMU lab and is being conducted by the university's Robotics Institute, a department that employs 17 full-time research scientists

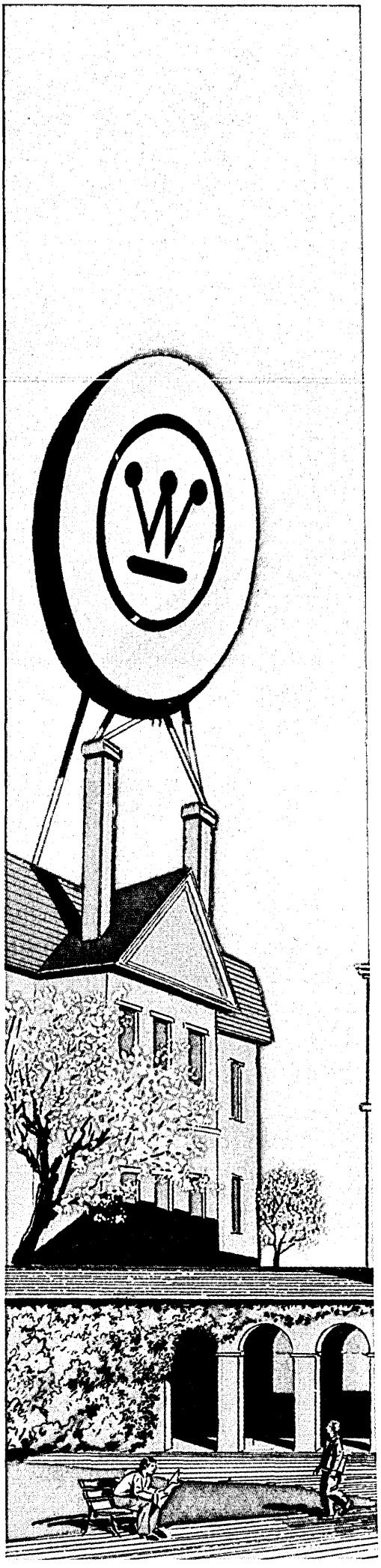

ILLUSTRATION BY ANDREA BARUFFI

*Cornell University associate dean Donald F. Berth estimates that overall industrial funding has gone from 5% to about 12% in the past several years.


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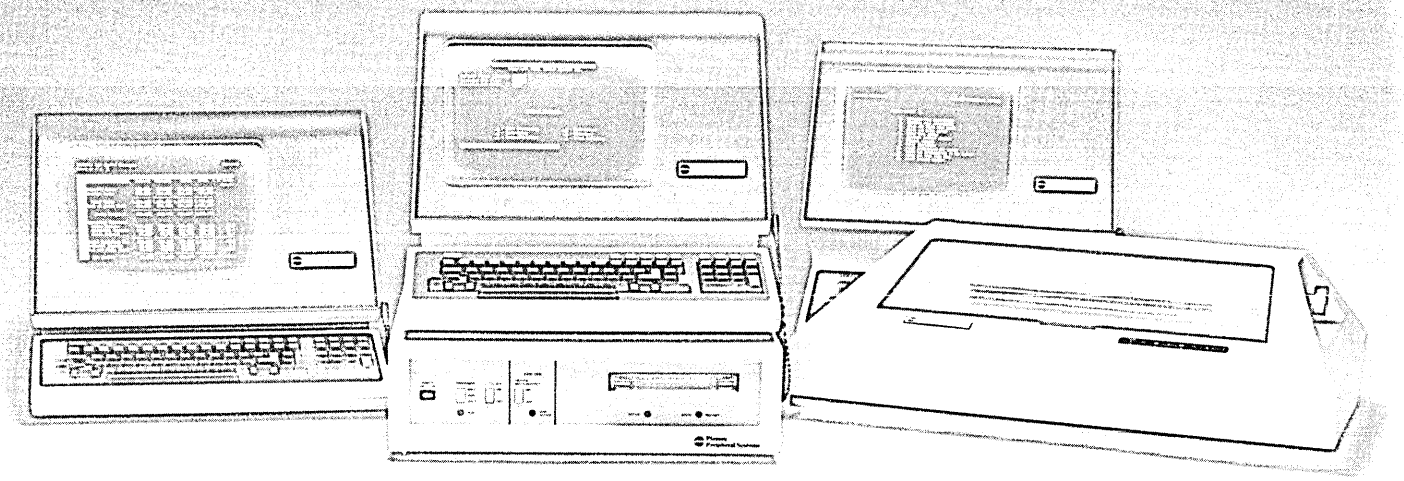

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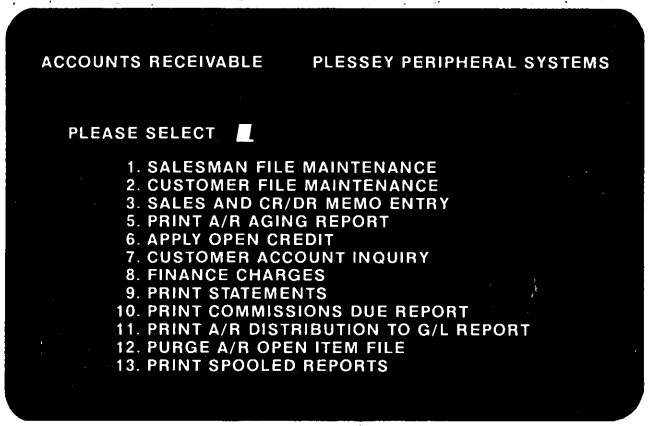

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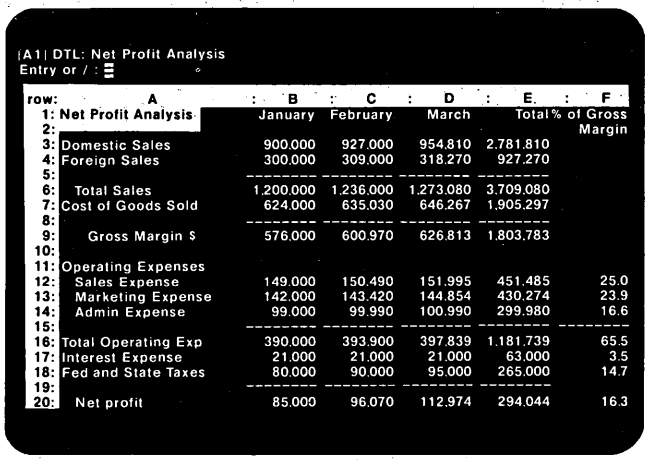

row:	A	B	C	D	E	F
1:	Net Profit Analysis	January	February	March	Total	% of Gross Margin
2:						
3:	Domestic Sales	900.000	927.000	954.810	2.781.810	
4:	Foreign Sales	300.000	309.000	318.270	927.270	
5:						
6:	Total Sales	1.200.000	1.236.000	1.273.080	3.709.080	
7:	Cost of Goods Sold	624.000	635.030	646.267	1.905.297	
8:						
9:	Gross Margin $	576.000	600.970	626.813	1.803.783	
10:						
11:	Operating Expenses					
12:	Sales Expense	149.000	150.490	151.995	451.485	25.0
13:	Marketing Expense	142.000	143.420	144.854	430.274	23.9
14:	Admin Expense	99.000	99.990	100.990	299.980	16.6
15:						
16:	Total Operating Exp	390.000	393.900	397.839	1.181.739	65.5
17:	Interest Expense	21.000	21.000	21.000	63.000	3.5
18:	Fed and State Taxes	80.000	90.000	95.000	265.000	14.7
19:						
20:	Net profit	85.000	96.070	112.974	294.044	16.3

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PLESSEY

HOW INDUSTRY SUPPORTS UNIVERSITIES

Typically, industry support is offered in a variety of ways depending on the relationship that develops between the university and sponsor. RPI's president George Low breaks down the major categories of support:

Consulting. Individual faculty members are allowed to provide consulting contracts with corporations. Universities often encourage and sometimes expect their faculty members to spend up to one day a week in consulting activities.

Research grants and contracts. Here the agreement is between the university and a particular company that provides funds for research on a specific project. Usually faculty supported by graduate students agree to carry out the research.

Major contracts. These are multiyear, multimillion-dollar agreements whereby the university agrees to perform research, usually in a broad area. Case in point: Monsanto's $23.5 million contract with Washington University to conduct product-oriented genetic studies.

Affiliate programs. In this type of arrangement, a group of companies typically contributes between $10,000 to $50,000 each year as a membership fee that affords them a window into the university's research. As an example of this kind of relationship, MIT's Industrial Liaison Program attracts around $6 million annually in fees from almost 300 member companies.

University consortia. A number of universities join together to work on a specific problem or set of problems, and sometimes to bolster economic development in a particular region by fostering university-industry ties. For example, 15 New York State universities recently formed a partnership with industry sponsors.

Exhanges of people. Engineers, managers, and scientists from industry come to campus to study, lecture, or teach as adjunct faculty. In turn, faculty members and students work for corporate sponsors to gain "real world" experience.

Incubators and research parks. Universities often nurture startup companies by providing them with inexpensive land, advice, access to laboratory and library services, and sometimes the development of affiliated industrial parks. The most notable example of this is probably the Stanford Industrial Park, which served as the springboard for Silicon Valley.

In addition, under so-called educational allowances, mainframe manufacturers—IBM in particular—and some minicomputer companies such as DEC and HP have traditionally contributed equipment at no cost, or at substantial discounts, to favored academic institutions in exchange for goodwill, the opportunity of exposing potential future customers to their products, and substantial tax write-offs. Recently, microcomputer manufacturers have followed suit. Apple computer says it will contribute 10,000 computers to the California school system, and IBM proclaimed it will largely fund and jointly develop with Carnegie-Mellon a personal computer network for the school's students and faculty.

and utilizes faculty from other CMU departments including computer science and engineering. The institute has a $5 million annual budget, almost half of which comes from Digital Equipment, Westinghouse, TRW, Siemens, and many other corporations.

- Last year, Stanford University announced it had lined up $20 million in funding for its new Center for Integrated Systems. A major share of the funding is coming from corporate sponsors such as Xerox, Texas Instruments, Honeywell, Hewlett-Packard, Digital Equipment Corp., and IBM. Each sponsor has agreed to contribute $250,000 a year for three years to get the CIS project—one of dozens of industry-supported projects at Stanford—off the ground.
- As many as 600 companies contribute anywhere from $10,000 to $1 million each on a regular basis to sponsor research in areas such as computer science and CAD/CAM software at Lehigh University in Bethlehem, Pa. The institution, which receives more than 20% of its total funding from industry, is so overwhelmed by corporate interest in its research that it is seriously thinking of curtailing the several hundred visits it receives each year from industry.
- MIT has received extensive backing from Exxon for research in man/machine interface and information retrieval projects as well as research in studying combustion methods. It has developed a workstation for Exxon as a by-product of its research. (Stanford has also developed a workstation, through a project underwritten by Sun Oil.) In conjunction with Harvard Medical School, MIT recently signed a five-year, $3.4 million contract with IBM to develop equipment that can be used to detect diseased tissue without subjecting patients to X rays.
- Cornell's numerous industry-sponsored projects include research in microelectronics and computer aided design. It recently received one of three awards (the University of California at Berkeley and Carnegie-Mellon were the other recipients) toward establishing "centers of excellence" to carry out research in micro sciences, focusing specifically on those properties of integrated circuits that become significant when their dimensions are measured at the atomic level. The Cornell award, just under $1 million for the first year, was given by Semiconductor Research Corp., a newly formed Research Triangle Park, N.C.-based organization established by IBM, Hewlett-Packard, and virtually every major U.S. semiconductor manufacturer as an industry-wide means of underwriting U.S. research in the semiconductor field.
- Rensselaer Polytechnic Institute is building a $60 million center for industrial innovation. The 200,000-square-foot facility will house programs in computer graphics, manufacturing technology, and microelectronics. Funding is to be obtained primarily from corporate donations.

Academia Inc. takes a variety of forms that depend on the type of support being offered (see accompanying box for a breakdown of the major support categories), the extent of the support, and the policy—or lack thereof—of the university.

SCHOOLS SPIN OFF R&D FIRMS

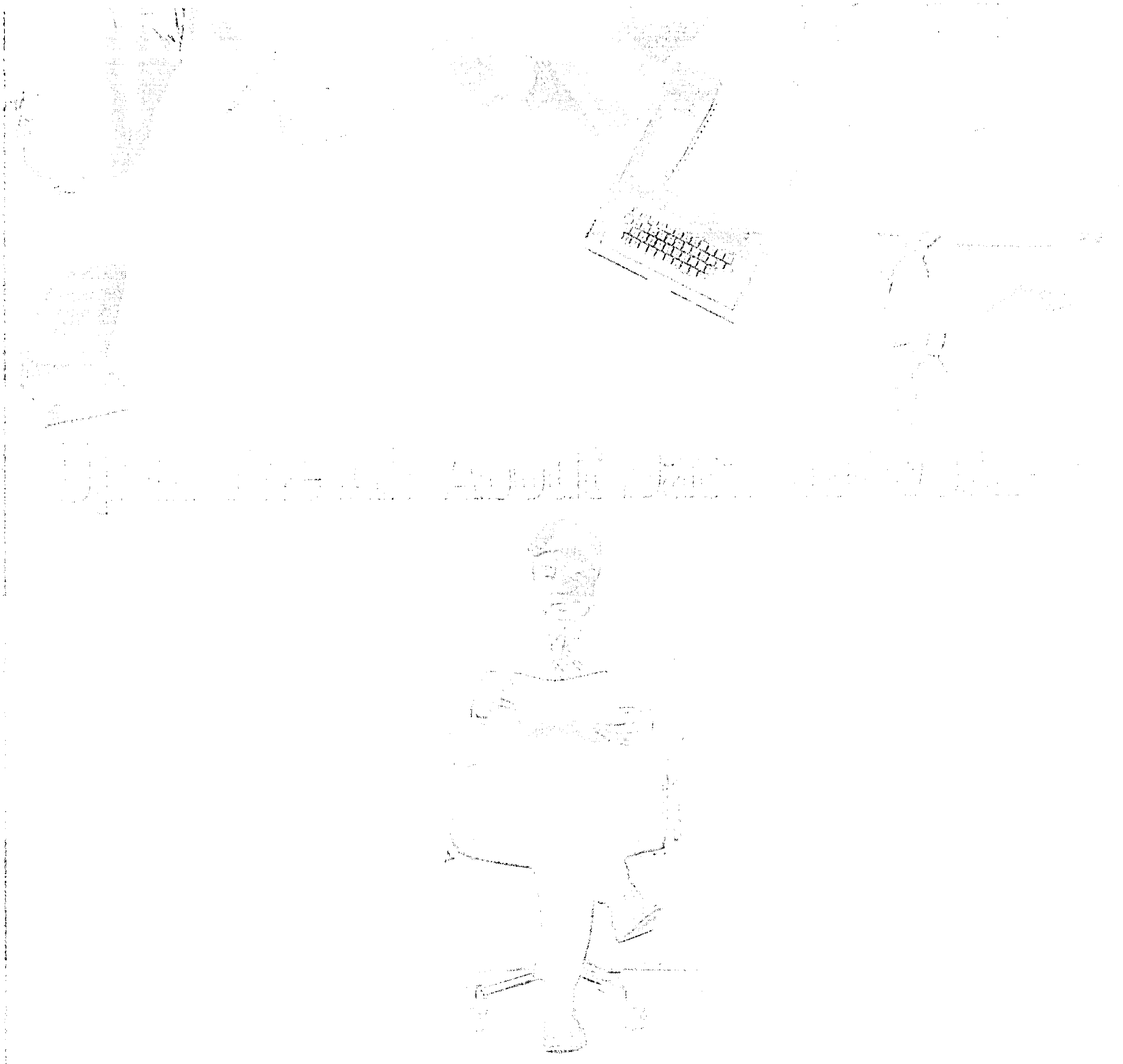
Some schools make no secret about their entrepreneurial stake in the industrial-academic relationship and have even spun off separate organizations—mini corporations, really—to deal with the business of transforming research and knowledge into cash. Washington University in St. Louis is a case in point. The recipient of close to $30 million from Monsanto as well as other corporate grants, Washington has established an off-campus organization called WUTA (Washington University Technology Associates) that functions essentially as an R&D firm, using faculty members to consult with corporate clients. The WUTA chairman is John Diggs, the university treasurer, while the WUTA board is made up entirely of engineering school faculty members.

Other institutions appear more ambivalent about their relationships with the private sector. Stanford probably has as extensive a relationship with industry as any university in America. Its gross income from technology licensing—royalty income from sales of products that have come out of university research—exceeded $2.5 million in 1981-1982, the largest sum received by one of the 20 major U.S. research universities.

The Stanford Industrial Park was the spawning ground for Silicon Valley, and numerous companies, including Hewlett-Packard, Varian Associates, Cromemco, and Fairchild Camera and Instrument, were founded by Stanford alumni and faculty. In addition to contributing to the Integrated Systems project, dozens of these companies have donated buildings and significant funding.

Even so, Stanford as an institution has taken the view as expressed by its president Donald Kennedy that the onus is really on the faculty members, and not the university, to establish and maintain the basic ground rules in industrial relationships and that, while it is acceptable for the university to own a piece of the action and perform proprietary work for industry, it cannot become a proprietor itself a la WUTA.

Harvard University appeared reluctant even to acknowledge industrial ties until it was confronted with sharp criticism and a congressional inquiry of some of the sub rosa DNA research being conducted on behalf of pharmaceutical manufacturers such as



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CIRCLE 67 ON READER CARD

The larger and more prestigious the university, the more leverage it has in dealing with corporate sponsors.

Hoechst, a West German firm; this forced the institution to bring its corporate links into the open and establish a policy regarding faculty involvement in outside projects.

No matter how the corporate-industry link is structured, however, its underpinnings are quid pro quo. Here, too, though, the quids and the quos may differ. Carnegie-Mellon, as an example, signs over all patent rights to corporate sponsors. "The function of a university is to create and disseminate new knowledge, and we should not insist on hanging on to patents if that becomes a bar to conducting research," explains Richard Cyert, CMU's president.

CMU, however, has worked out an arrangement by which it receives a share of royalties generated by patents emanating from its research. Perhaps equally as important from CMU's viewpoint is the experience of working directly with major robotics and CAD/CAM manufacturers in practical factory-floor situations.

"This gives us access to the very leading edge," asserts Daniel Berg, provost of science and technology. "It permits us to work out problems that are significant and truly basic to the course of technical development. We get direct feedback from the factory floor, and we can attract top-notch people who want to work with major CAD/CAM and robotics manufacturers at leading facilities."

EXPOSURE FOR STUDENTS

A somewhat similar situation exists at Lehigh, where a prototype program pioneering undergraduate use of CAD/CAM is one of the key research projects. With more than $6 million in support from companies that include Data General, DEC, Exxon, General Motors, Honeywell, Unimation, Applicon, IBM, McDonnell Douglas, and Bethlehem Steel, the program features hands-on experience with the latest CAD/CAM systems donated by those corporate sponsors. "The students get this exposure, and in turn may wind up writing new software for the system or ironing out any bugs they happen to come across," says Donald M. Bolle, dean of engineering and physical sciences. As an added bonus the student may eventually work for one of the sponsors, or be hired by a company where he or she may recommend using the sponsor's equipment. Manufacturers also use the program as a showcase, often bringing customers through the Lehigh research facilities.

In addition, sponsors are invited on campus once or twice a year for a briefing on Lehigh research. The university also brings in speakers from other universities and industry to provide sponsors with an overview on new developments in the field. It has yet to define its policy on royalties and patents since most potential products such as CAD/CAM software have thus far been used only internally and haven't been sold.

The industry-academic relationship takes a different form at the University of Vermont. Located in Burlington, where DEC and IBM, among others, have manufacturing plants, the school receives contributions to its microprocessor lab from Motorola and Intel; is involved in ongoing research with IBM; and has received as outright gifts or with substantial discounts complete computer systems from IBM, DEC, and Hewlett-Packard. UV faculty members often consult with industrial clients in their fields of expertise, the school offers a special graduate program to as many as 25 IBM master's candidates from all over the world, and specially packaged early morning and evening courses are provided for employees of all nearby corporations.

The result is a balanced give and take that seems to please industry and university. "Without the kind of gifts we receive and many more like them, I don't see how any engineering school can stay current," says Gerald P. Francis, dean of the UV division of engineering, math, and business.

As needed as industry support is, however, the University of Vermont sets certain guidelines in accepting it. One example: the right to publish. "If a student or faculty member is involved in doing research [relating to corporate interests], we insist that everything be published," Francis states.

Generally, the larger and more prestigious the university, the more leverage it has in dealing with corporate sponsors and attracting funding for broad-based, long-term research projects. Even in these situations, though, corporate sponsors receive a specific payout. Stanford's multidisciplinary Center for Integrated Systems, for instance, will offer graduate training in a broad range of areas including computers, telecommunications, and semiconductors. The 17 corporate sponsors won't dictate the course of study, but they will benefit directly from it.

"What they get can be encapsulated best by the words 'lead time,' " CIS codirector James Meindl explains. "They will get lead time on research being done here, they will have first access to it, and deeper access to it. I think they will also get a lead time on making connections with our best graduate students. . . . They will be participating and helping in the doctoral research of these students."

ACADEMICS LIKE THE LINK

Academics like Meindl and CIS codirector John Linvill, who began promoting the idea of an interdisciplinary center several years ago and attracted the support of computer and electronics industry executives such as Intel president Robert Noyce and Hewlett-Packard president John Young, can see nothing but good emerging from closer academic-industry links. Good for the university, good for industry, and good for the country. "The gifted and experienced manpower produced in the CIS will foster continuing American leadership in the computer, telecommunications, and semiconductor industries initiated by American invention," says Linvill.

This view is echoed by industry as well. Says Erich Block, chairman of the Semiconductor Research Corp.'s board of directors and an IBM vice president, "Both the [semiconductor] industry and the universities are sure to benefit from the expanded scale of interactions and research activities."

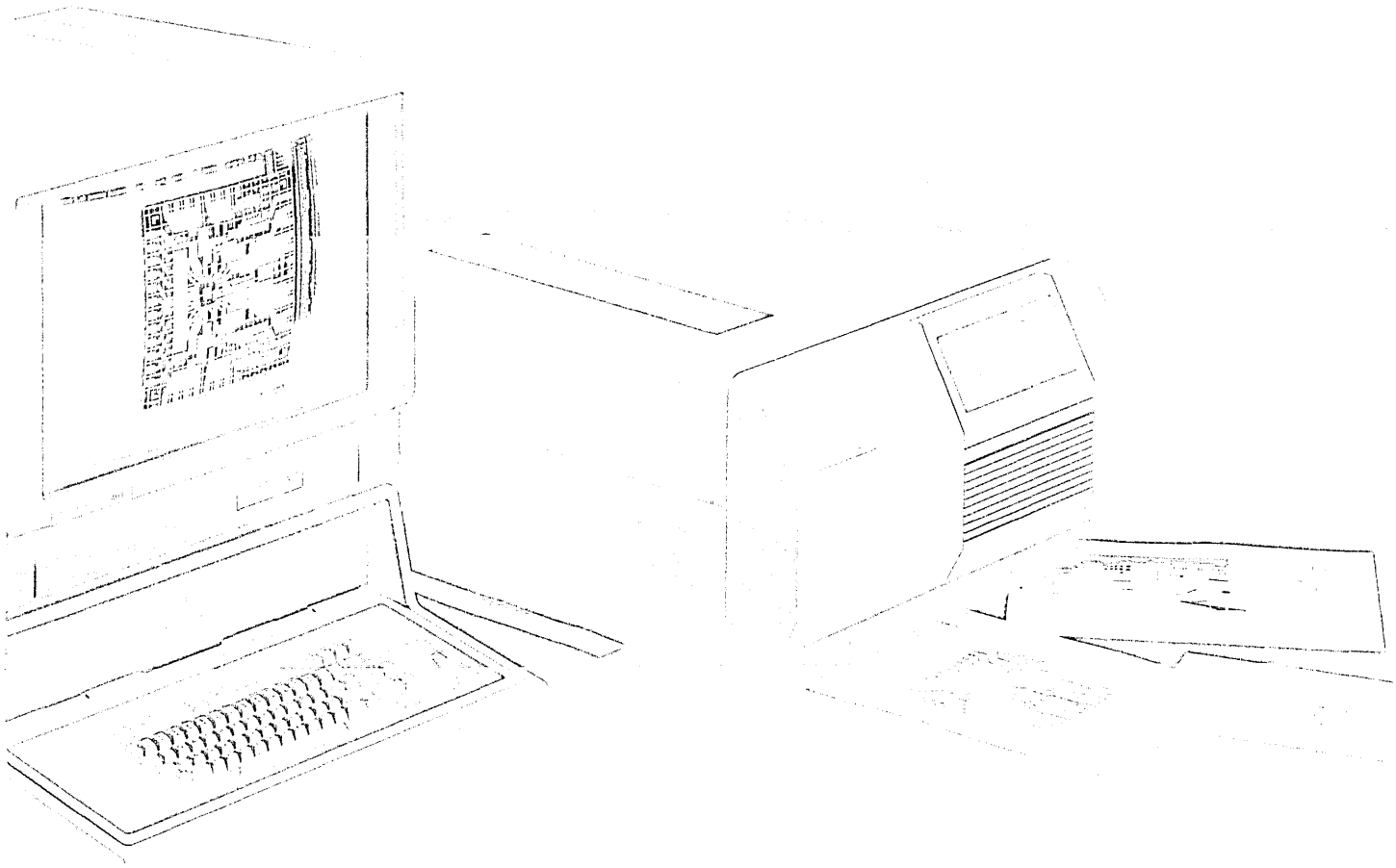
Moreover, both industry and academia appear determined to make this partnership a lasting affair. "We need help and they need help," notes Don Bolle. "There's a mutual seeking of support now, and we're trying to set up long-term interactions that have strong benefits to both sides."

Even so, some observers view the emergence of Academia Inc.—at least an Academia Inc. that doesn't exercise restraint—as jeopardizing the traditional corporate and academic processes. Kennedy of Stanford describes a number of abuses that have already arisen out of the corporate-college liason: graduate students pulled off their regular studies and forced to join in on outside research; university facilities used to house back-contracted spillover from outside commercial ventures; and university prestige and laboratories being used to promote commercial claims for a new venture.

Kennedy relates an anecdote that perhaps summarizes his concern. An acquaintance heard a scientist who had just made an important discovery being interviewed on a news broadcast. "You know," Kennedy quotes the acquaintance as telling him, "I used to get excited when I heard about those things. But now I find myself wondering if the person being interviewed is tied in with a company, and whether I have to discount what he says on the grounds that he's hyping his stock."

"Quite apart from whether basic science can prosper despite such suspicions, can it tolerate the loss of openness and trust that is likely to accompany the rush to proprietary control?" Kennedy asks.

Rensselaer's George Low, as head of an institution that's a major recipient of corporate largess, naturally favors stronger university-corporate ties, but at the same time points out some of the potential areas of concern. They include, says Low, "the possible erosion of basic academic values, of the educational goals of teaching and research, of giving faculty members their choice of questions to pursue, and of maintaining the uni-



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versity as a credible and impartial resource."

Low also points up the possible conflicts of interest that may arise when trade secret issues interfere with the freedom to publish, or when faculty's investments interfere with the commitment to teaching and scholarly work.

And from industry's point of view, he notes, there is "the possible leakage of information to domestic and foreign competitors when research results are communicated openly in traditional academic fashion."

Pat Hill Hubbard, president of the American Electronics Association's Educational Foundation, points up another tangential problem with Academia Inc. as it is now being structured. Almost all of the funding is going into "sexy" projects such as research centers and is being earmarked almost exclusively for graduate studies, asserts Hill, whose parent organization AEA recommends its members give a percentage of their R&D budgets to universities for research. Support for graduate projects represents the quicker payout, of course, in terms of potential product development and future employees, but it fails to address what Hubbard sees as the fundamental problem in technical education today.

"The real bottleneck is at the undergraduate level, and it is extremely difficult to attract funding to increase the number of undergraduate engineering faculty [there is a major shortage of engineering teachers at this level] or to underwrite undergraduate research."

Without these underpinnings, projects at the graduate level are ultimately going to fail, Hubbard asserts.

Until recently, the whole subject of academic-university ties, particularly in the computer and electronics area, has been more or less a closed subject. All too frequently universities and academics have accepted corporate money and worried about the consequences later, if at all. Now, however, a number of universities including Harvard, the University of California, and, most recently, Yale, have adopted policies regarding conflict of interest and outside faculty commitments. At the same time, a recent conference of industry-academic links at the University of Pennsylvania attracted leading industry and academic figures who aired some of the critical concerns attending the formulation of Academia Inc. "The question of corporate-sponsored research has become a murky, highly complex area, but the issues are too important to be ignored any longer," says one conference attendee. ✲

Laton McCartney, a former managing editor of DATAMATION, is a free-lance writer and regular contributor to this magazine.

REAL MONEY FOR FAKE BRAINS

While university-industry research and funding relationships may have gained notoriety with the boom several years ago in commercial bioengineering, a debate is also raging in computerdom's own backyard. The once "small, lovable field" of artificial intelligence (AI), as one professor turned entrepreneur calls it, has been changed practically overnight by the aroma of venture capital. AI promises to be big business and is drawing longing gazes from many an academic.

The past two years have seen as many as a dozen new firms begin operating in the artificial intelligence arena. Some offer hardware, some software, some consulting services.

Meanwhile, several large industrial manufacturers—Schlumberger in oil drilling equipment, Texas Instruments in oil well logging, Hewlett-Packard in office automation, among others—have invested heavily in AI research. The startups and established giants all share a common trait, however—each has staffed its AI team from the ranks of academia. The AI rush has caused several true-blue academics to deplore publicly the resulting brain drain. Traditional academic ethics and responsibilities are threatened, they say, and much-needed AI professors are lost from the very universities that trained them.

"I see an attempt to split theory and applied research. That just can't happen now," said Allen Newell, professor at Carnegie-Mellon, early researcher in AI, and panelist in an informal debate held last summer at an annual meeting of the AI community in Pittsburgh. "The invasion of the campus by commercialism is a problem. Students and faculty are keeping their eyes on the dollars to be made. That's the wrong role model for our students. Science is likely to get squeezed out."

Peter Hart, a researcher at the Fairchild Camera and Instrument subsidiary of Schlumberger, noted that "in an economic sense, AI is following closely behind the biotechnology and bioengineering fields. Attention is being paid to the same kinds of issues: corporate vs. government funding and the precise rights and obligations of parties in such arrangements, and the ethics of behavior for individuals."

Fairchild's AI effort is understood to be one of the best-funded in the world and is estimated to have on staff a good 10% of all U.S. PhDs in AI—numbering about 200 total as of last summer. The company is striving to perfect so-called expert systems, which in this case are computerized helpers designed to aid oil well drilling teams in evaluating well tests and geophysical data.

Added Newell: "The problem is not how to stop the outflow [from universities into business] but how to make the losers—the schools—competitive again so they can keep people. Perhaps we will see computer science schools operate the way medical schools do today, where doctors can have their private practices as well as teach."

The debate's moderator was Roger Schank, head of Yale University's computer science department, an AI researcher, and chief of his own company, Cognitive Systems Inc. in New Haven, Conn. "I have two propositions: business is fun, and AI is not finished. We all knew this [debate] was coming. We can't keep talking about how good AI programs are without expecting that people will eventually want them. It was inevitable that companies would be formed."

Schank's company designs expert systems and natural language front-ends for database inquiry applications. He has come under fire recently from Yale's top administration, which doesn't like the idea of its professors running companies, particularly when the company's business is related to the professor's main area of research. Schank, obviously, disagrees.

"Professors ought to have businesses," he says. "Universities have always been funded by the real world around them. Yale has been hiding its head in the sand and that is why there is no Silicon Valley near it and no Route 128. The universities that survive will be the ones that adapt. Besides, competition from business stimulates universities."

Schank told the Pittsburgh audience he's in favor of government backing for university research and some sort of long-range planning "against world competition."

Newell pointed out that the Japanese use U.S. schools extensively but U.S. researchers do not attend Japanese universities as much. There has been a growing concern in U.S. computer science circles that the Japanese fifth generation computer project represents a threat to U.S. computer supremacy, if only because it is a coordinated, wide-ranging effort that appears to be well funded by that country's government. "All that planning smoke means there must be some real fire underneath," said Newell of the Japanese project.

Finally, a comment came from Edward Feigenbaum, former head of Stanford's computer science department and co-founder of two AI-related startups in Palo Alto, Calif.—Teknowledge Inc., a builder of expert systems, and Intelligenetics, Inc., which designs expert systems to aid gene manipulators. "Businesses are forming so that our ideas can be protected as trade secrets," the entrepreneur said.

While few definitive proposals could be drawn from the Pittsburgh debate, it was clear that those attending were aware of the ethical issues at hand. Just as clear was the fact that AI has gone commercial and there's little anyone can do to stop it. Even MIT's Marvin Minsky, the dean of AI researchers, was seen recently doing a stint for technical training supermarket Deltak Inc. of Oak Brook, Ill.

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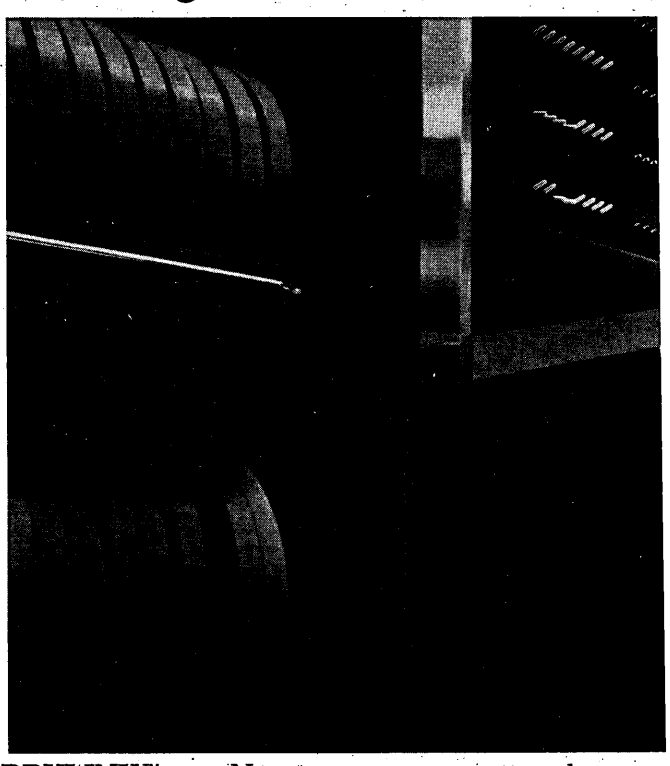

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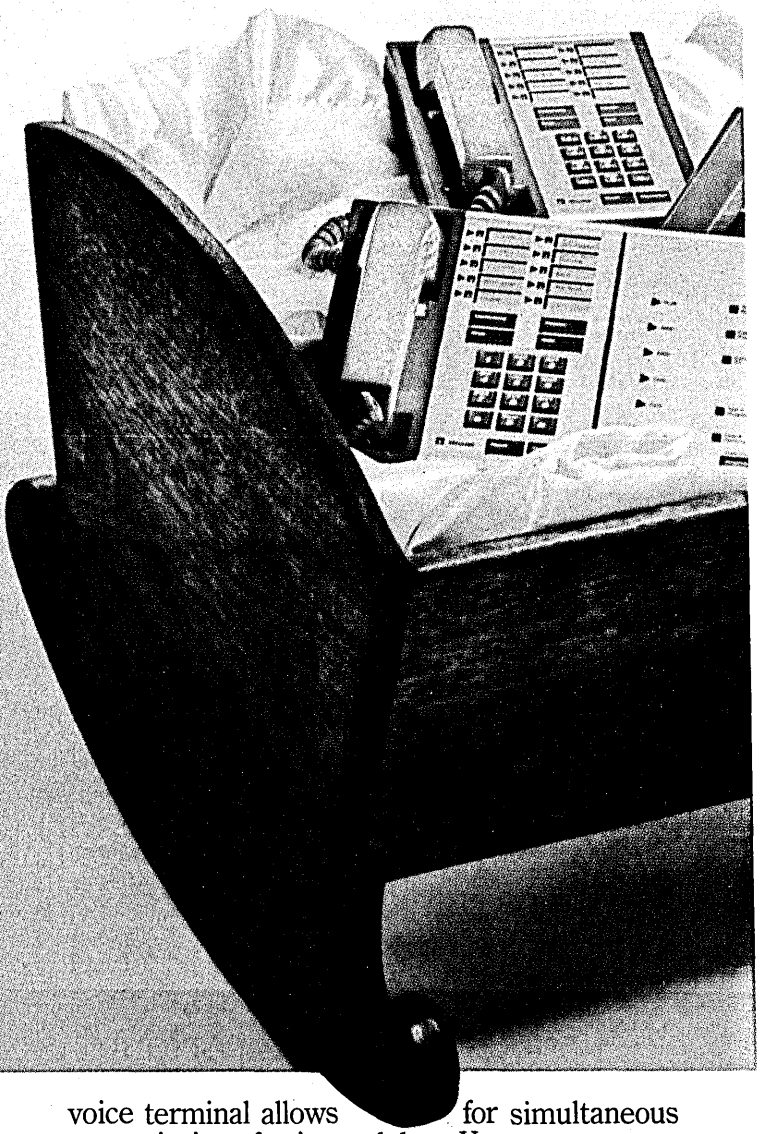

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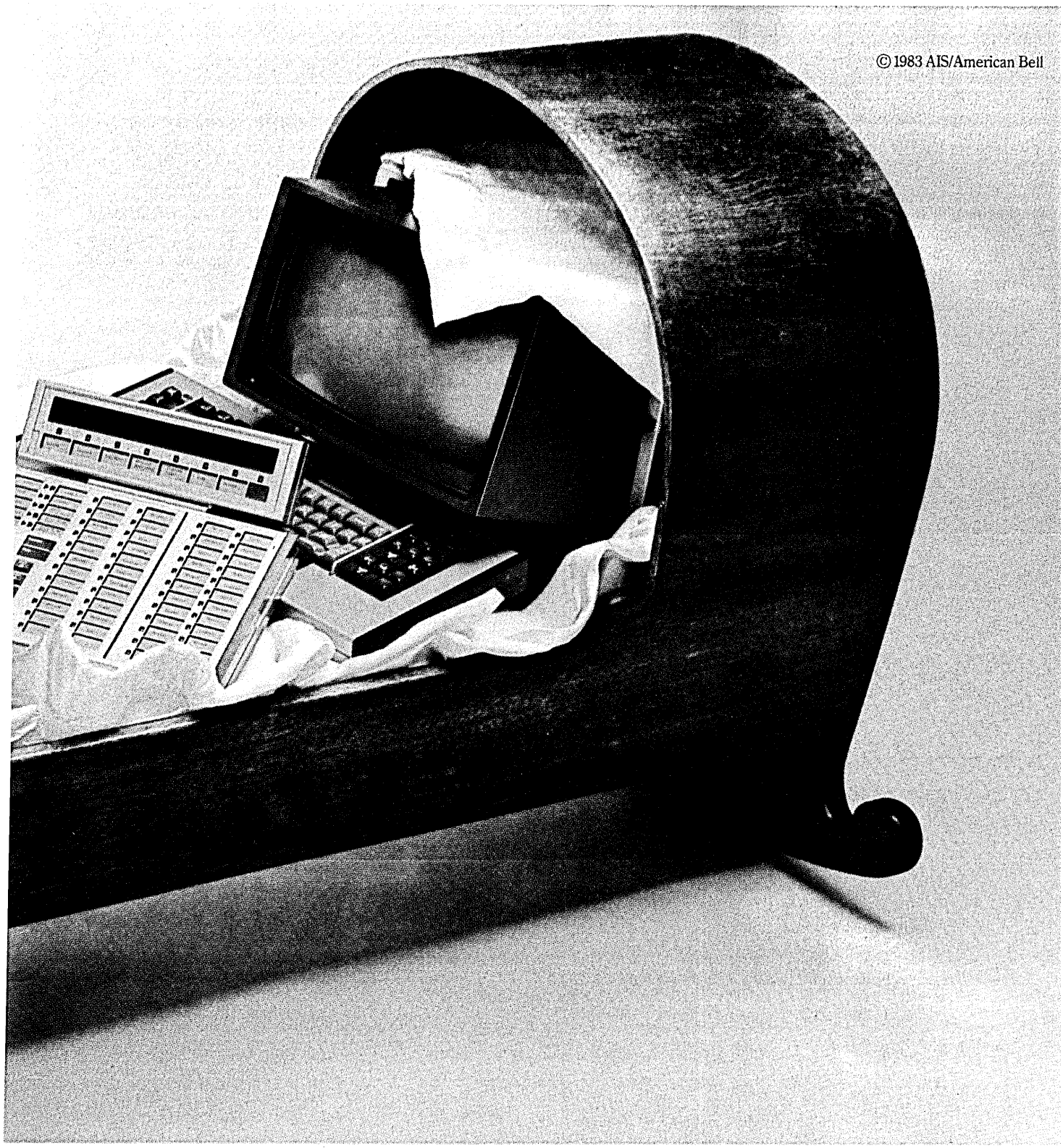

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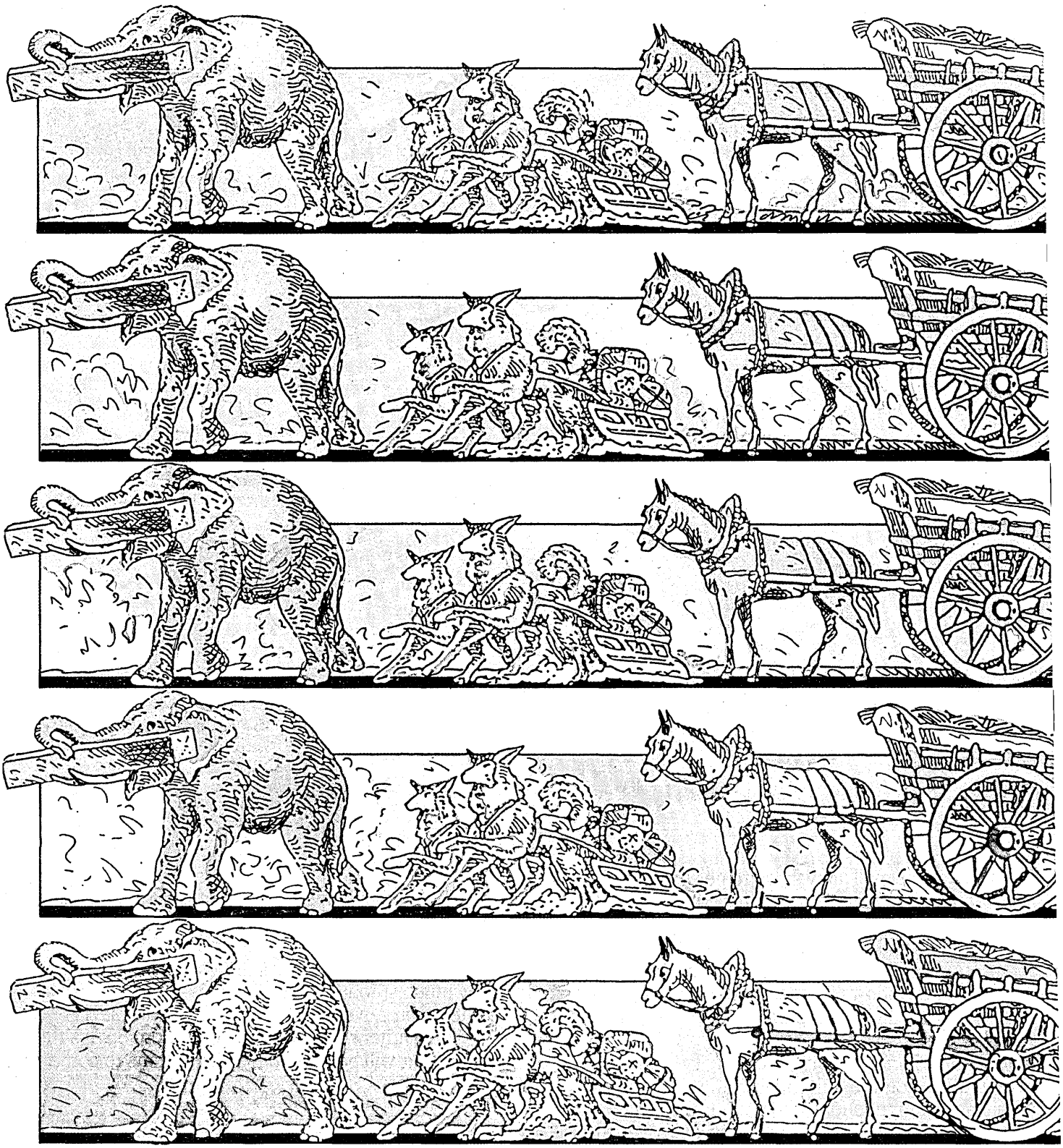

by Data Decisions

This report presents the results of a nationwide survey, conducted by Data Decisions in December 1982 and January 1983, of users known to have specific applications-oriented software packages installed. It complements a Data Decisions survey of systems software that was published in the December issue of DATAMATION.

Today, most general purpose mainframe data processing environments support a large percentage of on-line activities. Normally these activities include many of the user application packages run in the company. End users in functional work centers in various departments such as finance, personnel, and engineering are the primary parties who evaluate and select applications packages, appreciate and understand their current value, and determine the need to upgrade or replace them. Therefore, end users are the ones who should answer applications software user rating questionnaires.

We've taken this approach, and it has required that the vendors cooperate with a research organization in the conduct of the survey. Vendors were invited to provide a list of their 100 most recent customers, each of whom had the package in question installed a minimum of six months. The vendors certified that they had not deleted known unhappy customers or attempted to contact customers to influence their replies.

DATAMATION's systems and applications surveys were both conducted by Data

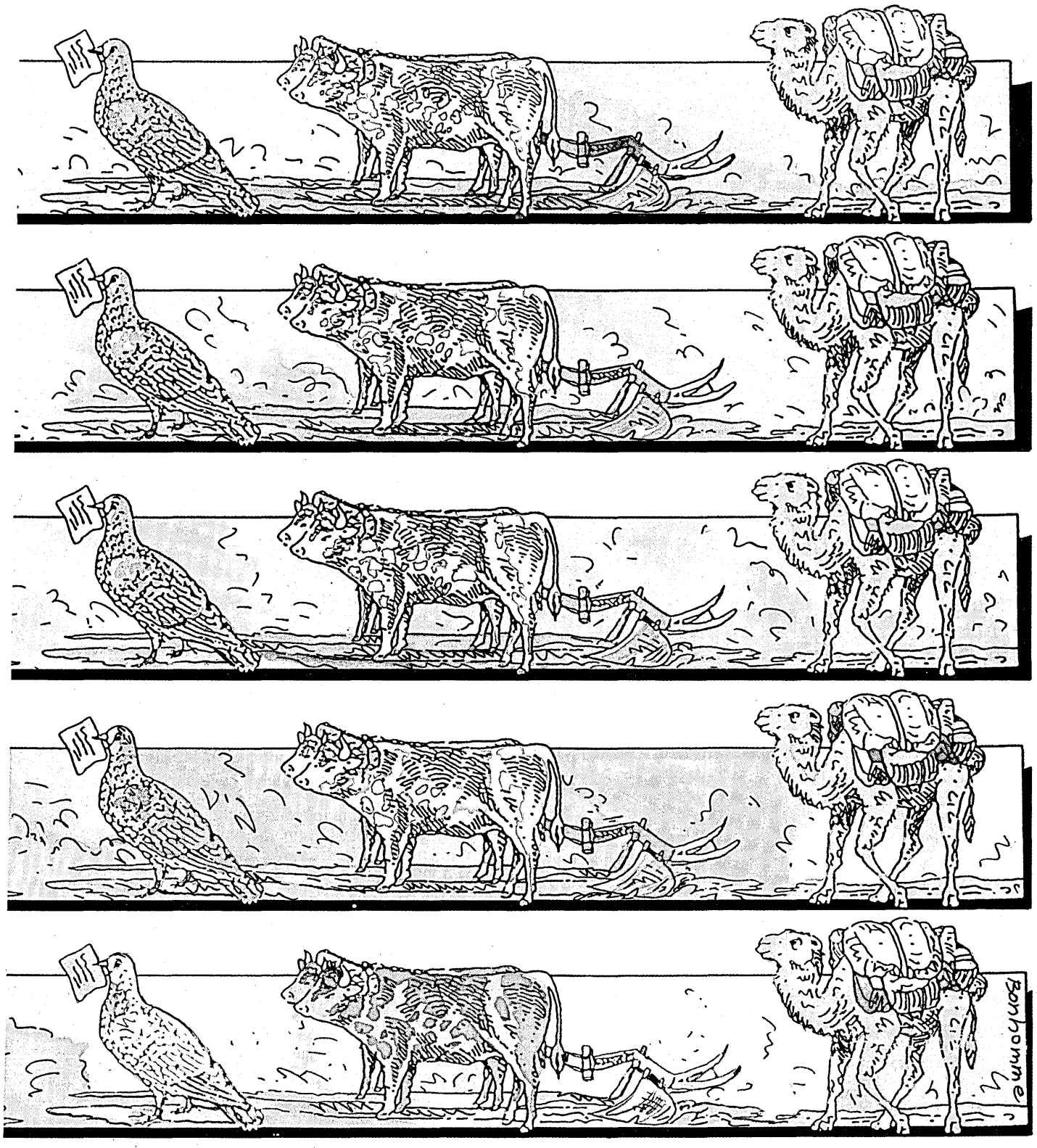

ILLUSTRATION BY BERNARD BONHOMME

Fifty-eight applications software packages were rated by more than 2,300 users.

Decisions of Cherry Hill, N.J., in conjunction with ratings reports published in Data Decisions' *Computer Systems* and *Software* edp information services. The user-site samplings were obtained directly from the applications software vendors, using International Computer Programs' (Indianapolis, Ind.) Million Dollar list as a source. Only vendors with packages identified by ICP as having grossed $5 million or more in sales were contacted for user source data.

The sample consisted of 4,653 known users of 58 applications software packages. Questionnaires were mailed during the first week in December. Telephone interviews were conducted with users of packages with low response rates to ensure that a minimum response of 40% was achieved for each package and that each package was evaluated by at least 15 users. As a result of these efforts, a total of 2,735 user responses were obtained (an overall response rate of 59%). Of this total, 2,387 are active users currently employing the packages surveyed. These users constitute the statistical base.

Users were asked to rate a specified applications package with respect to stated features, functions, and performance criteria. Four types of questions were asked. One type required only a yes or no response. The second asked users to select a phrase or phrases that defined various software performance criteria. The third type weighted user responses on a simple three-part scale. The fourth and most specific type required the user to assign a performance rating, based on a scale ranging from 10 to 9 for superior down to 2 or 1 for inadequate, to characteristics related to package use and operation, vendor service, and overall satisfaction.

A synthesis of the responses from 2,387 active users showed the following:

Buying Influences

An overwhelming 87% of users of the average package studied indicated that software features and functions were major influences in their decision to acquire the package. Other factors widely described as major influences were overall vendor "presence" or reputation in the industry (by 52% of users of the average package), related costs and time to implement the package by internal staff (44%), and the package's compatibility with existing software (40%).

On the other hand, 82% of users of the average package indicated that the results of benchmark runs had little or no influence on the buying decisions; 80% indicated that experience with other vendor packages also had little or no influence; and 76% said the same of consultants and third parties.

Alternative Packages

Overall, 72% of users of the average package stated that they had evaluated alternative packages before making an acquisition decision. By type of package, a high of 91% of the users of the average payroll/personnel package and a low of 54% of the users of the average business administration package evaluated alternatives.

Computer System

Sixty percent of the applications packages evaluated in this survey were run primarily on IBM hosts. Five percent were run primarily on DEC systems; 4% on Hewlett-Packard; 3% each on Texas Instruments and Burroughs; 2% each on Amdahl, Honeywell, Basic Four, Univac, and Data General; 1% on NAS; and 14% on other or unspecified hosts.

Time Installed

Overall, the average time period the applications packages were installed was 32 months, or about 2.7 years. The responses

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About 72% of users surveyed said their packages met or exceeded vendors' performance promises.

ranged from 18% employing the average package less than one year to 4% having the package installed more than eight years.

Maintenance

Some 83% of the respondents reported that their packages were maintained by the vendor. About 14% employed an in-house staff to maintain their packages, while only 2% employed a third-party software support organization.

Replacements

Only 10% of users of the average applications package studied indicated that they were actively considering replacement of their packages. Of this number, only 12% (or 1.2% overall) cited generally unsatisfactory performance as the reason, and only 13% (1.3% overall) stated that slow execution speed was a reason for replacement. The main reason given, cited by 33% of those considering replacement (3.3% overall), was the need for features not currently incorporated into the package.

Performance vs. Promises

About 72% of the users of the average package stated that it either met or exceeded all vendor promises with respect to installation time; features and capabilities; and performance, speed, and efficiency factors. Only 4% of the users said that vendor software performance factors had not been met.

Overall Satisfaction

Users were also asked to state their overall satisfaction with the package on a scale of 1 to 10, with 10 to 9 for superior, 8 to 6 for very good, 5 to 3 for acceptable, and 2 to 1 for inadequate. A total of 17% cited their satisfaction level as superior and 56% rated overall satisfaction as very good. A total of 23% rated overall satisfaction as acceptable and about 2% rated it inadequate.

HOW THEY RATE

The following bar charts show how each package was rated with regard to overall satisfaction, installation and initial use, vendor service and support, operations, and input/output criteria. Graphs are presented for all 58 applications software packages that were sampled.

Bar charts are also included for both the total survey and for the individual group averages. Additional information included with each chart cites the total number of responses, the number of users rating the package outstanding, the number actively considering replacing the package for any reason, and the number seeking replacement for generally unsatisfactory performance. The bar charts show ratings of superior (10 to 9), very good (8 to 6), and acceptable (5 to 4). Ratings under 4 are not graphed.

The *Overall Satisfaction* bar encompasses factors such as satisfaction with package features, capabilities, and utility; frequency of failures requiring special effort for recovery; and vendor installation, documentation, modification, and training support.

The bar labeled *Installation and Initial Use* is a composite that includes freedom from bugs/errors, time required for initial installation, ease of implementation, and quality of documentation and training.

The bar labeled *Vendor Service* gauges the vendor's speed and thoroughness in fixing bugs/errors, the quality of vendor program modifications, and the frequency of package updating.

The *Operations* bar is a measure of the package's ability to handle expanding processing volumes and an evaluation of initiation/calling and backup/recovery procedures.

(Special note: in split-bar presentations, the solid bar indicates the package's scores; the open bar denotes the common group average.)

NINE PACKAGE GROUPS

The 58 packages covered in this study have been grouped into nine categories for more meaningful averaging and comparison:

- *General Accounting Packages:* applications software for general ledger, accounts receivable, accounts payable, fixed asset, and integrated accounting systems.
- *Other Accounting Packages:* tax, financial, construction, and petroleum account software.
- *Banking and Finance Packages:* systems dealing with general banking, savings and loan, deposit, and financial planning and control applications.
- *Insurance Applications Packages:* general insurance, claims management, accounting, and policy management software.
- *Manufacturing Packages:* integrated manufacturing control, material requirements processing, production distribution software.
- *Industrial Management Applications Packages:* inventory and distribution management, management control systems.
- *Project Management Packages:* project planning and control, and simulation/projection software.
- *Business/Office Administration Packages:* audit analysis, spreadsheet business planning, and statistical simulation software.
- *Payroll/Personnel Packages:* payroll and human resources management software.

The findings presented in this report reflect user perceptions of package performance in response to the particular dimensions probed by the questionnaire. These perceptions are not intended to be all-inclusive, nor do they necessarily provide evaluations comparable to those that would be obtained under conditions of a controlled engineering test or experiment. The numbers reported are estimates within a range of what would have been obtained had all user sites in the survey universe been similarly enumerated. ❋

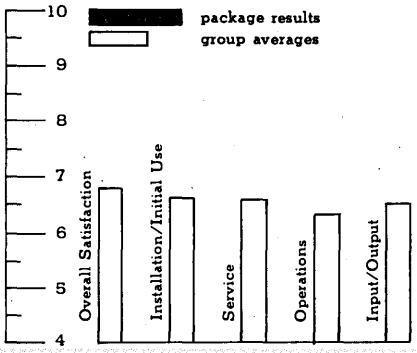
"Before he got the computer he was a guru. Now he's just a resource person."

CARTOON BY HENRY MARTIN

This survey is based on a forthcoming report in Data Decisions' *Software* service, a monthly updated loose-leaf information service covering systems and applications software. A trial review is available from Data Decisions, 20 Brace Road, Cherry Hill, NJ 08034. Telephone (609) 429-7100.

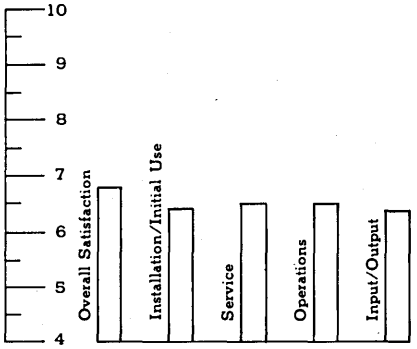
☐ OVERALL SUMMARY
Average - All Packages • 58 packages

2,387 responses • 42% of users judged features/capabilities outstanding • 10% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



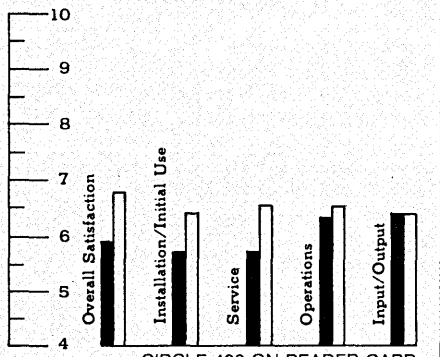
☐ GENERAL ACCOUNTING PACKAGES
Group Average • 14 packages

748 responses • 38% of users judged features/capabilities outstanding • 9% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



PROFIT • Computer Methods Incorporated, 9401 West Beloit Road, Milwaukee, WI 53227 • 414-327-4471

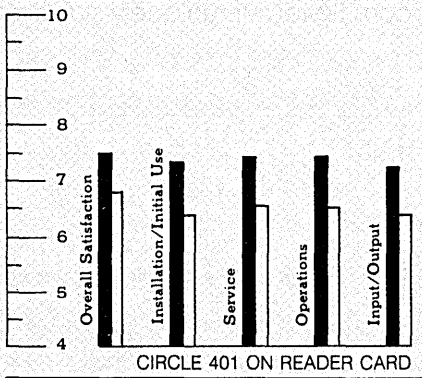
47 responses • 11 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 400 ON READER CARD

CUSTOMAR • Computeristics Incorporated, 2 Skiff Street, Hamden, CT 06514 • 203-288-4885

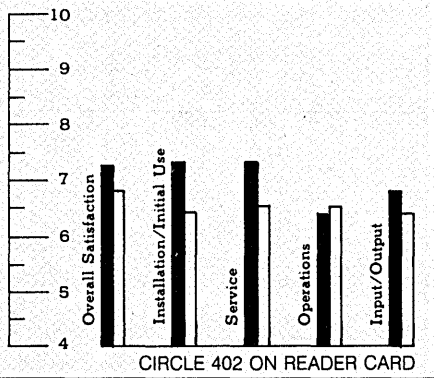
36 responses • 17 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 401 ON READER CARD

FIXED ASSETS ACCOUNTING SYSTEM • Data Design Associates, 1250 Oakmead Parkway, Suite 310, Sunnyvale, CA 94086 • 408-730-0100

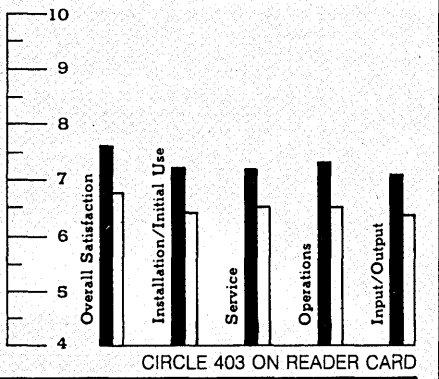
66 responses • 28 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 402 ON READER CARD

DISC ACCOUNT RECONCILIATION PACKAGE (ARP) • Disc Incorporated, 3837 Naylors Lane, Baltimore, MD 21208 • 301-486-0410

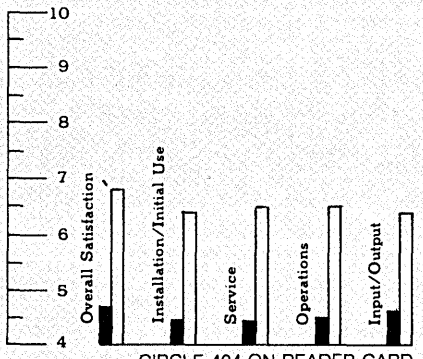
46 responses • 27 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 403 ON READER CARD

ACCOUNTS PAYABLE SYSTEM • Global Software Incorporated, 1009 Spring Forest Road, Raleigh, NC 27609 • 919-872-7800

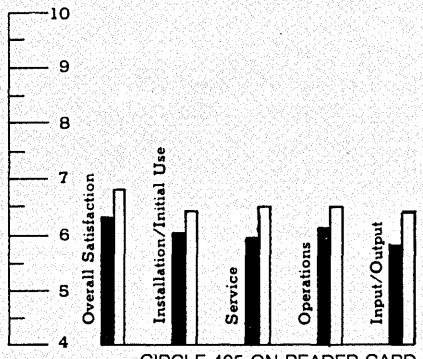
38 responses • 2 users judged features/capabilities outstanding • 12 users actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



CIRCLE 404 ON READER CARD

GENERAL LEDGER & FINANCIAL REPORTING SYSTEM • Global Software Incorporated, 1009 Spring Forest Road, Raleigh, NC 27609 • 919-872-7800

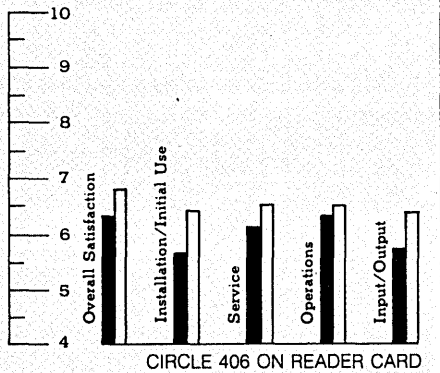
94 responses • 19 users judged features/capabilities outstanding • 10 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 405 ON READER CARD

A/P PLUS • McCormack & Dodge Corporation, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

41 responses • 14 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 406 ON READER CARD

DIRECTION: BEFORE CHOOSING YOUR SOFTWARE SYSTEM, CHOOSE YOUR STRATEGIC SOFTWARE PARTNER.

Today, it's evident that software has surpassed hardware as the key strategic element of the corporate information system.

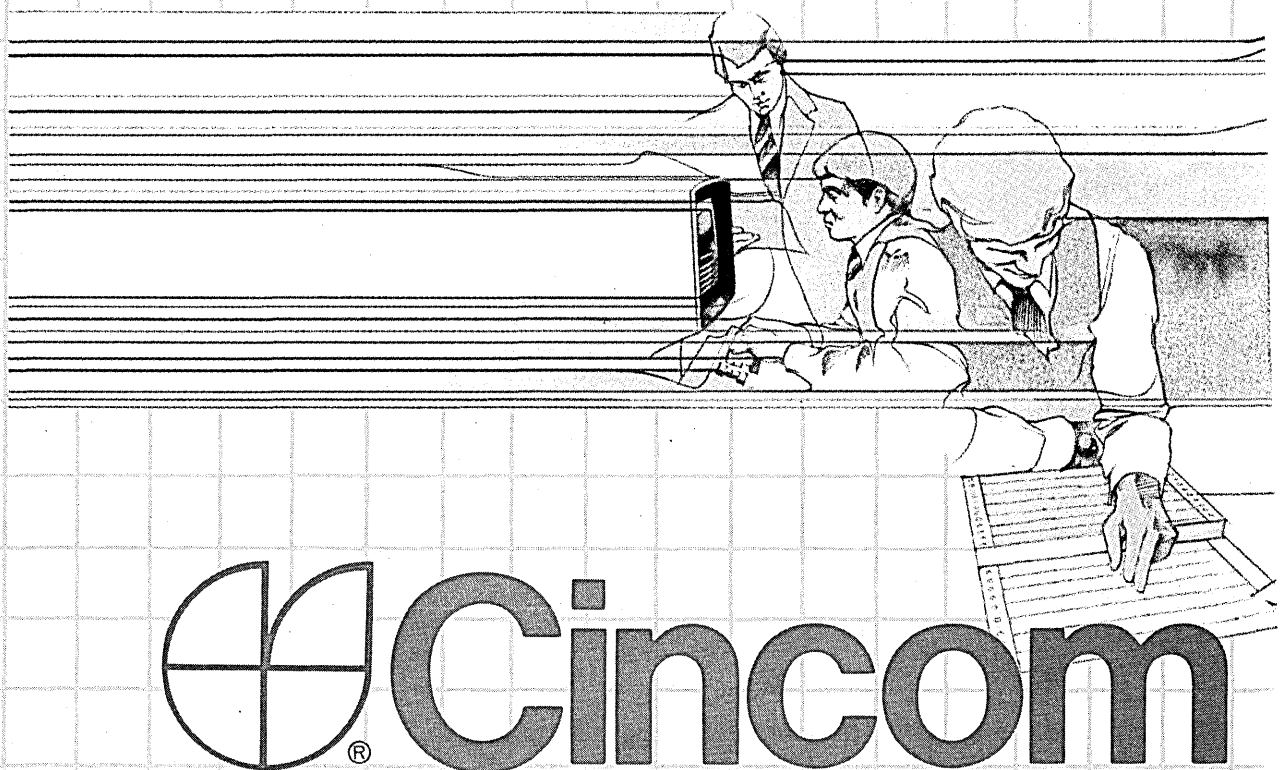
But a software strategy built upon patchwork, multi-vendor approaches is simply another form of the outmoded hardware orientation. Direction in software begins with choosing a single supplier that can "partner" with you in building the software infrastructure you need to support all systems requirements.

Your software partner should be one that can:

- Create and deliver new software, not just provide enhanced or repackaged old technology.
- Support multiple hardware and operating environments to satisfy your complete needs now and in the future.
- Demonstrate a concern for investing in R&D to meet your growing needs, rather than with optimizing its revenues from old technology.

CINCOM: YOUR FIRST STEP IN THE RIGHT DIRECTION.

As the leader in advanced software technology, Cincom Systems is uniquely qualified to



Cincom®

become your strategic software partner. In the past four years, we've developed a complete range of new software technology that obsoletes all previous approaches. The scope of these systems encompasses the needs of the largest to the most modest-sized environments.

At the foundation is an entirely new generation of data base technology. The new foundation features the data structuring power and performance levels necessary to support truly integrated systems. Which, in turn, can support virtually all usage requirements.

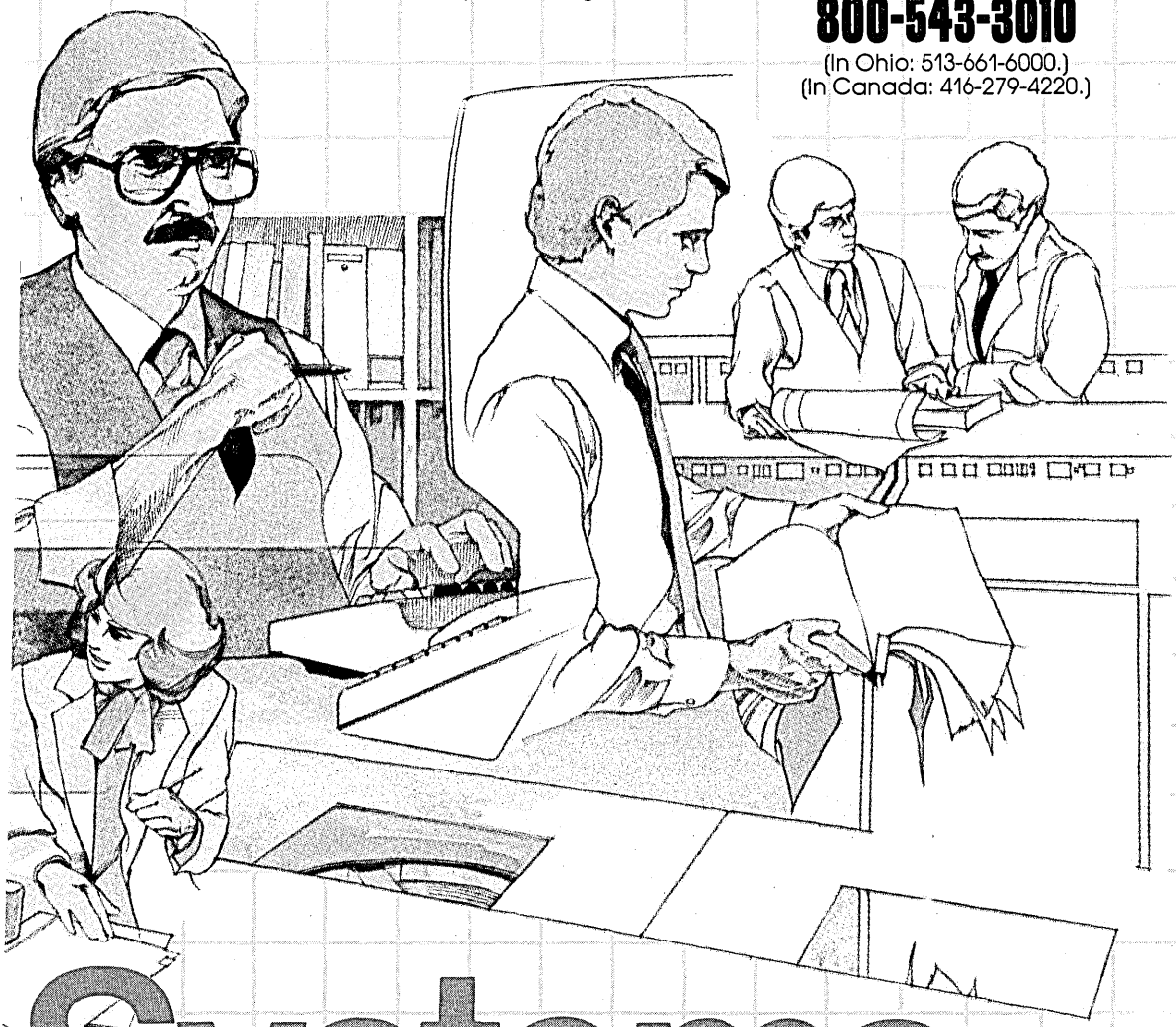
From this base, we provide a host of innovative software tools to assist both data processing and the end-user in achieving their objectives. And we help you reach out to functional areas—such as manufacturing and finance—to help them control their environments.

Cincom Systems. We provide more than products. We provide business solutions through advanced software technology. That's the essence of a strategic software partner.

Your first step in the right direction? Select Cincom Systems as your strategic software partner. Contact our Marketing Services Department. 2300 Montana Ave., Cincinnati, OH 45211.

800-543-3010

(In Ohio: 513-661-6000.)
(In Canada: 416-279-4220.)



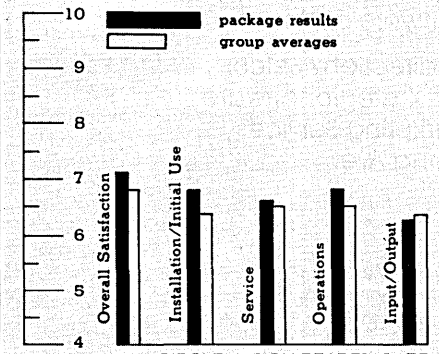
Systems

Your strategic software partner.

CIRCLE 104 ON READER CARD

F/A PLUS • McCormack & Dodge Corporation, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

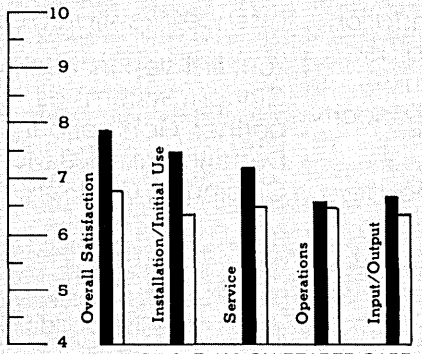
55 responses • 22 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 407 ON READER CARD

G/L PLUS • McCormack & Dodge Corporation, 560 Hillside Avenue, Needham Heights, MA 02194 • 617-449-4012

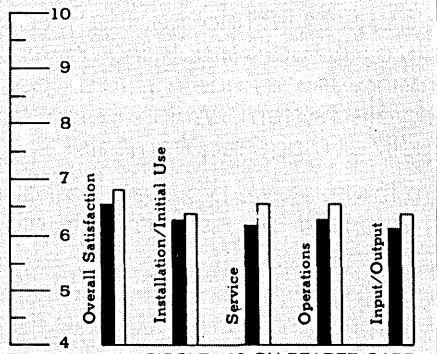
65 responses • 37 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 408 ON READER CARD

MSA ACCOUNTS PAYABLE • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

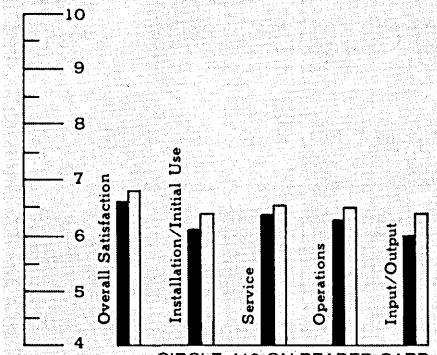
58 responses • 19 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 409 ON READER CARD

MSA ACCOUNTS RECEIVABLE • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

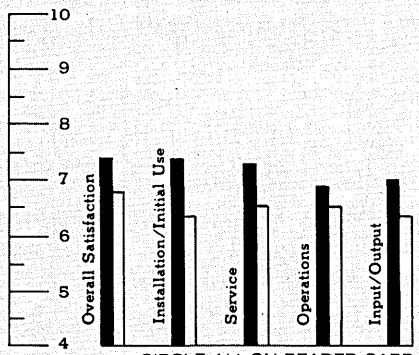
39 responses • 13 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 410 ON READER CARD

MSA FIXED ASSETS ACCOUNTING SYSTEM • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

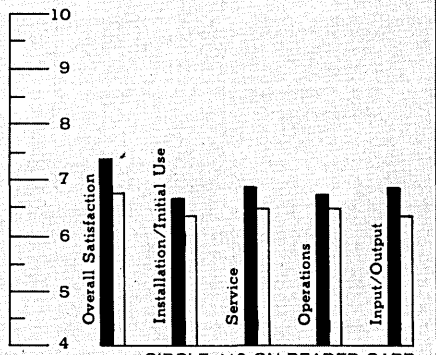
49 responses • 17 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 411 ON READER CARD

MSA GENERAL LEDGER • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

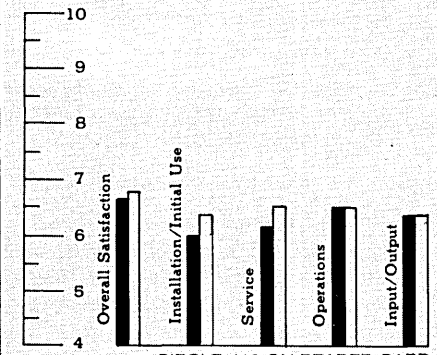
67 responses • 40 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 412 ON READER CARD

GENERAL LEDGER & FINANCIAL REPORTING • Software International Corporation, 1 Tech Drive, Andover, MA 01810 • 617-685-1400

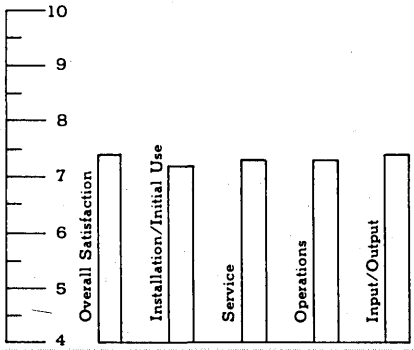
47 responses • 20 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 413 ON READER CARD

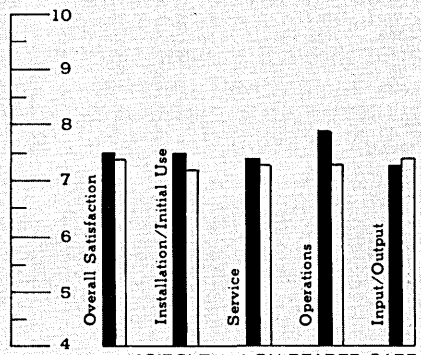
☐ **OTHER ACCOUNTING PACKAGES**
Group Average • 6 packages

250 responses • 53% of users judged features/capabilities outstanding • 11% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



SYSTEM 5 • Construction Computer Control Corporation, 615 East Michigan Street, Milwaukee, WI 53202 • 414-278-0500

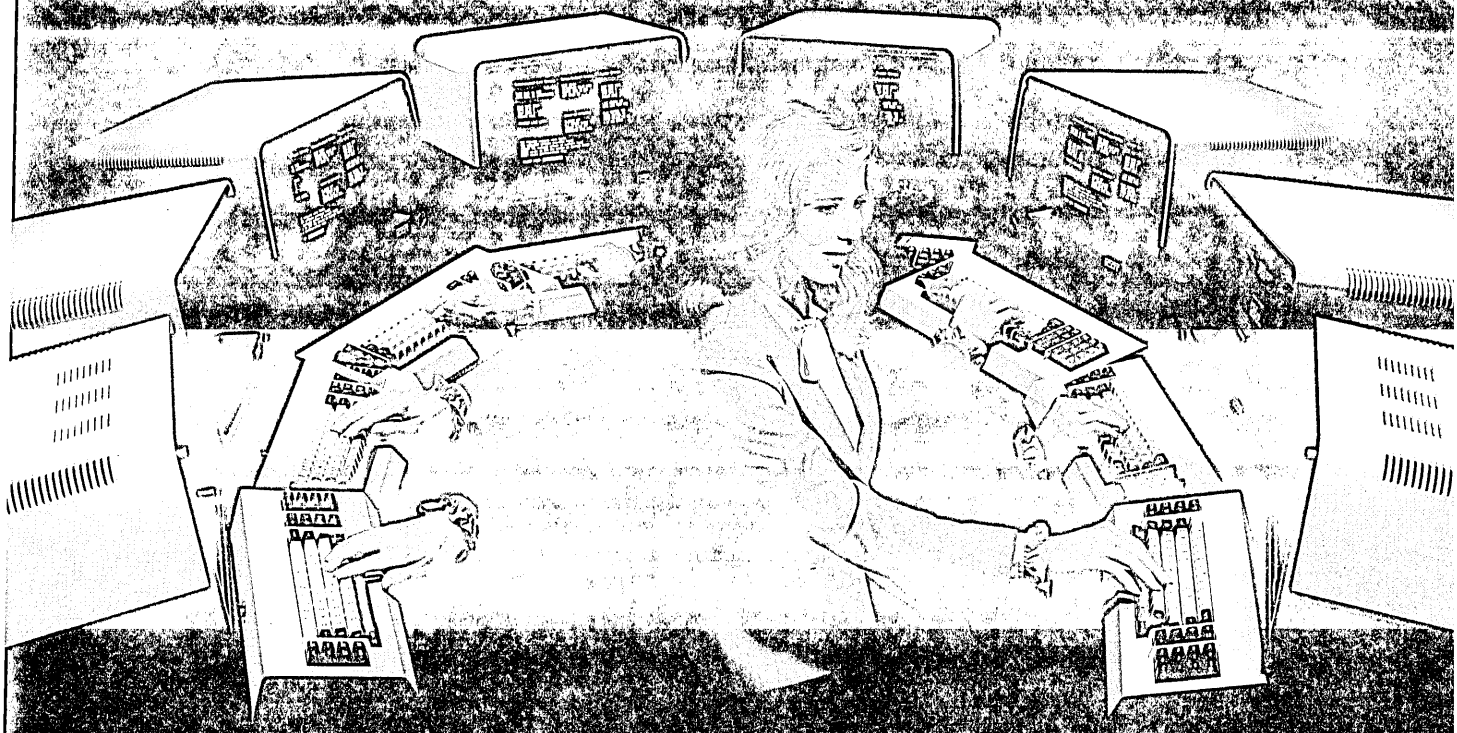
43 responses • 19 users judged features/capabilities outstanding • 7 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 414 ON READER CARD

3270 USERS

ICOT NOW HAS ALL THE SCREEN SIZES YOU NEED IN ONE WORKSTATION.



NOW YOU CAN HAVE ALL YOUR IBM-SUPPORTED SCREEN SIZES AT ONE COST-EFFECTIVE WORKSTATION.

ICOT's new 3270-lookalike workstation automatically changes screens to any IBM-supported format. So you eliminate the cost of adding extra terminals for separate applications.

Using this new workstation is already second nature to your IBM 3270-trained operators – because the keyboard looks and works the same. So you eliminate the cost of retraining.

You can also eliminate the cost of separate lines and modems: you have a choice of local or auto dial connections and a local printer interface.

One exclusive built-in touch converts a portion of the keyboard into a 12-key calculator, letting you go offline for local calculations.

In addition, you get real-time flexibility through ICOT Virtual Terminal Systems™: you can run two application sessions on two different computers – without logging off.

ICOT Virtual Terminal Systems stay up and online, because they're backed by local user diagnostics and nationwide service from ICOT. So you eliminate the cost of needless downtime.

ICOT's growing family of systems solutions offers you a range of cost-effective alternatives to your data communications problems. For complete information, call ICOT toll-free. Inquiries from international and domestic distributors are welcome.

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1-800-528-0470 (Alaska and Hawaii).

ICOT™

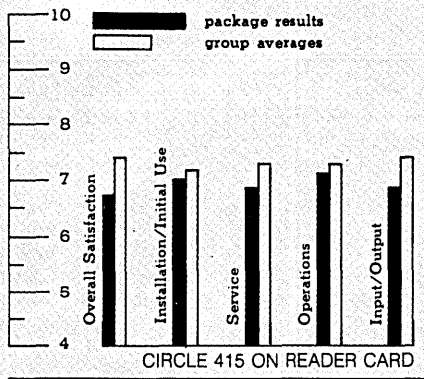
... a data communications company

ICOT Corporation, P.O. Box 7428, 830 Maude Avenue, Mountain View, CA 94039, TWX 910-379-6479

CIRCLE 105 ON READER CARD

PASHAL PETROLEUM ACCOUNTING SYSTEM • HAL Systems & Services, 5339 Alpha Road, Suite 100, Dallas, TX 75240 • 214-385-2300

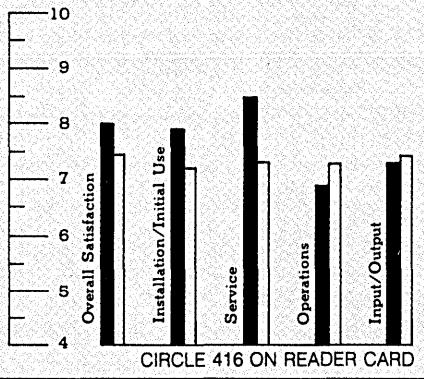
21 responses • 8 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 415 ON READER CARD

MSA ALLTAX • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

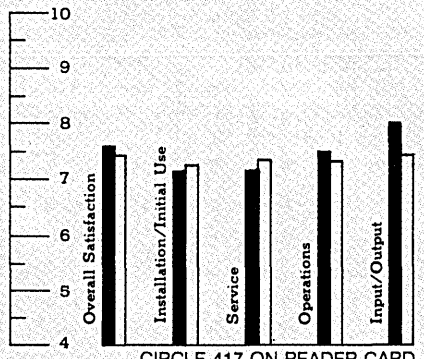
52 responses • 24 users judged features/capabilities outstanding • 9 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 416 ON READER CARD

MAC (Management Accounting for Construction) • Timberline Systems Incorporated, 10550 Southwest Allen Boulevard, Suite 220, Beaverton, OR 97005 • 503-643-9461

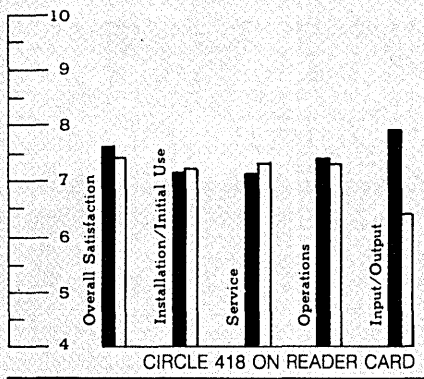
29 responses • 19 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 417 ON READER CARD

CLIENT ACCOUNTING SYSTEM • Tymshare Incorporated, 6655 Southwest Hampton, Tigard, OR 97223 • 503-684-1351

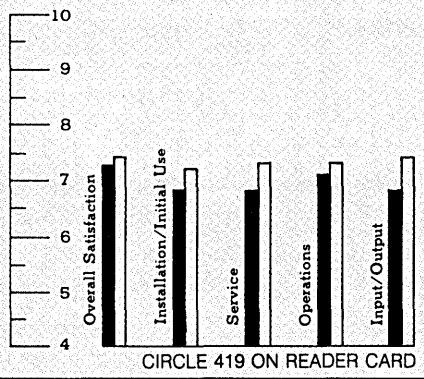
55 responses • 36 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 418 ON READER CARD

FINANCIAL ACCOUNTING SYSTEM • Westinghouse Information Services, PO Box 30, Iowa City, IO 52244 • 319-354-9200 ext. 142

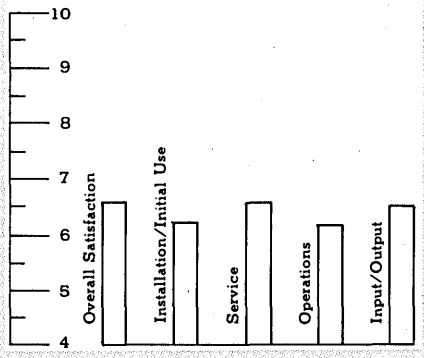
50 responses • 28 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 419 ON READER CARD

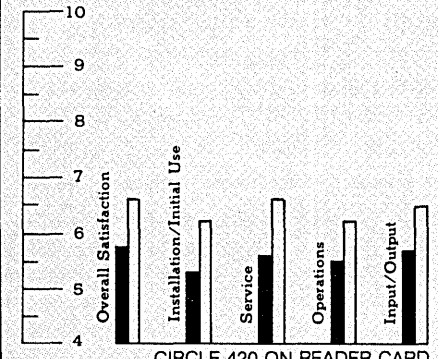
☐ **BANKING/FINANCE PACKAGES Group Average** • 8 packages

217 responses • 44% of users judged features/capabilities outstanding • 16% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



ONLINE BANKING SYSTEM • Bob White Computing & Software, 830 Diane Lane, Naperville, IL 60540 • 312-961-3350

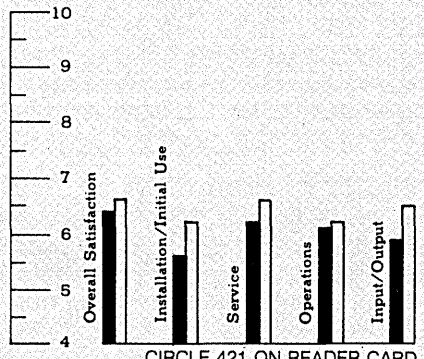
15 responses • 3 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 420 ON READER CARD

THE CANTON SYSTEM/80 • Citizens Automated System, 100 South Central Plaza, Canton, OH 44702 • 216-489-3600

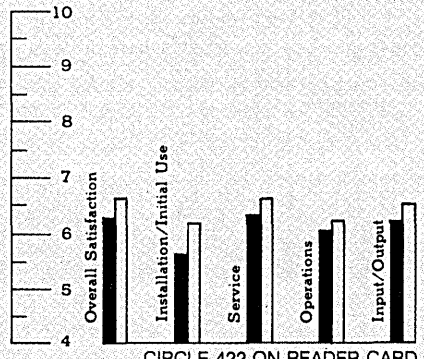
19 responses • 4 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 421 ON READER CARD

PRO-TRUST SYSTEMS • Dyatron Corporation/General Systems Division, PO Box 235, Birmingham, AL 35201 • 205-956-7500

16 responses • 4 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 422 ON READER CARD

Working with the wrong software is like questioning a fish.

Unproductive.

But now there's DigiSoft. We help you choose the micro-software that's right for you.

You can't go wrong with DigiSoft. We've taken all the surprises out of buying software. No guesswork. No regrets. We give you all the information you need to make the right choice. But we don't stop there. You get plenty of professional support after the sale. And we guarantee your full satisfaction.

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You'll get lots of help from our well-trained software consultants. They'll answer your questions, offer solutions and present several alternatives.

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Limited Introductory Offer* 20% Off DMS™ II, and DCalc™ II

DMS is a totally relational database management program that can be part of an integrated financial system. It's compatible with a number of other DigiSoft programs including DCalc II, an electronic spreadsheet. Both can be easily mastered by anyone. If DMS or DCalc II is for you, be sure to take advantage of this special DigiSoft price.

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Name

Title Company

Computer Type

Address

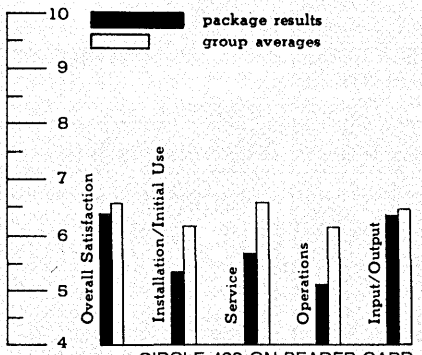
City State Zip

Mail to: DigiSoft, 10901 Red Circle Drive, Mpls., MN 55343 Call 800/328-2777 D

CIRCLE 100 ON READER CARD

INTEGRATED DEPOSITS SYSTEMS • Hogan Systems Incorporated, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-688-1675

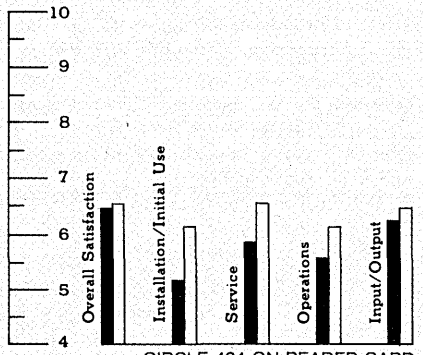
17 responses • 12 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 423 ON READER CARD

TRANSACTION SYSTEMS DEPOSITS • Hogan Systems Incorporated, 14951 Dallas Parkway, Suite 400, Dallas, TX 75240 • 214-688-1675

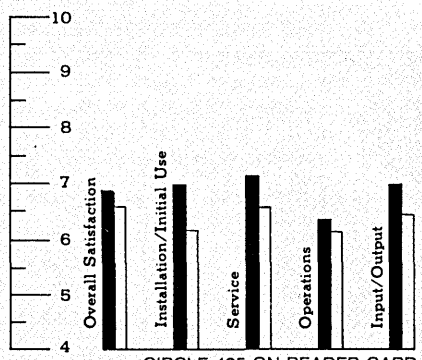
16 responses • 9 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 424 ON READER CARD

SAVINGS & LOAN PACKAGE • Remote Computing Corporation, 1076 East Meadow Circle, Palo Alto, CA 94303 • 415-494-6111

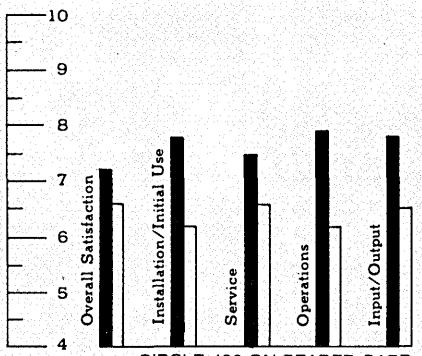
30 responses • 9 users judged features/capabilities outstanding • 14 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.



CIRCLE 425 ON READER CARD

FINANCIAL PLANNING & CONTROL SYSTEM • Saddlebrook Corporation, 76 Rogers Street, Cambridge, MA 02142 • 617-661-8100

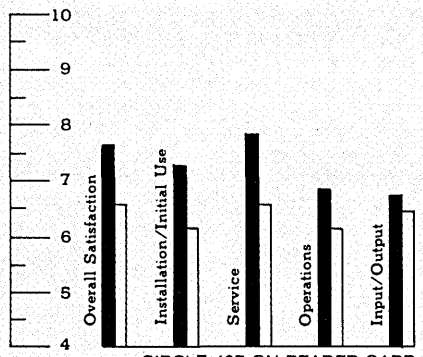
42 responses • 29 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 426 ON READER CARD

PEP • Stockholder Systems Incorporated, 1965 North Park Place, Atlanta, GA 30339 • 404-952-EFTS

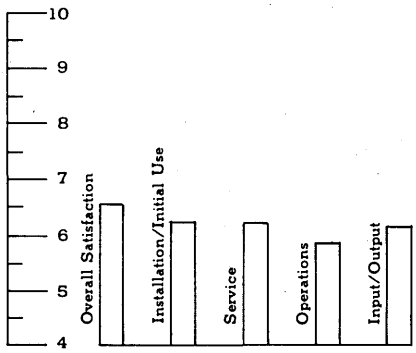
62 responses • 35 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 427 ON READER CARD

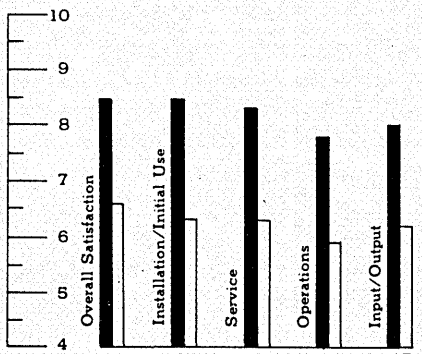
☐ **INSURANCE PACKAGES**
Group Average • 7 packages

209 responses • 38% of users judged features/capabilities outstanding • 6% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



CLAIMFACTS • Erisco Incorporated, 1700 Broadway, New York, NY 10019 • 212-247-2444

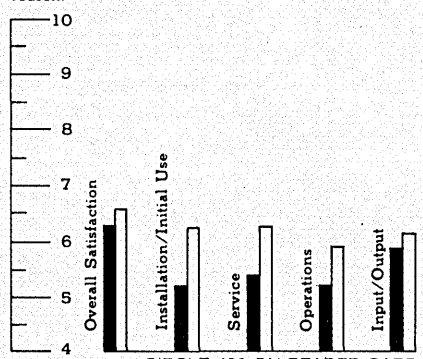
15 responses • 11 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 428 ON READER CARD

LIFE-COMM • Informatics General Corporation, 21031 Ventura Boulevard, Suite 800, Woodland Hills, CA 91364 • 213-887-9040

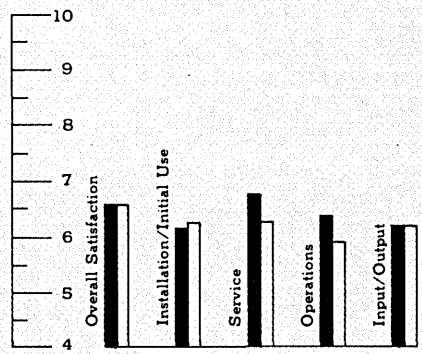
34 responses • 13 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 429 ON READER CARD

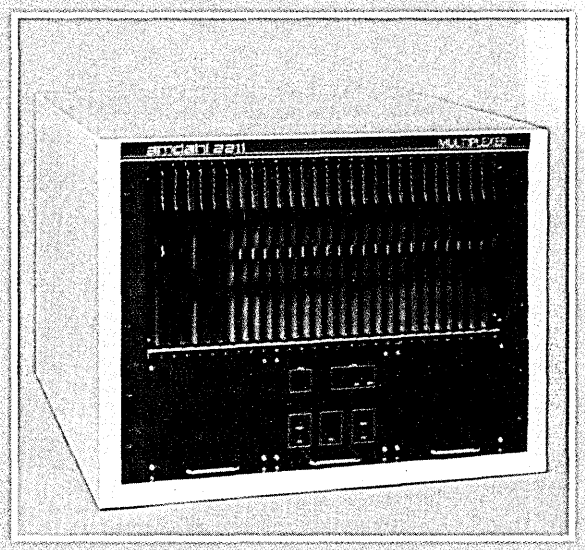
ACCOUNTING BUDGET & COST SYSTEM • Information Systems of America, PO Box 47975, Atlanta, GA 30362 • 404-441-8800

46 responses • 14 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 430 ON READER CARD

If you're looking for the best TDM for your T1 line, look no further.



The good news: T1* lines are now less expensive and more available on many routes than ever before. The best news: Amdahl's new time division multiplexers let you take full advantage.

Our 2211 incorporates all the latest microprocessor design advances including soft-configurability. You can design more efficient networks and reconfigure them quickly and easily when they need changing... all from one central site.

Redundant common control logic, backup power, continuous monitoring, and built-in diagnostics ensure high availability.

The 2211 is perfect for microwave, optical fiber, satellite links, and other types of high speed facilities. A wide selection of data rates and interfaces supports up to 96 channels on one high speed link. This includes Amdahl's 980 Series Limited Distance Modems which extend network diagnostics to the remote terminal or host.

This is the third generation of Amdahl TDMs. Satisfied customers have used thousands of our multiplexers over the last decade. Our reliability record is unsurpassed. Write or call today for full details. The Amdahl 2211 simplifies every aspect of the design, implementation, and operation of your network. Consider the search for the best TDM at an end.

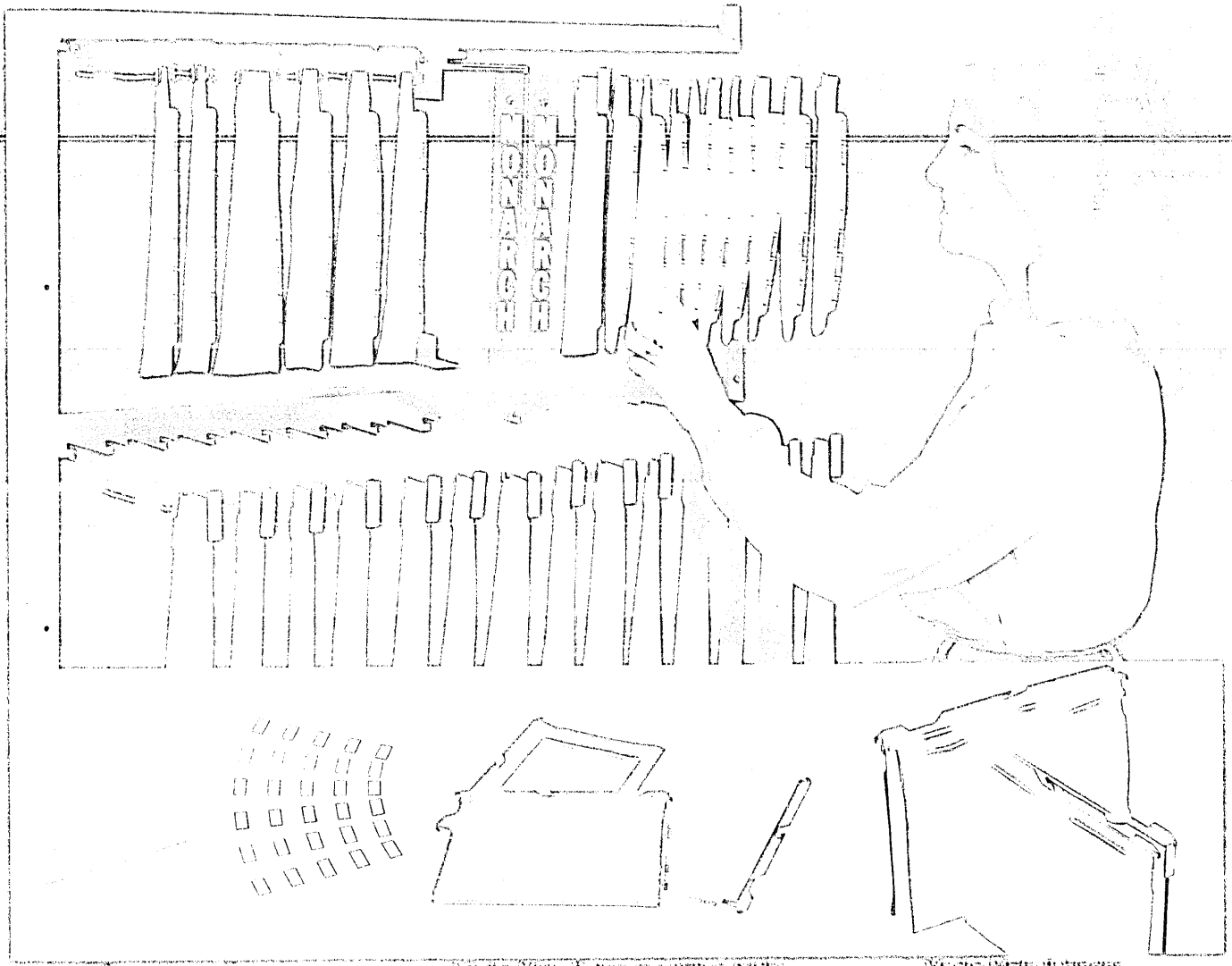
*T1 lines carry over one and one-half million bits of data each second. They are available from your common carrier in an increasing number of locations.

amdahl **COMMUNICATIONS SYSTEMS DIVISION**

2500 Walnut Ave., Marina del Rey, CA 90291
(213) 822-3202

CIRCLE 107 ON READER CARD

WE'VE MADE IT ALL HANG TOGETHER



Two color coding systems | Media Mate II documentation folder | Media Mate I divider

NEW MEDIA MATE II™ SPEEDS DOCUMENTATION FILING

It doesn't make sense to go separately for documentation every time a program needs updating. Systems analysis and programmers make expensive file clerks. And the rest of your staff has better things to do with your time.

New Media Mate II™ from MONARCH speeds filing and retrieving with a choice of two color coding systems. And Media Mate II declares search and retrieval times by allowing related documents to be filed together — even if their sizes are not related. Media Mate II keeps all forms of documentation neat, organized and under control. And with a complete system of components to choose from, Media Mate II increases productivity at every point of use.

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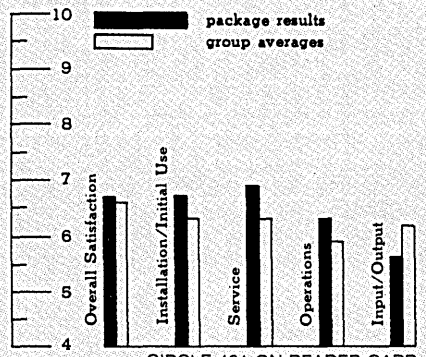
CIRCLE 108 ON READER CARD

BOND & STOCK SYSTEM • Information Systems of America, PO Box 47975, Atlanta, GA 30362 • 404-441-8800

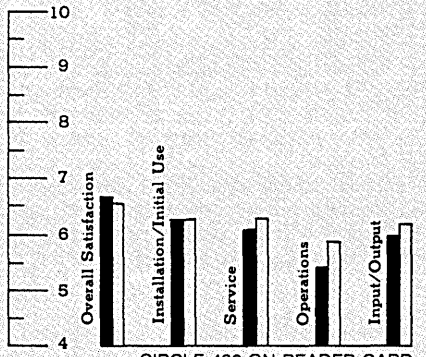
67 responses • 19 users judged features/capabilities outstanding • 8 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 431 ON READER CARD

CREDIT LIFE ADMINISTRATION SYSTEM • Logic Incorporated, 2720 Stemmons Freeway, 1100 Stemmons Tower South, Dallas, TX 75207 • 214-630-6131

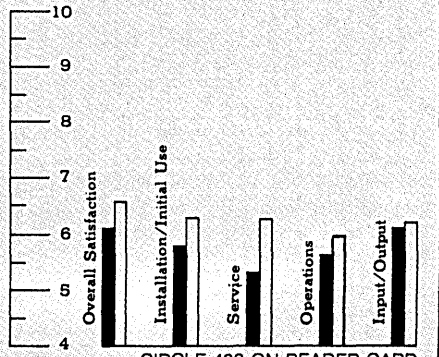
15 responses • 7 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 432 ON READER CARD

PALLM-LIFE • PALLM Incorporated, 2606 Fortune Circle, East Drive, Indianapolis, IN 46241 • 317-243-7591

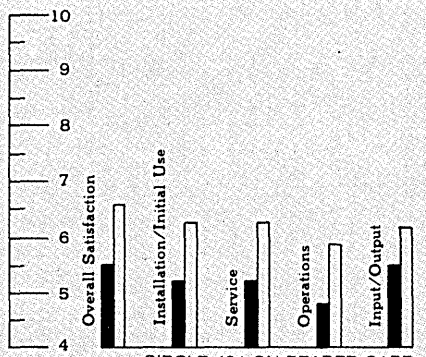
17 responses • 5 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 433 ON READER CARD

INSURANCE MANAGEMENT INFORMATION SYSTEM • Policy Management Systems Corporation, PO Box 10, Columbia, SC 29202 • 803-748-2000

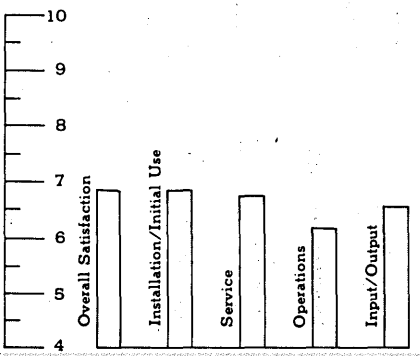
15 responses • 3 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 434 ON READER CARD

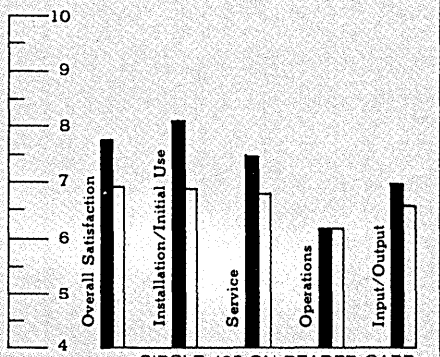
☐ **MANUFACTURING PACKAGES Group Average** • 5 packages

207 responses • 46% of users judged features/capabilities outstanding • 13% of users actively seeking to replace package, with 3% citing unsatisfactory performance as reason.



MANMAN • Ask Computer Systems Incorporated, 730 Distel Drive, Los Altos, CA 94022 • 415-969-4442

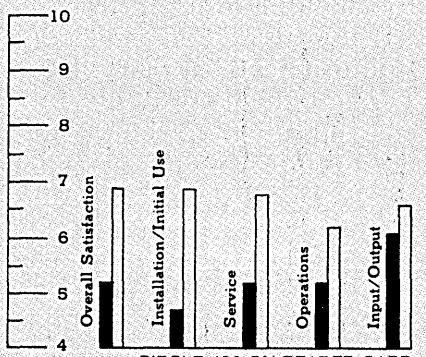
65 responses • 33 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 435 ON READER CARD

MINI-MIZ • Automated Quill Incorporated, Top Floor, 3501 South Corona Street, Englewood, CO 80110 • 303-761-2722

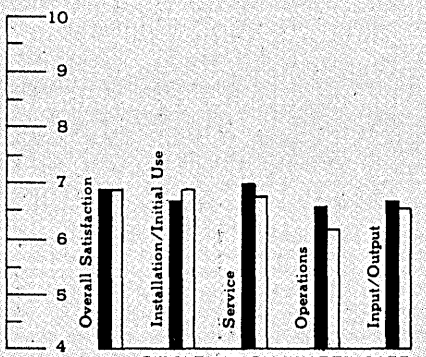
29 responses • 4 users judged features/capabilities outstanding • 9 users actively seeking to replace package, with 4 citing unsatisfactory performance as reason.



CIRCLE 436 ON READER CARD

MRPS • Cincom Systems Incorporated, 2300 Montana Avenue, Cincinnati, OH 45211 • 513-662-2300

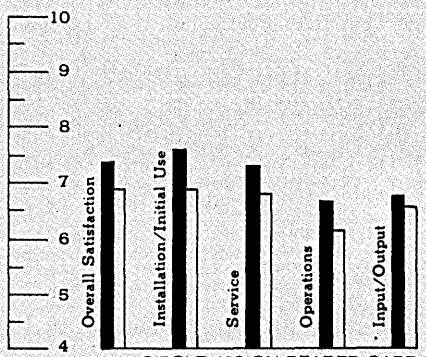
15 responses • 8 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 437 ON READER CARD

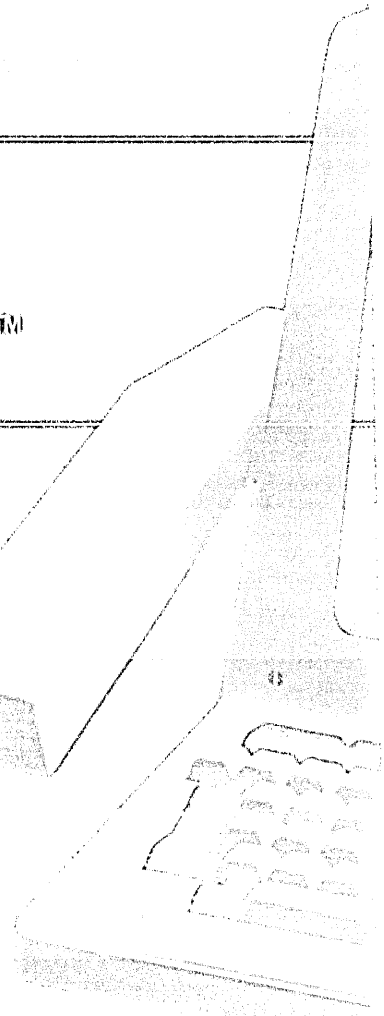
UNIVATION • Management Science Incorporated, 4321 West College Avenue, Appleton, WI 45914 • 414-739-3616

57 responses • 36 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 438 ON READER CARD

"GTE Telenet provides 24-hour, 7-day-a-week worldwide TELEMAIL™ service thanks to the unique capabilities of the Tandem NonStop™ Computer System."



© Thomas Taylor, Vice President
Network Applications & Terminals
GTE Telenet Communications Corporation

"As the world's most advanced computer-based message system, GTE's TELEMAIL™ service assures our customers one thing: that their information will get to the right place, and on time. Without excuses. The certainty behind that guarantee is our Tandem NonStop computer system.

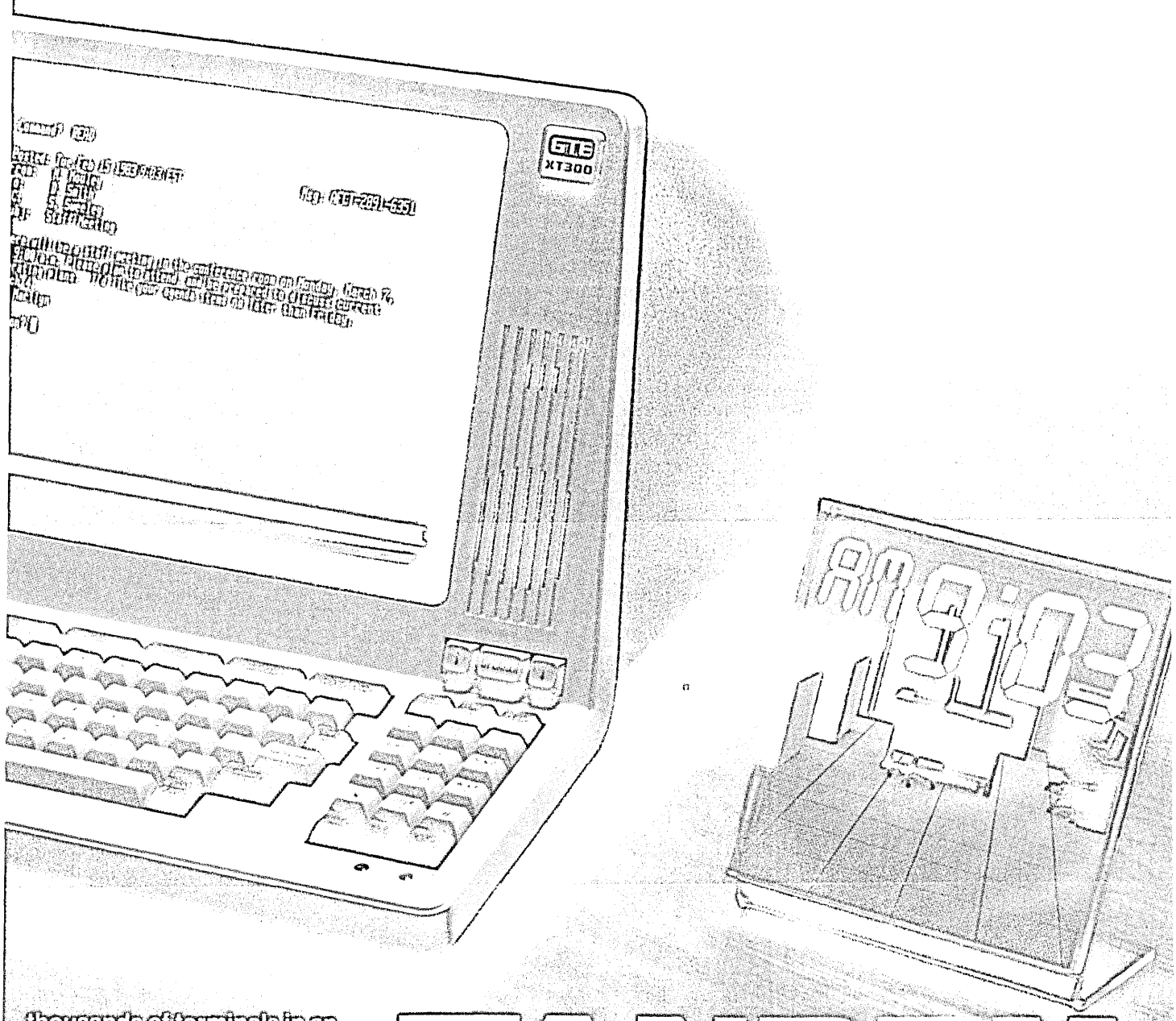
"Currently, more than 100 of the nation's largest corporations, government agencies, and other associations are using TELEMAIL to send and receive information within their organizations, anywhere in the world. But our TELEMAIL system is more than just a super-efficient message center. It also lets users enter orders from the field, manage sales and distribution channels, even facilitate financial reporting and electronic publishing.

"Clearly, with people entrusting critical applications like these to the system, we needed a computer that could not only provide 100% availability, but could ensure that data would not get lost or destroyed in case of a failure or outage.

"Almost as important in our selection of the Tandem computer was the ease with which we can expand the system. Tandem's modular design allowed us to start with a system that met our early needs, and then grow with us, consistent with our expanding business requirements. We didn't have to rewrite any of our software—just add processors and disc storage as we went along.

"Whether it's providing the TELEMAIL service or supplying an entire TELEMAIL system, we look forward to satisfying more and more of our customers' communications needs. And the contribution of the Tandem NonStop system is essential."

The NonStop System.
The only system on the market today that can provide a distributed network of up to 255 systems, each ranging from 2 to 16 processors, supporting



thousands of terminals in an on-line, transaction-based environment.

Tandem. Fully supported by a worldwide sales, training, service and manufacturing organization.

For information on how a Tandem NonStop computing system can improve your company's competitive posture and P/L statement, call your local sales office or Tandem Computers Incorporated, 19333 Vallco Parkway, Cupertino, California 95014, U.S.A. Toll Free 800-538-3114 or (408) 725-6000 in California.

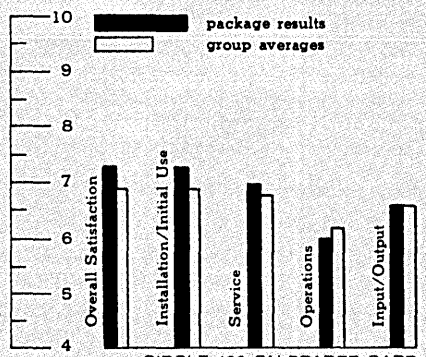
TANDEM

NonStop Computing Systems

CIRCLE 109 ON READER CARD

MAXCIM • NCA Corporation, 388 Oakmead Parkway, Sunnyvale, CA 94086 • 408-245-7990

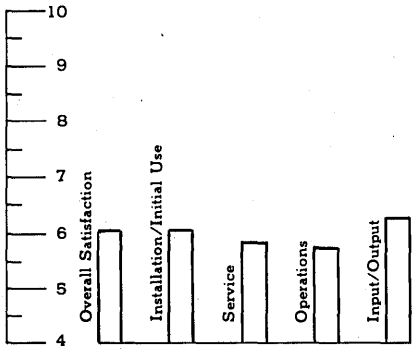
41 responses • 21 users judged features/capabilities outstanding • 7 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 439 ON READER CARD

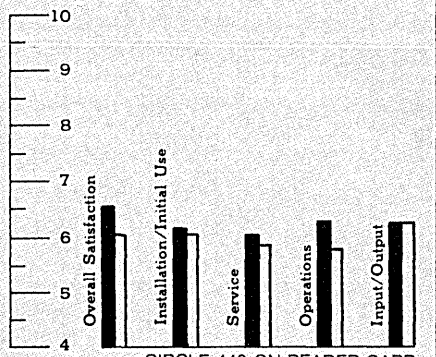
☐ INDUSTRIAL MANAGEMENT PACKAGES
Group Average • 5 packages

104 responses • 40% of users judged features/capabilities outstanding • 7% of users actively seeking to replace package, with 0% citing unsatisfactory performance as reason.



INVENTORY MANAGEMENT SYSTEM • American Software Incorporated, 443 East Paces Ferry Road, Atlanta, GA 30305 • 404-261-4381

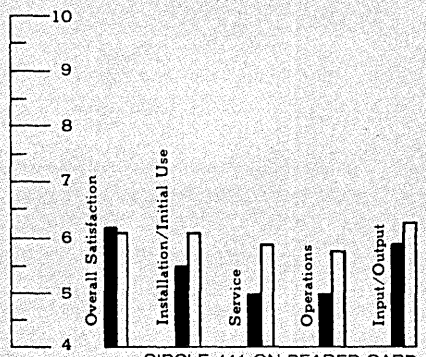
15 responses • 9 users judged features/capabilities outstanding • 1 user actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 440 ON READER CARD

DMS • Distribution Management Systems, 81 Hartwell Avenue, Lexington, MA 02173 • 617-863-5000

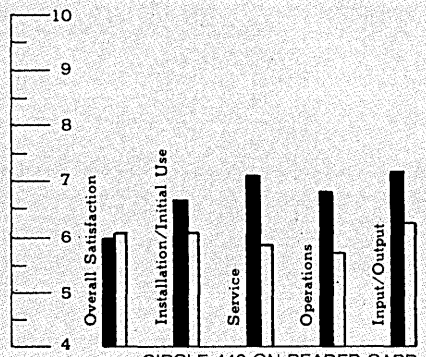
17 responses • 7 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 441 ON READER CARD

IMCS • Interactive Information Systems, 10 Knollcrest Drive, Cincinnati, OH 45237 • 513-761-0132

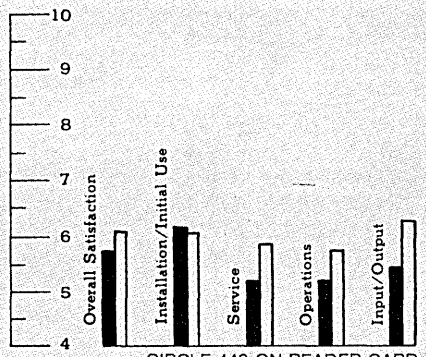
16 responses • 7 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 442 ON READER CARD

MSA INVENTORY & PURCHASING SYSTEM • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

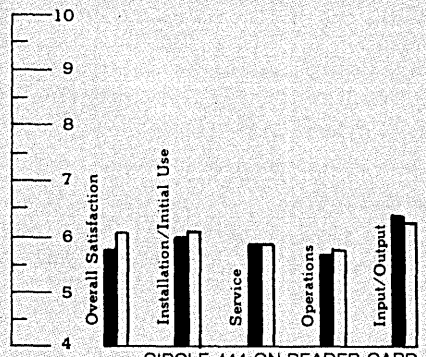
41 responses • 6 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 443 ON READER CARD

CIDS • Rand Information Systems, 98 Battery Street, San Francisco, CA 94111 • 415-392-2500

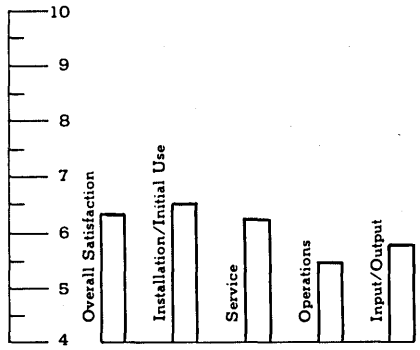
15 responses • 6 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 444 ON READER CARD

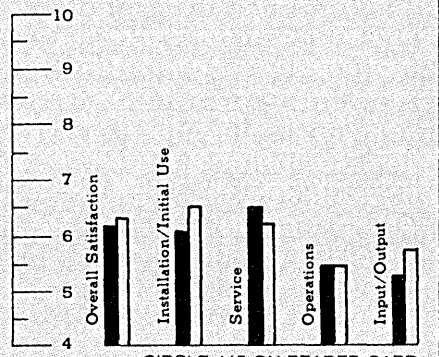
☐ PROJECT MANAGEMENT PACKAGES
Group Average • 3 packages

179 responses • 34% of users judged features/capabilities outstanding • 13% of users actively seeking to replace package, with 4% citing unsatisfactory performance as reason.



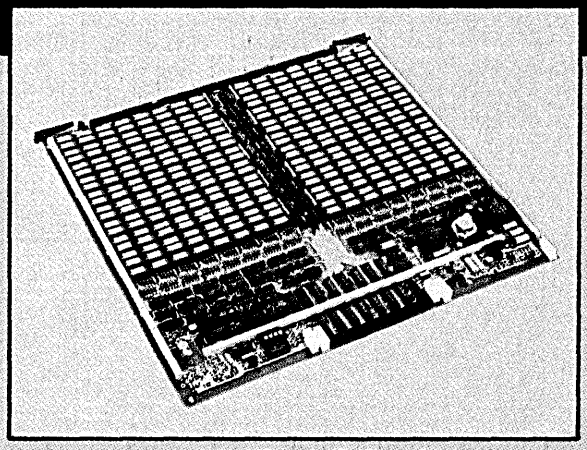
PAC SYSTEM • AGS Management Systems, 890 Valley Forge Plaza, King of Prussia, PA 19406 • 215-265-1550

59 responses • 16 users judged features/capabilities outstanding • 5 users actively seeking to replace package, with 3 citing unsatisfactory performance as reason.

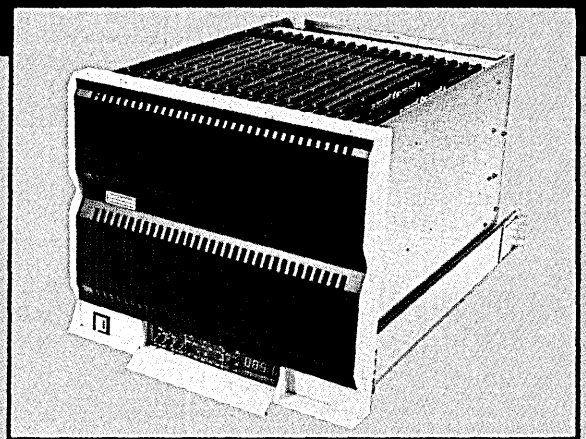


CIRCLE 445 ON READER CARD

Perk up your Perkin-Elmer 3200 with DATARAM MEMORY



2.0MB ADD-IN



32MB BULK SEMI

Dataram Corporation, the leader in Perkin-Elmer compatible memory, introduces two new memory products for the Perkin-Elmer 3200 — with storage capacities from 256KB to 128MB. A dramatic demonstration of our ongoing commitment to Perkin-Elmer users, these new memory products are the latest in an impressive family of products that has been meeting the memory needs of the minicomputer market since 1967.

Both feature speed, capacity, reliability, performance...and low price. Features you won't find in memory from any other Perkin-Elmer memory supplier. Products such as high-performance BULK SEMI that are available only from Dataram. All good reasons why Perkin-Elmer users should look to Dataram when they're looking to perk up their 3200 Series computers.

Dataram 2.0MB DR-330 semiconductor ADD-IN memory operates across the complete range of Perkin-Elmer 3200 Series — 3210, 3220, 3230, 3240 and 3250. Smaller capacities of 1.0MB, 512KB, and 256KB are also available and all are compatible with Perkin-Elmer memory management and ECC. Sockets are standard and a spare on-board RAM is provided. These simple-to-install, highly reliable memory boards are backed up by Dataram's standard one-year warranty.

Write or call now for more information:
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Princeton Road, Cranbury, NJ 08512
609-799-0071

Dataram's new BS-702, the industry's only high-performance BULK SEMI to interface to Perkin-Elmer's 3200 Series. With everything you need to get optimum performance from your 3200 system. Compact size — 32 MB in 15¾". The I/O driver required to support the BS-702. And the impressive capability to drive up to four 32MB chassis...for a whopping capacity of 128MB!

Solid-state speed enables the BULK SEMI to run at the full SELCH rate of 4.0MB/sec. More than that, solid-state technology means high reliability, further enhanced by standard Dataram features like error correcting and off-line test capability.

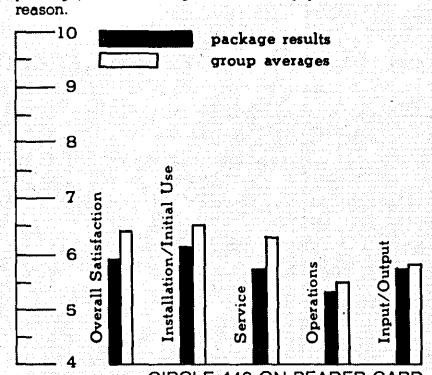
And when you talk about capability, you'll talk about the BS-702's unique dual-port operation that allows you to bring your image processing, array processing, or data acquisition input in on one port and off-load to your 3200 on the other.

DATARAM CORPORATION

CIRCLE 110 ON READER CARD

N5500 PROJECT PLANNING & CONTROL SYSTEM • Nichols & Company Incorporated, 5839 Green Valley Circle, Suite 104, Culver City, CA 90230 • 213-670-6400

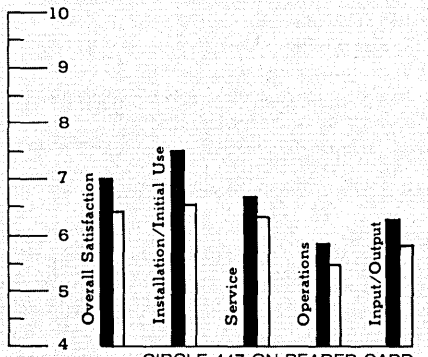
54 responses • 16 users judged features/capabilities outstanding • 8 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 446 ON READER CARD

FORESIGHT • United Information Services, 5454 West 110th Street, Overland Park, KS 66211 • 913-341-9161

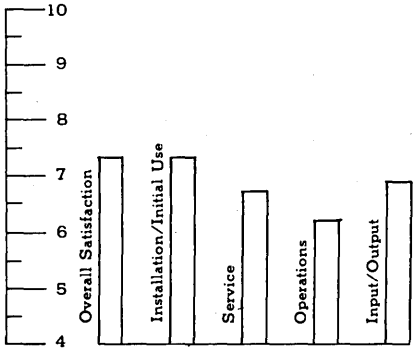
66 responses • 29 users judged features/capabilities outstanding • 11 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 447 ON READER CARD

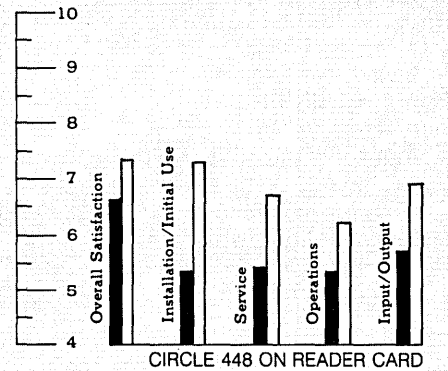
☐ **BUSINESS/OFFICE ADMINISTRATION PACKAGES**
Group Average • 6 packages

262 responses • 45% of users judged features/capabilities outstanding • 11% of users actively seeking to replace package, with 1% citing unsatisfactory performance as reason.



SALES FORECASTING SYSTEM • American Software Incorporated, 443 East Paces Ferry Road, Atlanta, GA 30305 • 404-261-4381

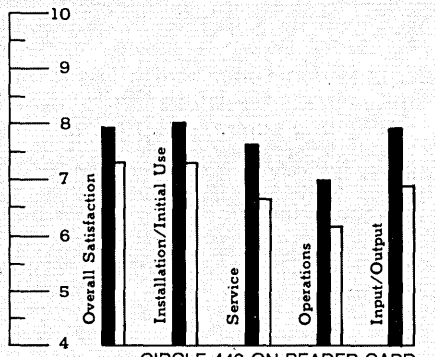
25 responses • 15 users judged features/capabilities outstanding • 2 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 448 ON READER CARD

EDP AUDITOR • Cullinane Database Systems Incorporated, 400 Blue Hill Drive, Westwood, MA 02090 • 617-329-7700

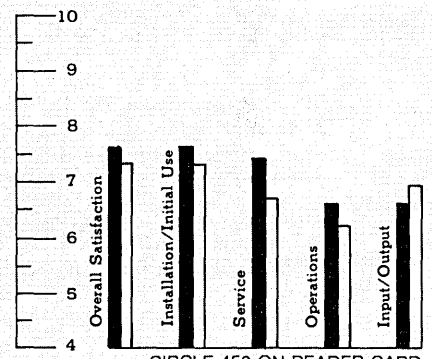
35 responses • 20 users judged features/capabilities outstanding • 0 users actively seeking to replace package.



CIRCLE 449 ON READER CARD

CARRIER ROUTE CODING SYSTEM • List Processing Company Incorporated, 555 Waters Edge, Lombard, IL 60148 • 312-932-7000

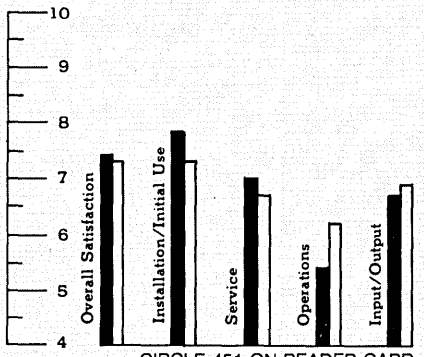
64 responses • 30 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 450 ON READER CARD

SPSS BATCH SYSTEM • SPSS Incorporated, 444 North Michigan Avenue, Suite 3000, Chicago, IL 60611 • 312-329-2400

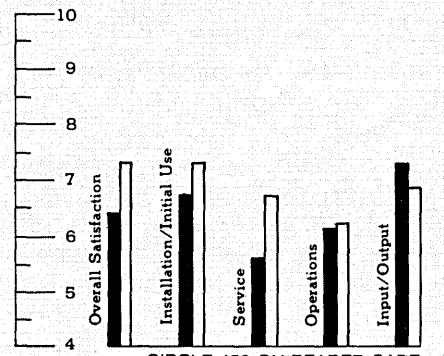
67 responses • 28 users judged features/capabilities outstanding • 8 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 451 ON READER CARD

THE AUDIT ANALYZER • TSI International, 50 Washington Street, Norwalk, CT 06854 • 203-853-2884

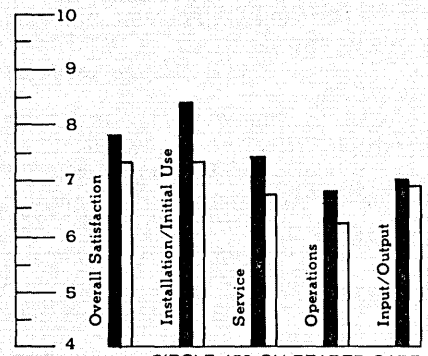
40 responses • 12 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 452 ON READER CARD

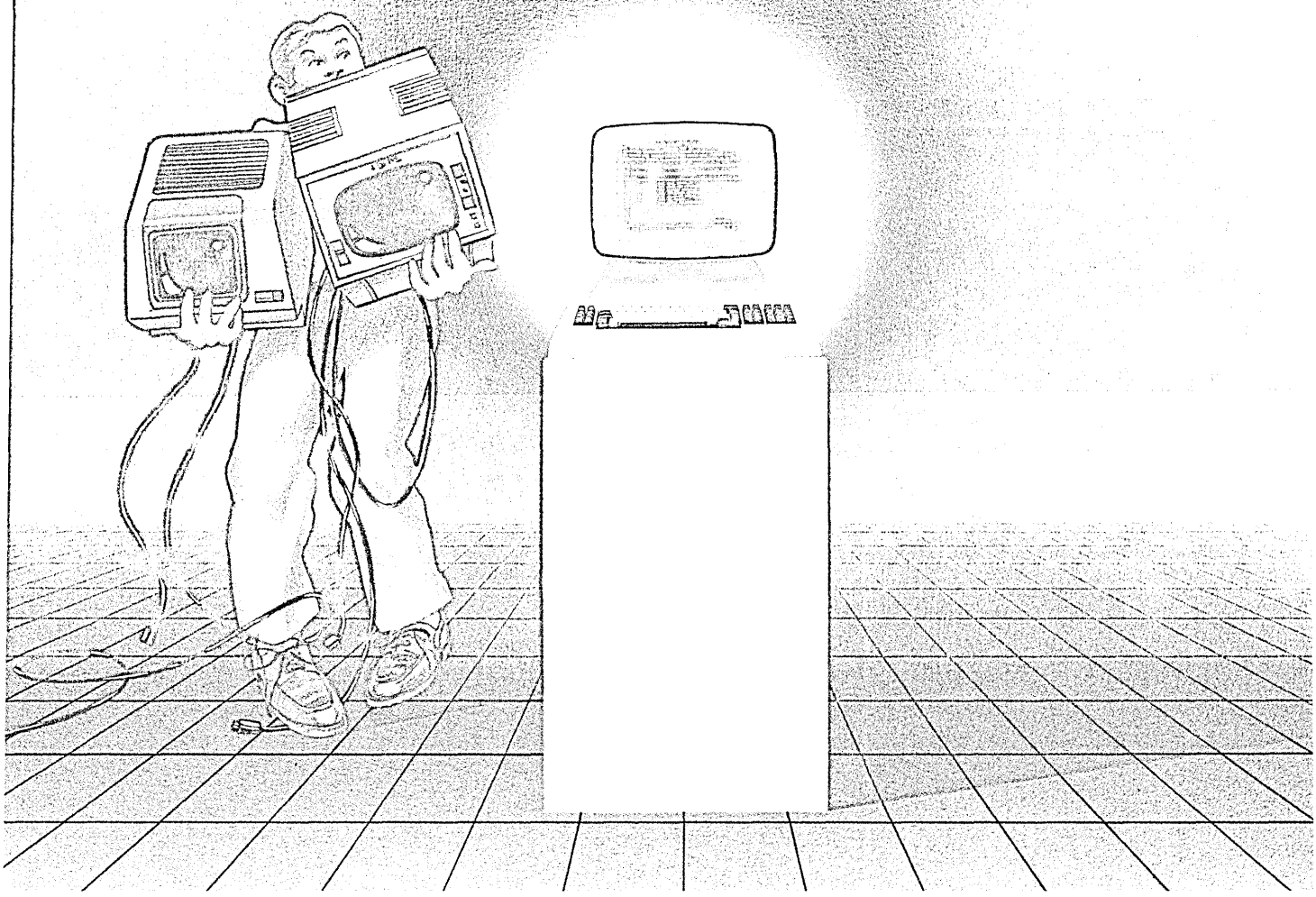
VISICALC • Visicorp, 2895 Zanker Road, San Jose, CA 95134 • 408-946-9000

31 responses • 11 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 453 ON READER CARD

Why two when one will do?



Lee Data's universal terminal system design provides access to both 3270 and VT100 applications.

Now with Lee Data's new 3270/Async Communication System (Series 400) you can eliminate the cost and inconvenience of needing separate displays for access to 3270 and VT100 applications.

The Lee Data universal terminal system approach is another innovative Lee Data design that allows a single Lee Data display to access applications and data from an IBM CPU, a non-IBM system such as DEC, H-P or Prime, and timesharing services. And a simple command entered from the display keyboard is all that is required to switch from 3270 to VT100 operating mode and back again. What could be easier?

The Series 400 System incorporates a new hybrid approach to system operation that is simpler and more efficient than protocol conversion. This approach allows a Lee Data controller to provide dedicated 3270 and VT100 processors for concurrent, but independent application access.

In addition, a single Lee Data controller provides you 3270 compatibility via either a remote BSC or SNA/SDLC or a local SNA or non-SNA interface, as well as 1 to 16 RS232C ports for your asynchronous application needs. Line speeds available are from 300 to 19,200 BPS.

The Series 400 System also provides you support for up to 32 devices, including Lee Data's unique All-In-One display that offers dynamic selection of 4 screen sizes—three 80-column and one 132-column. Lee Data's 3279-compatible color displays and a full line of printers are also available as part of the 32-device complement.

3270 and VT100 capabilities combined in a single terminal system—a reality with the new 3270-plus-Async system from Lee Data.

Discover what our system can do for your company's terminal network. Call our system specialists toll free:

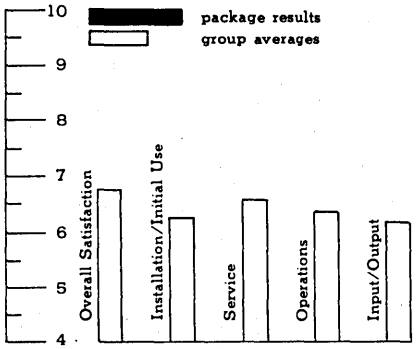
800/328-3998.

Designers of innovative systems for the information worker

10206 Crosstown Circle
Minneapolis, MN 55344

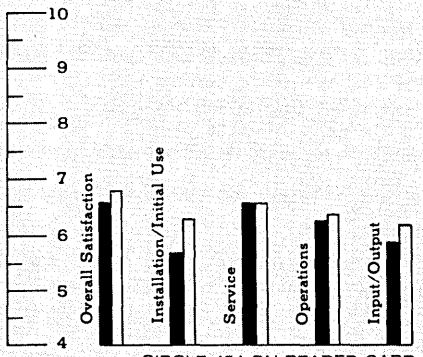
☐ PAYROLL/PERSONNEL PACKAGES Group Average • 4 packages

211 responses • 42% of users judged features/capabilities outstanding • 7% of users actively seeking to replace package, with 2% citing unsatisfactory performance as reason.



CYBORG PAYROLL/PERSONNEL SYSTEM • Cyborg Systems Incorporated, 2 North Riverside Plaza, Suite 2160, Chicago, IL 60606 • 312-454-1865

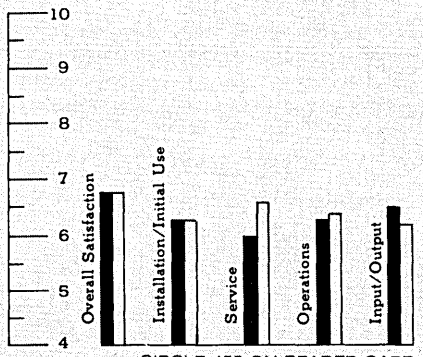
52 responses • 17 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 2 citing unsatisfactory performance as reason.



CIRCLE 454 ON READER CARD

INSCI HUMAN RESOURCE SYSTEM • Information Science Incorporated, 95 Chestnut Ridge Road, Montvale, NJ 07645 • 201-391-1600

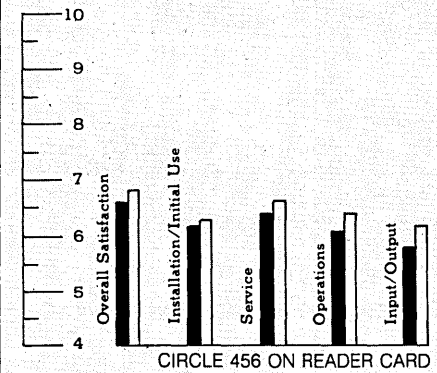
57 responses • 21 users judged features/capabilities outstanding • 6 users actively seeking to replace package, with 1 citing unsatisfactory performance as reason.



CIRCLE 455 ON READER CARD

MSA PAYROLL SYSTEM • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

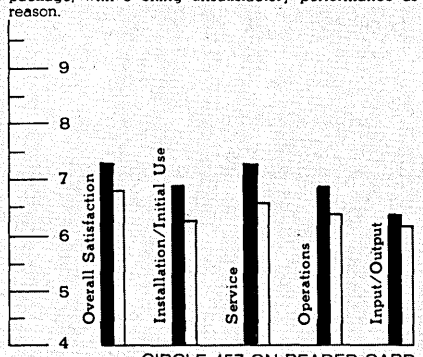
57 responses • 22 users judged features/capabilities outstanding • 4 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 456 ON READER CARD

MSA PERSONNEL AND REPORTING SYSTEM • Management Science America Incorporated, 3445 Peachtree Road Northeast, Atlanta, GA 30326 • 404-262-2376

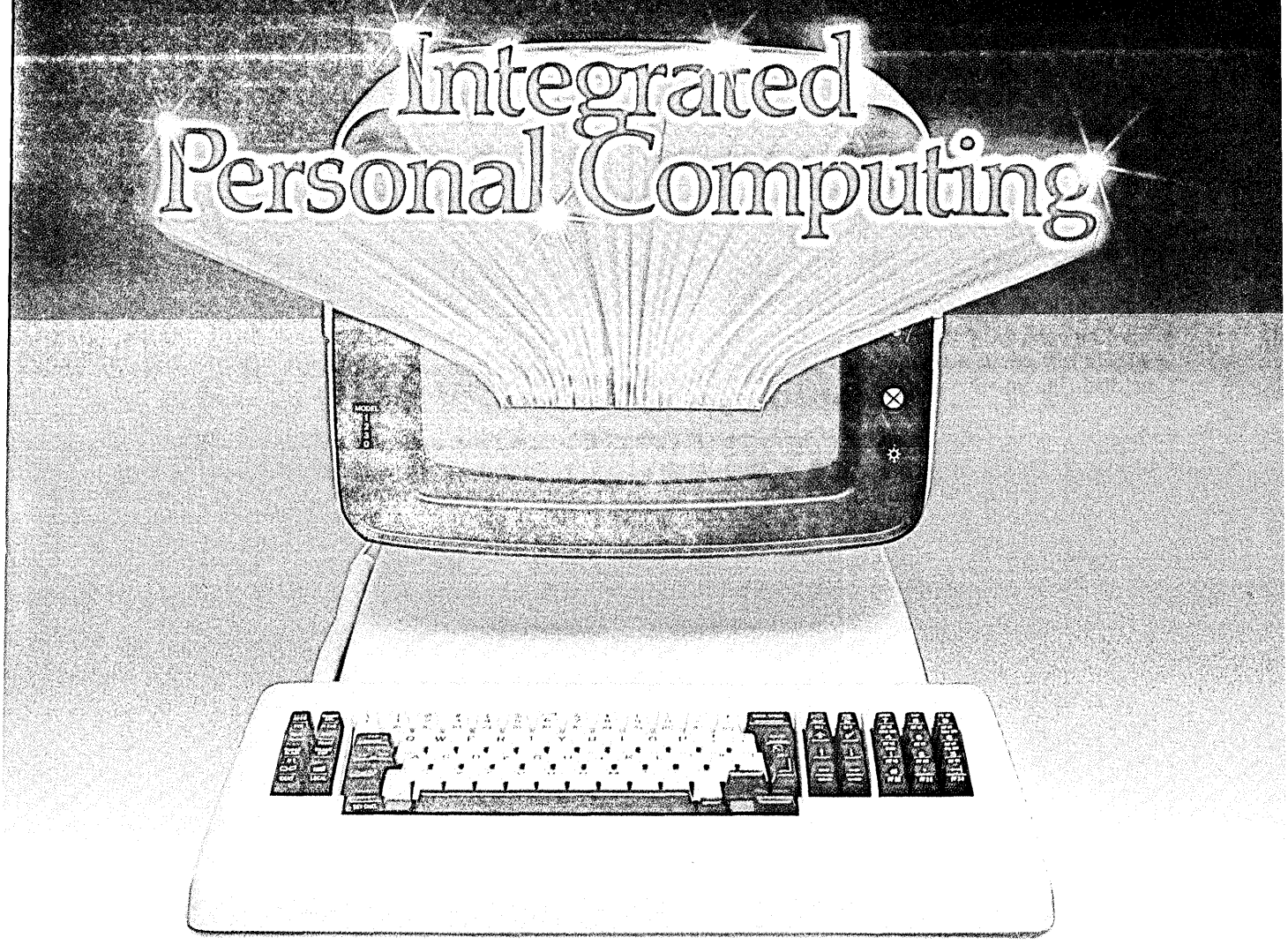
45 responses • 27 users judged features/capabilities outstanding • 3 users actively seeking to replace package, with 0 citing unsatisfactory performance as reason.



CIRCLE 457 ON READER CARD

More versatility than ever with Lee Data's 3270 terminal system

Integrated Personal Computing



Lee Data's new Personal Workstation now lets you enjoy all the advantages of professional business computing plus have both 3270 and asynchronous access to CPU-based applications—all from the same Lee Data workstation!

That's right! Completely-integrated, IBM-compatible personal computing —offering the latest functional capabilities and these value-added features:

Support for a wide variety of popular applications, including all compatible IBM Personal Computer software.

Personal Workstation-to-host file transfer capabilities that allow transfer of data from CPU-based files through existing system communications networks, meaning no new communications networks are ever required.

A single board design that incorporates both display station and printer support, as well as 128K of random access memory standard—with up to 256K of expanded memory on the same board. Plus a dual diskette drive feature that offers two 5¼-inch floppy diskettes, each with 320K of storage capacity!

And four standard system expansion slots for add-on requirements as your needs change.

3270 and asynchronous application access and now personal computing, too—all part of an advanced system design by Lee Data.

Let us show you how easily personal computing can become a part of your company's terminal system.

Call our system specialists toll free:

800/328-3998

Designers of innovative systems for the information worker

LEE DATA CORPORATION

10206 Crosstown Circle
Minneapolis, MN 55344

CIRCLE 112 ON READER CARD

What if you could actually "soup up" your data center?

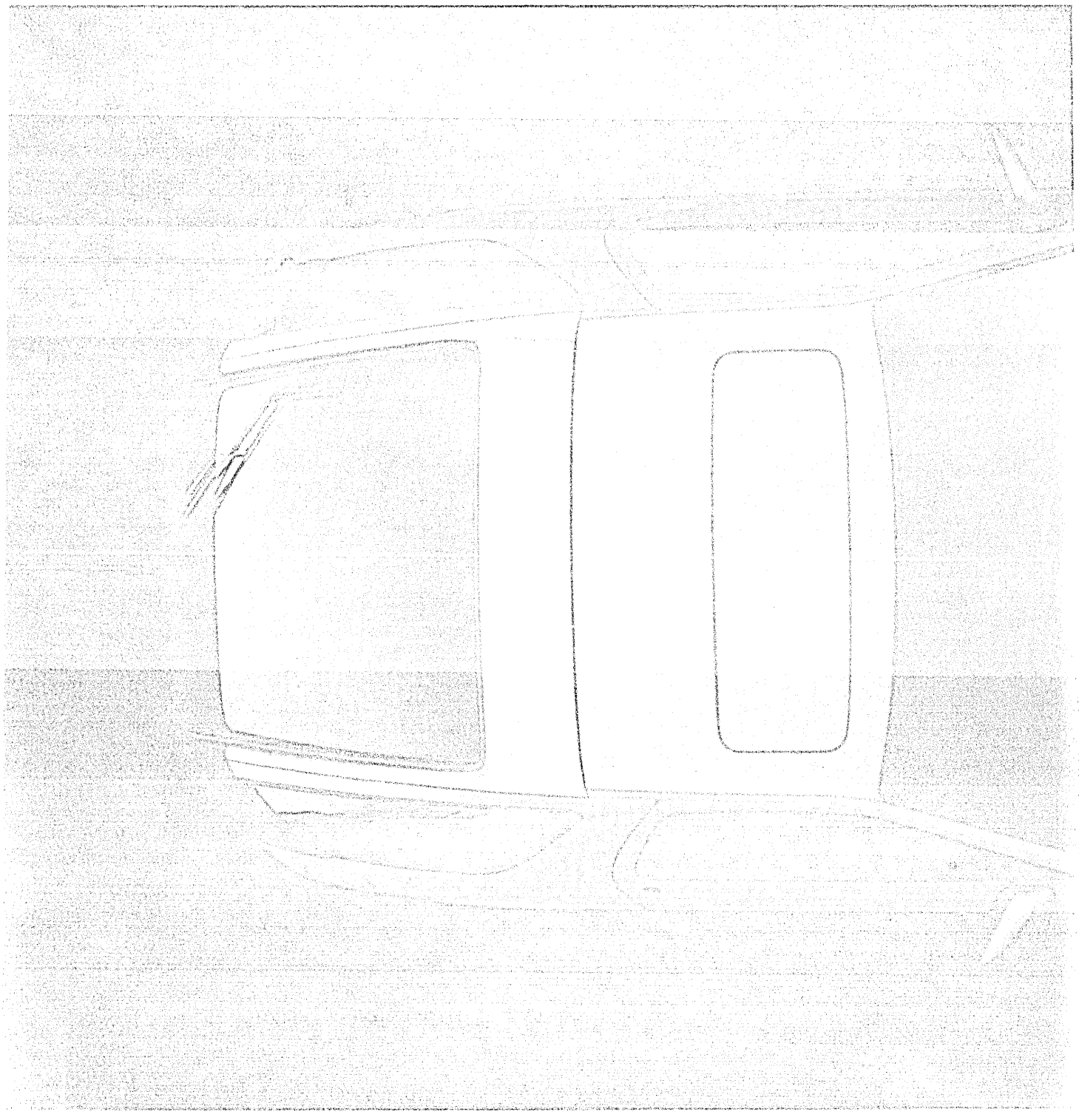
Increase your production …improve your productivity …all within existing resources? Run faster. Run better. Run more efficiently.

You can.

One software company can help you take complete charge of your entire production process…and manage it more efficiently. That software company is UCC.

Our Production Workload Management systems move the workload to, through, and out of the data center On time. Every time.

UCC software centralizes control of all work areas.



The best way to protect software is to copyright it and register it as a trade secret. Sound like a contradiction? It's not.

PROGRAM PURLOINERS DOUBLY DETERRED

by Roger M. Milgrim

For the first two decades hardware reigned, with software thrown in gratis by the industry leader. In 1970, presumably in response to antitrust pressures, IBM began offering hardware and software separately. With that famous unbundling, the age of software began.

Since that time hardware has been shrinking, speeding up, and costing less, and the significance of software as a technological phenomenon has been on the upswing. More money is spent on the development of software today than on any other single technological asset. (In 1978 the aggregate value of domestic software was estimated by the Supreme Court to exceed $70 billion.) Programmers are in critically short supply and becoming more so. We are told that ultimately the computer will center on software in much the same sense as the individual motion picture embodied upon film medium is dominant, not the projector or the sound system.

That glimpse of the future is particularly telling at the dawn of the home computer age. Today that gawky newcomer primarily yields rather finite scientific, financial, and word processing capabilities, and ubiquitous games. But soon it will offer the long-awaited electronic mail system, the link to general and topical news, and an important gateway to a database that is likely to expand fantastically over the coming decades, with concomitant growth in software to permit rapid retrieval and, yes, reliable billing to users.

Thus, computer software, already vital in our society, is expected to increase in importance. It is worthwhile, therefore, to consider which forms of protection are available today for software and ask how they can best be employed. The answer, it will be seen, is that most people who engage in the increasingly expensive, arguably risky, but potentially very profitable game of developing software will find themselves best protected by a combination of existing methods.

Three forms of legal protection are available to safeguard software. Two of those, patent and copyright, flow from federal statutes. The other, trade secret, is court-made law. While no one of these forms is ideally suited to protect this new technology, they are the only games in town until a suitable, tailored solution comes into effect. Because their availability and utility is neither unlimited nor perfect, choices must be made, techniques developed. My remarks are intended to aid in informed decision-making.

In the ferment of the early computer industry, there appears to have been little support for bestowing upon software the strongest form of protection available for technology under our legal system. Mainframe computer manufacturers, regarding their profits as a function of hardware sales, feared software patents as possible barriers—unwanted tollgates—to development of the industry. They argued that the patent laws would be improperly applied to software programs because those programs are no more than mathematical expressions that no one invented, but that were always implicit in the world of mathematical formulation and were only newly expressed or discovered. Reasoning thus, opponents of the patentability of software assert that invention based on algorithm does not fall into any of the cognizable classes of matter protected by the Patent Act of 1952, even if it meets the otherwise awesome patent requirements of novelty, utility, and nonobviousness.

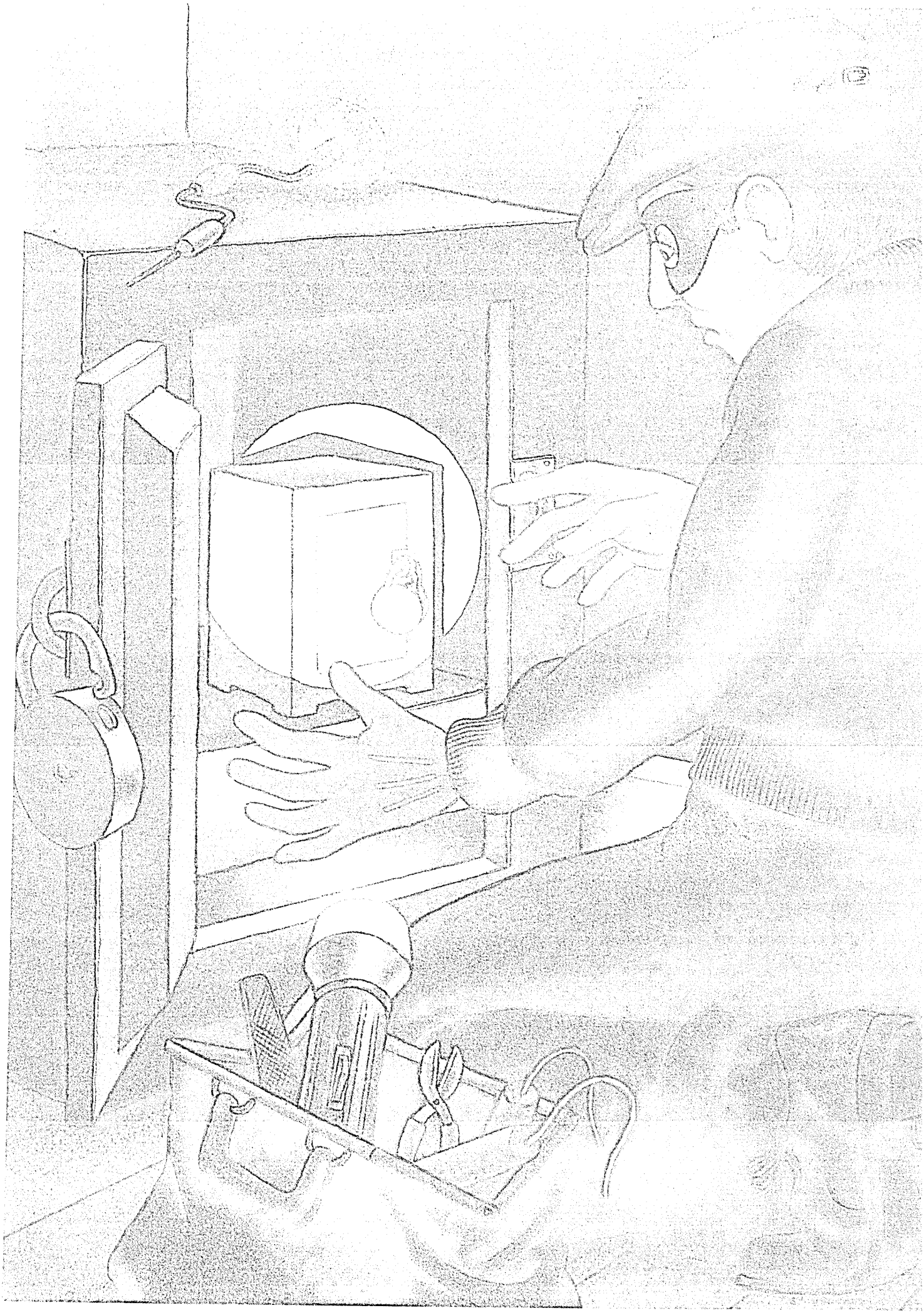
While numerous efforts have been made to achieve patent status for software or firmware, the bulk of those attempts have failed, (e.g., *Parker* v. *Flook*, 1978). Although patent protection for inventions continuing or stressing software is not totally ruled out, the extent to which such protection may be available is unclear, and the rewards may be small. Patent application fees have recently increased fivefold. Patent prosecution is expensive, costing many thousands of dollars. Long delays are typical. And, even where patents have been issued, judicial reception has been largely negative. All in all, patent protection is ill suited to this rapidly evolving form of technology, which will often be obsolete by the time patent issuance might be achieved.

COPYRIGHT COVERAGE CHANGES

From the advent of the computer until the Copyright Act of 1976, it was not at all clear whether our constitutionally rooted copyright laws could protect computer programs. As recently as 1980, John Hersey, the sole member of the literary world on the President's Commission to Study the New Technologies (CONTU), posited that inclusion of computer programs as copyrightable works is incompatible with our copyright law, which Hersey argued is constitutionally intended to protect "writings"—literary and literate expressions—and not utilitarian sets and subsets of mathematical expression. The reasoning set forth in that dissent is, incidentally, apparently prophetic in terms of worldwide practice. To date, aside from the United States, which has recently adopted its new copyright law, only the Republic of the Philippines and one Japanese trial court opinion in December 1982 are reported to extend copyright protection to computer software.

The landmark Copyright Act of 1909 quickly proved unequal to new technologies such as phonograph records, radio, motion pictures, and talkies. Need for new legislation was apparent commencing in the 1920s, and numerous interest groups, from the film to the radio and infant television industries, took up the cudgel. The product of much agitation, the 1976 act took more than 30 years to nurture, and emerged in bloated form—roughly 75 pages of print to the 1909 act's 25 and, in the words of one thoughtful copyright expert, written as if by people for whom English is a second language. The 1976 act did not take effect until Jan. 1, 1978, and has yet to be extensively explored by the courts.

It provides the first express statutory protection for computer software, that current reigning queen of American R&D. Specifically, the 1976 act embraced computer programs as literary works, and by a 1980 amendment made that congressional intention even clearer by expressly dealing with certain aspects of use and use-related reproduction of computer programs.



The 1976 Copyright Act provides the first express statutory protection for computer software.

As works subject to copyright, computer programs are eligible for the 1976 act's exclusive rights to copy, distribute, perform, and prepare works based upon (derived from) them.

But, and this is an ever so important but, the act excludes copyright protection for any idea, procedure, process, system, concept, or principle. Hence, only "expression," not ideas, is protectable under the copyright law. Accordingly, if a program creator elects to use the copyright laws fully, and registers the entire program, he risks loss of protection for the idea. As the following discussion shows, however, techniques are available to protect the program without sacrificing copyright protection or divulging the idea.

Indeed, in no small part because of the "idea" exclusion, game software developers are relying heavily not on the actual software, but on the resultant audiovisual display of the game. Thus far, the courts have protected such displays, although the microcircuits or disks or tapes yielding them provide infinitely variable performances.

To date, limited authority has recognized ROMs as copyrightable, despite the arguments that they are merely utilitarian objects, and not "writings"; the game performances have been regarded as "fixed," although they are infinitely variable in all save the "attract" mode. (See *Williams Electronics* v. *Arctic International*, 1982, and *Stern Electronics* v. *Kaufman*, 1982.) Cogent arguments have been offered against this point of view, but they are unlikely to prevail.

Copyright remedies are particularly useful for registered works; in addition to damages and injunctions, the 1976 act provides statutory (judge fixed) damages and discretionary attorney's fees, both potent deterrents. Copyright remedies also include seizure and destruction of infringing works.

PROTECTED TRADE SECRET

In the early years, with hardware types fighting against patent coverage and analytic types questioning the appropriateness of copyright protection, software developers hunted about for pragmatic protection. It came from an area of law designed to protect virtually all types of information. That is the court-made law of trade secrets, which gives legal protection to any information used in one's trade or business that is not generally known in that trade, is used in secrecy, and affords a competitive advantage.

That legal protection is a limited but important one. It protects persons or enterprises standing in a special relationship to the owner from using or disclosing the information except as authorized by the owner. The special relationship can be one that is implied by law or the more customary one that arises from contract, such as an express employment or license agreement.

Trade secret law was recognized early on as extending its protection to computer software. That was not at all surprising because, unlike the patent-law impediment that prohibits patent protection for any category of information not falling within the stated statutory categories, trade secret law extends protection to any information lending a competitive advantage and otherwise meeting the definitional aspects of a trade secret.

Trade secret protection is particularly helpful, moreover, for computer software programs. Unlike copyright protection, which covers only the form of expression but not the underlying idea (although, as hinted at above, the two may blur into one in certain cases), trade secret protection covers both the expression and the idea.

The real test, of course, for the suitability of the law of trade secrets to protecting computer software originally lay in one major area: could the software be commercialized and yet still be found to have the requisite degree of secrecy?

To the extent that we have the judicial views in on this, they are encouraging. Courts have found that widespread distribution of computer software and other computer-related aids to licensees or purchasers of computer systems is not inconsistent with the software being a trade secret if the recipients are bound to no further use or disclosure.

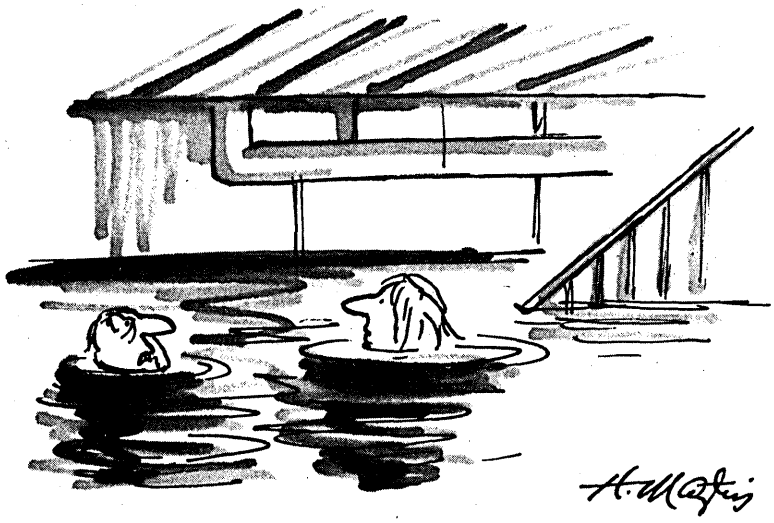
Another key question that focuses upon the utility of trade secret law to protect computer software is raised by the 1976 act itself. Congress expressly sought to supplant any state copyright law with the 1976 act to the extent that the state law covered both copyrightable subject matter and extended the same exclusive rights as those granted by the 1976 act (copying, distribution, performance, etc.).

The logical question then becomes whether state-created trade secret law has been preempted. Quite aside from an abundantly clear statutory history showing it was not Congress's intention to preempt state trade secret law, it is clear on the face of the 1976 act that trade secret law should not be preempted. First, unlike copyright law, trade secret law protects both the form of expression and the underlying ideas. Second, it provides no exlusive rights as against third parties, but only limited rights to prevent unauthorized use and disclosure by third parties standing in a special contractual or confidential relationship to the trade secret owner. All others are at total liberty to develop independently.

Accordingly, while there has been relatively little case law focusing on these rather elemental and elementary distinctions, one case (*M. Bryce & Assoc.* v. *Gladstone*, 1982) has faced them squarely and held unequivocally that the Copyright Act does not preempt trade secret law. The Supreme Court has declined to review the case.

THE BEST OF BOTH WORLDS

Copyright protection has its limitations; it does not cover ideas, but only the forms in which they're expressed. Moreover, a work must be registered in order to secure some of the 1976 act's most effective remedies, statutory (i.e., nonproven) damages and attorney's fees. It is possible, though, to register computer soft-



"Well, I for one have had it up to here with this wet basement problem."

CARTOON BY HENRY MARTIN

"Hyatt was a pioneer of local area networks. When Datapoint introduced the first one, we ordered."

—Bob Regan
V.P. Management Information Systems
Hyatt Hotels Corporation

"Local area networks are the hot topic in data processing these days. But they're nothing new to us," says Hyatt's Bob Regan. "Ours have been up and running for five years."

When Datapoint introduced the first local area network, the ARC® system, in 1977, Hyatt was among the first to install it. Today there are approximately 5,000 ARC local area networks in use, far more than any competing system.

"One reason the ARC network has been so effective for Hyatt is because it's easy to expand," says Regan. "Hyatt has had phenomenal growth, and the ARC has kept up. When more people needed the system to do more work, we simply added to the network."

The ARC local area network can be expanded virtually without limit by simply plugging in additional Datapoint processors, printers, storage disks, and terminals. Each new processor adds power to the network so new users get the same fast response the original users were getting. Companies can closely match the power of an ARC system to their needs, expanding in small, inexpensive increments instead of buying "more computer than they need" in order to have room for growth.

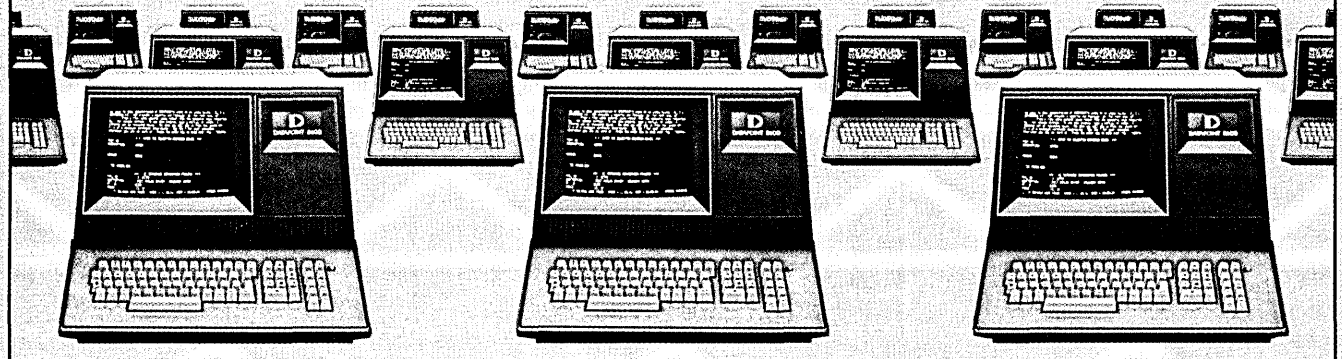
What's more, Datapoint systems can be expanded or upgraded without replacing software. "We run some programs on ARC networks that were originally written for our first Datapoint computer more than ten years ago," says Regan. "That means we didn't lose any of the money we invested in programming and training. And it made the growth steps easy on our people. The changeover to the ARC network was accomplished in only two days."

No matter how far an ARC system is expanded, all the users can have access to all the data except where security precautions are installed. So even though more and more people are using more and more computers, there's never a need to duplicate files.

"At present, Hyatt operates forty-five ARC systems," Regan says. "Others are in the planning stages right now. On the operations side we use them for accounting, reservations, and group sales. At Corporate we use them for accounting and for systems development. Obviously, we depend on them heavily. They're like the meters where we check our own financial performance. They simply have to work. And they do.

"Hyatt has stayed with the ARC system because it's been cost-effective. That's the bottom line. I can recommend a certain system to a hotel, but in the end, the system has to sell itself. And keep selling itself after it's installed. Our Datapoint ARC systems have done that."

For more about Datapoint, call (800) 531-5639. In Texas, call (800) 292-5099. Telex 767300 in the U.S.; 06986622 in Canada; or 923494 in Europe (UK). Or write Datapoint Corporation, Marketing Communications T41DM, 9725 Datapoint Drive, San Antonio, Texas 78284.

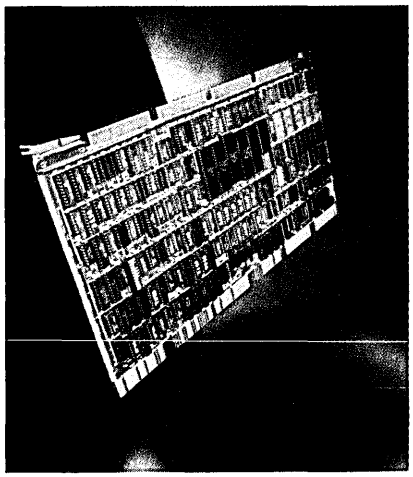


DATAPOINT

CIRCLE 115 ON READER CARD

ACCESS

Access the X.25 world. Today.



A Unibus/DMA system that provides DEC minicomputers access to X.25 networks. Great!

Today's X.25 public networks offer an alternative to the high cost of dedicated lines and the slow speed of dial-up connections. ACC's X.25 products help major government agencies and Fortune 500 companies take advantage of this alternative.

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CIRCLE 116 ON READER CARD

Reliance upon trade secret principles has particular utility for international licensing transactions.

ware (and databases) by depositing simply the first and last 25 pages of the program as "identifying matter."

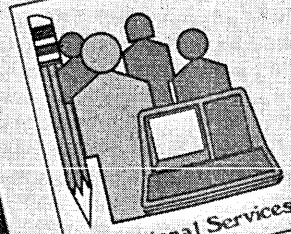
Accordingly, given the case law recognition that claims of copyright protection and trade secrecy are not mutually inconsistent, and taking into account the 1976 act's instantaneous application to unpublished and published works, a software developer has the opportunity to avail itself of both statutory copyright and retain the matter as a trade secret.

The advantages of doing so are not inconsiderable. First, protection of the software as a trade secret safeguards the underlying ideas through use of contractual licensing and related techniques. Layering on copyright protection as well provides protection from third-party recipients who have not signed agreements restricting use or disclosure. Moreover, the availability of statutory remedies, which in cases of willful infringement can go as high as $50,000, are a meaningful deterrent, as is the possibility of a judge ordering the offender to pay the plaintiff's attorney's fees.

If trade secret protection can be preserved, moreover, some rather critical advantages are obtained. First, copyright protection is necessarily limited to the United States plus other countries that recognize computer software as proper subject matter of copyright and have "automatic copyright" treatises with the U.S. To date, no other major jurisdiction has recognized software as something that can be copyrighted. Thus, reliance upon trade secret principles has particular utility for international licensing transactions. Putting aside the arguably aberrant laws of certain developing countries (which adversely affect technology licensing in general), most nations recognize and respect trade secret licensing arrangements. Licensing transactions relying on that approach for computer software are routine outside the United States and seem secure.

The law moves slowly; technology, quickly. For whatever the reasons, our legal system has hardly achieved either a foolproof or perfect form of protection for computer software, notwithstanding its vast economic, sociological, technological, and cultural implications in our society. We do have patent protection available in very limited software instances, and rather clearly have both copyright and trade secret protection. They are not mutually inconsistent and may be employed together. Computer software that readily admits of the "specially identifying" registration under the Copyright Act will permit these dual forms of protection and the helpful remedies that in some respects may be duplicative but in other respects may be complementary. No pat answers, however, are available. Copyright alone may be ideally suited to certain types of widely distributed programs and trade secret alone may be applicable to others for which specially identifying deposits are not suited. But, in many instances, the two forms of protection may be simultaneously available and may offer, in combination, superior protection than either alone. ✱

Roger M. Milgrim, a member of the New York-based law firm of Milgrim Thomajan Jacobs & Lee P.C., is author of *Trade Secrets* (Matthew Bender, 1968, annually supplemented), and specializes in trade secret and related work in the high-technology field. He is also an adjunct professor of law at the New York University School of Law.



Student Opinion Form

Course Name: _____

Course Number: _____

Course Ending Date: _____

Training Center: _____

Educational Services/Quality Assurance Program

This Student Opinion Form is designed to help Digital assure the quality and usefulness of its training courses. Please respond carefully and objectively as indicated below.

- Complete the course information above. Do *not* write your name anywhere on this sheet.
- The other side of this sheet consists of two sections: *Background Information* and *Evaluation of Course*. In the *Evaluation of Course* section you will find a list of numbered statements that may or may not describe your opinions about this course. Please indicate whether you agree or disagree with each statement by selecting the appropriate lettered box from the following choices:

SA = Strongly Agree
A = Agree
U = Undecided

PLEASE READ DIRECTIONS ON THE OTHER SIDE. SELECT THE *ONE* BEST ANSWER.

BACKGROUND INFORMATION

- What is your relationship with Digital? (a) customer (b) employee (c) other — a b c
- What is your primary job area? (a) hardware (b) software (c) management (d) education (e) other — a b c d e
- How many years of experience have you had with computers? (a) less than 1 (b) 1–3 (c) 4–6 (d) 7–9 (e) 10 or more — a b c d e
- Did you meet all the stated prerequisites? (a) Yes (b) No — a b
- Why did you take this course? (a) general interest (b) required for current job (c) required for new job (d) to help get new position — a b c d
- What is your native language? (a) English (b) Spanish (c) French (d) German (e) Italian (f) Japanese (g) Chinese (h) Dutch (i) Swedish (j) Other — a b c d e f g h i j

FEED

EVALUATION OF COURSE

SA=Strongly Agree A=Agree U=Uncertain D=Disagree SD=Strongly Disagree NA=Not Applicable

COURSE DESIGN AND RESOURCES	1. I learned a lot of valuable skills and information.	1	SA	A	U	D	SD	NA
	2. The course content met my expectations.	2	SA	A	U	D	SD	NA
	3. The course was well organized.	3	SA	A	U	D	SD	NA
	4. The course materials were easy to understand.	4	SA	A	U	D	SD	NA
	5. I needed all the information contained in the course materials.	5	SA	A	U	D	SD	NA
	6. The course emphasized the real job.	6	SA	A	U	D	SD	NA
	7. My test scores accurately reflected what I learned.	7	SA	A	U	D	SD	NA
	8. The lab exercises were useful for learning.	8	SA	A	U	D	SD	NA
INSTRUCTOR	9. The instructor was very knowledgeable in the subject.	9	SA	A	U	D	SD	NA
	10. The instructor answered difficult questions easily.	10	SA	A	U	D	SD	NA
	11. The instructor's presentations were easy to understand.	11	SA	A	U	D	SD	NA
	12. The instructor made the course interesting.	12	SA	A	U	D	SD	NA
	13. The instructor managed class discussions well.	13	SA					
	14. The instructor took the time to answer questions.	14	SA					
	15. The instructor was patient and helpful.	15	SA					
	16. The instructor emphasized the objectives of the course.	16						
	17. The instructor made effective use of the available time.							
TRAINING FACILITY	18. The training center provided all the services I needed.							
	19. My workspace in the classroom was comfortable.							
	20. The classroom was well laid out.							
	21. The lab was functionally laid out.							
	22. The lab time was adequate for this course.							
	23. My housing was satisfactory.							

24. Please indicate your *overall* impression of this training experience.
E=Excellent VG=Very Good G=Good F=Fair P=Poor

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CIRCLE 120 ON READER CARD

How one manufacturer meets the basic design requirements for an on-line system.

NONSTOP TRANSACTION PROCESSING

by Lloyd Smith and Kent Madsen

On-line transaction processing is, as the name implies, computer processing of data relevant to individual business transactions as they occur.

It is perhaps best understood in contrast to batch processing, the carefully sequenced posting of large numbers of transactions the night after, the week after, or the month after they occur. Systems capable of on-line transaction processing are attractive because they can provide accurate information on the state of a business at any instant. This allows companies to respond in a timely and intelligent way to unforeseen events and rapidly changing business conditions.

On-line transaction processing has obvious applications in banking, inventory control, ticket and flight reservation processing, and many other areas. The major operational requirements are illustrated in Fig. 1. A large number of terminals must access and update a common database in real time. Changes in the database must be immediately available to all users and the system must be capable of dealing with large numbers of transactions of various types, arriving in an unpredictable sequence.

In what follows, we will discuss software design considerations relevant to transaction processing in a network environment and show how Tandem Computers approached these sometimes conflicting requirements.

Designers of software for transaction processing quite naturally tend to focus on the technical problems, which are substantial. But unless they take a broader view of the system as a service—a tool that people must use—the technical successes may be overshadowed by devastating practical failures.

Inherent in the concept of service is a concern not just for the fact that the system must work, but for how easy it is for people to work with it over its entire lifetime. Of particular importance is its amenability to change as user demands evolve and as the number of users increases. If the design is too rigid, the system may work beautifully at first but become obsolete so quickly that it never provides enough service to justify the development costs.

The concept of service in a transaction-processing environment can be translated into more specific software design goals: reliability, flexibility (including ease of installation, maintenance, modification, and expansion), and rapid response.

Reliability is crucial because an on-line system is used in the day-to-day operation of the business. Often it performs crucial job functions that cannot go on when the system is down. The database it manages comes to be viewed not just as an approximation of reality (as in a batch-processing environment), but as a precise and up-to-date reflection of the state of the business. Thus, the system becomes less a backstage auditing tool and more a front-line performer and instrument of strategic planning and decision-making.

Ease of installation (i.e., ease of coding, testing, and implementation) is a prime design consideration because from the time the design is frozen and the coding begins, users will continue to have ideas about what the system should do. Being human, they may even change their minds about things that were definitely agreed upon. Thus, if there are substantial delays in testing and bringing up the various application components, the system may be out of step with the users (and thus unable to serve them fully) from day one.

Ease of maintenance is important because software bugs plague any system. If it takes too long to fix them, the on-line service may be off-line a good deal of the time. Furthermore, if the system is so complex that only the developers can fix the bugs, it will be hopelessly crippled if they ever leave or lose interest.

Ease of modification is important because if the system is successful, a flood of requests for new functions and changes will roll in. If additions, deletions, and changes are easy to make, users will be satisfied, and the system will continue to perform its service. If changes are difficult to make, the system will soon be obsolete, regardless of the other merits of the design.

System expandability is vital because successful applications tend to grow. If the software and hardware cannot accommodate increased user traffic, or if growth produces a noticeable increase in response time, users will be frustrated, and the system may have to be abandoned or overhauled.

Response times are critical in a transaction-processing environment because, as shown in Fig. 1, the system is people-driven. If it is slow to respond, users will be frustrated and unproductive while interacting with it.

A GENERIC MODEL FOR SYSTEMS

An on-line transaction-processing system is unique in the extent to which it is driven by human beings. Every transaction begins and ends with human intervention, and this has a definite impact on the facilities that the software must provide. Fig. 2 shows the software components of a typical transaction-oriented system. Each one is necessary either to cope with the human element in the system or to get the work done. Each one poses unique challenges for the designer.

Terminal interface. The user interacts with the system via a terminal. Because there are many different kinds of terminals employing many different protocols, the soft-

The software must make some provisions for detecting and dealing with the errors people commonly make.

ware should contain a terminal interface capable of dealing with them. It is advantageous to isolate this code so that it will be easy to test and install new terminal types, to locate and fix problems, and to take advantage of new features that may become available on existing or future terminal types.

Field validation. Because the system is people-driven, the software must make some provision for detecting and dealing with the errors that people commonly make—forgetting to supply a required parameter, putting numeric data in a nonnumeric field, etc. Field-validation criteria are normally defined when the screen format is established. It makes sense to handle these edits as close to the user as possible. Then, notification of a problem with a data field entered will be timely, and the impact of such a problem minimized.

Data mapping. At the time the input data are checked, they are still in a form determined somewhat by their human origin. The function of a data-mapping facility is to convert data from this external form to an internal form (i.e., to make of them a record, free of delimiters and formatted to suit the machine). The conversion must work both ways so that data can be translated both to and from the internal format. By developing application tasks that refer to the data in the internal form, the designer can ensure that changes in the external characteristics of a system will not affect the internal workings.

Transaction control. In any application, there must be a control center—a software component with all the logic necessary to display the screens relevant to each transaction, to interpret input passed through the data-mapping facility to it, to perform interfield consistency checks, to route the user's request to the facility best able to handle it, to interpret the reply of that service facility, and to send the reply back to the user via the data-mapping facility.

The transaction control facility is a manager. It has a global view. It can compare data from several related screens to ensure consistency. It knows where a particular transaction procedure begins and ends. Thus, if for any reason a transaction must be stopped in midstream, the control facility has the logic to back out intelligently and reliably. Although it contains a relatively small portion of the actual code, it constitutes the heart and brains of the application.

Database service. The preceding four software components are request oriented, that is, they exist to receive, validate, reformat, and interpret the user's requests. When all of this preliminary work has been done, the request is sent to a service-oriented component, capable of doing the actual work.

The database service (or server) is responsible for all interactions with the database and for other operations involving heavy processing or I/O (table handling, table look-up functions, calculations, etc.). It is a very important facility because it has the power to alter the database. For this reason, it should be kept simple. Regardless of how well the rest of the application is designed, if there are bugs in the server, the system will be unreliable. The most elementary server would do the following:

FIG. 1

THE ENVIRONMENT OF ON-LINE TRANSACTION PROCESSING

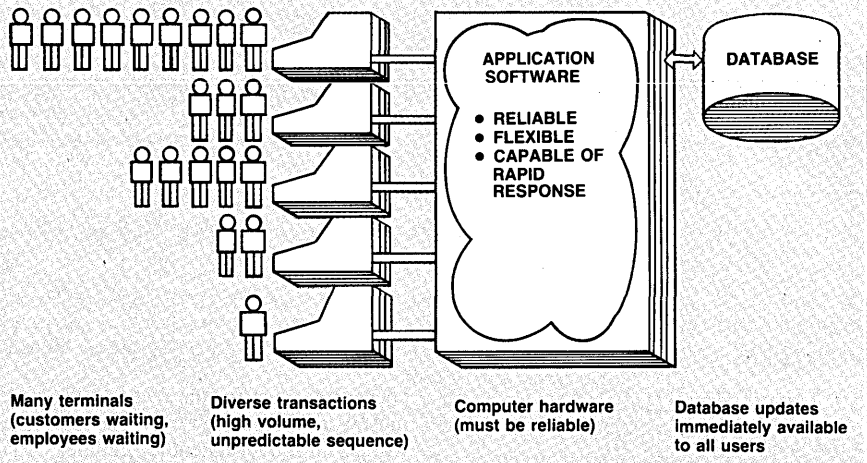
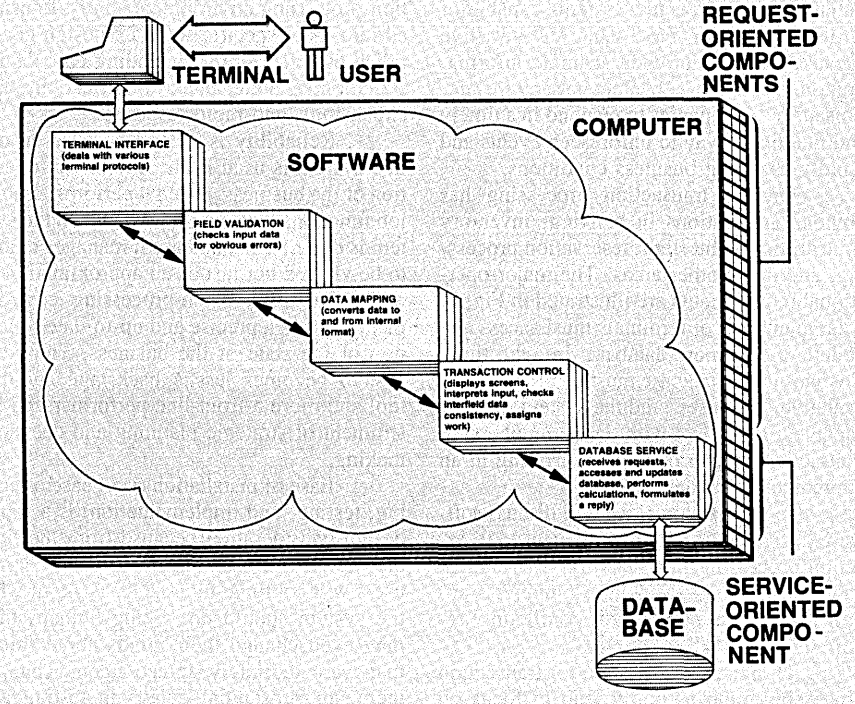


FIG. 2

SOFTWARE COMPONENTS OF A TRANSACTION-PROCESSING SYSTEM



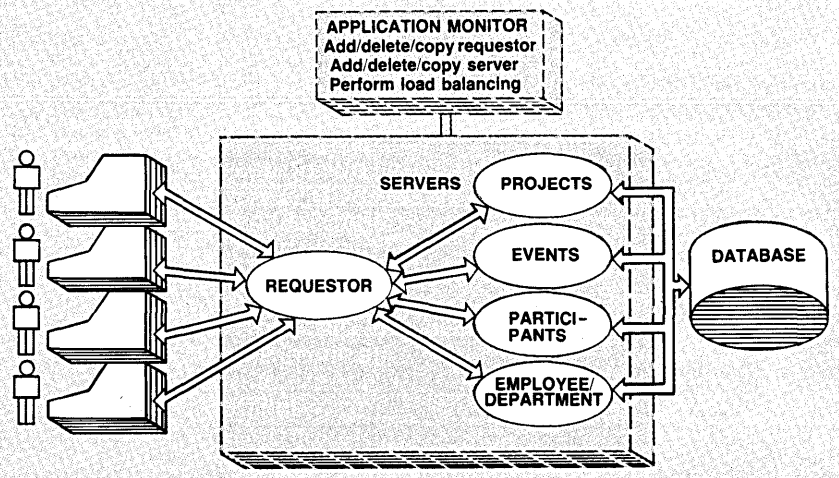
The requestor/server concept provides an attractive modular framework for the design of application software.

• Receive a request from a transaction control facility. (This is the point of entry for database service.)
• Access the database. (The request may be for reads, writes, updates, deletes, or any combination of the four.)
• Build a reply based on the results of the database access. (The reply could contain actual data from the database, control information describing any error condition that occurred, or any combination of the two.)
• Reply to the transaction control facility. (This is the exit point for database service.)

The server should process requests uniformly from one or more user functions. It should be a general utility, independent of any particular user function but accessible to each. (This eliminates redundant code and simplifies the implementation of new user functions requiring database services already established.) Furthermore, the server should be context-free, i.e., it should not have to retain data between requests. Such an approach simplfies the code, making it easier to understand and maintain.

FIG. 3

APPLICATION MONITOR MANAGES THE SOFTWARE ENVIRONMENT



SERVER, REQUESTOR MODULES

The trend in on-line transaction processing is toward network applications (i.e., the distribution of functionality among multiple processors in various geographical locations). In such applications, it is wise to group request-oriented functions and service-oriented functions in separate modules. Thus, the system can receive input on one processor linked to the user's terminal, handle the human interface functions there, and then ship a single, concise, machine-oriented request over the communication line to a processor close to the database.

A server on the second processor can then access the database as many times as necessary to process the request (without having to use the communication line each time) and send the reply back over the line to the requestor module. Such a division of labor minimizes the number of slow and costly communication-line messages required to process the transaction.

The requestor handles all the human-interface functions: terminal interface, field validation, data mapping, and transaction control. The servers handle database access and other functions required to process the various transactions listed.

The requestor/server concept provides an attractive modular framework for the design of application software for transaction processing. Under such a structure, one can easily build a basic software skeleton and then test and integrate individual requestor and server elements as needed.

As one considers the problems created by the growth of such a system to 100 or more modules, and as one considers the need to maintain reliable service and consistent performance during such a period of growth, it becomes evident that certain specialized tools for dynamically changing requestor and server capabilities without bringing the system down should be put in place from the beginning.

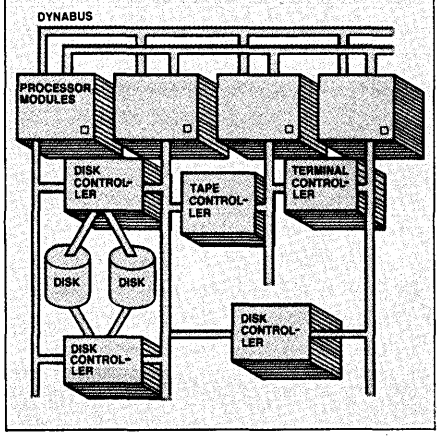
The best way to create the dynamic environment needed is to provide an application control facility capable of managing software resources much as the computer operator manages hardware resources (Fig. 3). We will refer to this control facility as the application monitor. The application monitor should have the ability to add requestors, add servers, and perform load-balancing functions on-line, with a minimal impact on the user community.

Because the requestors provide the logic that communicates with the user (whose needs and desires are changeable), they must be extremely flexible. A means of adding, changing, and deleting screen formats is essential. Internal record formats should be kept and maintained in a data definition library similar to the libraries associated with record definitions on a database management system. The transaction control facility should be written in a procedural language that is easy to use but flexible enough to handle total application flow.

All requestor facilities should be maintained in a library accessible at run-time. This allows smooth integration of each function within a requestor. It also allows modular expansion of functions within an application with little or no impact on current running functions.

FIG. 4

ARCHITECTURE OF THE TANDEM NONSTOP SYSTEM



Recognizing the vulnerability of transaction-processing applications to hardware failures, Tandem Computers has developed a unique system architecture that offers strong protection against such failures. In addition, Tandem provides software tools and application development aids based on the requestor/server concept. Together, these hardware and software tools facilitate the development of working systems that meet the design criteria previously set forth.

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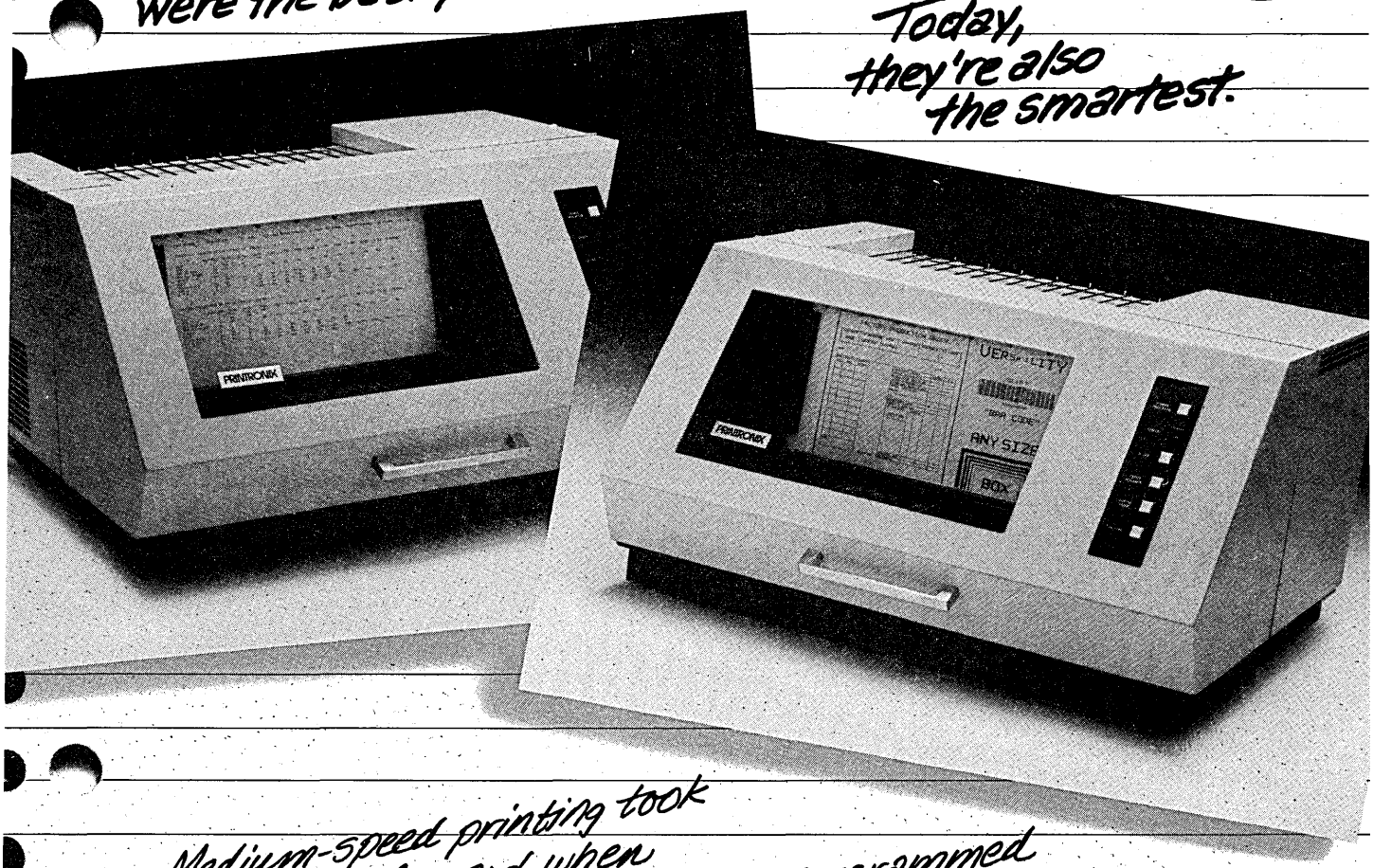

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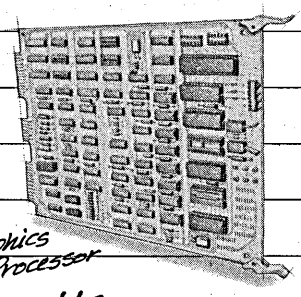

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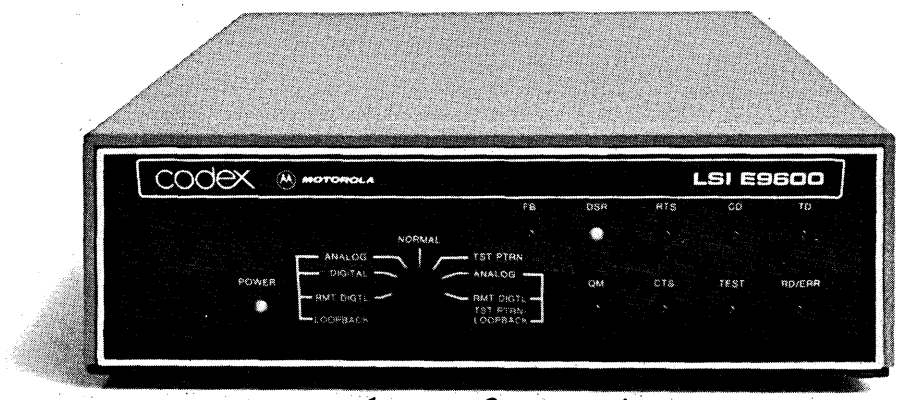

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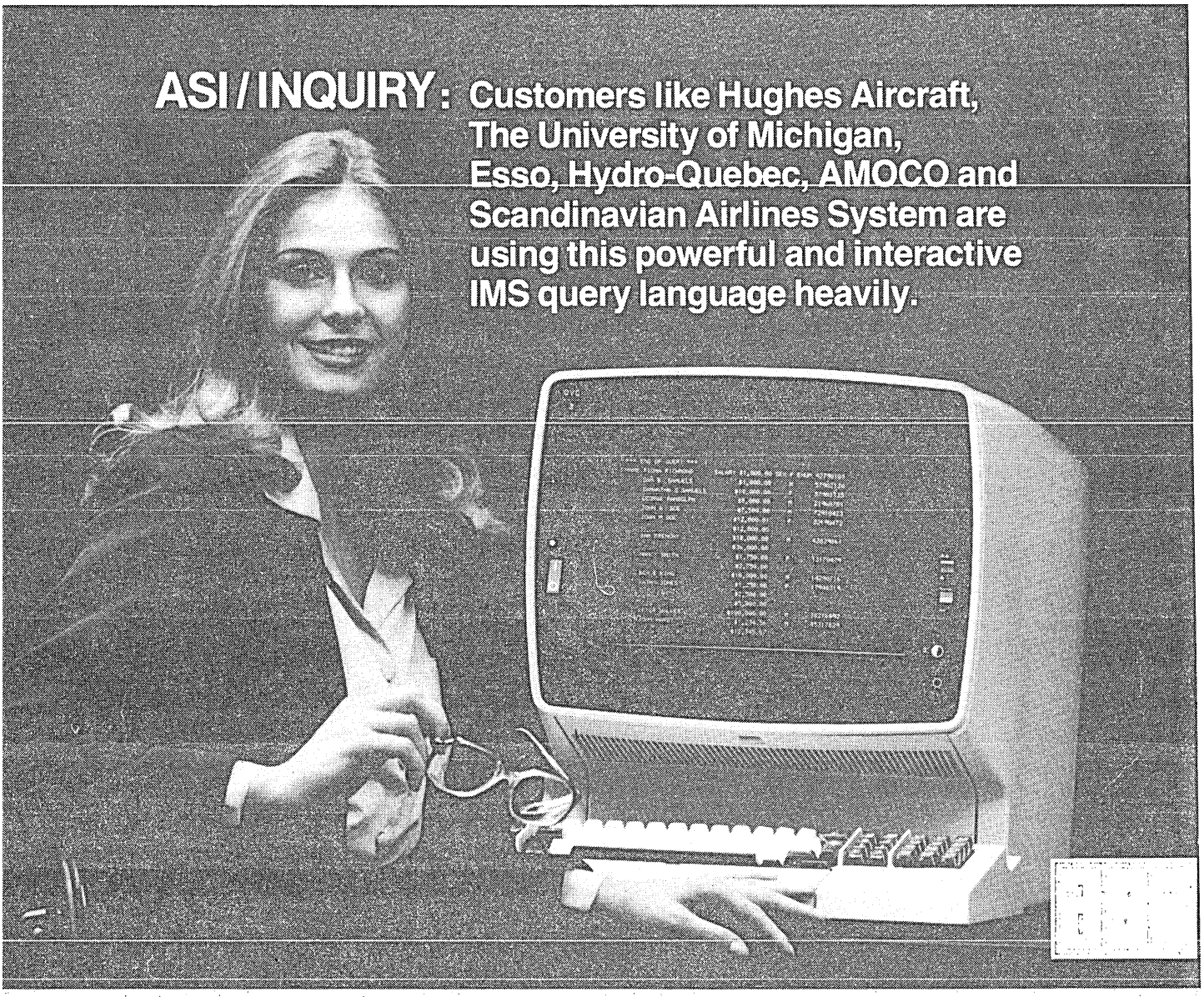

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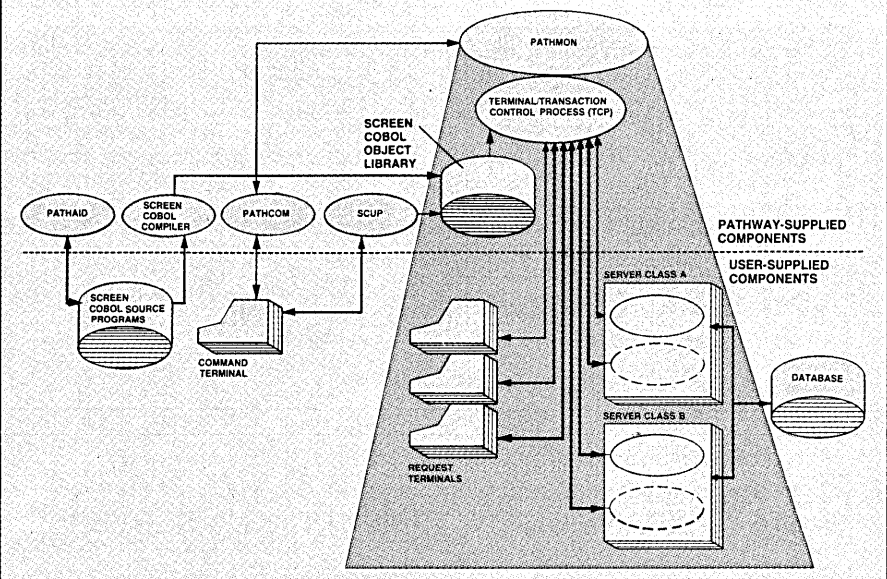
System capacity can be expanded simply by adding more processor modules.

FIG. 5

COMPONENTS OF A PATHWAY TRANSACTION-PROCESSING APPLICATION



has its own private memory and multiplexed input/output channel. The processor modules communicate with one another over a pair of high-speed interprocessor buses (DYNABUS). Peripheral device controllers are connected to the input/output channel of two processor modules so that the device is accessible even if one cpu fails. Disk volumes can be mirrored (i.e., replicated and maintained separately) so that the system can continue running even in the event of a disk crash.

System capacity can be expanded simply by adding more processor modules as the workload increases. (One logical computer system may incorporate from two to 16 independent cpus.) Such expansion is possible without reprogramming.

A process (i.e., a program running on the Tandem machine) can be protected from system failures by the execution of a secondary, or backup, process in another processor. The primary sends periodic checkpoint messages to the backup so that the backup always has the information it needs to take over in the event of a primary failure.

EFFICIENCY MESSAGE SYSTEM

The logistics involved in maintaining a collection of concurrently executing process pairs (primaries and backups), distributed over as many as 16 cpus, would be horrendous were it not for a simple and extremely efficient message system, which is at the heart of Guardian, the Tandem operating system. This message system allows any process in the system to communicate with any other without detailed knowledge of its physical location. Furthermore, it positively confirms receipt of each message and keeps the sender's address on hand so that the receiver can reply as if the sender were still on the line. The message system makes every process running on a 16-processor system as easy to access as a file on a conventional machine.

With these facilities as a foundation, Tandem has introduced Pathway, a software product that reduces significantly the time needed to develop a working transaction-processing system. Pathway provides a basic design framework (the requestor/server structure described above) together with system tools that make it possible for application developers to reach the basic design goals of reliability, flexibility, and rapid response.

The structure of a simple Pathway application and the relationships between user-supplied and Pathway-supplied components are shown in Fig. 5. The user-supplied software consists of 1) a collection of single-threaded source programs (written in a Tandem-developed, terminal-oriented language known as Screen COBOL), which define data formats, message formats, terminal screen displays for the transactions to be processed, and transaction control logic, and 2) various single-threaded server programs, which handle database access and associated processing. The server programs can be written in COBOL, FORTRAN, MUMPS, or TAL (Tandem's Transaction Application Language).

Pathway supplies a Screen COBOL compiler, a Screen COBOL utility program (SCUP), an interactive screen builder (Pathaid), a multithreaded terminal/transaction control process (TCP), an overall monitoring and control facility (Pathmon), and a command language (Pathcom) through which operators can make inquiries of the system and instruct Pathmon to modify the working environment (without having to bring the system down).

From user source code, the Screen COBOL compiler creates a library of object programs interpreted by Pathway's terminal/transaction control process (TCP). The TCP is a multithreaded process, but it provides a terminal interface that allows the Screen COBOL source code to be written as if it had to deal with only one terminal. This is an extremely valuable service. Equally valuable is the TCP-supplied "NonStop coding," which automatically handles the checkpointing needed to ensure that a backup TCP (in another cpu) is always ready to take over should a hardware or software failure incapacitate the primary.

The TCP, drawing upon the Screen COBOL object library, acts as a requestor in a Pathway transaction-processing system. In addition to the multithreaded terminal interface described above, it provides field validation, data mapping, and control services (in accordance with logic contained in the Screen COBOL object library). When the TCP has performed any preliminary edits required in connection with an incoming transaction, it sends a message to the appropriate server, which accesses and/or modifies the database as it has been programmed to do. The server then replies to the TCP, supplying the required information or confirming that the transaction has been completed. Finally, the TCP may send an appropriate acknowledgment message (also defined by the Screen COBOL object program) to the terminal.

The requestor-server concept (together with Tandem hardware and the Pathway software described above) provides a framework within which the basic design goals of reliability, flexibility, and rapid response can be reached.

Reliability. The most effective way of assuring reliability in complex systems is by breaking them down into smaller parts. Writing complex transaction-processing software in terms of simpler requestor and server modules reduces the likelihood of errors in design and coding, while making the software easier to modify. Each module is highly independent of every other. (The interface between a requestor and a server is restricted to a well-defined and limited set of message formats and function codes.) Thus, a change in any component is unlikely to have unexpected or subtle effects on other components.

Modifying code is the most expensive way to tune because of the manpower costs involved.

STRUCTURE EASES UPKEEP

Flexibility. The modular structure of properly designed requestor/server software greatly facilitates the installation, maintenance, modification, and expansion of a system. Because of their independence, server modules can be tested in a familiar batch mode using mock databases and input transactions read from a disk file. Likewise, Screen COBOL modules (which provide the requestor logic in a Pathway system) can be tested independently and then brought up.

Requestor/server software is relatively easy to maintain and change primarily because it is readily understood. An analyst or designer with previous exposure to the basic model has only to ask a few simple questions to get an overview of the system. What functions does the application perform? What do the various servers do? What is the format of the messages exchanged between requestors and servers?

At the component level, he asks: what is the format of each screen (menu screen, add-event screen, etc.) presented to the terminal? What is the logical hierarchy of the screens?

With regard to a particular server, he asks: what requests does this server respond to? What database files does it access? What transactions does it take part in?

The Pathway and the Tandem NonStop hardware offer another dimension to the flexibility of application software based on the requestor/server concept. When an increase in the number of users overloads a particular terminal/transaction control process (TCP) with the result that response times become unacceptably high, the operator can instruct the application monitor (Pathmon) to create a new one in a different cpu (Fig. 6). (This can be done without shutting the system down.) Some fraction of the terminal queries will then be routed to that new TCP to minimize queuing and increase throughput. All TCPs are able to use the same server facilities and run in any cpu in the local system.

When overloading and the resulting increase in response time are caused by an increased demand on a single server, Pathmon can start up another server, identical to the first, in some other cpu and distribute requests between the two processes, effectively increasing the throughput and bringing response times back down. In the example shown in Fig. 7, the preponderance of user demand was for project transactions, and therefore Pathmon has created a second project server.

When a new function must be added to an existing application, the expansion is facilitated by the fact that only the new Screen COBOL and server modules must be written. Existing servers can, of course, be called upon by new Screen COBOL modules just as they are by old ones.

FIG. 6

SYSTEM EXPANSION BY DUPLICATING THE REQUESTOR

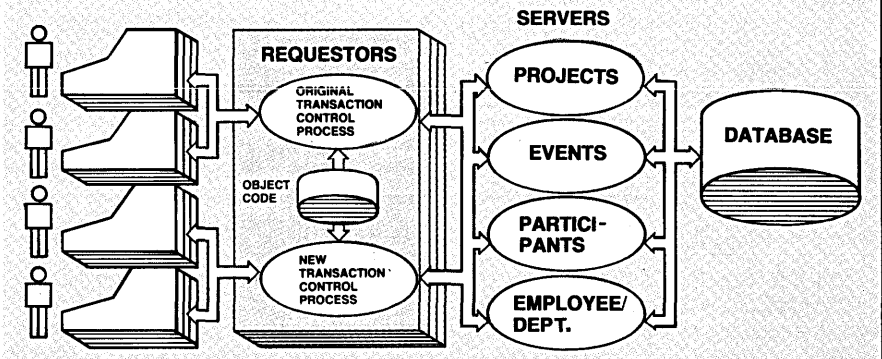
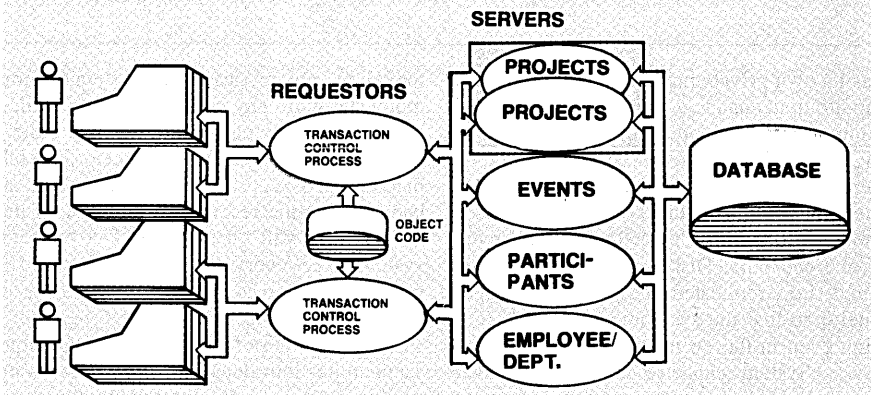


FIG. 7

SYSTEM EXPANSION BY DUPLICATING A SERVER



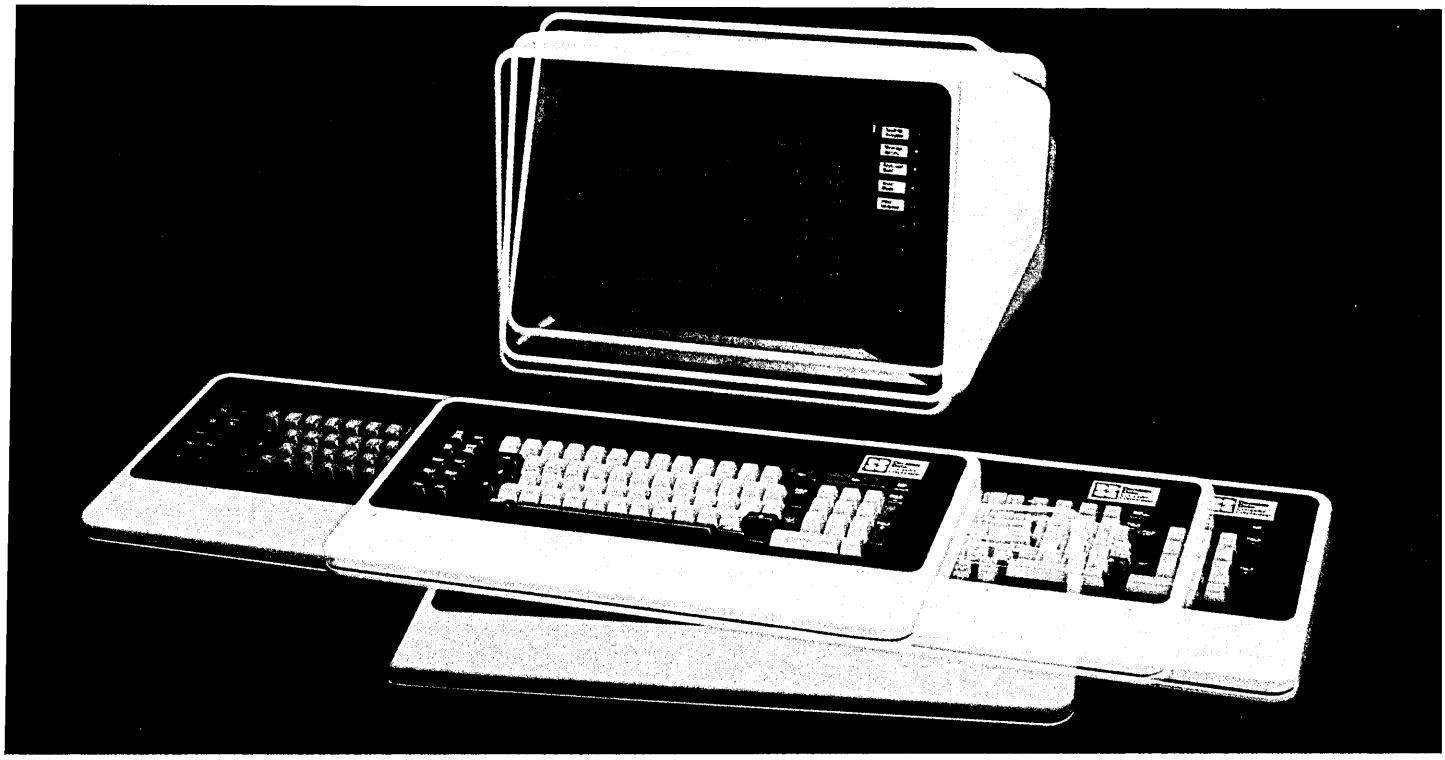
Response time. As mentioned before, an advantage of the requestor/server structure in a network environment is the fact that it minimizes the use of the communication line connecting the user's machine with the machine responsible for the database he wishes to access. If the requestor is multithreaded, it can handle other requests while waiting for a reply from the server. This permits the application to take advantage of opportunities for parallel processing within the network.

Beyond this, however, some of the most striking benefits of the requestor/server structure stem from its ability to take full advantage of the opportunities for parallel processing within a single Tandem System. Because of its multiple-processor architecture, the Tandem NonStop system is capable of a tremendous amount of this parallel processing, and the requestor/server structure makes possible what might be referred to as transaction pipelining.

DANGERS OF MODIFYING

Performance gains can also be achieved through the use of system tuning features unique to the Pathway environment. Traditionally the tuning of application software to improve performance has been done by modifying the program itself. But there are several dangers inherent in this practice:

- Modifying code may introduce bugs.
- The time required to modify code can be considerable.
- Tuning of this kind usually involves coding tricks that also make the programs harder to understand, debug, and maintain.



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• Modifying code is the most expensive way to tune because of the manpower costs.

A more reasonable approach to tuning is available on the Tandem software and the requestor/server model. The performance problem can be traced either to hardware or software overloading. If the performance problem is due to an excessive queue on a hardware component, more hardware can be added, as on any computer system. The NonStop system is unique, however, in that it allows cpus to be added as easily as any other type of hardware (and without reprogramming).

If the performance problem is due to software overloading, it can be traced to terminal software overloading or database software overloading via an XRAY, a performance measurement tool. Once the problem is identified, the application manager needs only to introduce additional requestors or servers into the system to correct it (see Figs. 6, 7). This involves no recoding because the requestor or server processes added are simply new executions of existing programs.

The Tandem system architecture allows any process to run in any processor module. The message system allows processes to communicate with one another regardless of which cpu they are running in and without the need for either process to know which cpu the other is running in. Therefore, there is no need to modify the code of a process when moving it from one cpu to another.

By adding software capacity in modular fashion and balancing the load on each cpu, the application manager can tune the application software without recoding, while preserving its logical structure, its modularity, and its simplicity.

Viewed in light of the design goals of reliability, flexibility, and rapid response, a transaction-processing system based upon the Tandem hardware and software tools described above is very attractive. The fault-tolerant hardware configuration ensures excellent reliability and data integrity. The Pathway software offers a quick and easy way of developing requestor/server application software and a means of making on-line additions, modifications, or deletions of transaction types, screen characteristics, application tasks, and terminals. Unique system tuning features and opportunities for parallel processing in individual multiple-processor systems and throughout a network can be further exploited to decrease response times and increase overall throughput. ✻

Kent Madsen is a technical writer at Tandem Computers. Prior to joining Tandem he was editor of *Energy and Technology Review*, published by Lawrence Livermore National Laboratories.

Lloyd Smith is manager of marketing technical support at Tandem Computers. He has 13 years' experience in implementing applications in on-line environments at Tandem and other companies.

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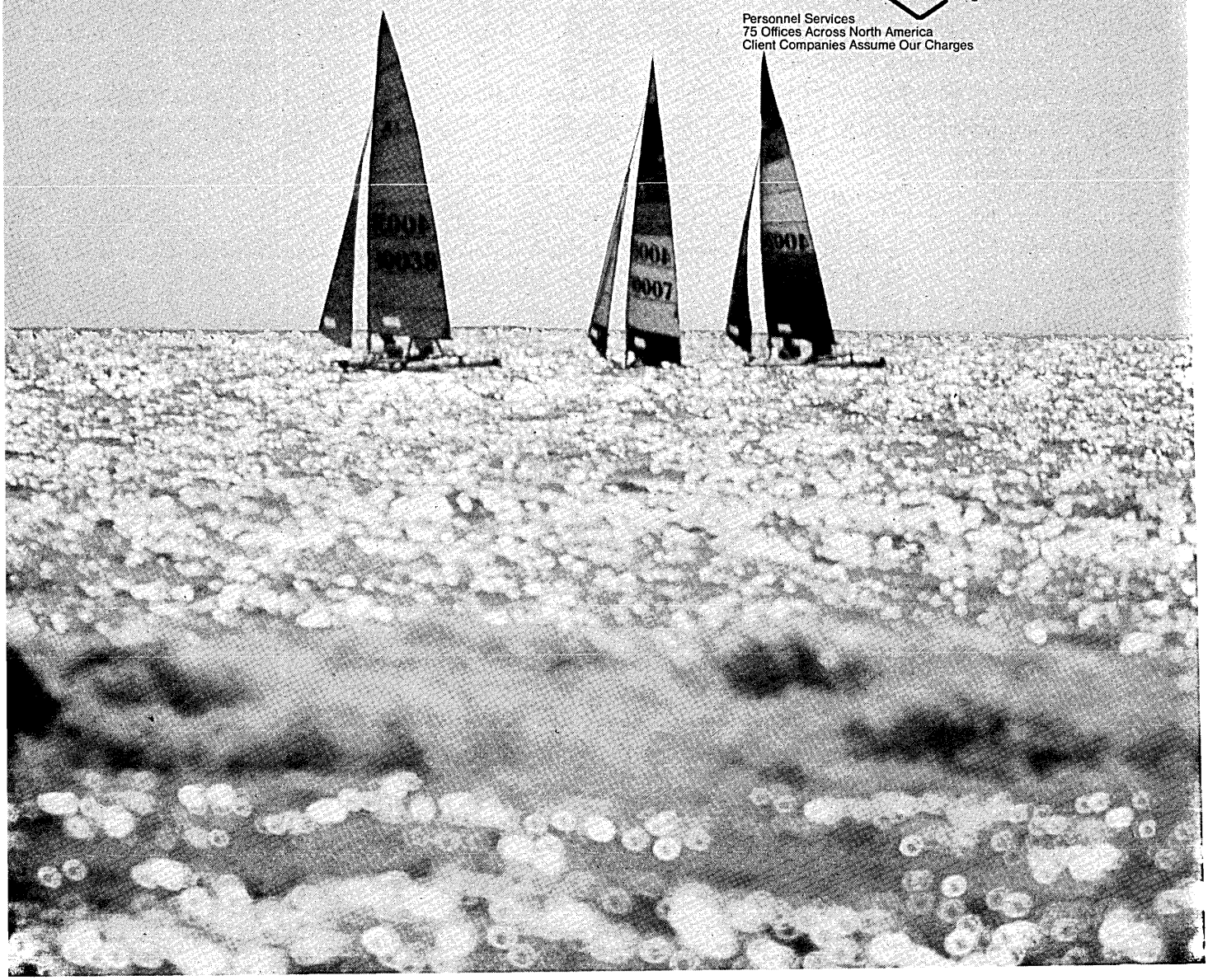

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Northern California

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Internal Consultant — IDMS. Progressive Bay area firm located in a highly desirable suburb seeks a proven Systems Analyst with an extensive background in Systems Development using IDMS. **To $40,000.**

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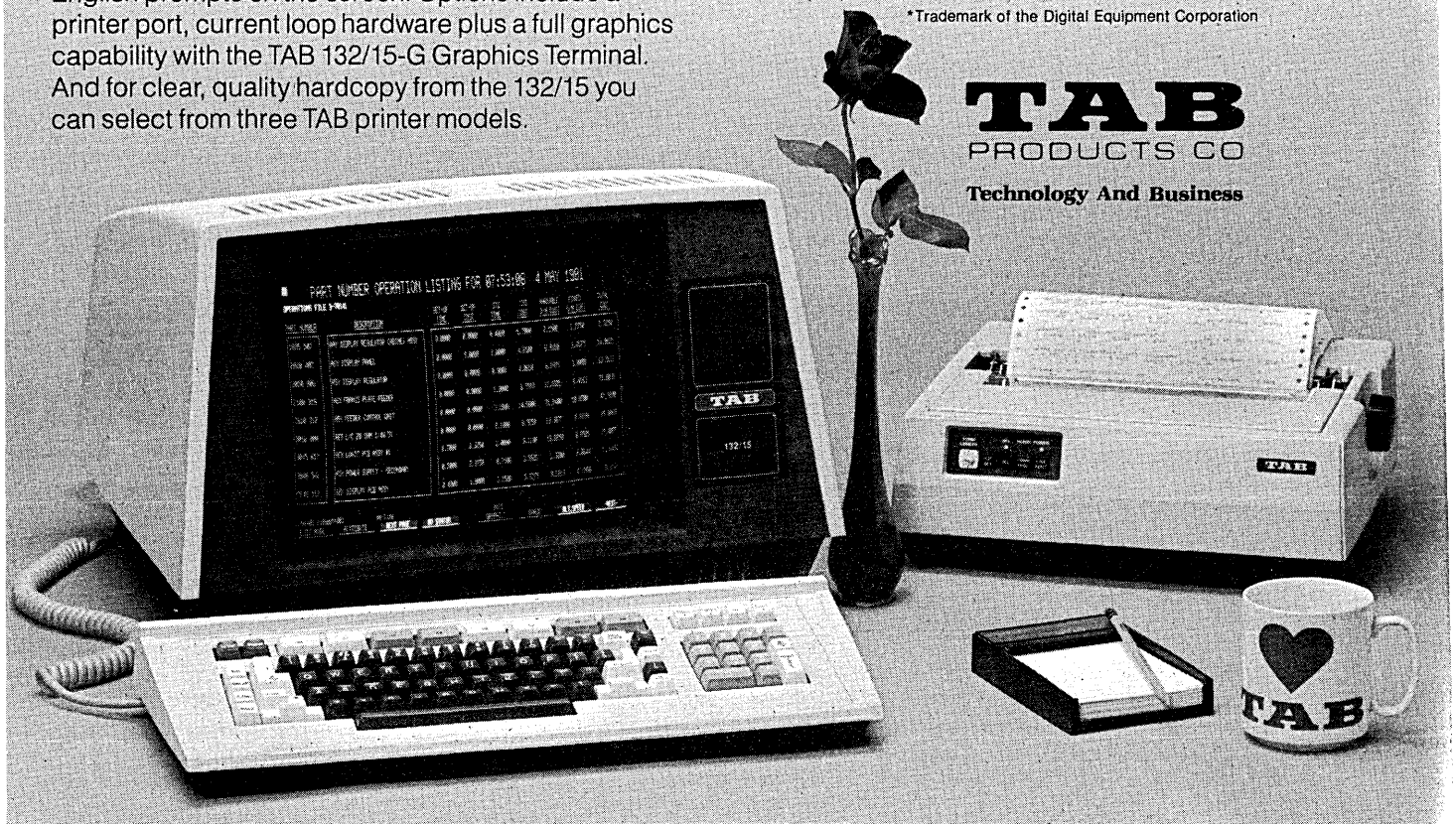


CIRCLE 129 ON READER CARD

In their 1964 census, the Chinese relied on the abacus. For the 1982 count they used computers, and the country will never be the same.

COUNTING TO A BILLION

by Daniel Burstein

Fu Xin Men Street is like most others in Beijing, the capital of the People's Republic of China. The volume of traffic belongs to bicycles, ox-drawn carts, and strange-looking farm implements that bring peasants and vegetables in from the countryside. Cars and buses are scarce. But archaic as the scene may be, it is another story altogether inside the street's most prominent building. For here is the nerve center of the largest computerized operation ever carried out in China—the census.

Inside the State Statistical Bureau's National Computer Center, employees and visitors remove their shoes and don surgical smocks before entering what seems the most spotless and brightly lit room in China. In the center is an IBM 4341, compiling census data fed to it by 21 smaller IBM 4300 series mainframes and eight Wang 2200 VS units dispersed throughout China's provinces, autonomous regions, and municipalities.

The actual enumeration took place between July 1 and July 10, 1982. Some 5 million enumerators and other workers were involved in the project which included interviews with every Chinese household. Based on initial manual tabulations, a total population figure of 1,031,882,511 was announced in October. Now, however, the sophisticated computer network put in place specifically for the census is going to work. By the end of 1984 it will have tabulated and cross-analyzed the responses of more than 1 billion Chinese to 19 demographic questions. Nearly 400 cross-indexed data tables will be generated, with tabulations broken down as far as the basic units of Chinese life—the street committees and cities in the urban areas, the communes and counties in the rural areas.

Considering that the last census in 1964 was done chiefly by abacus, computerization of this vast task is a symbol that China has indeed embarked on the road to the modernized social and technical infrastructure its leaders envision by the year 2000. Ostensibly, the purpose of computerizing the census was to obtain the wealth of accurate demographic data about the society that could never be gathered by manual tabulation. But at the same time the installation of the computer system, the training of its operators, and the spread of computer-consciousness that accompanies highly visible use of computers in a national undertaking will surely accelerate China's climb into the computer era.

China is no newcomer to the need to count its people. The world's very first census was probably taken in China during the reign of Emperor Yu (2100 B.C.) whose enumerators discovered that there were then 13.5 million Chinese. Since the 1949 revolution, national population counts have been done twice, in 1953 and 1964. Today, however, China is more concerned with the demographic details of its population than the total number of people, and for that, a computerized census was mandatory. Effective management and correlation of more than 10 billion answers on an estimated 200 million census forms (which if stacked one on top of another would be 16 miles high) was more than even the quickest manipulators of the abacus could reasonable hope to deal with.

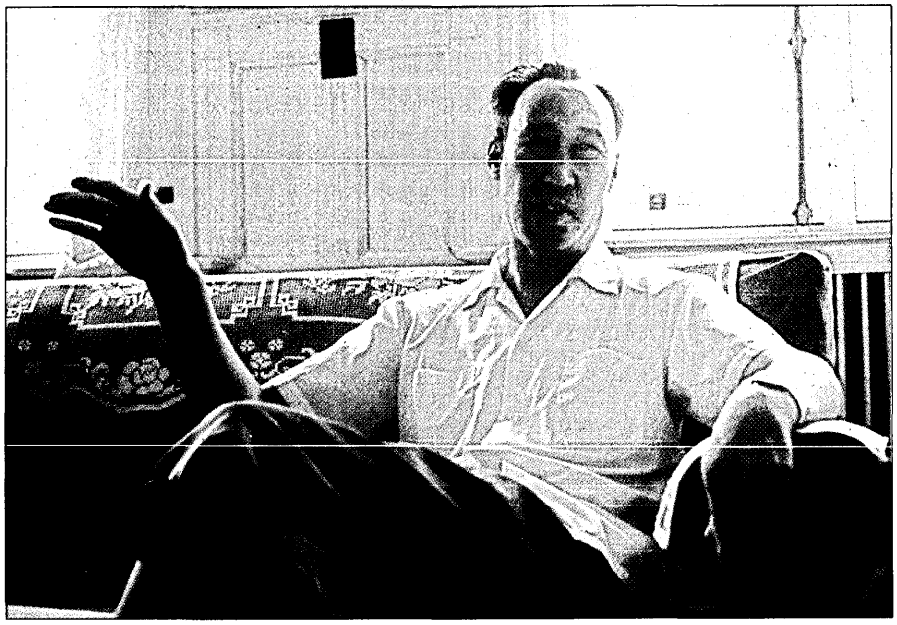
U.N. EXPERTISE SOUGHT

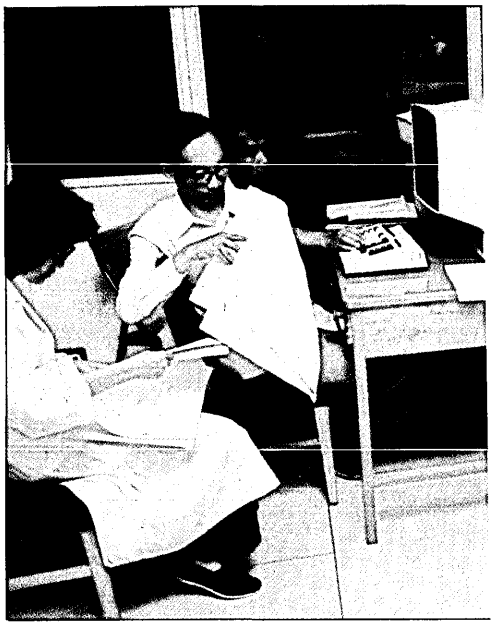
China's interest in computerizing its census first came to the attention of the outside world in 1979, when authorities sought the expertise of the United Nations and a number of its organizations. Having worked in over a hundred countries to develop statistical and demographic programs, experienced hands from the U.N. Development Program (UNDP), U.N. Fund for Population Activities (UNFPA), U.N. Statistical Office, and the U.N. Department of Technical Cooperation for Development (UNDTCD) got involved. The U.N. has long provided assistance to developing countries in census data processing, and, as a natural extension of that program, worked with Chinese officials to structure a definition of the census project, to obtain international funding for the purchase of data processing equipment and operator training, and to provide technical support throughout the undertaking.

In the end, the U.N. organizations allocated some $16 million, largely for the purchase of equipment. China itself allocated $110 million in direct costs. Bai Jianhua, spokesman for China's Population Census Leading Group, estimates that total costs to China will run 470 million yuan (about $250 million). More than a third of that money will go toward building computer stations that, according to Bai, will be put to good use after the census. "The computers will enable us to carry out systematic statistics gathering in industry and agriculture. We will also be able to perfect our household registration system by keeping constantly updated information on births, marriages, and deaths. Diversified uses of the equipment are now being studied in economic planning, education, and population control work."

In a nation where the population of the smallest province would be an average-sized country by world standards, one would expect local authorities to be enthusiastic about the prospects of computerized tabulations. But when planning for the census first began, China was still sorting itself out for the disastrous period known as the Cultural Revolution, when extremist political doctrine led to the closing of universities, purging of capable technicians, and the branding of studies like demography as "reactionary." China's huge population was regarded as its prime resource, with human labor able to make up for technological backwardness. Birth control was viewed as an imperialist conspiracy of Western countries.

After Mao's death in 1976, China's new leadership pledged to end the chaos of the previous years and make up for lost time in science and technology by allowing scientists themselves to control research institutions and by initiating exchange programs with foreign countries on an unprecedented scale. Even so, there were still leaders who continued to cling to the discredited political policies of the Maoist era and voiced resistance to new directions in technology, such as the proposal to computerize the census. Some failed to see the value in it and opposed the costs—which were shared in thirds





Bai Jianhua of the State Population Census Leading Group; scene at the State Statistical Bureau in Beijing. Nearly 600 new computer technicians were trained for the census.

among national, provincial, and county budgets—or the allocation of so many census workers who were to continue to draw pay from regular employers throughout the project. Others worried that China's historically tight national security would be jeopardized by wide access to population details. Still others opposed the trend of proliferating foreign technology in China, of which the census equipment was only a small part.

But as the pragmatist leadership associated with Vice Chairman Deng Xiaoping clearly gained the ascendancy, technophobia in the ranks was swept away as well. The new generation of savvy socialist managers brought into power by Deng eagerly awaited the day when they would be able to access a computer terminal to discover the correlation between educational level and birth rate in a remote Chinese county in order to tailor social policy accordingly.

BIDDING FOR THE CONTRACT

To get experimental work going to design the computerized census, China got in touch with An Wang, who despite his life as a capitalist success story, is viewed in Beijing as a fellow countryman first and foremost. Initial equipment was bought from Wang Laboratories and put into place to carry out pilot tabulations for several locales. Later, the U.N. team joined with Chinese technicians to draw up an equipment requirement proposal that was circulated to 20 companies all over the world. Interest was keen in winning the supply contract not only because it was a sizable deal, but because all the bidders knew the project would have high international visibility and be a foot in the door of the Chinese computer market.

IBM was eventually chosen as the supplier. Says George Sadowsky, a technical adviser with the U.N. Statistical Office who was involved throughout the U.N.'s participation in the Chinese census, "The IBM equipment is steady, reliable, does the job, and does it well. The equipment is not on the frontier of technology, but reliability and durability were among the most important factors."

Sadowsky, who is currently working on U.N. census projects in a dozen countries, says that the Chinese effort has been one of the most successful he has seen. "The Chinese data entry operators are very, very good. Less equipment per capita was needed in China than elsewhere. In fact, they had a contest for the top entry operator and it was won by a person entering accurately 21,000 strokes an hour."

IBM also provided the keyboard entry stations including 25 clusters of 3742 units that were available at the beginning of the project and 170 clusters of 5280s that became available later.

According to U.N. sources, most Third World countries have opted against the hefty long-term investment that must be made to train domestic installation and maintenance experts, preferring to contract with the supplier for those services. But looking to the future beyond the census, the Chinese wanted to be as self-sufficient as possible in the use and maintenance of the IBM equipment. Therefore, rather than contracting with IBM, the Chinese took it on themselves, something Sadowsky says "caused a lot of anxiety on our part at first, because self-sufficiency in these areas has been uncommon in our experience."

A training program was set up by IBM-Japan, and after the first wave of Chinese hardware specialists was trained, they returned to China to train more of their colleagues. Chinese officials estimate that as many as 600 new experts in hardware and software were trained as a result. Notes Sadowsky, "The Chinese are very serious about spreading knowledge. The trickle-down effect really works. They hold meetings to discuss software problems, and one wave of people trains the next."

Chinese authorities also dispersed top students in information sciences to the U.S., Japan, and Western Europe into a variety of graduate programs, seminars, and scientific exchanges to enhance their own domestic cadre of experts for the census. U.N. projects typically include permanent resident experts. But in this case the Chinese did so well on their own that the residents were terminated, although specialist visits continued.

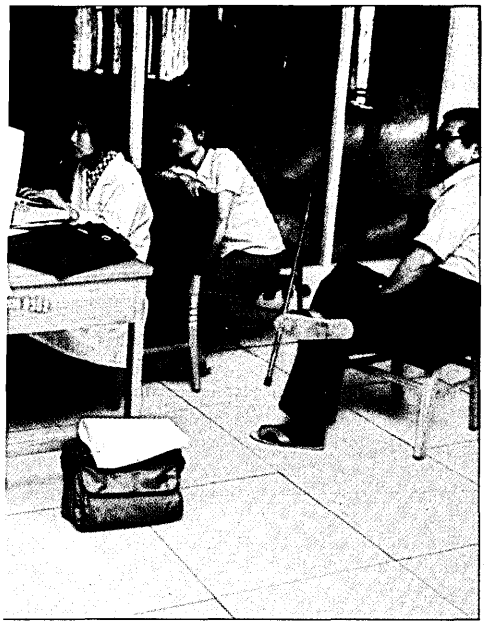
UNSTABLE POWER SOURCES

The project did have its technical hitches of course. One hurdle Chinese specialists had to clear early on was ensuring consistency of data between IBM and Wang machines. Another problem was the stability of the power sources in some of the less-developed provinces. U.N. experts helped with power line disturbance analysis and later supplied five uninterruptable power supply units to critical areas. China, which recently began manufacturing its own UPS units, supplied them to the other sites.

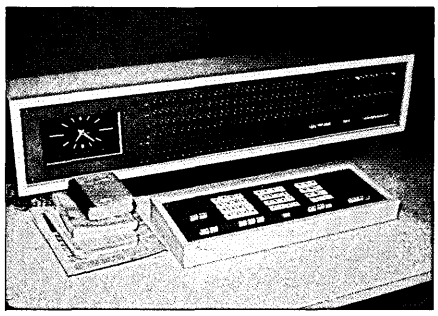
The language barrier was also a factor, with the IBM training program being run in English and then translated into Chinese. All the IBM documentation was also in English and the processing of the data required basic computer-English skills. "Naturally the effort is degraded somewhat by having to use English, but there is no alternative at this time," observes Sadowsky, who also notes that Wang and other companies, as well as Chinese researchers, are working hard to standardize the encoding of Chinese characters and develop efficient Chinese character output devices.

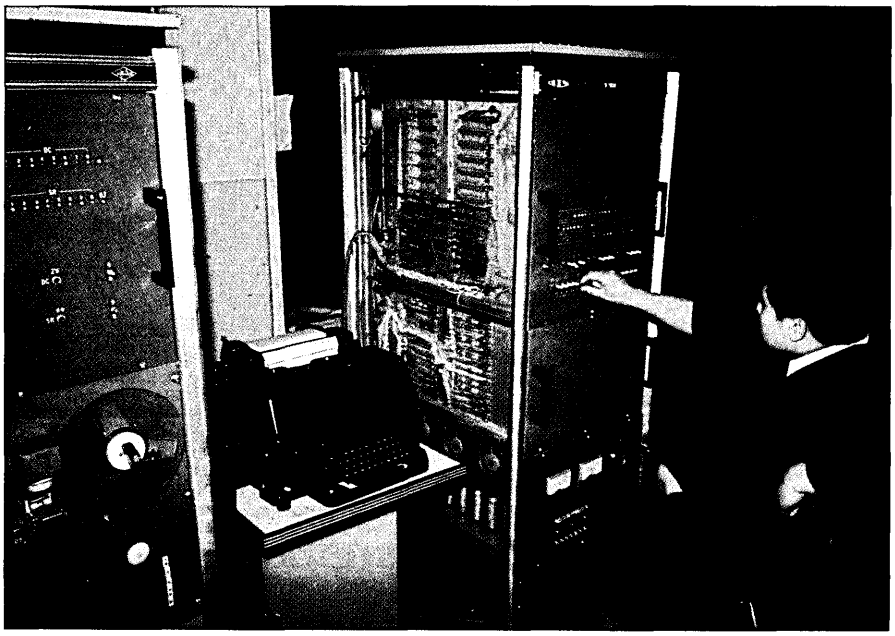
On balance, however, the human and natural problems outweighted the technical ones. Although China had consulted with population experts all over the world in drawing up the census questionnaires, specific social and cultural factors still had to be over-

PHOTOGRAPHS BY JULIE O'CONNOR



Below: domestically manufactured equipment inside the Shanghai Computer Factory. Annual output of large computers is over 500.





come in getting accurate information. A scan of the national guidebook for census workers makes some of those problems evident:

- "For the convenience of circling, the order of categories and their codes under this topic are not arranged by seniority in family. Explanation should be given if somebody misunderstands it as disrespect to elders."
- "Census workers are obliged to keep the secret on certain topics when the respondents do not want others to know. For instance, cohabitation without any legal marriage registration, premarital childbearing. . . ."
- "With regard to the data, month, and year of birth, the Gregorian calendar is recommended."

Preference for the Gregorian calendar over the traditional Chinese lunar calendar notwithstanding, there were still further difficulties in ascertaining age. According to one report in the Chinese press, "An old man of the Wa nationality could not give his birth date. He could only state that he was born 'when the hamlet was burnt, dry rice was being transplanted, and the moon was full.' " A special local team of "age assessors" looked back through lunar calendar tables to compute the man's birth date.

Tibet was the one area where no computer substation was established. There had never been any census at all in Tibet, and officials expected it to be a more complicated process owing to the forbidding terrain as well as local customs. Tibetans, for example, do not like mentioning the names of the dead, so information about recent deaths had to be elicited in indirect ways. The census there was begun two months early.

There were political problems as well. A highly centralized household registration system is a key element in Chinese daily life. Grain, cotton, and other necessities are rationed according to how many people are registered in the household. Opportunities to move to larger quarters are similarly determined. Thus there is a tendency not to report deaths. People had to be convinced that they could give honest answers to census-takers without fear of reprisals.

RECORDING TRUE BIRTHRATE

Similar challenges also existed in recording the true number of recent births. The Chinese government has enacted stern measures to persuade couples to have fewer children and to penalize them financially if they will not comply with the suggested national norms. The problem is particularly severe in the countryside, where more children mean more hands for the rice fields and fathering several male offspring is considered the surest route to prosperity.

How many births have been kept secret is hard to assess, but the computerized census was used as an occasion to pull out the stops

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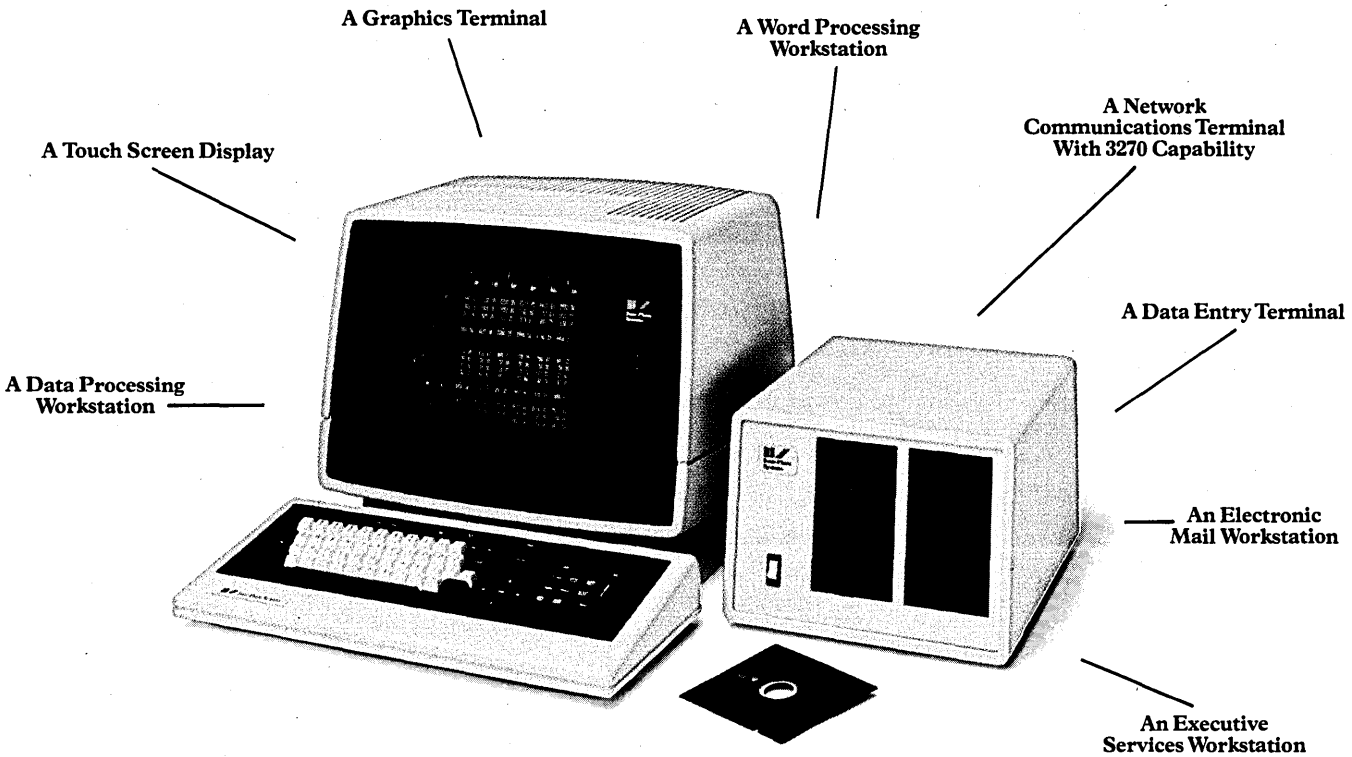

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CIRCLE 130 ON READER CARD

China has a blossoming domestic computer industry, with 10 major factories producing equipment for civilian use.

in trying to get an accurate count. Although the old household registration system may have been generally accurate, highly exact and nationally centralized figures are mandatory for tracking the population growth rate. Small shifts that may not even be numerically significant at the county level can foretell important trends at the national level. Accurate sampling areas can be chosen on the basis of computerized tabulations, something that is only now being introduced into Chinese demographic studies. Cross-analysis can enable planners to compare areas and find the factors that account for the success of one county in birth control and the failure of another.

"The very first fact you must understand in order to understand China's problems is its population," says Zhao Fusan, a researcher with the Academy of Social Science in Beijing. "For every Chinese to eat one more egg next year than this year, we must produce a billion more eggs. Even a tiny province like Hupeh [Hebei] has a population the size of Poland." Professor Zhao believes that the computerized census will not only be albe to keep better track of population patterns, but will call national attention to the ineluctable fact of China's human growth the need to curb it.

"Although the investment is large, the value is great," says Bai Jianhua of the cost of carrying out the census. Indeed, its contributions to population control and to social planning alone are considered major breakthroughs. Even more important, however, may be the indirect spin-off benefits for China's quest to computerize.

George Sadowsky compares the importance of using computer-based techniques in processing the census data in China to Herman Hollerith's introduction of punch-card technology in the 1890 census in the U.S. At that time, the new punch-card technology reduced what had been nine years of limited manual tabulations to two years of mechanical ones. The immediate value of Hollerith's innovation, of course, was that it saved labor and made statistics available before they had become outdated. But Hollerith's punch cards also stimulated inventions of all kinds in mechanical counting devices, and his work is considered a major step on the road to the computer.

China already has a blossoming domestic computer industry, with 10 major factories producing equipment for civilian use. Annual output of large computers is over 500, although interest in advanced models like the TQ-6 (1 million operations per second, 128K memory) has been waning recently in favor of more development and wider application for minis and micros. Counterparts to Intel 8080 chips are being manufactured; work on 8086s is being pursued. In August of 1982, China announced its first-ever export of micros to a Western country, with the sale of 1,000 BCM-IIIs to West Germany.

ADVANCED EQUIPMENT FROM U.S.

Some 100,000 Chinese have been trained in essential computer skills, and computers are becoming more widespread in power stations, factories, communications institutions, and universities. China has also bought some advanced equipment from abroad, including mainframes from Burroughs and Honeywell and turnkey CAD systems from Computervision. Hewlett-Packard maintains a local distributorship and maintenance office in Beijing. Although little is known about China's military applications of computer technology, computer-controlled ICBMs and research satellites have been successfully launched in recent years.

But at the same time, China faces a tangled web of obstacles in its efforts to computerize. The Chinese believe, for example, that the Reagan Administration is blocking exports of sophisticated U.S. equipment to China and is also trying to restrict Japanese and French exports through American influence in the Paris-based Committee for Export Controls on Strategic Goods to Communist Countries. International politics aside, China faces major dilemmas in determining where to concentrate its limited resources in developing computer technology.

"Can a computer solve the key problems of a certain factory or institution? If the directors cannot see how it can do so immediately, there is a reluctance to use it," notes Chen Xing Xiang, a top engineer at the Shanghai Computer Factory. His factory manufactured a DJS-131 series for the local telegraph office in Shanghai. But workers there found it too complicated so it sat idle most of the time. When the annual Spring Festival came, however, and telegraphic volume reached 100,000 a day, they suddenly found that the computer could indeed be a time-saver and began to use it. "There are many barriers in the mind and barriers of tradition that need to be overcome," says Chen.

Students come back from training in the West with new ideas—like designing payroll programs in the factories—until they remember that with China's cash payment system, computerized payrolls are of little use. In Chinese universities, meanwhile, computer students have little hands-on time even at the graduate level. One American programming specialist teaching in Shanghai reports that many students have no access at all to computer time, and their programs are reviewed by teachers who have scant hands-on experience themselves. On hundred hours of hands-on training over a four-year computer science program is considered the ideal, but admittedly it is rarely achieved.

Purchasing foreign-manufactured computers is often difficult because import licenses have to be obtained from the Ministry of Electronics, which has become increasingly protectionist. Domestically produced equipment tends to be more expensive, however. Rudimentary knowledge of English and Roman characters remains a roadblock to real popularization of computers. User-friendly design concepts are rare.

The list of problems goes on and on, but it does not diminish the enthusiasm of China's computer scientists and visionaries for the future. "There are few countries where scientific information management could be put to such good use," says a scholar attached to the state's commission on science and technology. "We have so many people, so much paperwork, so many levels, and so many hierarchies that computerization can simplify."

Pan Cheng-lieh, a leader of China's recently created professional society of factory managers, sees computers as "a key element in bringing scientific inventory control, modern management, and marketing techniques to our enterprises." Xu Lian-cang, a psychologist with the Academy of Sciences, is pioneering new studies of worker behavior and attitudes with the aid of an Apple computer he brought home with him from his studies in Michigan. Hu Ping of the state's Department of Science and Technical Policy sees his country making great strides by emphasizing "software rather than hardware, and applied rather than basic research." Hu says he expects that in the new five-year economic plan, the state will increase its spending on computer technology. And unlike before, when investment was concentrated on single advanced breakthroughs, the funds will go toward application of existing technologies on a wider scale.

For all those in China who see the computer as a weapon in the battle they are waging for a modernized country with a vastly improved standard of living, the census project is a model and an inspriration. In concrete terms, it has increased the number of hardware and software engineers, broadened the scope of the data processing infrastructure, and created the first nationwide computer system. Perhaps more importantly, however, it has underscored the virtues and applicability of the computer in China. In so doing, computers have been a tool not only for tabulating the existence of China's 1 billion people, but undoubtedly for changing their future as well. *

Daniel Burstein is a free-lance writer based in New York who frequently travels to Asia.

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DATAMATION listens to Latin leaders discuss their informatics hopes and headaches.

ROUNDUP IN RIO

by Marc Burbridge

On a bright hot day in Rio de Janeiro, top-ranking government officials from Argentina, Brazil, Chile, and Mexico got together at the Rio Palace Hotel, overlooking the famous Copa Cabana beach, to discuss some of the key issues in the Latin American informatics realm. Taking part in this exclusive DATAMATION round table were Vice Commodore Juan Manuel de Beverina, chief of informatics in Argentina's Office of Planning, Colonel Joubert de Olivera Brízida, president of Brazil's Special Secretariat of Informatics; Brigadier General José Mutis Puccio, president of ECON, Chile's national computer company; and Dr. Carlos Enriquez, Mexico's director general of informatics policy.

DATAMATION: What are the implications of computer technology on the future economic development of Latin American countries? Can they rationally absorb it?

Carlos Enriquez: I think that in Mexico the implications of technology that principally involve technological processes must be very carefully evaluated due to our present economic and monetary recession. It would be dangerous to think that these technologies could be important to future development only because of their effect on employment. I do not think that would be the answer. Only in the case of strategic industries should this type of technology be applied, if we do not want to aggravate the increasing unemployment situation we are facing, despite our use of more traditional technology.

DTM: In some cases, computerized numerical control has been said to result in productivity gains as high as 20 to 1. Is there any problem in delaying the absorption of this technology?

Joubert de Olivera Brízida: Yes, a problem exists, and I want to expand my comments to include office automation, which is parallel to industrial automation, and the cause of serious problems of unemployment. I feel that countries in our region should try to absorb industrial automation, being careful nevertheless to avoid the problems Dr. Enriquez explained. Brazil has clearly stated its own policy on these problems. If it is a question of doing business in international markets, where rigid control of quality is necessary and competitive international prices are required, Brazil will have to automate its production, which in fact is already being done in some fields. For that purpose, the Brazilian government, through its Special Secretariat of Informatics (SEI), is developing a special program of CAD/CAM, numerical control, and programmed controllers in order to penetrate the area of industrial automation.

As for the internal market, Brazil must make as much use as possible of available hand labor, which is the opposite of automation. In office automation, the problem is even greater since our countries have a large concentration of public employment. Therefore, if office automation is inadequately introduced, it could create an enormous social problem. Brazil is deeply worried about office automation invading the principal societies in the world.

Juan Manuel de Beverina: I think that somehow we must differentiate between the main trends and objectives. Office and industrial automation is a fact and we must admit that some day we will have it. The problem is how to achieve this goal. It will depend on the internal situation—in other words, whether the government controls it—as well as on the external situation. These two factors will influence the solutions. If we are going to try to conquer an international market that demands a certain quality and price, we will have to adopt CAD/CAM or we shall not be able to compete. But that also depends on the labor force available in the country.

In Latin America, conditions are different. The same applies to office automation, but in this case it is an internal problem. If the office is not automated, I am governing in a less efficient way. On the other hand, if I automate the office, certain jobs will be eliminated and unemployment will increase. But I think in the end it will be necessary to automate, so that the government will be able to make better and quicker decisions through good and precise information.

DTM: What is the basis of concern over transborder dataflows (TDF)? What can be done to control them, and what would the effects be?

Brízida: I have the feeling that this question was directed at Brazil, because Brazil has, in fact, been quite concerned with TDF. Brazil has a relatively coherent and clear policy regarding this problem. For us, four basic principles govern our TDF policy. The first is that

"All the government should do is encourage local production and protect national manufacturers."

Brazil thinks that it should have within its own frontiers the greatest possible amount of information resources—that includes computers, software, databanks, and computing centers, as well as technical and management jobs. The second principle is that Brazil must control technologies and decisions on TDF in Brazil. The third principle is that Brazil wants to offer its society the broadest, most universal access possible to knowledge filed in large databases in the more developed countries. And finally, all Brazilian TDF policies are directed toward implementing and improving the culture and democratic regime of our nation.

As for what can be done by Latin American countries to control TDFs, Brazil cannot suggest what other countries should do. Brazil thinks that through data communications nodes and public packet-switching networks, it is possible to exert relative control, but each country in our region must decide the best way for itself.

José Mutis Puccio: TDF is a problem that greatly concerns Chile. We are now experiencing what could be called "one-way flow." During industrialization, some countries produced raw materials. These materials were sent to industrialized countries and finished products would return. Today, a similar, undeniable fact exists—countries produce raw data that are captured by very sophisticated systems that cannot be controlled by the country owning the data. These data flow out of the country and immediately come back transformed into processed or "finished" information that has to be acquired. We are, therefore, importing information.

This is what we call "unilateral dataflow." This phenomenon must be studied and somehow countries will have to begin developing t ir own database systems in order to partici ate in this interchange and prevent it from being unilateral. Evidently there is a danger to national security in this uncontrolled flow of data and it is necessary that each country establish regulations to ensure that its sovereignty will not be affected.

Enriquez: I think that the basis of concern is a real one. The implications and the mounting importance of TDF from an economic point of view cannot be overlooked. First, because we are talking of unfavorable transactions or interchange of information in the developing countries. The unfavorable terms of exchange that can exist in international commerce when the developing countries export raw materials in exchange for manufactured goods, can similarly be applied in TDF terms when data are considered raw materials. These raw materials or primary data from the developing countries are transferred to the developed nations at a very low cost or none at all, only later to flow back and be sold as processed data at a much higher price.

JUAN MANUEL DE BEVERINA

There are other implications, such as the use of these dataflows by transnational companies for commercial transactions between their subsidiaries and home offices. On the other hand, there exists in developed countries, and in these companies, an active policy of free flow of information that translates into tacit opposition to any attempt made by any country to regulate that flow. Nevertheless, I think that regulation is inevitable, and an example of this is the outline of national policy prepared by the OECD for its members.

DTM: What is the government's role in the development and control of informatics, especially in regard to procurement of equipment and services for the public and semipublic sectors, training of dp personnel, and approval of hardware/software?

Enriquez: In order to make good use of informatics, the role of the government is very important—not only in regulating informatics, but also in stimulating it and giving it a proper orientation. Informatics began in Mexico not as a result of an autonomous decision, but when companies started selling informatics services. About 20 to 25 years later, the government realized it was important to regulate this activity. Acquisition of equipment and services is now being regulated by the Mexican federal government according to technical and financial needs.

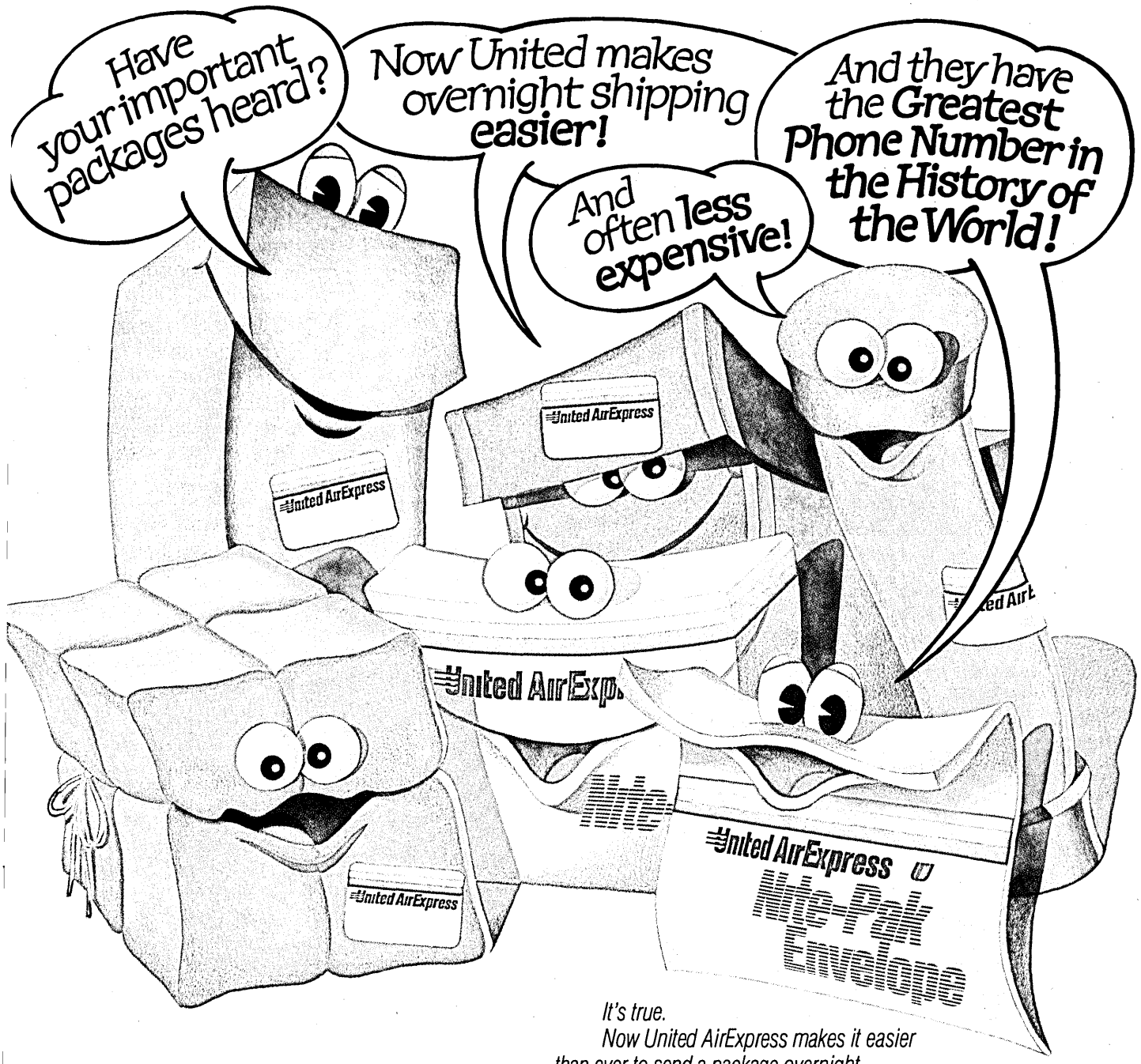
As for dp training, we recognize that this is one of our major problems. We are trying to train as many people as possible, even those working in public administration, since many of them have practical experience but no formal education in this field.

On the subject of hardware/software, there are two aspects to the problem. The first one refers to hardware and software that is marketed in Mexico by companies located in the country. Until now there have been no real limitations here. There is freedom to import new technologies and products. Perhaps later it will be necessary to review the situation to see if a changeover to other types of products and services is needed. We may, for example, have to invest not so much in the big computing centers created by the government, but more in minicomputers with distributed or autonomous processing.

A year ago, the Mexican government approved a program for local manufacturing of computer equipment and services. We now have 42 approved projects both from major multinational firms, as well as national companies. All this is subject to importation restrictions because of the difficulties our country is going through. More facilities, for example, are given to companies that manufacture equipment domestically, while fewer facilities are granted to those importing equipment.

Mutis Puccio: As to procurement of equipment and services, it is in the public sector that there seems to be a greater need for the government's coordinator role. On the subject of training dp personnel, one must make a distinction between professional education and technical training. In Chile professional education is handled by the universities through the Consejo de Rectores, where common programs are developed. Universities also give special brief postgraduate courses for professional improvement. Obviously the Ministry of Education also plays an important role in this field and in the supervision of training programs in the private sector. As for the approval of hardware/software, all the government should do is encourage local production and protect national manufacturers.

Brízida: I feel that the government must play a dominant role when you are dealing with such an advanced technology as informatics, which has so many strategic implications, including that of national sovereignty. Many countries have worked hard in this respect. The U.S., through its formidable power to subsidize R&D at private companies, was able to give an enormous impetus to informatics. Japan, thanks to massive investments and protection of its dp companies, was able to achieve extraordinary technical advances. Other developed and developing countries are also trying to establish this important industry. In this respect, therefore, the government's role must be substantial. One of the best ways to achieve this is to use governmental purchasing power in the way France does to try and develop national industry.



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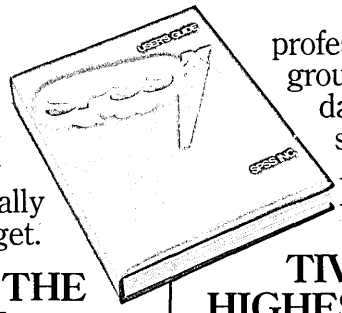

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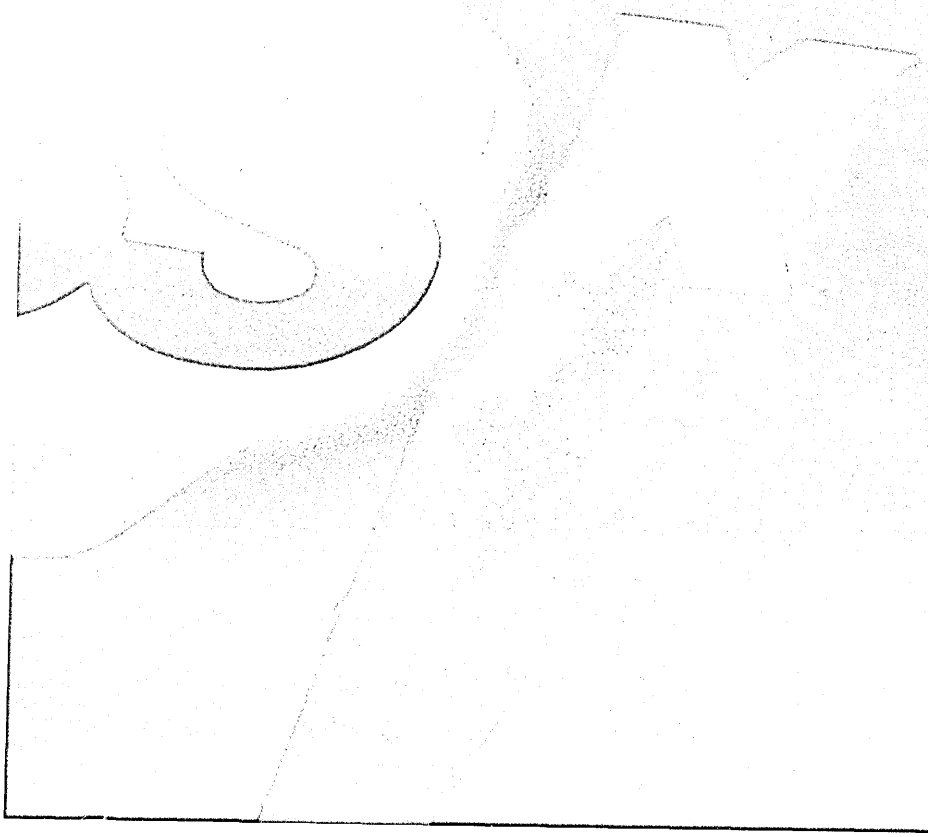

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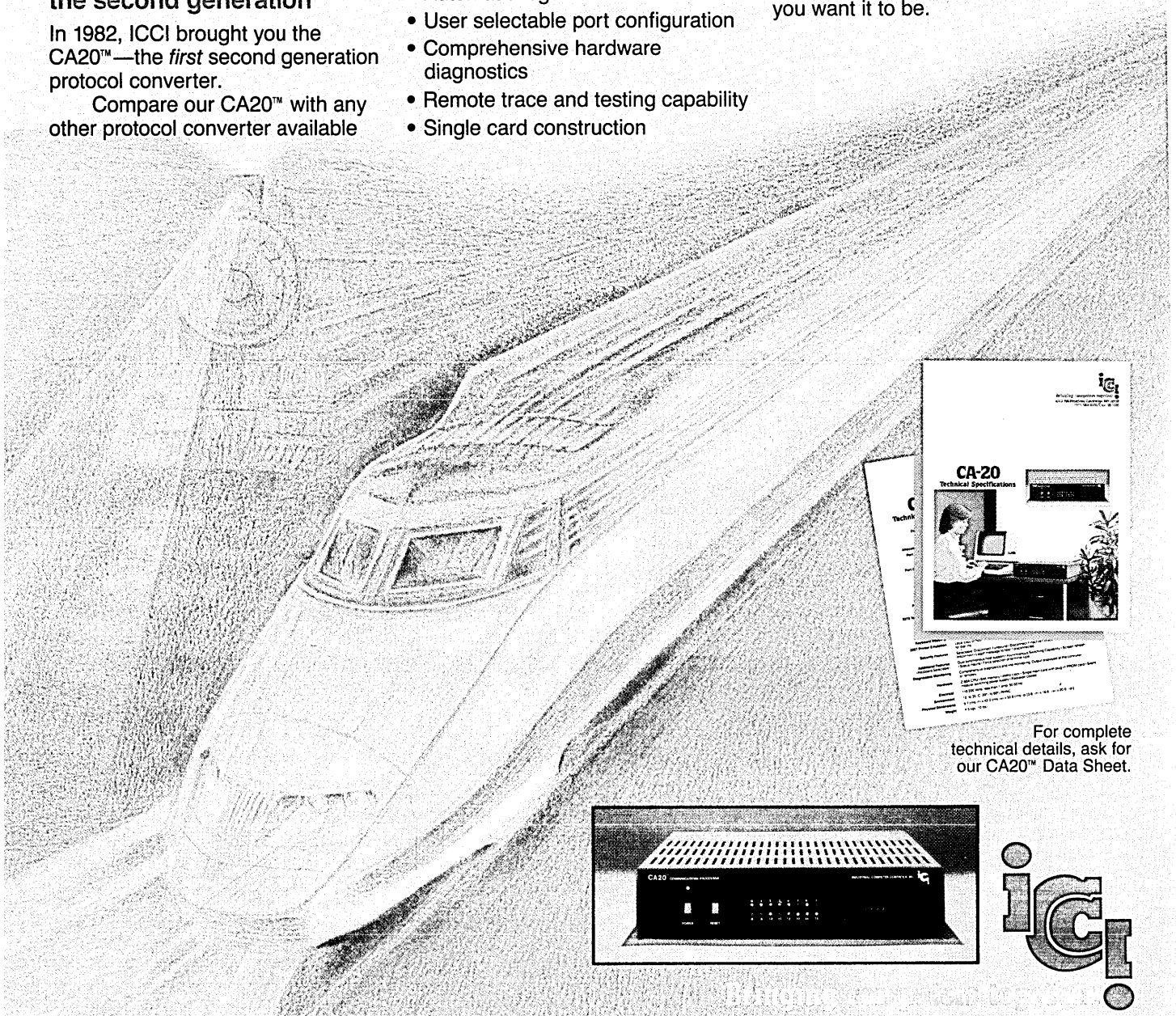

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"The only possibility of developing a microelectronics industry would be at the Latin American level."

In the area of dp training, the government also plays an important role. In Brazil we do it through our principal dp agency, SERPRO, which not only does dp but also trains people who will go on to work in the Brazilian dp industries. With regard to hardware/software, the Brazilian government has tried to obtain a genuinely national industry—a goal that we currently consider to be both a necessary and coherent approach.

Beverina: Argentina shares all the opinions that have been expressed until now. We are, however, currently changing our policies on government acquisition. In the beginning we had to manage with the few technicians that we had. We are now trying to counteract the attempts by big multinational companies to place large amounts of equipment, regardless of real market needs. I think that we have now reached the first stage, since we already have technicians capable of determining our real needs.

The government is now studying not so much the problem of hardware, but of systems. We are not interested in knowing what processor or what peripheral each department is going to use. Instead, we want to know about their three- to four-year system plans. Therefore, I think that governmental intervention depends a great deal on the status of the internal organization and personnel training. The government provides subsidies when the upper levels do not fulfill their mission and the lower levels cannot act independently.

DTM: What is the current trend in Latin America toward regional cooperation in informatics? What will be gained from this cooperation and what are the barriers to it?

Beverina: I take it for granted that we need to have regional cooperation. Should any of our countries want to develop a hardware or software industry of its own, it will find that the market is small—that the industry requires very few people to obtain a high level of production that far surpasses the country's needs. All this forces us to think in terms of regional markets. It forces decisions to be made by the governments of the region, not be imposed by multinational companies. It will also force the governments to decide who will do what in order to act in a multilateral way, enabling us to come into the market with products that have been the result of the joint effort.

Enriquez: I think that the present situation in regard to cooperation would be really disheartening if we did not take into account two facts: that Latin American is a market dominated by the multinational companies, and that each Latin American country is trying to reverse this trend, given its own capabilities. Commodore Beverina put it very well when he said no national market is big enough to absorb this kind of industry, so we should begin by reviewing the conditions of the basic microelectronics industry.

JOUBERT DE OLIVERA BRÍZIDA

Recently a meeting was held in Mexico City to analyze the implications of microelectronics. The conclusion reached was that currently the only possibility to develop an industry lay in creating a regional enterprise, formed by all the countries ready to consider the Latin American market as a whole. Such an arrangement would have to be based on bilateral agreements, beginning with decisions on complementary production of such items as software, where a large market exists. I think that all our markets are established more or less on the same scale and, based on our mutual capacity, we could think of the possibility of cooperation.

Brízida: I agree with what Beverina and Enriquez have said, but I want to add that the sixth Congress of Latin American Authorities in Informatics (CALAI) will mark the start of more effective cooperation in informatics in our region. CALAI will be an adequate forum for our countries, each of which is in a different stage of development in informatics.

DTM: How is this rapid trend in microelectronics development viewed? Does it represent a threat to technological development in Latin American countries?

Brízida: Microelectronics is the basis of informatics. There has been a worldwide tendency for manufacturers of finished equipment to expand vertically, transforming themselves also into producers of components. They manufacture microelectronics components with all the features, all the firmware, all the technology implanted in that small chip, and then the equipment grows around that chip.

But recently we have observed the opposite trend in the world. In the U.S., manufacturers, especially big ones, are avoiding the custom-made approach. Instead, they are using shelf or common components in their equipment. They are no longer making special components for the equipment. This is done to obtain lower and more competitive products.

At any rate, microelectronics is at its peak. Brazil recognized the necessity of acquiring know-how for some microelectronics technologies. We do not intend to dominate all these technologies, since I don't think any country can master all of them. But we do want to dominate certain areas, and to this end, the government has provided funds to create the Institute of Micro-Electronics in Campinas, to establish pilot manufacturing programs to help the two Brazilian companies that are going to work in this field.

Enriquez: I want to emphasize that as long as microelectronics is an important element in increasing productivity, the chance of having a competitive export industry is very small. On the other hand, we must not be too concerned when internal consumption is not based on the most advanced technologies. The current economic situation that will probably extend into the near future obliges us to revise our views on the need to have the most advanced technologies at our disposal. This especially applies to electronics.

In Mexico free importation of goods causes us to import the latest technologies at the consumer level. If we already had an infrastructure, we would have to keep it going, creating a national industry for that purpose that would probably face increasing difficulties incorporating microelectronics as a key element in productivity. As long as there is a real difficulty keeping an export industry based on the use of microelectronics going, we will have to turn to national industries, even if they do not have these types of electronic components. On the other hand, I think that the only possibility of developing a microelectronics industry would be at the Latin American level.

DTM: What is the state of the art in Latin American informatics and what are the prospects for Latin nations to act not only as recipients of technology, services, and equipment, but also as suppliers?

Enriquez: Compared with the latest technologies, the state of the art in Latin American equipment is relatively poor, since we basically have been importers. I think that our possibilities are based on our real capacity for assimilating technology via effective transfer

processes. It is not only a question of buying and using technology, but also a question of being able to modify it and use it for specific purposes. In Mexico some companies have bought technology and are now suppliers of terminals. One government department, wanting around 6,000 terminals, bought them from a Mexican manufacturer that had previously acquired foreign technology. That is a good example of our capacity to begin handling this technology. Nevertheless, the possibilities of doing the same thing with more sophisticated equipment are still very limited.

Brízida: With respect to the state of the art, I certainly agree with Dr. Enriquez that the actual state of Latin American technology is backward. But now I would like to say something on a Latin American level based on the Brazilian experience. We in Brazil feel that we must not desperately run after everything new that is produced in other countries. We feel that for a certain period of time, our country can live with a technology that's adequate to our needs. By keeping up-to-date with what is happening elsewhere, we can try to bridge the gap later on to attain a higher technological level. In this way, the technological gap can be maintained at a constant level.

We believe that the continuous and undisciplined search for every innovation that appears in developed countries will only bring frustration and widen the technological gap. I think that Latin American countries, and excuse me for suggesting something in the name of the whole region, can live with technologies that permit them to achieve an adequate level of development.

DTM: What kind of industrial policies and backup investments are being devoted to building up the informatics industries in Latin American countries?

Enriquez: When the development program was conceived in Mexico, there was a big need for collateral investments (especially in the area of spare parts) to ensure equipment manufacturing. A search was made throughout the local electronics sector to find which establishments could back up the governmental program. These companies would be subject to a special stipulation that a large percentage of the capital be Mexican. Some problems appeared, however. Few of the electronics companies had an adequate base. In Mexico the quality control systems needed by the companies that were going to manufacture the equipment did not exist. The possibility of obtaining a high degree of national integration was also limited. Considerably bigger investments than those imagined at the beginning of the project were needed.

Apart from investment in industry, the development program also requires an investment in human resources. The program, for example, will need to recruit technicians from the manufacturing sector since there currently are not enough qualified personnel. Large complementary investments are also needed. So, in order to avoid stopping the development program, we have accepted the fact that external help for technical support and research and development is needed.

Brízida: Investing in informatics is an expensive proposition. The U.S. does it through large government contracts. Japan also invests a lot of money in this area. Unfortunately, Brazil is going through an economic crisis that does not allow the government to invest as many resources as it would like to in informatics. As a result, all of this effort being carried on in Brazil is being paid for, in part, by the consumer. Brazilian consumers are currently paying higher prices than those set by the international market. But prices are coming down every year, and I hope that in a short time we will be operating on a par with international prices. For the time being, the two actions our government has taken to support this market involve protecting the internal market, and financing the purchasing and selling of equipment.

Beverina: In regard to national industrial policies in the informatics industry, I only want to add that in Argentina we believe that an industry begins in the engineering department and not at the manufacturing level. That is to say, we consider an industry to be national only when truly domestic engineering goes into the development of the final product. This does not mean that in the first stage we do not buy a license or emulate foreign equipment, but basically we aim for national engineering to be the first stage in the manufacturing process.

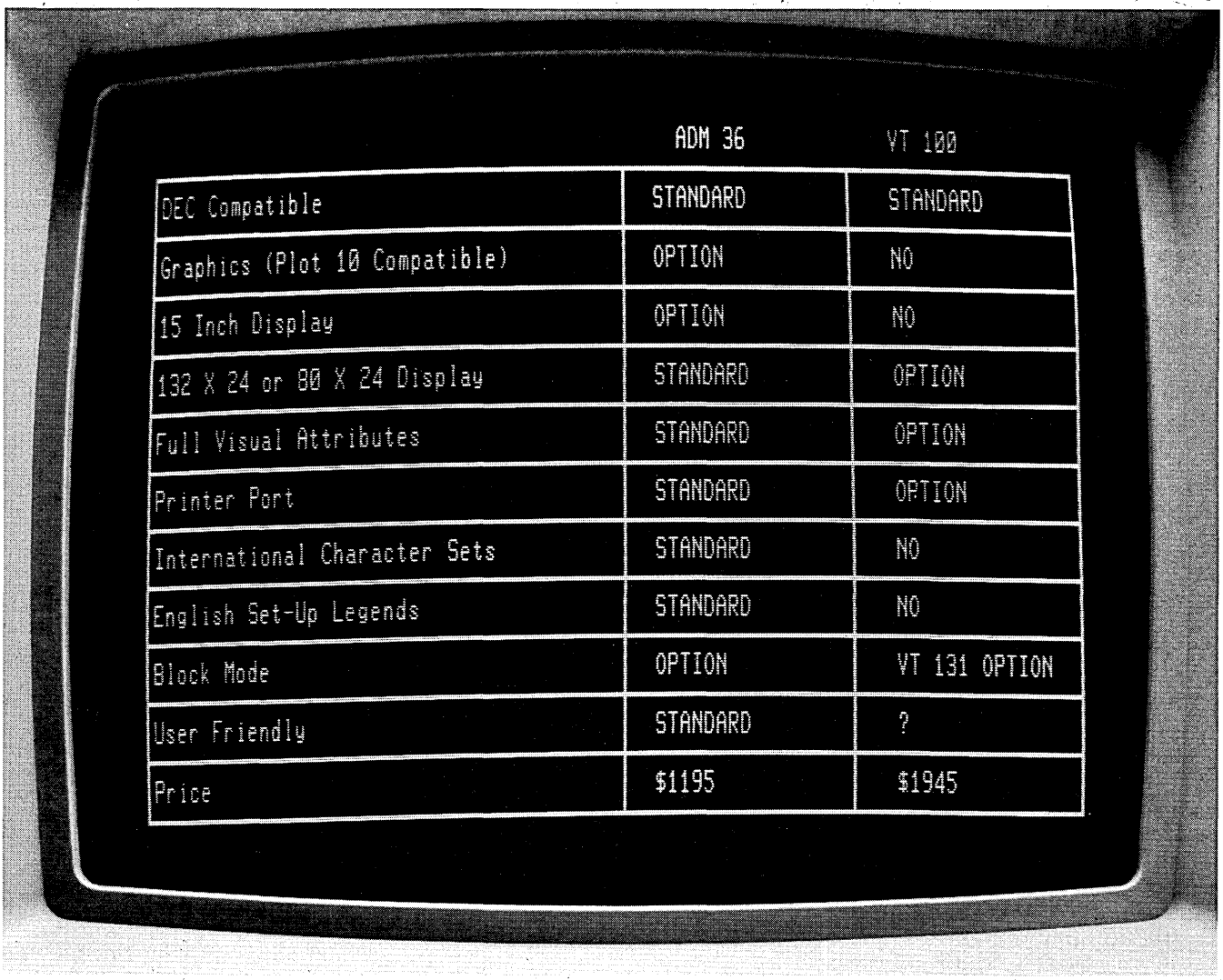
CARLOS ENRIQUEZ

Mutis Puccio: Chile's internal market is small; therefore, we do not consider it important to develop a national industry in this area. Our government has asked foreign companies to participate in joint ventures, where they must meet preestablished conditions and assume the market risks. Nevertheless, our government has established policies to create a software industry. This software, which we have been selling to other countries, is manufactured with national engineering.

DTM: How much impact does the current economic situation have on the strategic plans of Latin American countries in the informatics area? To what extent do international financial pressures influence national informatics policies?

Beverina: The present economic situation must not be the reason for limiting an informatics or informatics industrialization plan. Every plan is long range—a strategic policy of five or six years. But it must not worry us if we do not have a long-range policy. It will take us longer to get there, but we must have a very clear picture of the need for industrialization. I think that it will take longer, somehow, to obtain that industrialization level due to the fact that we are going through a bad international crisis. To what extent do international financial pressures influence national informatics policies? I think that we must face things very directly. If I am interfering with the international market of a transnational company, pressures will exist because, if I am going to get a part of its market, its government will defend it by exerting pressure on me. Governments will have to clearly outline their policies; they will have to state their policy and then move forward.

Enriquez: The first part of the question is very clear in regard to Mexico. The actual economic situation of our country will definitely affect informatics. From 1978 to 1981 we had accelerated economic growth. The development of informatics had a very wide market, due not only to the rapid economic development, but also to a free import policy. A year later we have the opposite situation. Serious difficulties in paying our debt have led to exchange controls, a shortage of import quotas, and a reduction of government expenditures. All this will affect the growth rate in the near future, and therefore, we shall have to make better use of the resources we already have. The small import quota will first be used to acquire necessary spare parts to maintain the already existing systems and equipment. The imports will then go toward supporting our development programs and any future needs of the companies working on these programs.



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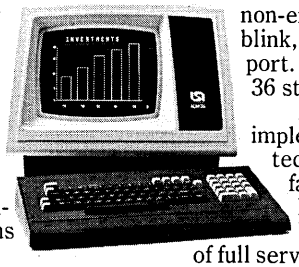

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"If the technology-rich nations want to help us, they must start in the field of education."

Brízida: I am optimistic as far as Brazil is concerned, although we cannot ignore the fact that the international economic situation is difficult. Next year Brazil is going to face a period of limited importation and an effort in exportation will have to be made in order to improve the balance of payments. This is positive for the Brazilian informatics industry. If we can not import, we shall have to produce it locally, and this is very good for the Brazilian informatics industry.

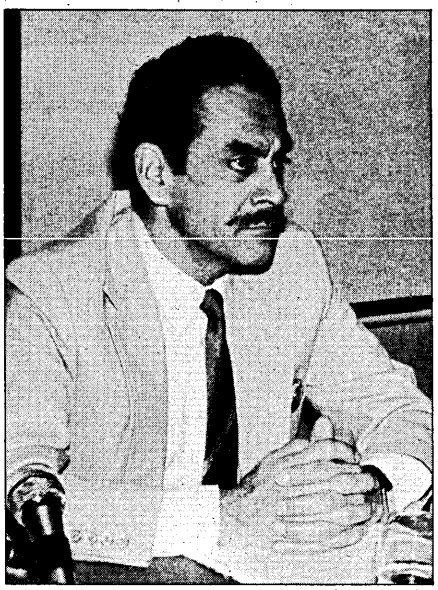
Mutis Puccio: Chile has naturally felt the international recession. In our country we must first try to solve the more pressing social problems, which leaves informatics development, at least for the time being, in second place—slightly behind the other countries. I think that the recession will slow down but never stop the development of national informatics.

DTM: What is the role of technologically advanced countries in the development of informatics in Latin American nations? How could North-South relationships in this field be improved?

Beverina: I think that the term "cooperation in informatics" with technologically more advanced countries is included in the agreements of general cooperation already signed and established between developed countries and developing ones. If the more advanced countries want the developing ones to attain better living standards, they will have to make informatics development take place in the quickest way possible and at the lowest possible cost—that is, if they are really interested in our advancement in this technology.

In order to master an advanced technology, an broad base is needed, not only in material resources, but in human ones as well. It is a technology that cannot stand alone as if it were a tower in the middle of the desert. This technology needs to be accompanied by development of the whole community, of the whole industrial complex—development of the human context upon which it feeds. If technologically advanced countries really want the development of our countries, they should not send us modern equipment that costs more each time, thus creating an even greater dependency. They will have to make a real commitment to helping our nations conquer the technology in order to reduce the existing gap between countries that have advanced informatics cultures, where full use of new technology is possible. That is why I agree with what Mexico said about not desperately running after the latest technology, but only after the technology that our countries—in a different cultural context than the Northern ones—need.

I think that if the technologically rich nations want to help us, they must start in the field of education. If in 20 years we do not get positive results, we will find ourselves in a worse situation than the one we are in today. My question is, where will the children who are six years old today find themselves in the year 2000? If I do not begin to educate them to think more clearly, so that they will have more information and therefore arrive at more logical and correct answers, will those children end up trying to absorb a technology being imposed on them by the Northern countries? I think that it is the duty of each country to try to offer in the informatics teaching area—more in software than in hardware—the best possible means of creating an educational plan that will allow these six-year-olds the possibility of obtaining a better education than the one we had. In this way, our people will be able to make better decisions. Therefore, it is in the field of education that developed countries must help us to make future generations better than we are.



JOSÉ MUTIS PUCCIO

Enriquez: The informatics market in Mexico is supplied mainly by American companies. Many times these companies have sold equipment and systems that, if analyzed from the Mexican point of view, would have proved to be unnecessary. This has caused us to underutilize dp equipment.

Companies in other countries that have tried in vain to conquer Mexican markets have suffered very unfortunate experiences. Distance and transportation costs were some of the reasons why they could not enter our market. I believe that cooperation has been difficult because commercial interests have prevailed over any desire to make a real effort for mutual cooperation. I, therefore, believe that there is a truly open field for cooperation if the idea is really to create effective technology transfer programs that are aimed at supporting mutual concerns and not simply the interests of commercial enterprises.

Brízida: I have little to add on this subject since I entirely agree with what Colonel Beverina and Dr. Enriquez have said. In finishing I would like to state that the role developed countries can play in Latin America is a very big one, not only through cooperative agreements at the government level, but also through the operation of transnational companies that maintain subsidiaries in our countries. We think that those transnational companies should partly redirect their operations so that while still maintaining profitability, they also adopt a philosophy that is not so short term. In other words, they should try to give to their subsidiaries in our countries greater technological capacity and, indeed, some autonomy in decision making. Only in this way will these companies leave a technological legacy in our countries. Concerning North-South informatics relationships, it is necessary that the exchange of information and experience be increased. The North-South dialog on informatics technology is still very limited. It is essential that we know more about what is happening in developed societies, and that they know more about us.

Mutis Puccio: I also agree with what has already been said, but I think that the question should be reformulated because at the moment the role of the developed countries is in the hands of the multinational companies. That is to say, it is not the country that plays the role, but rather the multinational companies operating in our countries that play the role. Naturally, these companies must be profitable, otherwise there would be no sense in them functioning as commercial enterprises. They are the suppliers, and only rarely will they diminish their profits to benefit the country where they are operating.

With respect to the developed countries themselves, I would say that if they want to help us they should first get acquainted with our reality since they, in fact, do not know it. I believe it is most important that the technologically advanced countries understand our reality as a basis for communications. Secondly, they must recognize our achievements, because important ones have indeed been made in Latin America. It is necessary that developed countries recognize these achievements so we can communicate and negotiate with them on an open and equal basis. ✲

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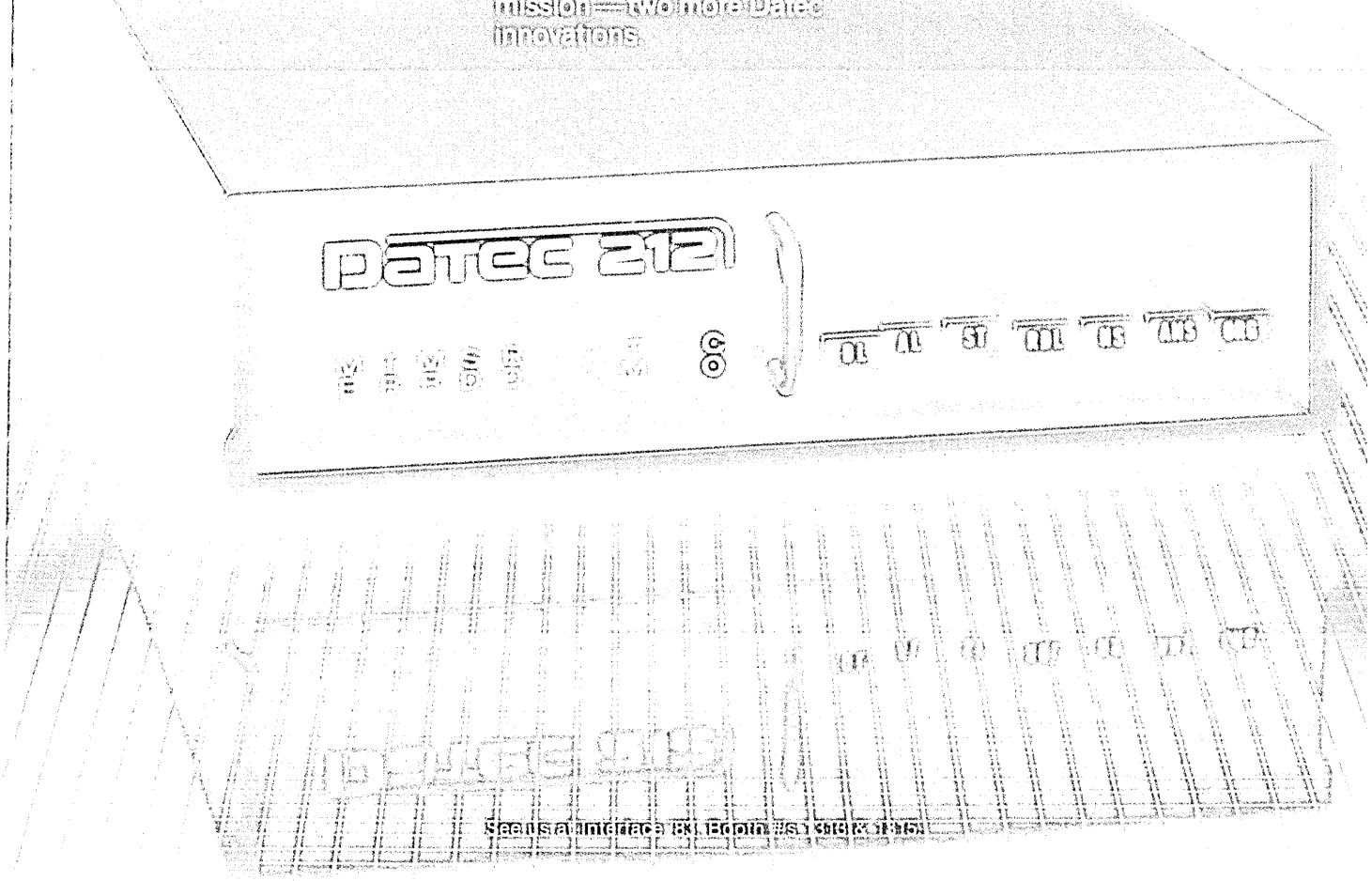

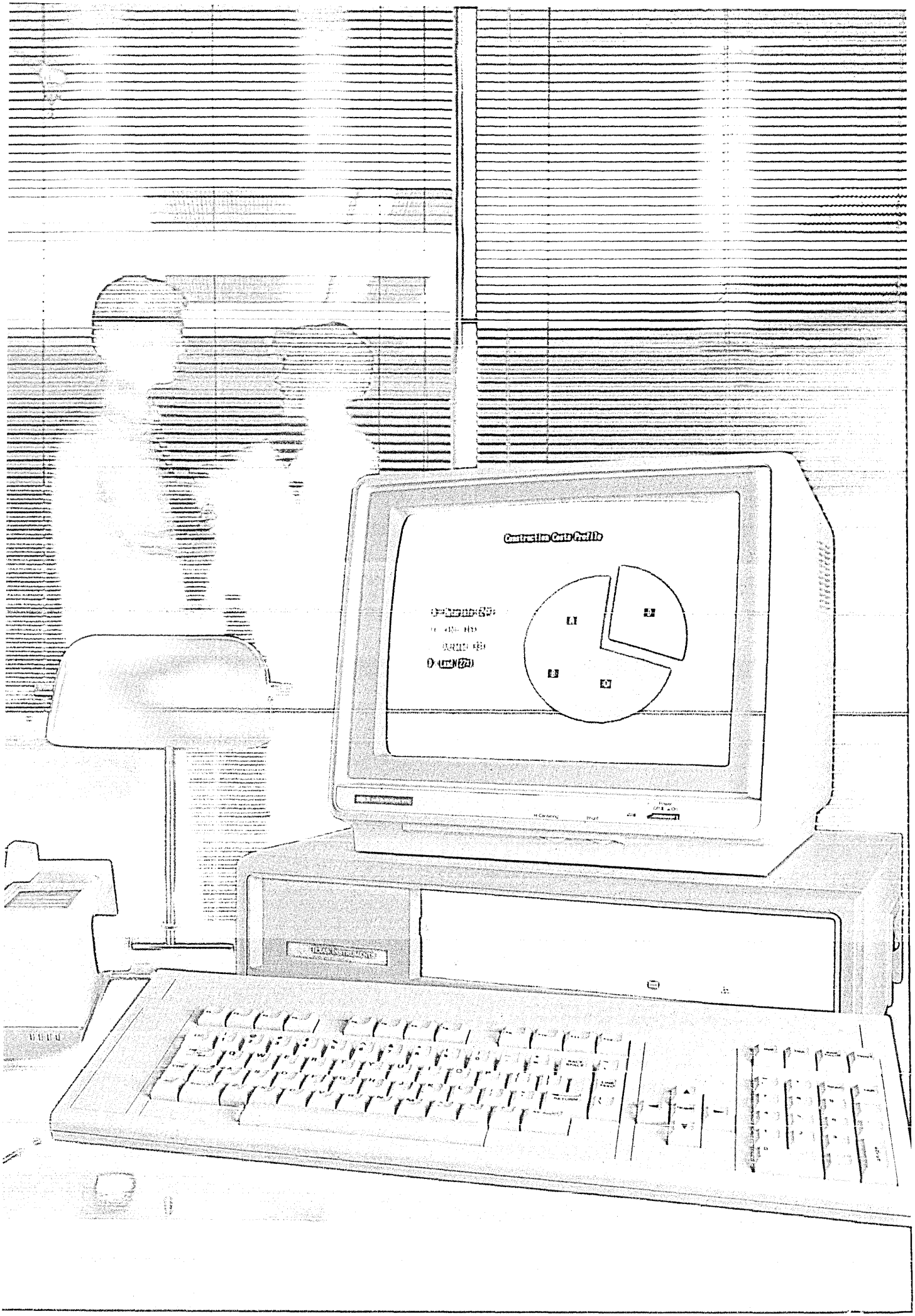

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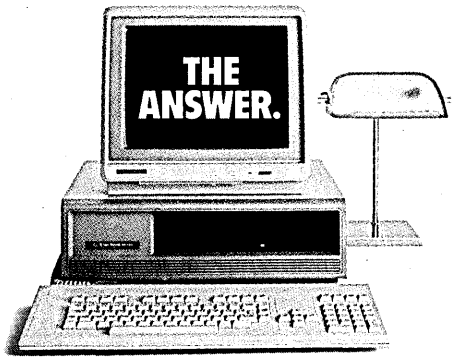

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CIRCLE 138 ON READER CARD

A visitor views eight mainframes capable of a dozen MIPs apiece, storage capacity of over 70 gigabytes, and other mysteries of the East.

COMPUTING AT TOKYO U.

by Michael Cashman

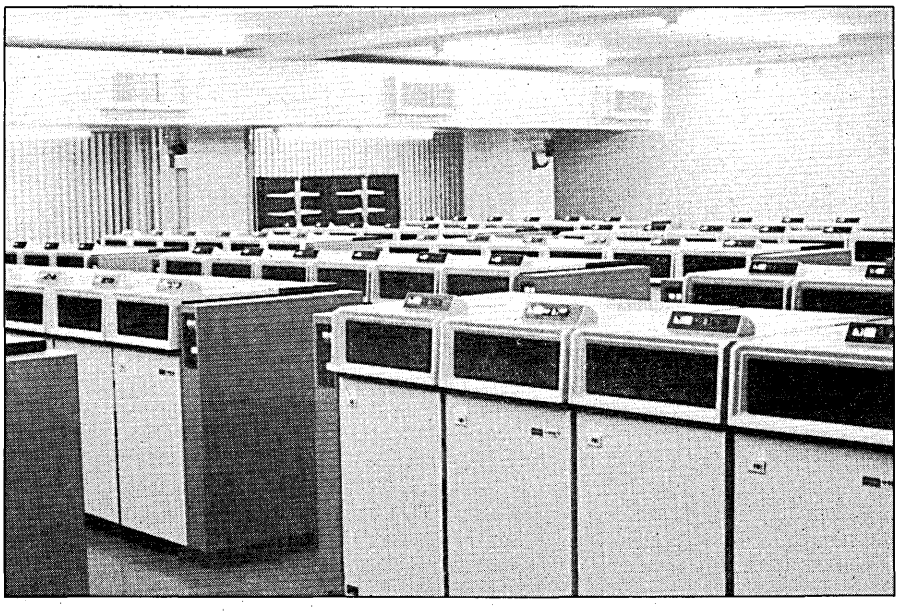
Nearing the steps that lead to the entrance of the massive brown building, one is confronted by a metallic slab that seems to be an awkwardly placed air-conditioning filter. An anxious escort instructs the first-time visitor to step *onto* the device, not over or around it. A subtle buffing is felt. It turns out that the grillwork is not some engineering afterthought at all, but a logically placed automatic shoe-sole scrubber.

The electric shoe cleaner was just one of many delights that would be enjoyed this day by a Western visitor to the computer laboratory at Japan's most prestigious institution of higher learning, the University of Tokyo, or, more properly, Tokyo Daigaku. For while computers and software are pretty much the same around the world, the ways they are configured and used can vary remarkably.

A key to what is contained in this six-story Pandora's box is found in the kanji characters mounted above the building's entrance. "Oogata Keisanki" translates approximately to large-scale computation center. Prof. Haruhisa Ishida, associate professor of the university and essentially the computing center's director, believes the institution has assembled the largest computing system in the world. Whether that claim is valid or not, it would seem that the system is almost certainly the most powerful shared by an academic community.

In Japan, academic computing is divided into seven geographical areas. Each of these areas is served by a principal computing center located at one of the country's large universities, formerly imperial colleges. With 167 out of 443 national and private universities in the Tokyo geographic district, it was inevitable that the University of Tokyo's computing center would become Japan's largest. With the great emphasis placed on computing skill in Japan, the computing center has been compelled to keep to an expansion pace that certainly makes it one of the premier computing facilities in the world.

Today, more than 5,000 researchers and graduate students throughout the Tokyo computing district have access to the resources of the University of Tokyo's computing center. It isn't easy to calculate the absolute upper limit of users it can support, but it often does support 500 simultaneous remote batch, and heavy demand TSS terminal connections.



A halon-atmosphere disk farm. Capacity is about 39 gigabytes.

The heart of the computer resource consists of a loosely coupled multiprocessor system that comprises eight Hitachi HITAC M-200H mainframes. Each machine is estimated to operate at approximately 115% of the speed of an IBM 3081, or in the range of 11 to 14 MIPS. Each processor has 8MB of semiconductor storage appended to it. It is helpful to think of this configuration as four sets of dual processors, with one set assigned as global processors. To each of the other six M-200H systems are attached integrated array processors. The entire configuration runs under a functional equivalent of IBM's MVS operating system that is called Virtual Operating System 3, or VOS3. The system, controlled by a single master console, could be expanded to 32 cpus and 128MB (eight sets of four cpus with 16MB of storage).

As impressive as the computing component is, with well over 100 MIPS of resources not counting the integrated array processors, the file storage complement supporting the processors is equally awesome. This is especially true when one considers that this is virtually a non-database-processing environment. (Database development is relatively primitive in Japan, according to Ishida.)

HUGE AMOUNT OF STORAGE

For openers, there are 96 modules of 300MB disk drives that in reality store about 317MB each, for a total of 30,432MB, or more than 30 gigabytes. To attempt to put that into perspective, it could be noted that the complete passenger reservations database for all but the largest domestic airlines requires approximately one tenth this amount of storage.

Additionally, there are 32 more disk modules, each of which stores approximately 211MB, for 6.7 more gigabytes. Eight 15MB drums are dedicated to an in-house timesharing system and support about 60 terminals. Finally, there is a "minimally configured" mass store system that looks very much like

If a student is having trouble mastering English FORTRAN 77, a vending machine will dispense a manual on the subject.

the IBM 3851 "beer can" cartridge store. Currently, 706 cartridges store 50MB each, for a total of 35,300MB. The total of 72.6 gigabytes doesn't count the set of a dozen 211MB disks that are used to stage data from the cartridge store. Three network processors and five data communication processors are responsible for connecting hundreds of 1,200 baud lines to appropriate processors. In addition, each of the seven major university computing centers is linked by 48 kilobit/second packet-switching lines. A 2MB Digital Equipment VAX-11/780 that runs under the Unix system is also tucked away in the computing center.

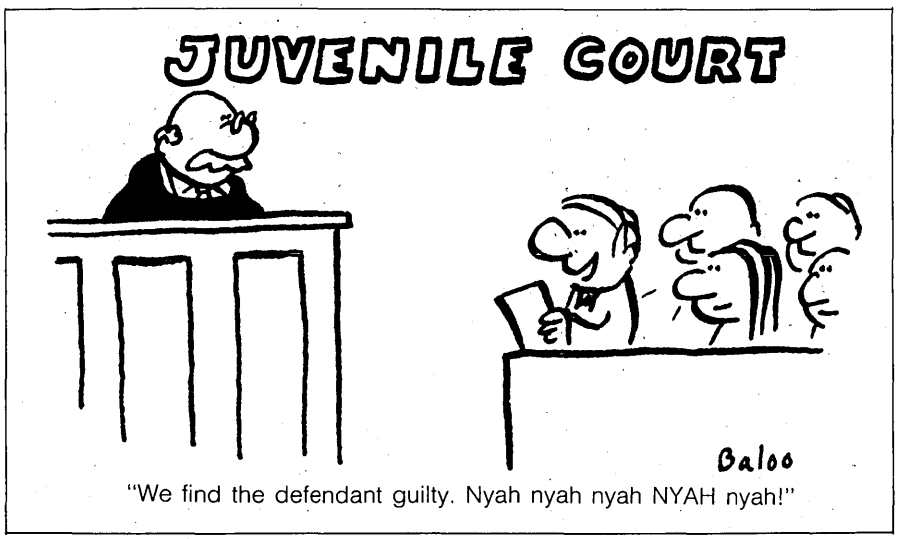
There is the usual complement of peripherals in the center (with perhaps a relatively high number of card readers and a relatively low number of tape drives). There are some peripherals, however, that most Westerners will never see, such as a laser beam kanji printer/plotter that runs at 720 lines a minute and three ink-jet kanji printers and five kanji displays with alphanumeric kanji keyboards. It should be pointed out that while all programming is done in familiar, English-based programming languages, data, and output are likely to look much more familiar to the Japanese in their native language.

FORTRAN 77 is the most prominent language used at the University of Tokyo, accounting for perhaps 90% of the processing. Other languages are available, too, however, including Pascal, PL/1, COBOL, APL, LISP, REDUCE (a formula manipulator), Snobol, and Algol 68, among others. In addition, there is a well-developed program library that encompasses everything from nuclear physics to astronomy. The top nine libraries accessed, in order of usage, are statistics, simultaneous linear equations, bessel functions, eigenvalues and vectors, matrices and their inversions, random numbers, numerical integrations, curve fitting, and algebraic equation solving.

The real flavor of computing as it is practiced at Tokyo University isn't so much in the "what" as in the "how." It is contained in the collection of operational practices and inventions that are not seen in computing centers in other countries, although they could very well be.

To appreciate them, it is necessary to return to the building's entrance. A step through the sliding glass door reveals a highly buffed floor with reflections on it that pull the visitor's eye to a scoreboard-like display. It is a magnetically operated billboard connected on-line to the main computing system via a line printer interface. The scoreboard apprises students at the university of system status, the approximate turnaround time for jobs if submitted at this time, and other messages, such as scheduled outages.

Contrary to popular opinion, the Japanese do not have inexhaustible funds for every technical endeavor, and this has led to other interesting developments at Tokyo Daigaku's giant complex. For example, much as Professor Ishida would like to operate the center around the clock, economics, and in particular labor rates that approach and often exceed U.S. scale, prevent him from doing so. As a result, at the end of a typical computing day, which lasts from 0930 to 2200, the entire center is simply powered off as casually as a tv set might be. The thought of doing this on a daily basis would cause most administrators of large-scale dp operations in the U.S. to cringe. Hundreds of thousands of dollars have been earned by operators in the U.S. who simply "babysit" computers. This is allegedly done to satisfy local fire codes, but the real reason is to keep circuitry temperatures stable by leaving the machines on at all times. At the University of Tokyo, however, there are no fears about whether the machines will come back up next morning. A total crash of the Hitachi system is regarded as conceivable, but highly unlikely.



"We find the defendant guilty. Nyah nyah nyah NYAH nyah!"

CARTOON BY REX F. MAY

HALON AT ALL TIMES

The disk room that contains the 96 modules of 300MB drives can't be seen from the computer room. Halon gas is added to the air in the disk room to prevent fires. This gas, which extinguishes flames but is readily breathable, is demonstrated at virtually every dp show in the U.S., but the systems displayed usually have fire detectors that trigger the release of the halon. The Japanese, with their historical respect for fire, maintain a constant halon level in the room's atmosphere. And prominent, large-gauge water mains and fire-hose boxes are seemingly everywhere, as they are in most Japanese buildings.

To keep the number of computer operators to a minimum, Tokyo University decided to involve its computing students more directly than perhaps any other university in getting their own computing accomplished. This is done by means of a scheme called advanced open batch processing. With seven card readers and 13 line printers required to support the batch processing activity at the institution, an interesting set of techniques is used to minimize paper handling. Automatic paper feeders were built that enable operators to interleave up to four boxes of one-part paper at a time. That's enough paper so that operators don't have to look in on this area for days at a time. An electric eye monitors the paper level beneath the printer, and activates the feeder to move the next stack of paper forward when necessary.

When a job is finished printing, the printer ejects several sheets of blank paper automatically. A disk-like paper cutter then rolls slowly across the output inside the printer. The printout then drops down a slide and through a glass partition into a hopper. The partition keeps students out of the computer room but close to the action. The automatic paper cutting seems like a particularly good idea when one considers that thousands of printouts are misplaced in any large installation when operators fail to find the end of one job's printout and the start of the next.

There are limits on how much computing each student will be able to do, too. At the beginning of each semester, a debit card with an account number is issued. When the student ascertains that his or her job is completed (via a crt in the output area), his plastic card is inserted into a special reader mounted on the line printer. The job is printed out and the student charged accordingly.

Another twist: if the student is having trouble mastering this foreign language called English FORTRAN 77, there are vending machines that will, for the proper number of yen, dispense a manual on the subject.

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Contrary to popular opinion, the Japanese do not have inexhaustible funds for every technical endeavor.

An analysis of hundreds of thousands of jobs run at Tokyo Daigaku shows the average job profile to be

Cpu time	33 seconds
Virtual Memory Usage	1041KB
Terminal Input Records	50
Terminal Output Records	403
Number of Input Cards	175
Number of Printed Pages	28
Turnaround Time	0-10 minutes
Computing Charge	297 yen (about $1.35)

COLOSSUS STILL EXPANDING

The already imposing computing colossus at Tokyo University continues to expand. Professor Ishida's desire to acquire a Cray supercomputer and integrate it into the principal configuration sheds some light on how modern products evolve in this ancient land. Ishida attempted to interest Hitachi in doing research on what would it would take to add the Cray processor to the system.

After two years of little progress, Hitachi admitted that it really wasn't interested in assigning resources for what appeared to be a one-time special project. However, the computer manufacturer said it *would* be willing to develop a machine with the equivalent computing power of the Cray and assist Ishida in integrating it into the system. Hitachi, it seems, figured that if the university needed a processor with 100 MIPS-plus capability, other customers eventually would too, and this was probably as good a time as any to get busy developing one.

Ishida's relationship with Hitachi is a close one. In return for developing sophisticated system prototypes, he typically receives a 70% discount on product prices from the manufacturer.

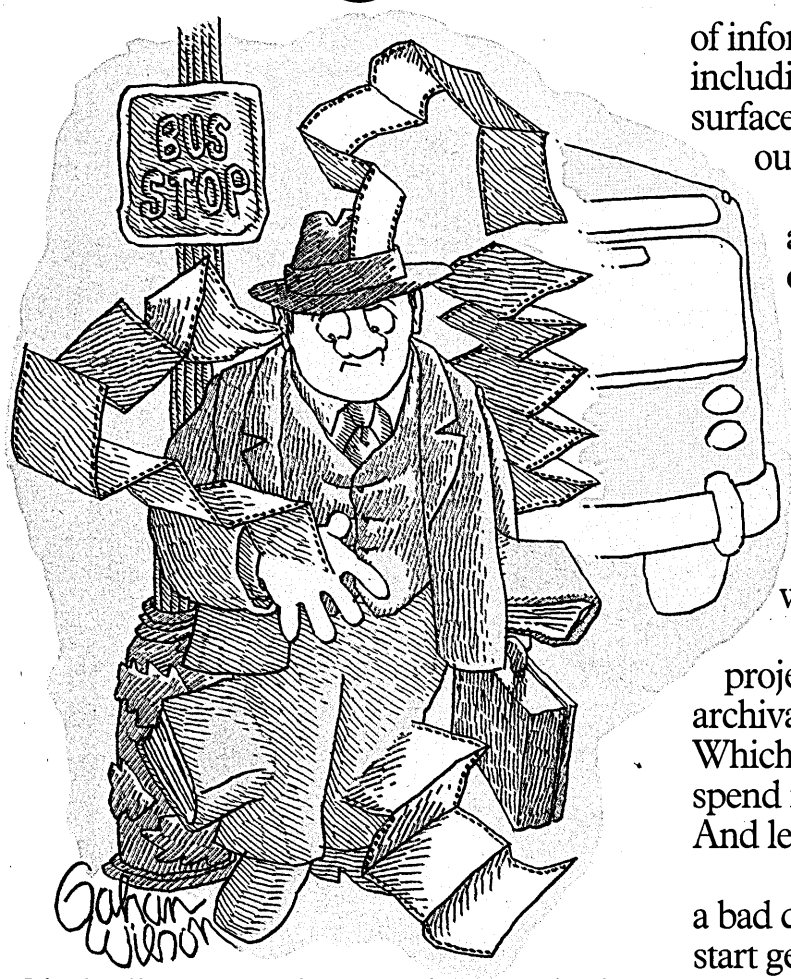
At the other end of the spectrum, the personal computer and its potential have not escaped the attention of the Japanese, be they computing students, instructors, or businessmen. Currently, Professor Ishida is evaluating a number of systems to see how they might be integrated into the on-campus network. This project is at least as enjoyable to him as setting up the large-scale configurations. Eleven years ago Ishida was one of the first users of a microprocessor in Japan; he believes he had the first Intel 4004 in the country, and he wrote the first magazine article and book on the subject.

The boundaries of a possible network would be the campus, because of the relatively high phone charges imposed by KDD, Japan's equivalent of AT&T (though in Japan's case, government owned). Unregulated, private lines can be installed by private companies in Japan, and in this country, staying away from the high tariff structure of the phone company has become a major user religion. The AT&T breakup in the U.S. is being viewed with analytical eyes to see if a similar move here might decrease phone charges and make remote processing more practical.

Leaving the computing center at the University of Tokyo, one ducks into an alcove full of the ubiquitous vending machines. They are labeled milk, noodle, coffee, tobacco, hot & cold, foods, and candy. These signs underscore the Japanese familiarity with the English language and their eternal struggle with plurals, a feature their language mostly does without. Mastery of database technology will probably occur before plurals are solved. ✲

Michael Cashman, a former DATAMATION editor, is a free-lance writer based in southern California.

Funny how computers grow on you.



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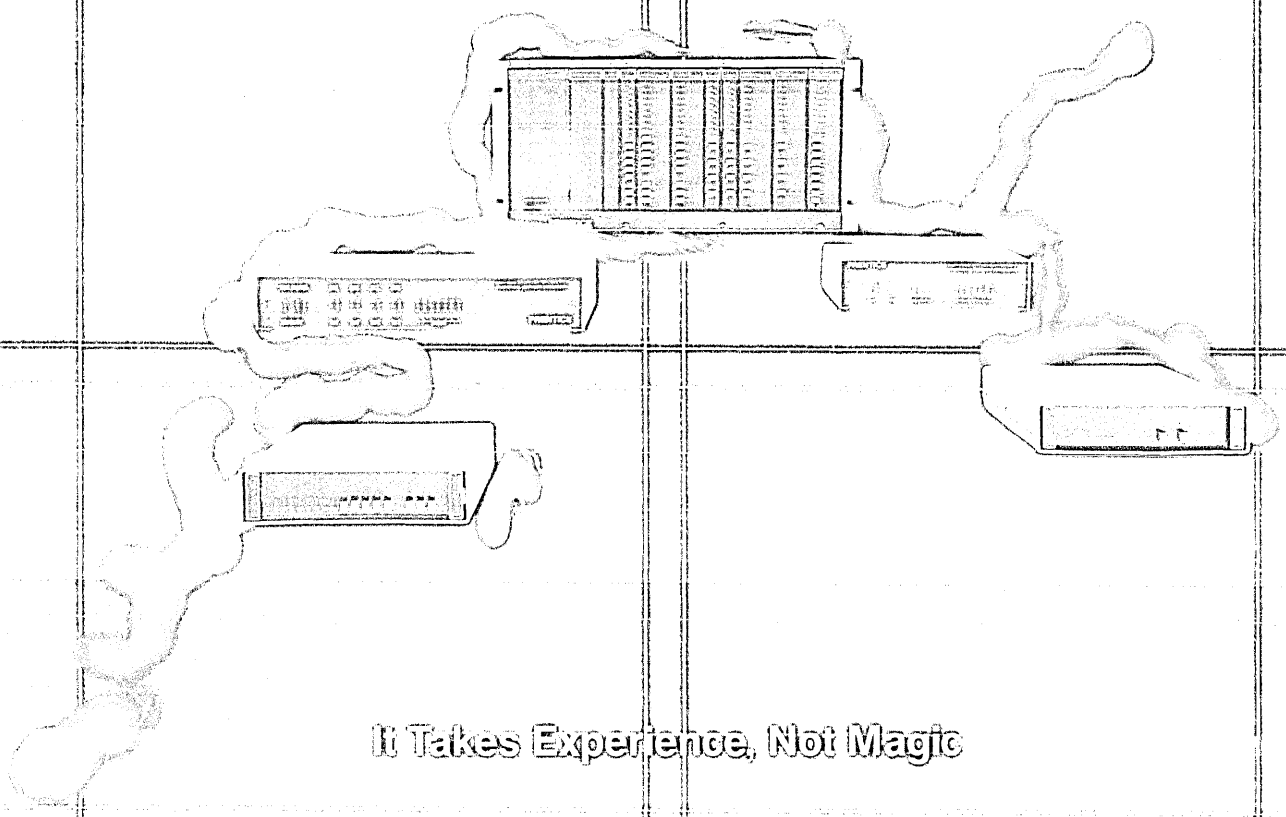

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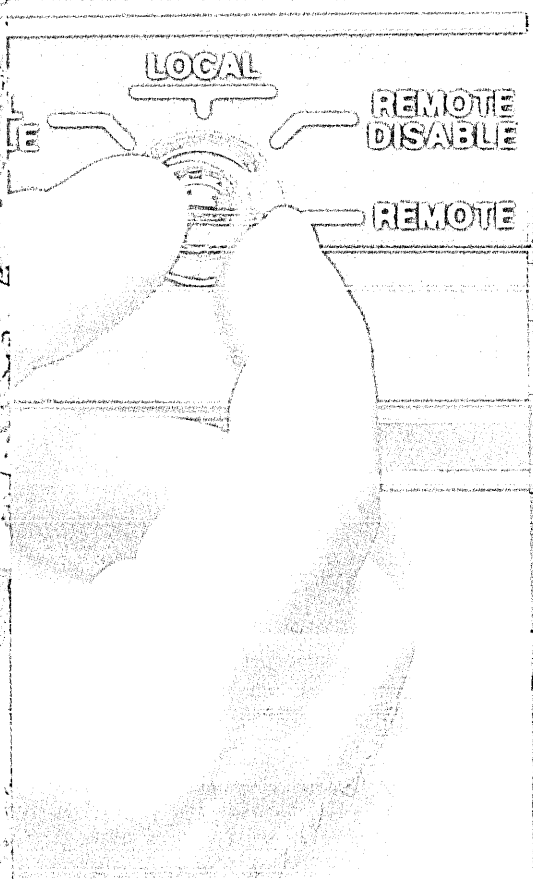

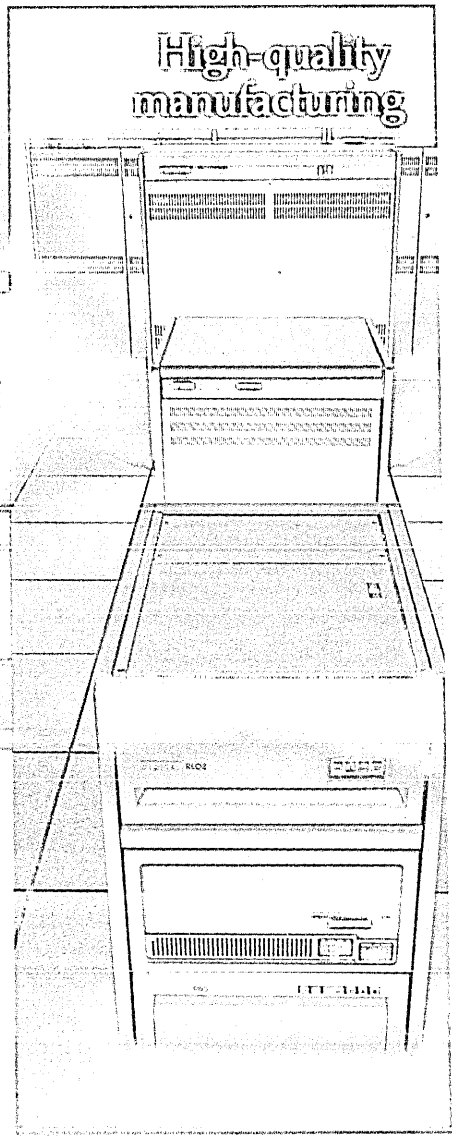

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PEOPLE

A VALID GOAL

"You have to have suffered through the agony to appreciate what it can do."

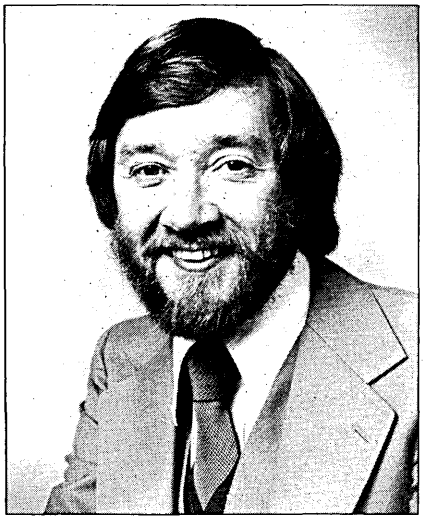
The agony Jared A. Anderson refers to is that of designing a computer. "It" is a computer aided design (CAD) workstation developed by Valid Logic Systems, Inc., a 1½-year-old Sunnyvale, Calif., firm of which Anderson is president.

The workstation is based on the SCALD (Structural Computer Aided Logic Design) system developed at Lawrence Livermore Laboratory (Sept. '79, p. 90) in the course of development of the S-1 supercomputer for the Navy. Three men close to that development helped found and remain involved with Valid. Thomas McWilliams, an S-1 developer, is with the company full time. Another S-1 developer, Curtis Widoes, and an S-1 programmer, Jeff Rubin, are Valid consultants while remaining at Livermore.

Anderson has been following the SCALD and S-1 work at Livermore for some time. "My interest is in the design automation system, not in the S-1 computer itself," he says.

The Valid founder's association with Lawrence Laboratories goes back many years. He never worked at Livermore but he did work at Lawrence Berkeley Laboratory and was involved in projects performed in conjunction with the sister lab some 50 miles away.

Anderson received his PhD in physics from the University of California, Berkeley, during the time he was working at the Berkeley lab doing research in high energy physics and pattern recognition. He was a part of a research team sent out to X-ray the Egyptian pyramids to find what were thought to be hidden chambers full of gold. "The Israelis and the Six-day War [in 1967] tended to dent that project," he recalls. "In 1970, after the moon landing," he adds, "there was a sharp decline in interest in science. Our team was broken up."



JARED A. ANDERSON: "It's not CAD/CAM. It's office automation for the engineer."

Anderson and three team members formed Decision Inc., in Oakland, to produce optical character recognition (OCR) devices. This company was sold to Ball Computer Products in 1973.

Anderson then went to Computer Machinery Corp., Marina Del Rey, Calif. "I was brought in as vice president of R&D and spent most of my time in meetings with bankers trying to resolve cash flow problems," he says. He left Computer Machinery in 1974. "I went to my drawing board in Topanga [Topanga Canyon in Los Angeles] to draw the kind of computer I wanted to make." The computer he wanted to make was a 32-bit mini with the power and instruction set of an IBM 370/138.

"I found my old buddies from Decision weren't doing anything so we charged in during 1975 and built a prototype," Anderson remembers. That was the beginning of Two Pi Corp. of Sunnyvale, Calif. That was also when Anderson became very much interested in the design automation work being done at the Lawrence Livermore lab.

As for Two Pi, Anderson notes, "after the prototype had been built, we looked for a big partner." They found one in the Dutch electronics giant Philips, which had also acquired Signetics Corp., Sunnyvale, Calif. "They wanted a technical entity here," said Anderson of Philips.

"We sold all rights to them. I agreed to stay on two years and then stayed two more years. I gave them one year's notice in 1980."

Philips subsequently sold Two Pi to Four-Phase Systems, Inc., which in turn was bought by Motorola last year.

"I walked around Silicon Valley meeting a lot of bright young guys," Anderson recalls of the time immediately following his departure from Two Pi. He began to talk very seriously with those involved in the Livermore SCALD efforts.

Valid was informally started in 1980 and formally launched in January 1981. Venture capital was finalized in August 1982, Anderson says, when $7.2 million was raised on top of a previous $2.5 million.

Anderson sees Valid's offerings as "office automation for the engineer." He emphasizes that the company is not in CAD/CAM. "An engineer wants to know if his schematics will work or won't work." With the SCALD approach, he explains, a computer can debug hardware and software without the need for a wired prototype.

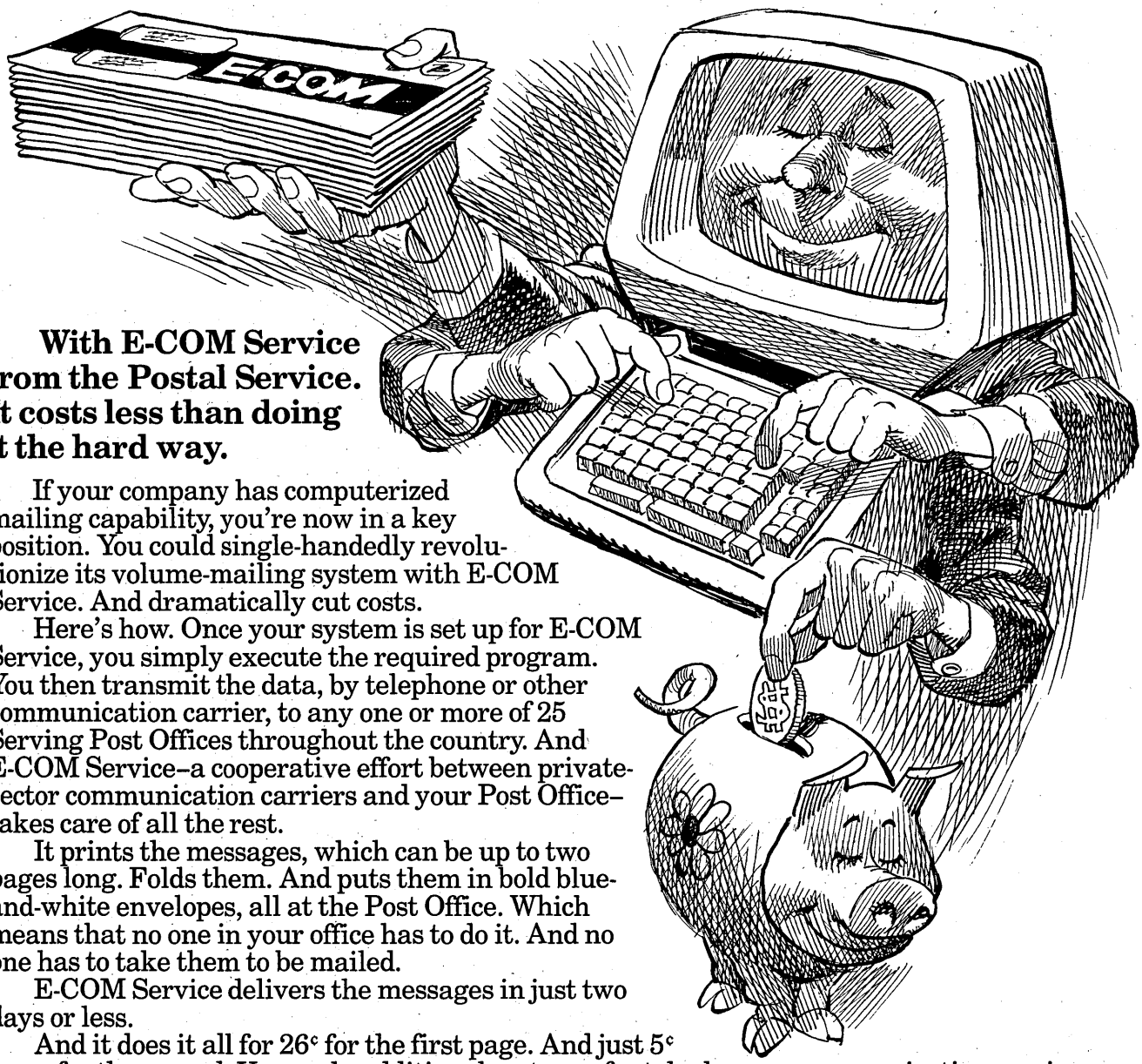
He says Valid has more than 100 systems installed and is in quantity production as scheduled. The SCALD systems offered by Valid consist of one or more design stations (in clusters of up to four) and an integrated set of programs that provides computer assistance in engineering digital integrated circuits or printed circuits. The system is based on the Motorola 6800 microprocessor.

The system tools, Anderson explains, "support a structured logic design methodology that makes it possible to design digital systems that are error free and to design those systems faster and with less effort than before. The key to the success of the system is its ability to validate a design prior to its implementation in hardware.

"I find it all very exciting," says Anderson. "I think we can raise the efficiency of electronic engineers up to the level of programmers."

—Edith Myers

TEACH YOUR COMPUTER TO GET OUT THE COMPANY'S MAIL AND BRING IN THE SAVINGS.



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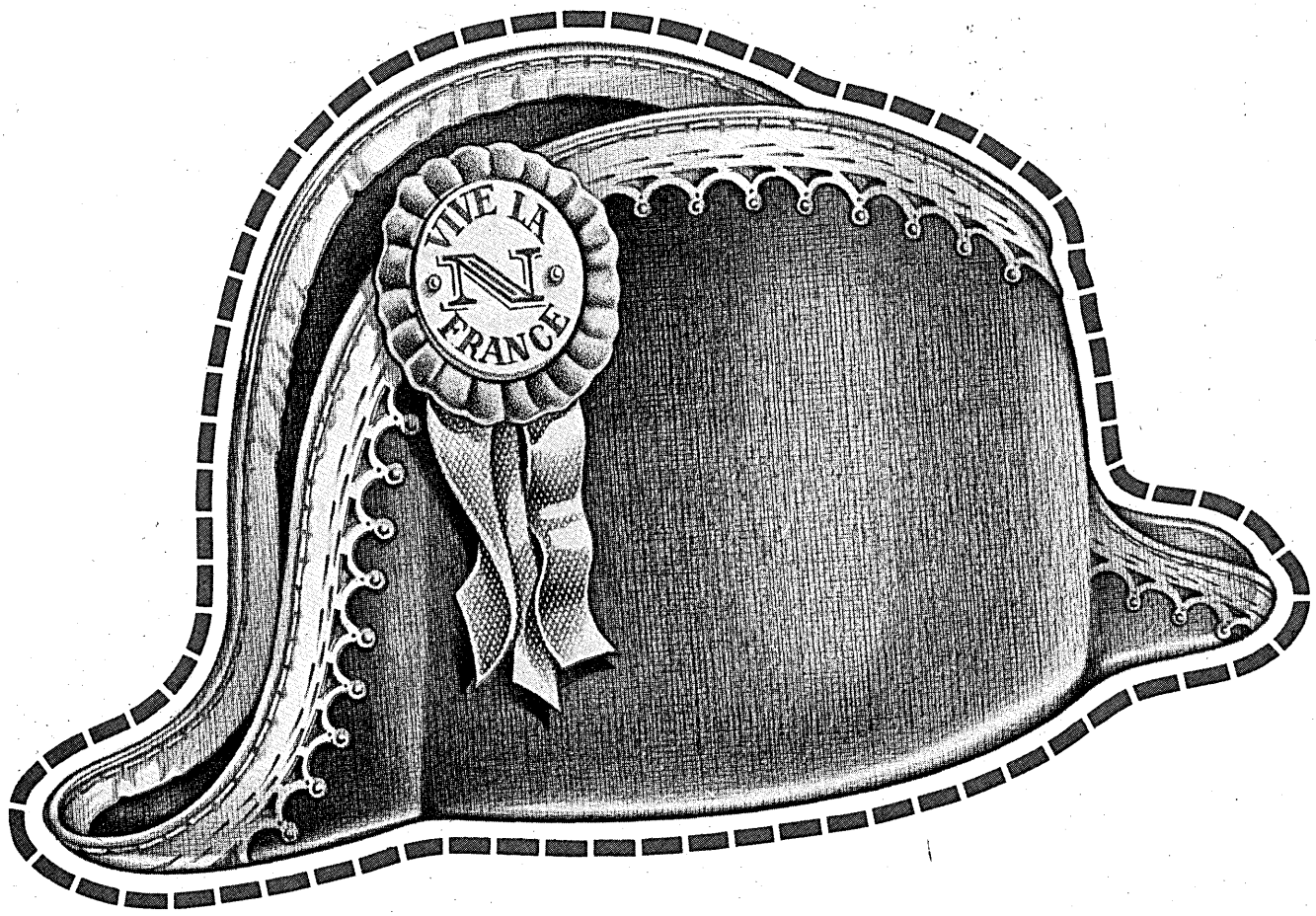
CIRCLE 173 ON READER CARD

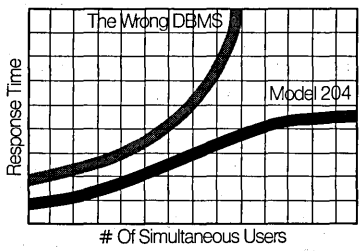
TEMPORARY INSANITY IS NO EXCUSE FOR BUYING THE WRONG DBMS.



If you're looking for productivity and performance in a database management system, (and who isn't?), you really only have two choices. Buy MODEL 204 DBMS from us at Computer Corporation of America. Or have a very good story ready for why you didn't.

The reason?

MODEL 204 is the only commercial DBMS ever designed from scratch for on-line systems. Every other DBMS was converted from batch to on-line. And that means new applications come up faster with MODEL 204 and are easier to maintain.



But let's say you ignore our logic. And some salesman talks you into a DBMS that takes forever to get up and running. You may want to tell your management something like, "We're taking our time, sir, to get this thing right." And hope for the best.

And when the subject of performance comes up, just plead ignorance. "Who knew we'd need more capacity and faster response time?" you could say. "Who knew?"

Referring, of course, to the fact that your DBMS is struggling to carry a few million records and a few hundred users, while a DBMS like MODEL 204 can handle up to 513,000,000,000 records and still have 999 users doing simultaneous updates. And where MODEL 204 responds almost instantly to complex queries under heavy loads, you could grow a long beard waiting for some systems to respond.

And if all else fails? Well, you can always cut out our little hat, and plead temporary insanity. Which, inexcusable as it seems, may actually be close to the truth.

Faced with the obvious superiority of MODEL 204 DBMS, you'd have to be crazy to buy anything else.

MORE ON MODEL 204 DBMS.

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CIRCLE 153 ON READER CARD

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HARDWARE

OFF-LINE

Hewlett-Packard recently unleashed a slew of new products intended to fill some holes in its lines of business systems and peripherals. Among them are low-end models of the 3000 and 250 systems and some mass storage devices. Of note is a combination 10MB Winchester and 512KB 3.5-inch floppy drive.

Xylogics has come out with what it calls the industry's first disk drive controller that can handle data transfer rates of up to 1.8MB/sec. The Burlington, Mass., vendor also announced a tape controller that can work with the disk controller to facilitate disk-to-tape transfers over the Multibus. Coming in the next few months, they say, will be a product that can accomplish the transfer without using the Multibus.

Look for Commodore's next generation of microcomputers to use the Zilog Z8000 microprocessor. No word is available on when the machine will be announced, but sources say it will be much cheaper than 16-bit machines currently on the market.

The debate over microfloppy disk drives continues, but it is beginning to look as if the 3.5-inch format will become a standard. So says International Resource Development, a Norwalk, Conn., market research firm, in a 270-page study. They also predict that the drives will only cost about $225 in oem quantities within two years.

Although Southern New England Bell is a Bell Operating Company, it is not wholly owned by AT&T, and is therefore free to enter the unregulated communications business. Its Sonecor Systems Division will sell a "full range" of products and services, bringing it into direct competition with American Bell in some areas.

POWER PROTECTION SYSTEM

The Sentec System II reactive computer protection system can guard minicomputers against 14 environmental, power line, and security threats. It is designed to protect minis from 40% to 80% of failures due to fault conditions generated in the power line or environment.

System II monitors and reacts to overheating, power line transients, multiple power interrupts, power switching transients, humidity, airborne particulates, phase loss, brownouts, power line fluctuations, incorrect phase sequence, and water under the computer floor. When a potentially damaging condition in the environment occurs, System II audibly and visually warns the operator and terminates computer power when necessary. The LED system status panels on the unit display the type of fault and the time of occurrence.

The $15,300 system was originally developed for the medical/hospital field, but it has been adapted to manufacturing, transportation, and business environments. An optional feature called a Software Protection Interface sounds an alarm if an unauthorized user attempts to break into the computer, and shuts down the computer after an adjustable delay period. The system can also be interfaced to an existing security system. SENTEC INC., Santa Rosa, Calif.

FOR DATA CIRCLE 301 ON READER CARD

LOCAL AREA NETWORK

The Planet series represents this vendor's first foray into local area networks, extending its line of modems, multiplexors, and data encryption and terminal equipment. The token-passing network uses baseband coaxial cable in a twin ring configuration as the local area communications link. The cable can be installed throughout a building or complex of buildings, offering comprehensive capabilities for data routing, resource sharing, and systems expansion.

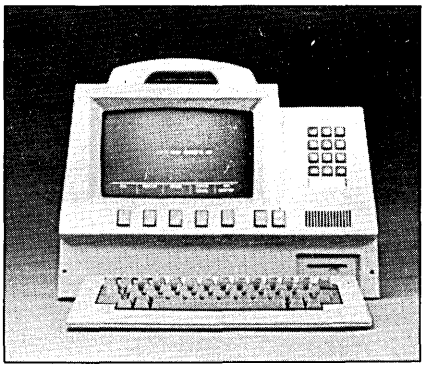
The system can be configured using half or full duplex communications and accommodates devices from multiple vendors regardless of protocol. Each network can accommodate up to 500 communicating devices, including word processors, terminals, systems, and printers. The link is controlled by the Planet Director, a desktop intelligent network processor. Nodes interface with the processor via terminal access points (TAPs). Up to 250 TAPs can be controlled by one director. Each TAP has two RS232 ports which can operate synchronously, asynchronously, or mixed, at speeds up to 19.2Kbps. Each port on the TAP handles an independent device.

Uptime on the network is maximized through the system's fail-safe mechanism, whereby Planet will reconfigure itself in the event of a cable fault and reestablish the communications link automatically. The system also features diagnostic aids, network control features, and a range of management capabilities. Each Planet Director costs $9,450, or $342 per month on a 26-month lease; each TAP costs $2,250, or $82 per month over a three-year lease. RACAL-MILGO, Miami, Fla.

FOR DATA CIRCLE 302 ON READER CARD

COMMUNICATION WORKSTATION

The DataVoice communication workstation—designed for professsional office workers—provides advanced telephone, electronic mail, voice mail, and computer-terminal features in a compact desktop console. The unit, which looks like an ordinary terminal with a telephone handset on top and a telephone keypad alongside the display, allows a user to send and receive data and voice messages at any time, independent of office hours. In addition, users can jointly review data during a telephone con-



versation with remote offices and dial phone calls automatically from a software directory.

The unit also performs conventional terminal functions, including full duplex communication with host computers or databases; composition and editing of memos and reports; an electronic calendar; and full electronic mail. The terminal can also operate in standalone mode and function as a node in a voice store and forward network.

The terminal uses an RS232C port and a Bell 103 compatible direct connect 300-baud modem for communications, and includes a parallel printer port. Direct communications through the RS232C port can be at any of eight selectable rates from 110 to 9,600 baud, conversational or block send mode. The unit costs $2,150, or $2,500 with a tape recorder for voice mail. BASIC TELECOMMUNICATIONS CORP., Fort Collins, Colo.

FOR DATA CIRCLE 303 ON READER CARD

UNIBUS REPEATER

The BMA-1U Unibus repeater permits users of PDP-11 and VAX computers effectively to double their system capacity by providing an external interface to the cpu backplane. The repeater provides a physical and electrical extension of any Unibus so that up to 19 extra bus loads may be interfaced, using a bus extension of up to 50 feet from the cpu. The BMA-1U consists of a single dual-width printed circuit board installed in the connector paddle slots normally used for the Unibus cable or interconnect module.

The repeater permits the attachment of virtually any device to a PDP-11 or VAX Unibus, including main memory, terminals, printers, or other peripherals. The unit occupies one slot in the Unibus backplane and is totally software compatible, the vendor says. Its amplifier allows the extra bus loads to operate faster than DEC's Unibus repeaters, the vendor says. One drawback is that there is an 80 nanosecond increase in access time when interaction occurs between devices on different sides of the BMA-1U . Cycle time is not affected if both master and slave devices are on the same side of the repeater.

The unit costs $1,480 in single unit quantities. It requires 4.1 amps at 5 volts power, which includes the terminations for both sides of the bus. RANYAN COMPUTER ENHANCEMENT SYSTEMS, Huntington Beach, Calif.

FOR DATA CIRCLE 304 ON READER CARD

DOUBLE IDENTITY

The Chameleon portable business computer is essentially two microcomputers in one: a Z80-A-based CP/M machine and an 8088-based MS/DOS machine. The double identity is intended to facilitate communications with other vendors' microcomputers, since the user has a choice of which operating system and microprocessor to use. Unfortunately, the two computers in this box cannot talk to each other; for that, the vendor says, you will have to wait a couple of months for a utility program.

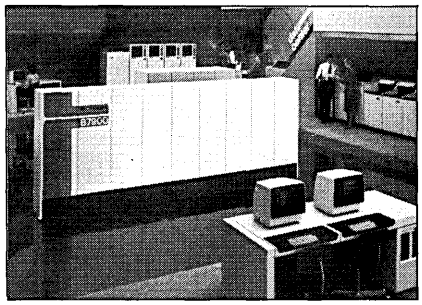
The two computers in the Chameleon share 128KB RAM, which can be expanded to 700KB, as well as dual 5¼-inch floppy disk drives, a 9-inch green display with a 25-row by 80-column matrix, and high resolution graphics. In addition, Perfect Software's Perfect Writer and Perfect Calc packages and a BASIC interpreter are included in the $2,000 list price. MS/DOS and CP/M are also included.

The 28-pound Chameleon consists of only six internal parts to facilitate maintenance. Communications are supported through a bisynchronous interface. SEEQUA COMPUTER CORP., Annapolis, Md.

FOR DATA CIRCLE 305 ON READER CARD

MAINFRAME SERIES

The B 7900 series of large-scale computer systems offers more power and speed than any other system made by this vendor,



while consuming 55% less power and air conditioning and 50% less floor space. The B 7900 will initially be offered as three families, based on workload requirements: the F family includes a single processor with 12MB main memory; the H family employs two processors with 24MB main memory; and the K family uses three processors with 36MB main memory. The B 7900 F can be field upgraded to the H, and the H can be field upgraded to the K.

The system uses a distributed system architecture, which includes multiple specialized functional processing units. These units include the Central Processing Module, which employs a parallel pipeline architecture supported by multiple high-speed cache memories; a Host Data Unit to handle high-speed data transfers concurrently; and an Auxiliary Processor that is code compatible with the processor module to allow processing of specified work off-loaded from the cpu.

The system can be expanded to a full memory capacity of 96MB. A separate kit is available that allows a B 7900 to be partitioned into the two totally independent systems. First deliveries on the $2.5 million system, which is software compatible with the vendor's other mainframes, are expected in the third quarter. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 306 ON READER CARD

CONCENTRATOR PAD

The Micro800/X.25 Concentrator PAD packetizes data from up to 16 asynchronous terminals or computer ports for transmission over a single phone line to a public or

HARDWARE SPOTLIGHT

T-1 FACILITIES MANAGEMENT SYSTEM

The Link/1 management system is designed to be a complete telecommunications facilities management system for 1.5 million bps T-1 transmission links. It represents the first time that a network manager has been integrated with a dynamic time division multiplexor in a T-1 network, facilitating central site control. The system features up to six data links, 200 ports on each unit, automatic alternate routing, and an error-protected supervisory channel. Link/1 is fault tolerant, with redundant common control logic, data link controllers, power supplies, and T-1 drivers.

The facilities manager, the product of the company's largest R&D effort to date, is designed to permit Link/1 users to perform all network management and diagnostic functions from the central site. The supervisory operator can configure the system and route any ports at the near end to specific ports at the far end. A series of menu-driven routines aids the operator using the supervisory channel. A variety of diagnostic functions and routines are available from the supervisory port. A special computer interface port, separate from the supervisory port, is designed to connect to higher-level network management systems.

The microprocessor-based intelligence in the internal network manager can be programmed by the user to dynamically allocate available bandwidth on the data link to specific ports, types of applications, or particular end users on the basis of user-defined priority rankings. Users contend for bandwidth, and the manager automatically reduces the bandwidth available for low priority users when high priority users attempt to use the network. If necessary, the facilities manager will shut out very low priority users to service the high priority users, and will restore bandwidth to lower priorities when permissible. Up to 16 levels of priority can be programmed.

The system can cost anywhere from $9,000 to $70,000, depending on the size of the network and the options desired. First customer deliveries will be in April. As with the vendor's other systems products, each Link/1 system is fully configured and tested before shipping. TIMEPLEX INC., Rochelle Park, N.J.

FOR DATA CIRCLE 300 ON READER CARD

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Graham Magnetics' position is simple: Put Epoch 480* computer tape in your library, then utilize our Media Management Program© to keep it in top shape. With Graham "Super Stars" in place, your media will last longer and run virtually error-free.

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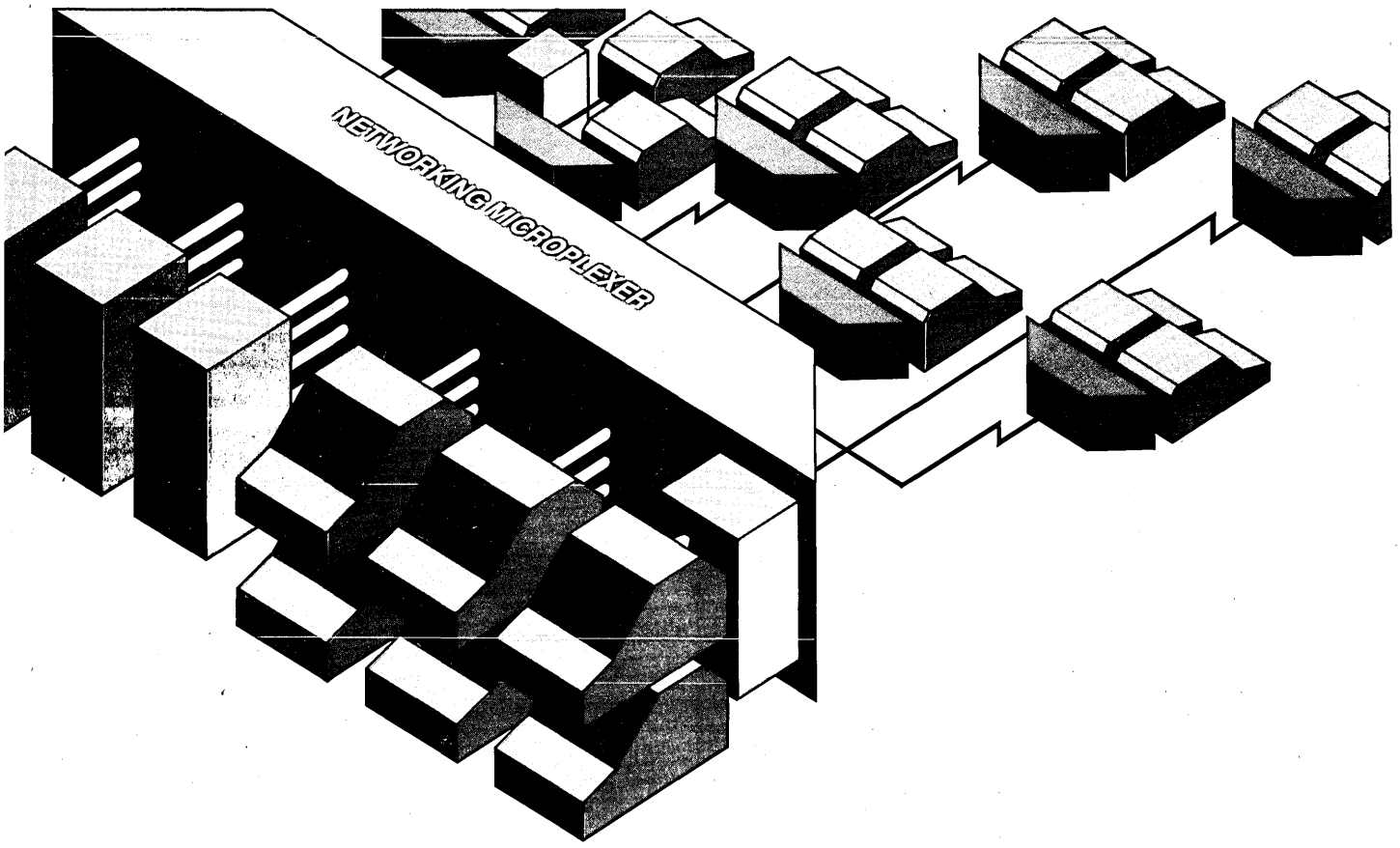
CIRCLE 154 ON READER CARD

New from Timeplex:

A brawny, brainy system for building large distributed switching networks.



The NETWORKING MICROPLEXER. Made to give you the muscle to efficiently run your multi-node, data switching network... with all control from a single location.

Compatible with our SWITCHING MICROPLEXER family, the NETWORKING MICROPLEXER combines the flexibility of switching with the economy of statistical multiplexing.

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CIRCLE 155 ON READER CARD

private X.25 Packet Data Network. Certified for use on Telenet, Tymnet, and Uninet in the U.S., it requires no changes to a user's existing hardware or software.

The concentrator is designed to smooth the transition to packet switching by storing user-selectable preprogrammed channel profiles that can be altered or replaced with options presented to the user in a menu format. In other systems, this specification process can require calling out more than two dozen parameters for each channel, and sometimes can be done only in the factory.

The Micro800/X.25 is compatible with CCITT recommendations X.25, X.3, X.28, and X.29, supporting functions such as permanent and switched virtual circuits, fast select, and throughput class negotiation. It also provides add-on functions that include local switching, class selection/resource contention, channel priority assignment, and password protection.

An incorporated command facility allows many managerial functions to be performed from a central site. This facility can be accessed through a dedicated command port on the unit or through the network; it can change channel and terminal configuration data, perform diagnostics, and assign priorities. Prices start at $2,050 for a four-channel Micro800/X.25. MICOM SYSTEMS, INC., Chatsworth, Calif.

FOR DATA CIRCLE 307 ON READER CARD

FACSIMILE MACHINE

The MV-3000 WL is a subminute desktop facsimile machine, designed to accept a 10-inch-wide well log to meet the special requirements of offshore drilling operations for the oil/gas industry. It also will accommodate oversized documents such as computer printouts, engineering drawings, or accounting ledgers.

The system meets CCITT Group 3 standards and, with options, can be compatible with Group 2 and 4 and with six-minute machines currently in use. The microprocessor-based digital machine can send a page of copy over telephone lines in 20 seconds, the vendor says. The unit automatically matches modes with the receiving or sending unit.

The unit selects the fastest transmission speed that will yield a clear transmission and steps down to a slower speed if problems are encountered. The unit keeps records numbering all transmitted logs, documents, letters, and other material. Each transaction can be verified by time of day, duration of transmission, number of pages, and identification code of transmitter, upon a user's command.

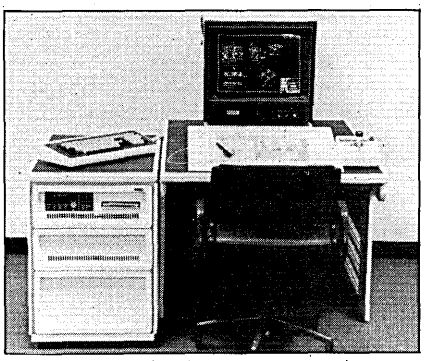
Transmission security can be enhanced by employing an encrypting device through an RS232C interface. The unit ranges from $8,550 to $10,100. PANAFAX CORP., Woodbury, N.Y.

FOR DATA CIRCLE 308 ON READER CARD

CAD WORKSTATION

The PW200 (Prime Workstation 200) series of intelligent CAD workstations is designed to improve productivity in mechanical design environments. It represents the first intelligent standalone workstation this vendor has produced that is capable of solids modeling.

Based on a 32-bit, virtual memory processor, the PW200 series incorporates dedicated modules of the Medusa intergrated mechanical CAD system. Medusa offers two-dimensional design and drafting and three-dimensional solids modeling capabilities. In single unit quantities, the PW200



costs $61,000 and up. The stations can be linked together with the vendor's series 50 minicomputers into a design network.

The station consists of a graphics unit, which includes a 19-inch color raster display monitor with 1,168 × 860 resolution; a data entry tablet; keyboard; and joystick. Each workstation is powered by a processor with a megabyte of main memory, a 68MB Winchester disk, and a 15MB cartridge tape drive. A display controller supports six serial ports, four of which are dedicated.

The workstations are available in two basic configurations. The PW200S is a design station for use in dispersed environments in which data are shared between systems primarily by tape transport. The PW200N incorporates networking software for use in a Prime host-based distributed design network. PRIME COMPUTER, INC., Natick, Mass.

FOR DATA CIRCLE 309 ON READER CARD

DATA COMPACTING MODEM

The turboMUX attachment doubles the throughput of a 1,200 baud modem by acting as a two-channel statistical multiplexor. The unit attaches, via RS232C interfaces, to the 212A modem on one end, and to the data terminal equipment on the other. When only one channel is used the device accepts data at 2,400 bps over that channel. When both channels are used, the device acts as a multiplexor receiving data at 1,200 baud through each channel. (The unit will accept any data rate in either channel provided the total data rate is 2,400 bps or less.)

To achieve the doubled throughput, the turboMUX uses a data compaction algorithm. The proprietary algorithm, according to the vendor, guarantees perfect fidelity in reconstitution of the data at the far end. During data transmission, each turboMUX compacts and reconstitutes the message dynamically. For phone line inconsistencies, the unit provides error detection and retransmission facilities.

The unit costs $1,275, or $1,000 without the multiplexing capability. CHUNG TELECOMMUNICATIONS, INC., Palo Alto, Calif.

FOR DATA CIRCLE 310 ON READER CARD

DOCUMENTATION SYSTEM

This computer graphics system is intended to fill all types of technical documentation needs—such as computer assisted drafting, technical publications, and related applications—that mix engineering drawings with text, illustrations, and photographs.

The product, labeled System 500, enables the user to scan the entire contents of engineering drawings or documents without regard to their complexity, the vendor says. The user then can interactively edit and enhance the resulting image with other sources of data. These revisions can subsequently be printed on laser or electrostatic printers. (The vendor supplies these as an option.) The system can accept word processor-prepared text and has many typesetting features. Pictures can be scanned, and halftones generated, for insertion into technical documents or product catalogs.

The system starts at $50,000. Each terminal on the system contains an 8086 processor, a high-speed graphics processor, 20MB main memory, a removable eight-inch floppy disk drive, a high resolution video display, keyboard, and graphics, tablet. IMPRES, INC., Austin, Texas.

FOR DATA CIRCLE 311 ON READER CARD

THREE PRINTERS

These three multifunction dot matrix serial printers are built around structural form chassis that the vendor says reduce noise significantly. The model 1100 performs in a draft/data processing mode at 200 characters per second, in a correspondence mode at 100 cps, and in a business letter mode at 40 cps. The printer also produces dot addressable graphics with a resolution of either 72 × 72 dots per inch or 144 × 144 dots per inch. The unit retails for $2,300, $1,285 in quantities of 100 or more.

The model 1200 uses a four-color ribbon to produce up to eight colors for text highlighting and graphic presentations. The unit prints at the same speeds as the model 1100, although the business letter mode is not standard. The graphics resolutions are identical to those for the 1100. The unit retails for $2,500 and is available in oem quantities for $1,400. The model 1500 is a high-speed model, which prints at 400 cps in the draft/data processing mode and 200 cps in the correspondence mode. The print-

er, which can also support graphics, costs $3,000, or $1,676 in oem quantities.

The distinguishing feature of the printers is the foam chassis, which makes the printers more precise and durable, the vendor says. The one-piece chassis also lowers the operating noise level to 54 dba and allows the vendor to delete 31 parts from the printer, cutting 15% off chassis costs. INFOSCRIBE, INC., Santa Ana, Calif.

FOR DATA CIRCLE 312 ON READER CARD

HIGH-END SUPERMINI

The MV/10000 caps off the high end of the vendor's Eclipse MV family of 32-bit superminicomputers. The system, which has nearly twice the power of a VAX-11/780 as measured in single precision whetstones, is designed for general purpose virtual storage applications, although it is also capable of functioning as a part of an OA/DDP system or as an engineering/scientific system.

The system includes 16MB main memory, with up to 14.1 gigabytes of disk storage, a 16KB system cache, and 4KB instruction cache. The machine also comes with an Intelligent Synchronous Controller, a dedicated communications processor also found on the vendor's recently introduced low-end MV/4000.

The system runs all of the software available for the vendor's less powerful machines, including the Comprehensive Electronic Office package, DG/SNA for communication to IBM mainframes, the DG/DBMS, a COBOL program generator, and interpreters or compilers for COBOL, BASIC, PL/1, FORTRAN, Pascal, APL, RPG-II, C, and Business BASIC. In addition, the vendor says the machine is capable of performing number-crunching applications that usually require a mainframe, such as finite element analysis, solids modeling, and CAD. An average system costs $325,000 with delivery 90 days ARO. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 307 ON READER CARD

PORTABLE COMPUTER

In addition to 64KB main memory for computation and 4KB memory for communications, the Athena 1 battery powered portable computer features 512KB of solid state "pseudo disk" storage with no moving parts. The system also comes with a 5¼-inch floppy disk drive.

Dual NSC-800 processors drive the CP/M system, which weighs 15 pounds. The four-line by 80-column display acts as a window on a 24 × 80 display memory. The screen snaps down over the attached keyboard for protection; a carrying handle is attached to the top of the screen.

Up to 15 of the microcomputers can be connected together in a local network. Two RS232 ports and a parallel printer port allow the Athena 1 to operate with screen terminals, printers, modems, plotters, and other accessories. The system's modular

design allows room for two additional circuit boards internally; these can be used for additional processing power or for more memory, up to a total of a megabyte of internal solid state storage. The computer costs $3,950. ATHENA COMPUTER & ELECTRONIC SYSTEMS, San Juan Capistrano, Calif.

FOR DATA CIRCLE 314 ON READER CARD

TURNKEY GRAPHICS

The System One turnkey video graphics system is designed for the advertising, broadcast, and cable industries. The design and production system features real-time frame animation, unlimited fonts, full color slide and transparency production capabilities, and direct output to RGB.

Input of existing two-dimensional artwork or three-dimensional objects to the System One is accomplished via a high resolution digitizing camera subsystem. Original designs can be created on the system's digitizing tablet, with 4,096 colors available. Graphics are stored on the system's floppy diskettes and can be transferred directly to videotape, slides, transparencies, prints, or gray scale copy.

System components include a 4MHz Z-80 based microcomputer, tablet and stylus, 13-inch monitor, dual eight-inch drives, digitizing camera and stand, RGB/NTSC serial output ports, and necessary software. The basic system costs $42,500; options include a $22,650 video editing package, a $14,075 animation hardware package, an $8,000 output camera system, and a $9,000 gray scale imager, among others. VIA VIDEO INC., Cupertino, Calif.

FOR DATA CIRCLE 315 ON READER CARD

SMALL BUSINESS SYSTEM

The Voyager 4000 series of small business computers comes with bundled software including word processing, spreadsheet with graphics, database management, mailing list, payroll, telex, executive time management, and CP/M. The basic system, which retails for under $5,000 with the software, combines two 5¼-inch double-sided, double-density floppy disk drives with an 8085-based cpu, and 64KB of RAM. It can be upgraded to incorporate and 8088 coprocessor with a megabyte of RAM address space. A 20MB plug-in hard disk is also available.

The self-contained system has a nonglare monitor with its own memory; it uses an 8 × 12 character matrix on a 10 × 14 dot grid. The 24-row by 80-column display can be in any of three colors. The monitor adjusts up and down and swivels nearly full circle.

The detached keyboard has 100 keys, each of which can have up to five defined functions, as well as a 10-key calculation pad. VOYAGER SYSTEMS, INC., Newbury Park, Calif.

FOR DATA CIRCLE 316 ON READER CARD

GRAPHICS TRS-80 PRINTER

The TRS-80 DMP-100 printer is capable of 10 characters per second at 10 characters per inch and has a bit-image mode to allow printing of fully addressable high resolution graphics. With an optional screen print program, the DMP-100 can produce detailed black and white graphics printouts similar to those on the vendor's Color Computer screen display.

The printer has 80 upper- and lowercase 5 × 7 dot matrix characters, which can be printed on an eight-inch line, with underline capability. The user can select either a 10 character per inch or 5 cpi mode.

The DMP-100 has a 480 byte full line dot buffer to increase graphic throughput. Other features include selectable parallel and serial interfaces at either 600 or 1,200 baud and a 4½- to 9½-inch adjustable tractor to facilitate fanfold paper use. The printer costs $400. RADIO SHACK, Fort Worth, Texas.

FOR DATA CIRCLE 317 ON READER CARD

HANDPRINT RECOGNITION TERMINAL

Here's a device that allows you to use an ordinary ball-point pen for data entry into a computer system. The Inforite terminal consists of a graphics tablet and a display unit, and includes the circuitry and software necessary to convert handwritten characters into ASCII codes. After establishing the format desired and describing the data entry form to the terminal (its Z-80A can remember the format for later use), the user merely places a paper form over the tablet and uses a pen to fill in the form.

The touch-sensitive tablet can recognize the full alphanumeric character set and associated symbols. Its resident software includes hand character recognition and editing algorithms, form layout, field type, calculation, and verification command structures. Multiple form definition, specification, and selection are also possible. Software protocols and hardware interfaces for data storage, retrieval, and communication to a local or remote host are also included in the 48KB CMOS RAM and 56KB ROM. The terminal costs $2,000. INFORITE CORP., New York, N.Y.

FOR DATA CIRCLE 313 ON READER CARD

XEROX

Okay. Tell me how I can replace my impact printer with the Xerox 2700 and get speedy printing, too.

Name/Title_____

Company_____

Street_____

City_____ State_____

Zip_____ Tel. (____)_____

Mail to: Keith Davidson, Xerox Printing Systems Group, 880 Apollo Street, El Segundo, CA 90245. Or call (213) 615-6329.

D 3/83

Okay. Tell me how I can replace my line printer with the Xerox 2700 and get letter-quality printing, too.

Name/Title_____

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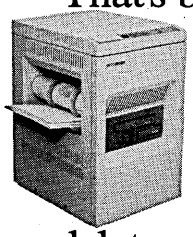
Mail to: Keith Davidson, Xerox Printing Systems Group, 880 Apollo Street, El Segundo, CA 90245. Or call (213) 615-6329.

D 3/83

There are two ways to look at the Xerox 2700.

The first is as a letter-quality printer. The second is as a speed printer.

That's because the Xerox 2700 distributed electronic printer actually functions as both.



But in a very creative way.

You see, it doesn't limit you to typical word processor and data processor type styles.

It lets you choose from a wide variety of font sizes, designs, styles and weights. And it lets you change them, even within a single line, if you want.

It also lets you print logos and signatures, actually format a page with headings and subheadings, and create simple forms or bar charts.

So your documents end up with a customized, print-shop look.

And the people you send them to end up getting them at a handy 12 pages per minute.

But what's nicer is, the Xerox 2700 is very small. And very quiet. So you can place it exactly where it's most convenient for the people who need it.

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CIRCLE 157 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

The Sage II and IV microcomputers, from Sage Computer Technology, Reno, Nev., are the first machines that will run the Modula-2 programming language. Developed by Niklaus Wirth (who also created Pascal), the language is intended for applications where low-level machine access, interrupts, concurrency, and real-time programming are important. The language shares many features of Pascal, including its portability.

Cogen, the COBOL program generator available on DEC and NCR minis and mainframes and on some microcomputers, has been converted to run under PC/DOS on the IBM Personal Computer. The product, which is sold by Bytek, in Berkeley, Calif., is currently installed in 300 locations worldwide.

The Oasis-16 operating system now has a graphics capability to make it more attractive to its base of professional and business users. The enhanced version supports raster scan random point graphic devices, and soon will support nonrandom and vector devices. The capability comes from a set of added functions within the system's BASIC that directly address graphics.

The California Insurance Group says it has achieved a first in the insurance industry, implementing an on-line real-time insurance processing system with complete historical retrieval. The Oracle system manages all aspects of homeowner, dwelling program, personal automobile, and commercial lines. The system, which is expected to speed policy writing and claim processing, was written using NCR's 8500 processing equipment, BOSS/3 and PLUS/4, a teleprocessing monitor, and a database management system from Century Analysis.

SECURITY MANAGEMENT

Aegis is designed to maintain the security of computer data by limiting access to them in a variety of ways. It can limit computer access to only certain individuals, at specified terminals, at particular hours of the day on authorized days of the week. When all of these requirements are met, a user is allowed to call up on the screen only information that he is authorized to see.

The Aegis system is designed to be user friendly in that a user needs only enter his name and password to gain access to information he is authorized to see from that terminal at that time. The terminal screen displays a menu of applications available to the user at that terminal. Within each application, the user is presented with a menu of available functions, from which he can select and control a program. The system allows a user to go from one function to another without terminating the first function. Should the user leave the terminal without logging off, Aegis will automatically log him off after a predetermined time period.

For further protection, the $17,500 system is designed so that several unsuccessful attempts to sign on at a particular terminal will result in that terminal's being removed from service. The names and passwords entered during such unsuccessful attempts are recorded. The conditions for gaining access can be changed at any time by security managers. The system runs on all IBM mainframes. CORNELL COMPUTER CORP., New York, N.Y.

FOR DATA CIRCLE 326 ON READER CARD

QUERY SYSTEM

Series 200 Intellect represents the second generation of this vendor's natural language query system, including a graphics display option and interfaces to IBM's DOS/SQL.

Coupling Intellect to IBM's Presentation Graphics Facility (PGF), the graphics display interface automatically converts Intellect's responses to presentation quality pie charts, bar charts, histograms, line graphs, or surface charts. Users need have no knowledge of PGF to use this option, although sophisticated users can exercise complete control over the graphics process via PGF's menu screens.

Series 200 Intellect handles incomplete queries by deriving missing information from questions asked previously. The system determines whether the user is attempting to narrow down a search (as in the sequence, "How many executives are employed in our Detroit office?" followed by "Paid less than $80,000?" followed by "And single?") or is simply substituting one search criterion for another (as in the sequence "How many executives are employed in our Detroit office?" followed by "In St. Louis?"). A View command hastens query entry and data retrieval by allowing the user to define at any point in the session the database subset that Intellect is to use for all succeeding queries.

Series 200 also includes enhancements to the Lex utility, such as lexicon segmentation, improved handling of data aggregate and group structures, more natural syntax, and enhanced error messages. A conversion option updates Series 100 source lexicons to Series 200. The Series 200 Intellect costs $69,500. ARTIFICIAL INTELLIGENCE CORP., Waltham, Mass.

FOR DATA CIRCLE 327 ON READER CARD

AUTHORING SYSTEM

The Wicat Interactive System for Education (WISE) is an authoring system for nonprogrammers that allows a curriculum author to compose text, design graphics displays, outline progress through courseware, and define criteria for evaluation, without computer coding.

An author can construct either program- or learner-controlled lessons. For example, WISE may require that all students view certain portions of the lesson and then offer a menu or activate programmable function keys for individual choices thereafter. Meanwhile, WISE keeps cumulative scores for the students and may return each to remedial or review materials as needed.

WISE allows screen location (touch panel), multiple choice, or free response testing. To judge free responses, the author may require exact answers or define synonym dictionaries, ignorable words, key

words, spelling tolerance algorithms, and numeric ranges. The $16,500 system also includes videodisk and computer audio capabilities.

The system also has a graphics editor that enables an author to create sophisticated graphics using two-letter commands for circles, rectangles, and other geometrical shapes. WICAT SYSTEMS INC., Orem, Utah.

FOR DATA CIRCLE 328 ON READER CARD

MANUFACTURING SYSTEM

The Xerox Manufacturing System integrates manufacturing, financial, distribution, marketing, engineering, and procurement functions in an on-line system running on IBM 4300, 30XX, and 370 computer systems. The package is completely portable across DOS/VSE, SSX, OS/VS1, and MVS operating systems. It can also incorporate personal computers, such as the vendor's 820-II, to give executives desktop access to the system.

Functions available under the system include master production scheduling, material requirements planning, inventory management, procurement management, production control, factory data collection, cost planning and control, engineering management, order management, receivables management, sales management, general ledger, accounts payable, fixed assets, payroll, and personnel. All of the applications run within a single unified architecture.

The system includes fourth generation high-level user programming instructions that simplify the interface between the user and the computer for query, reporting, and manipulation of information in the database. Data entry screens can be designed with flexible menu systems, and online help documentation is available for training and support.

The system is available for purchase on IBM computers or via a timeshared network service. Individual application modules cost from $15,000 to $35,000 under perpetual licenses. XEROX COMPUTER SERVICES, Los Angeles, Calif.

FOR DATA CIRCLE 329 ON READER CARD

MICRO INFORMATION SERVICE

The Microbase Information Service matches buyers and sellers of microcomputer related products, including software applications, hardware, and consulting services. The service is intended to allow companies to represent their products in a single facility where they are available to interested buyers, as an alternative to the relatively unstructured retail marketplace.

The heart of the service is a computerized database that maintains information on products developed for the major brands of microcomputers. This information is classified by both brand of computer and product category. Potential customers can request individualized reports that contain all listed products in a particular category that are compatible with their brand of computer. A report may contain, for example, financial applications for the IBM Personal Computer, or word processing applications for the Apple II. Each report costs $3.

Microbase reports are current as of the day issued; vendors can update their listings at any time. The service is scheduled to begin operation at the end of this month with information on products for 20 brands of microcomputers. MICROBASE, Greenwich, Conn.

FOR DATA CIRCLE 330 ON READER CARD

BENCHMARK MONITOR

The Benchmark Monitor for RSX takes measurements in a running PDP-11 computer system in order to identify the utilization of its various components. These measurements can be used to determine the system load during a benchmark test, to identify what can be done to get higher performance from a particular computer system, or to document available capacity in a system before increasing its workload.

The product identifies which programs have the greatest impact on the cpu, and hence have the greatest potential for improvement. It also determines whether faster disk access times would result from moving or reordering files.

Performance statistics are recorded for the overall system and for individual programs. These include cpu usage (broken down for interrupt, system, user, and idle states); number of interrupts, system requests, and context switches per second; and number of seconds per I/O transfer.

The units in which all figures are reported have been chosen to simplify the comparison of benchmarks of different durations. The software requires only loadable device driver support and can be installed with no sysgen. It is available for versions 3.2 and 4.0 of RSX-11M at $1,000 per cpu. DANIEL COMPUTING SYSTEMS INC., Calgary, Alberta, Canada.

FOR DATA CIRCLE 331 ON READER CARD

MICROCOMPUTER CAD

AutoCAD is a two-dimensional computer aided drafting and design package that runs on 8-bit and 16-bit microcomputers under CP/M-80, CP/M-86, or MS/DOS. It is a general purpose package, suitable for applications such as architectural and landscape drawings; mechanical, electrical, chemical, structural, and civil engineering; and printed circuit design.

The package lets the user make drawings from simple components, such as lines of any width, circles, arcs, and solid filled areas. Drawings may be created through keyboard commands, with a light pen and on-screen menu, or from existing paper drawings via a digitizing tablet. The set of editing commands allows drawn objects to be moved, copied, modified, erased, rotated, and scaled horizontally and vertically. Repetitive patterns such as brick walls and memory arrays can be generated automatically. A full bidirectional zoom facility allows the user to work on the drawing at any level of detail.

Systems currently supported by the $1,000 package include CP/M-80 machines

SOFTWARE SPOTLIGHT

SOFTWARE DEVELOPMENT

The Advanced Financial System (AFS) is actually a software development system that is said to reduce substantially the amount of time needed to build data entry screens, write business and financial applications, and edit previously written programs. The concept behind AFS is that 80% of what one financial system does is functionally consistent with other financial systems, and that these generic functions can be isolated and written only once. The result is that different modules of a financial package will all have the same user interface and basic commands, and will take less time to write since most of the code is already present.

The first product available under the system is a completely rewritten version of HiLite, the vendor's on-line query system. Through the AFS software, users can link from this module to other modules while retaining information on the screen. For example, a user may locate a general ledger item and keep it on the screen while he links to the accounts receivable module and examines details of that item.

Users can create their own individualized display screens using HiLite 2.0, through a menu-driven procedure. Other features include user-determined search fields, amount totaling and subtotaling, and a "wild card" capability that allows users to query information when only partial identification is known.

Security is provided on four levels: system, screen, record, and field. A given user may be restricted to seeing only certain system modules, only some screens within the system, only some records, or only some fields. A help documentation is also available on each level. By typing the help key, a user can learn how to work with a given record, screen, or system; this help facility is indexed to the reference manual. The HiLite system is currently available in IBM mainframe environments under CICS; other applications will follow. The vendor expects to have converted all its financial software to the AFS system by year-end. One application costs $15,000, each additional $5,000. MCCORMACK & DODGE CORP., Needham Heights, Mass.

FOR DATA CIRCLE 325 ON READER CARD

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DM9b2 (3/83)

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Title_____
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CIRCLE 158 ON READER CARD

with the Scion Microangelo graphics subsystem and optional light pen; the Victor 9000 with 256KB RAM and optional SunFlex Touch Pen; and the IBM Personal Computer with 128KB RAM and monochrome or color graphics card. All systems support Summagraphics and Houston Instruments digitizers and Hewlett-Packard and Houston Instruments plotters. AUTODESK, INC., Mill Valley, Calif.

FOR DATA CIRCLE 332 ON READER CARD

GEL CHROMATOGRAPHY

GPC4 is intended for data reduction computations in gel permeation chromatography. The package, which runs on the vendor's model 3600 Data Station, uses crt graphics, disk storage, and special function key capabilities interactively. It requires either the vendor's Chromatographics 2 or CIT software for data acquisition. Calibration, replot, and computation of molecular weight averages are then performed on disk-stored data using GPC4.

The package is operated through defined function keys on the data station, labeled by a keyboard overlay supplied with the software. Prompts on the bottom of the screen tell the user what action is expected, such as which parameter to enter or selection of another function key. There are no menus, methods, screen pages, or numerical codes needed to operate GPC4. Parameters such as baseline and data processing windows are entered via interactive graphics routines in which a cursor appears on a replot of the chromatogram.

Calibration data may be entered manually, point by point, or taken directly from Chromatographics 2 or CIT report files. The calibration data are sorted and assembled into a table, which may be plotted, copied, or stored on disk for use in future calculations. The package, which includes manual, practice data disk, overlay, and GPC teaching programs, costs $750. PERKIN-ELMER CORP., Norwalk, Conn.

FOR DATA CIRCLE 333 ON READER CARD

CICS SPREADSHEET

Omnicalc is a CICS application system that brings the electronic spreadsheet from microcomputers to large multi-user systems. Designed for use with the IBM 30XX, 4300, and System/370 computers, it provides business planners, managers, and other CICS users with a decision support tool that makes budgeting, forecasting, and planning easier.

As a CICS application system, Omnicalc simplifies on-line real-time accounting and forecasting by using a 26-column by 99-line matrix that can be used as one would use any other electronic spreadsheet. The program operates in three functional modes. Command mode provides the main user interface to the Omnicalc application matrix. This allows users to design screen layouts, enter data into the matrix, and control the display of information. Program mode is used to enter or modify program statements and is the mode in which the user controls the sequence of calculations. List mode facilitates the review of program statements in a logical sequence.

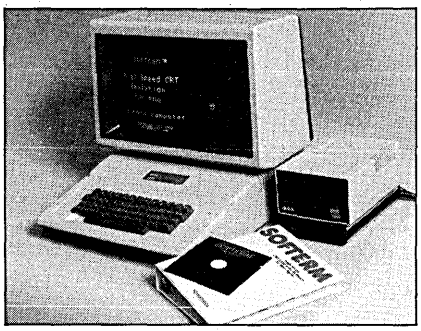
The Omnicalc package is available on a perpetual license for $2,000, or on a three-year lease for $125 a month. TOWER SYSTEMS, Irvine, Calif.

FOR DATA CIRCLE 334 ON READER CARD

APPLE TO HOST FILE TRANSFER

The Softrans protocol provides compatibility for file transfers between Apple personal computers and any host computer. The product is designed to be used in conjunction with Softerm, the vendor's high-speed crt terminal emulation program for the Apple. Data can be exchanged between an Apple and any host that provides FORTRAN 77 language capability.

The Softrans protocol, which operates in block mode using asynchronous communications, provides error detection



wiht automatic retransmission, automatic binary encoding and decoding, CRC-16 checksum, and data compression to enhance line utilization. The program is executed on the host cpu under the control of the Apple, which appears to be a standard terminal when it runs Softerm. Commands may be entered that allow file directories to be displayed and files to be transferred to and from the Apple.

File transfers utilize a command language that allows simple definition of complex multiple file transfers with handshaking. Twenty-three high-level commands are included, which may be executed interactively or from a macro command file previously saved on disk. The Softerm crt emulator (for IBM, DEC, Data General, Datapoint, ADDS, Lear Siegler, Hazeltine, TeleVideo, and Teletype terminals) and Softrans protocol cost $150. SOFTRONICS, INC., Memphis, Tenn.

FOR DATA CIRCLE 335 ON READER CARD

MATRIX LIBRARY

The Fast Matrix Solutions Library (FMSLIB) consists of fast matrix algebra routines for use with the vendor's FPS-164 Attached Processor. The routines are coded to make optimum use of FPS-164 architecture, allowing the programs to solve matrix problems at nearly the theoretical maximum speed of the hardware.

FMSLIB routines use asynchronous disk data transfers to operate on rows of the matrix as if the entire matrix were in main memory. This allows users to process matrices too large to fit in main memory.

The library is divided into four segments according to the type of matrix to be solved. These are real symmetric, real unsymmetric, complex symmetric, and complex unsymmetric. An additional segment providing fast utilities for finite element work, called Fast Finite Element Library (FFELIB), is also available.

Each of the segments can be purchased separately. The permanent license fee for the first is $15,000; each additional segment costs $5,000, and the FFELIB also costs $5,000. The libraries will be available in July. FLOATING POINT SYSTEMS INC., Portland, Ore.

FOR DATA CIRCLE 336 ON READER CARD

P.C. COMMUNICATIONS

Smartcom II is designed to manage data transfer over telephone lines for an IBM Personal Computer equipped with a Smartmodem 300 or 1200. It is built around a comprehensive menu of program options that are supported by help information. The help feature, displayed on demand, provides responses to questions about parameters, prompts, and messages. Smartcom II also transfers program files error free and allows the Smartmodem to be tailored for a unique communications environment.

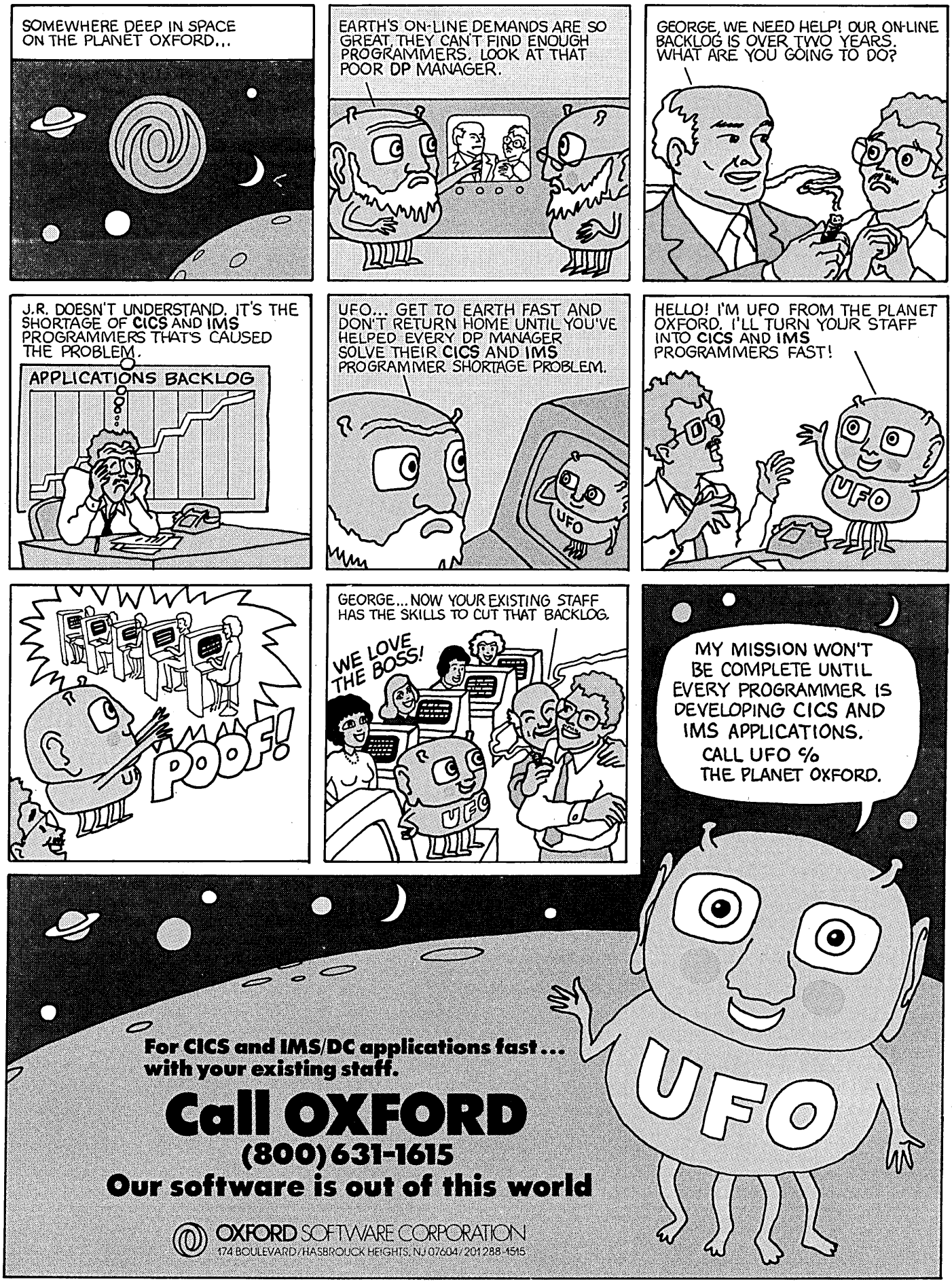
Smartcom II can automatically originate and answer telephone calls. It logs a user onto a remote system, such as a time-sharing device, information utility, database, or microcomputer. The log-on procedures can be stored as a single macro command for each remote source; the program disk comes prepared with macros for the Source, CompuServe, and the Dow Jones News/Retrieval services.

Parameters such as telephone number, baud rate, duplex, character delay, confidential mode, password, and keyboard definitions can be stored with the log-on macros as complete communications sets, to facilitate origination of communications. The program supports output directly to up to 16 disk drives (one of which can be a hard disk), both parallel and serial printers, and a monochrome or color graphics display. It requires an 80-column monitor, one drive, 96KB RAM, an asynchronous communications card, and PC/DOS. It costs $120. HAYES MICROCOMPUTER PRODUCTS INC., Norcross, Ga.

FOR DATA CIRCLE 337 ON READER CARD

ON-LINE SECURITY

The Security-II package runs on Honeywell's Level 66 and DPS 8 systems under GCOS-8 for users of the Data Management



CIRCLE 159 ON READER CARD

IV Transaction Processing database management system. The package is designed as an on-line real-time system, providing protection for the TP environment as well as individual transaction processing. Through the use of unique identification codes and passwords, the package prohibits on-line access of unauthorized users. In addition, transaction processing is limited to authorized users; permissions can be restricted to query or update for a given user transaction, as defined by the security administrator. Security verifications and modifications are maintained on-line.

Installation of the product requires no modifications to the teleprocessing monitor or to the operating system. The network need not be taken down to make changes. No off-line assemblies are necessary and the system is based on dynamic values that are not revealed in the source code. The package costs $7,300. CACI INC.-FEDERAL, Mechanicsburg, Pa.

FOR DATA CIRCLE 338 ON READER CARD

68000 OPERATING SYSTEM

PDOS is a multi-user, multitasking development operating system specifically designed for the Motorola 16/32-bit microprocessor. It includes a BASIC interpreter.

The operating system consists of a small, real-time, multitasking kernel, which is layered by file management, floating point, and user monitor modules. The 2KB kernel provides synchronization and control of events occurring in a real-time environment that uses semaphores, events, messages, mailboxes, and suspension primitives. All user console I/O and housekeeping routines are included in the PDOS kernel.

PDOS can be configured for any combination of large or small floppy disk drives, bubble memory devices, or Winchester mass storage units. A variety of target system configurations is supported for fast development of memory-efficient end products.

The file management module supports named files with sequential, random, and shared access. Mass storage device independence is achieved through read and write logical sector primitives. Conversion modules, assembler directives, and operating system calls allow integration of floating-point operations into user application programs. A perpetual license costs $1,500. EYRING RESEARCH INSTITUTE INC., Provo, Utah.

FOR DATA CIRCLE 339 ON READER CARD

COBOL GENERATOR

Cobgen is a parameter-driven language generator that can produce COBOL compile-ready source programs for IBM and compatible hardware operating under OS or DOS systems. The system provides complete program logic for file interrogation, record selection, file/record/field updating, and report generation.

Generated programs are characterized by structured data division alignment and predictable procedure division logic; this includes sequentially indexed paragraph names and allows for inclusion of user-specified standard or unique abbreviated source coding, which Cobgen expands to standard verbs and user-defined data names.

The $8,000 system allows access of ISAM/VSAM files and the utilization of a "COBOL Sort, COBOL Copy" facility. In addition, the system can be used to provide assistance to users in data selection and marching in ad-hoc type one-off reporting. SOFTWARE INFO SERVICES INC., Los Angeles, Calif.

FOR DATA CIRCLE 340 ON READER CARD

MICROCOMPUTER DBMS

InfoStar, a business applications development system designed for nonprogrammers, provides on-screen menus in English that guide the user through each step of data entry form design and detailed report generation. No programming procedures are required to use the database management system, which is available for use on many microcomputers.

The product's transaction processing and updating capabilities enable the user to update records across file boundaries, without requiring an understanding of the relational model. For data entry, a cursor is used to "draw" forms on the screen, instead of requiring the user to know commands and to calculate coordinates. For report generation, users can generate a preformatted "quick report" in about one minute by selecting the data desired and indicating the fields he wants totaled or subtotaled.

InfoStar also provides full report writing capabilities for custom applications. For example, it provides up to nine control breaks, can handle arithmetic calculations within the report, and allows the user to incorporate data from multiple files. Print enhancement features include boldfacing and underlining of selected data fields. Generating these custom applications is facilitated because no code is written or debugged.

The $500 DBMS includes four levels of help menus for novice and experienced users; these are indexed to the user reference manual. The DBMS can handle variable length records, with up to 65,535 records per file and 255 fields per records. It requires CP/M 2.2 or higher, 48KB memory, and dual floppy drives. MICROPRO INTERNATIONAL CORP., San Rafael, Calif.

FOR DATA CIRCLE 341 ON READER CARD

ACCOUNTING ON UNIX

The Business Accounting Control System (BACS) was developed on the Unix operating system for use in Altos, DECmate, Ithaca Intersystems, Onyx, Pixel, Plexus, and Zilog computers running Unix. The package is an integrated multi-user family of business accounting packages written in RM COBOL. It handles all accounting functions on five modules: order entry and inventory control, accounts payable, accounts receivable, payroll, and general ledger.

Because the system is designed for use by multiple simultaneous users, it should be most efficient for businesses grossing $100 million annually in sales, the vendor says. BACS provides instant access to a large set of management reports, allowing a business manager to focus more on profitability and to control operations more efficiently. Each module in the package costs $600. AMERICAN BUSINESS SYSTEMS, Westford, Mass.

FOR DATA CIRCLE 342 ON READER CARD

DPTX DRIVERS

These DPTX Driver packages allow a Prime DPTX user to communicate with a 3270-compatible host using a variety of commonly available crt terminals. The packages, which are high-performance versions of the Data Stream Compatibility software, can communicate at up to 9,600 bps as a 3277 model 2 emulation.

The drivers take advantage of extensive cursor addressing to paint screens quickly, and they can make use of the ability of some terminals to set up a repetitive sequence of characters on the screen with an abbreviated transmission; this results in a better throughput rate. A driver for the Lear Siegler ADM31 costs $1,000, with maintenance optional at $350 per year; for the Lear Siegler ADM42, the driver costs $1,200 with a $400 maintenance option; and for the TeleVideo 950, the driver costs $1,700, with maintenance at $450 a year. COMPUTRONICS, Wood Dale, Ill.

FOR DATA CIRCLE 343 ON READER CARD

TEFRA SOFTWARE

A subroutine module to this vendor's IRS software can handle interest withholding required by the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). The module extracts interest withholding information with minimum disruption to existing bank systems, the vendor says. IRS handles withholding for all types of interest-bearing accounts, and retains data on closed accounts, certificates, and over-the-counter transactions.

IRS calculates withholding, stores withholding data, determines exemption status, and tracks remittances to the government. Users can choose among the withholding methods allowed by TEFRA: periodic withholding, once-a-year withholding, or mixed methods. The module can be added to existing systems for $10,000; a new system costs $30,000, but trading in a used IRS system will count toward the price. DISC, INC., Baltimore, Md.

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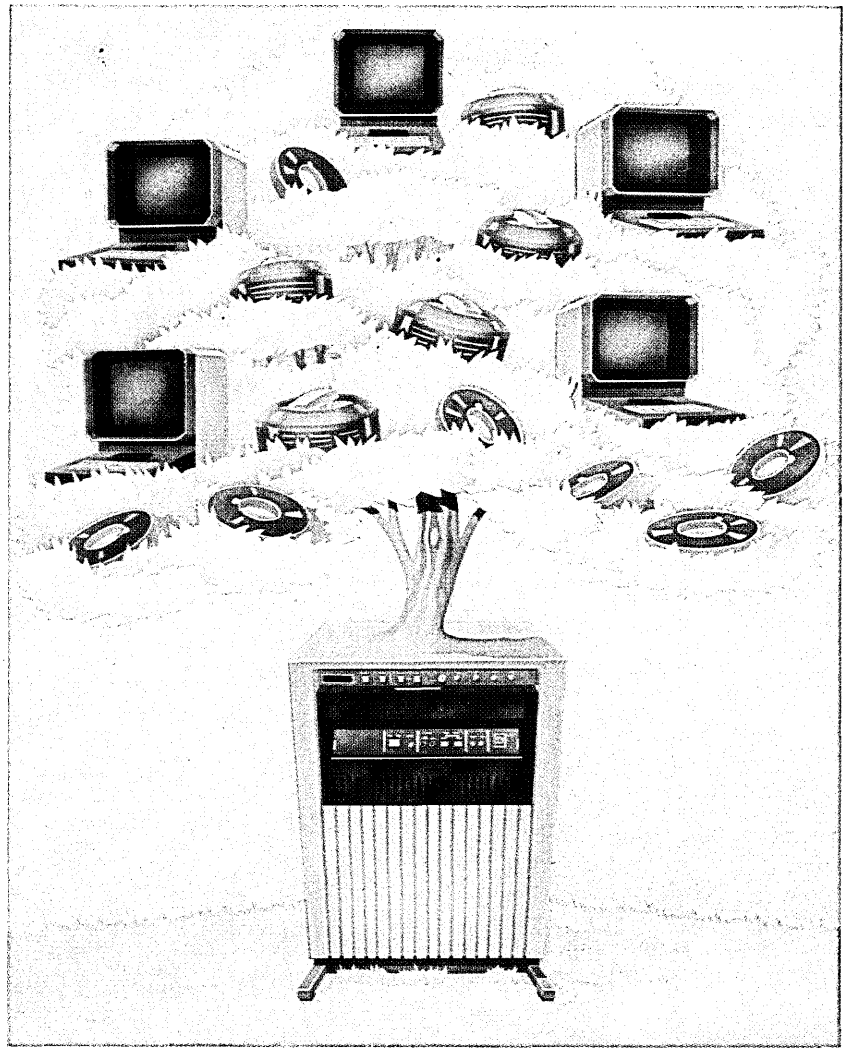

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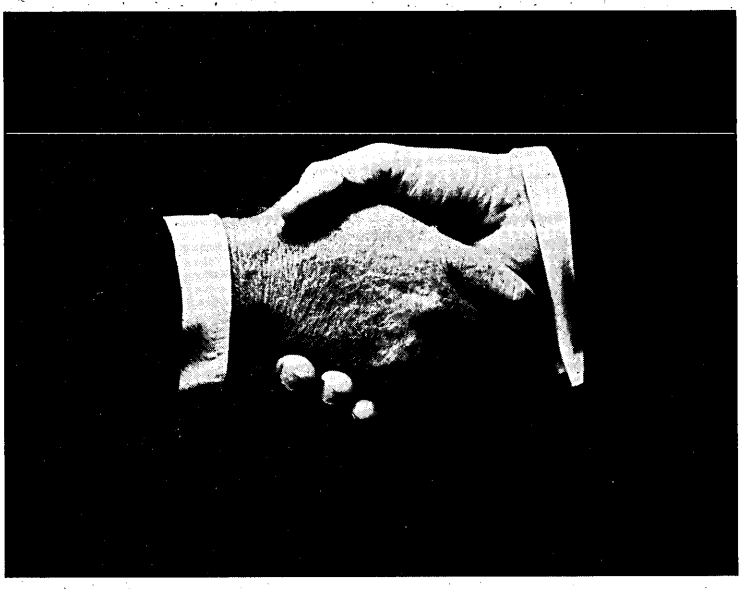

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CIRCLE 166 ON READER CARD

SOURCE DATA

BOOKS

TRADE SECRETS: HOW TO PROTECT YOUR IDEAS AND ASSETS
by James Pooley

If you've always had trouble keeping a secret, especially in business, then you stand to benefit from James Pooley's book on trade secrets. An attorney in fast-paced Silicon Valley, Pooley gives us a detailed look at industrial espionage.

In a compact, readable format, the book explains the extremely complex issues of trade secrets and intangible asset protection. Any employer will benefit from investing a few hours in reading it, even if he or she decides that trade secret protection is not needed.

Every business has something that could be considered a trade secret. Some examples are customer lists, marketing surveys, a process or product, and payroll breakdowns. Any one of these could be extremely valuable, so why not protect it? Most firms don't, because these things are generally intangible. These assets are in the form of an idea or a collection of data, and therefore are not subject to the usual forms of protection.

Reading the book may leave you paranoid, with an added feeling of helplessness if you're an employer. Pooley points out that your ideas and assets can be easily stolen by any employee who puts in enough planning and forethought.

Pooley preaches that the best defense is a good offense. The employer must be aware of what he needs to protect, the available forms of protection, and his limitations in implementing those forms. The book begins with an attempt to define a trade secret or proprietary information. This is fairly described as anything used by a business that gives it a competitive advantage over others in the same industry. Briefly, it is a "commercially useful idea." And, of course, it must be confidential.

Pooley says that the legal origin of the trade secret is not clear. Does it derive from property rights, contracts, or trust relationships? As he points out, this confusion can hurt you when you try to prove someone stole your trade secret, because judges have a tendency to decide such cases without considering legal precedent.

Pooley does not do much to relieve this confusion. He refers to contract and property law as "outdated or inapplicable," but states that "contracts are central to trade secrets." Using the case law only as a guideline, he solves the problem with an all-inclusive protection plan. Since one can not be sure what works or why, he reasons, one should consider using anything that might work.

Three forms of protection are discussed: patent, copyright, and trade secret. The advantages and disadvantages of each are compared, which leads to the conclusion that trade secret protection is the broadest form with the least risk.

The most important point Pooley makes is that it is necessary to identify ideas and assets by keeping an inventory of them. You cannot protect what you fail to realize you own. With inventory in hand, you can determine the most effective form of protection for your company and assets. Different strategies are presented, with guidelines on common work situations. This section points out that good security requires good office procedures.

Pooley says that poor employer-employee relationships are the cause of most trade secret thefts. Though emphasis is placed on high-technology companies, where ideas depreciate, the book is applicable to all businesses.

The main shortcoming of the book is its failure to deal with the problems a small business faces in bargaining for nondisclosure covenants (contractual provisions against telling what one has seen). The customers and suppliers of small businesses are likely to reject such contract restrictions as overly burdensome or unnecessary. A new company starting up has the most to lose and the least bargaining power.

The book is valuable to both the employer and employee, drawing clear lines as to the duties in this relationship as they are now legally perceived. Pooley's unique discission of how employees should start their own businesses is enlightening, and presents a look into the shifting values of employee loyalty to the employer. The employees described are mobile, intelligent, and very ambitious. Appropriately named True Adventure and Bruised Ego, they represent a constant threat to the employer.

Former employees are cautioned not to compete directly, but if they must, they are provided with instructions on how to justify any evidence that the erstwhile employer provided the head start. This should not be taken as permission to steal. There is a fine distinction between theft of trade secrets and pursuit of an opportunity discarded by the business. It would help if the text included a little ethical discussion to back up the legal reasoning. It should be pointed out that both civil and criminal sanctions exist for trade secret theft.

The final chapter discusses lawyers and lawsuits. Both are considered necessary evils in trade secret litigation. Pooley's experience in this area is shown by his pragmatic description of the lawsuit stages. It is reemphasized that you must be ready when the lawsuit strikes or face losing to a better prepared opponent. Such lawsuits are usually emotionally tainted and appearances can rule the day.

Pooley has taken a very difficult subject, important to most businesses, and provided a concise analysis of what the law presently permits. Despite criticisms stated, I highly recommend this book to employers, both present and prospective. Much of the anguish of trade secret litigation could be avoided by following Pooley's advice. The book serves as a practical handbook, with a variety of checklists and a good selection of letter and contract forms for different business problems. Osborne/McGraw-Hill Publishers, Berkeley, Calif. (1982, 144 pp., $20).

—Karl J. Dakin

THE TECHNOLOGY OF TEXT: Principles of Structuring, Designing, and Displaying Text edited by David H. Jonassen

Until recently, visual information has mostly been presented with graphs and figures, but seldom with text, but this emphasis is beginning to change. Responding to the new awareness, Educational Technology Publications has assembled a precedent-making book edited by David H. Jonassen of the University of North Carolina at Greensboro.

The first two sections lead up to the practices discussed in section three, Electronic Text. Jonassen argues that, in about a decade, the book as we know it will be as obsolete as movable type is today. Alvin Toffler pointed out in 1970 that information is expanding at an exponential rate, and that at current growth rates, our knowledge base will expand within the next five years to about 32 times what it is today. Under these circumstances, hardcopy print cannot long survive as the primary medium for information storage. In many areas, computer databanks have already supplanted this system function. While microforms have their place and have a contribution to make, Jonassen feels that they will probably have a minimal impact on the problem; storage and retrieval limitations will make them obsolete as well. Emerging technologies based on the ever-shrinking computer chip, bubble and solid state memory, and videodisks offer greater potential for the storage of information. Displaying, however, then becomes another problem. With the exception of microforms, most nonprint display of textual information is via a crt or television monitor. The peculiarities of reproducing high-resolution images on a tv screen pose significant problems for text designers, but the computer itself can facilitate text generation. The chapters in this part of the book relate to current techniques for producing and displaying text via the computer/television interface.

Dr. Esther U. Coke, of Bell Telephone Laboratories, explains in "Computer Aids for Writing Texts" that computer programs for generating text from information bases will not be available for some time. Presently, there are numerous programs for assembling text. Word processing systems are becoming as common as the typewriters that they are replacing. The functions and limits of the major systems are carefully treated in this well-written chapter.

Small computers are everywhere these days, and their applications are expanding into all areas of instruction. Paul F. Merrill gives us some guidelines for writing text in "Displaying Text on MicroComputers." His discussion includes the screen format, paging, and use of computer-stored text. The primary advantage of computer-delivered instruction over hardcopy print is the interactive nature of the electronic medium. Controlling the learner's interaction with the computer is one of the more important functions of a well-developed instructional program. Merrill provides some useful heuristics for the text programmer/designer.

The next chapter, "Display Problems for Teletext," is written by Linda Reynolds of London's Royal College of Art. Her article covers the newest means for displaying on demand computer-stored text broadcasts or transmitted signals from remote databases to remote television sets in homes and offices. Teletext and Viewdata networks are emerging worldwide; both are now available in England and are being used experimentally in the United States. Simply dialing a phone and connecting it to a home microcomputer or tv set allows instant access to huge amounts of information, including news wire services, commodity and stock quotations, travel information (which can be updated hourly), electronic mail services, sports scores, store catalogs, etc. For example, a two-way system in Ridgewood, N.J., enables subscribers to place orders at their local supermarket.

Screen limitations and the large numbers of pages (over 10^5) of information pose serious problems for electronic text designers. Based on her experience with the British Teletext and Viewdata systems, Reynolds offers guidelines for information display that are applicable to all developing systems. If a reader starts with section three of *The Technology of Text,* however, he or she will quickly realize the need to return to teh basics presented in sections one and two.

The first section of the book deals with the structure of ordinary prose. The organization of a passage can significantly enhance its transformation from the symbols printed on paper or on a crt into something that has meaning and use for the viewer. The arrangement and sequence of prose are subliminal but nevertheless implicit cues to the textual meaning. In a sense, the textual presentation becomes part of the message.

Two assumptions dominate the thoughts and writing in this section: 1) knowledge is organized in memory as networks of interrelated representations of objects, events, and concepts that form the structural foundation of meaning, and 2) the structure of text, like the structure of memory, has a primary role in the comprehension of all meaningful, informational prose. A review of these two concepts is developed by Jonassen in his introduction to section one.

The most prominent model used to describe knowledge in memory is schema theory. We develop schemata for our various life experiences. These schemata are mental constructs that represent our knowledge of those experiences. Words, or word combinations, then trigger a continuous flow of schemata.

Text bases, like schemata, contain unit ideas (propositions) that are hierarchical and can be embedded. The exact relationship between the two however, is not fully clear. Just as schemata represent individual knowledge structures, propositions combine to form the content structure of prose. This concept is more fully developed by Dr. Ann Jaffe Pace in her chapter on "Analyzing and Describing the Structure of Text."

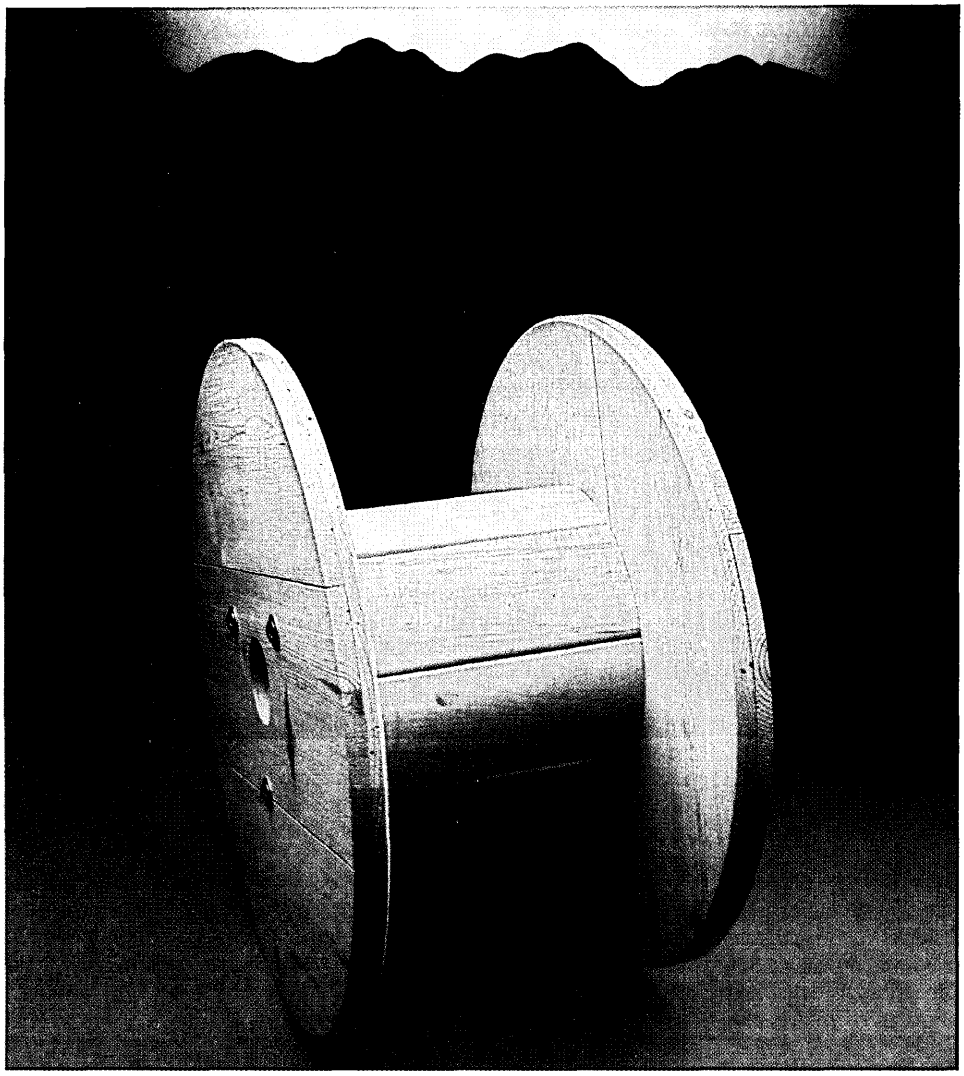
The most effective transfer of knowledge would result if an author and a reader possessed isomorphic, or identical, knowledge structures. Such an occurrence is practically and conceptually impossible, in that nothing could be learned from the other person. So the question arises, is comprehension of text data driven (text structurally controls the activation of schema in the reader) or conceptually driven (motives, goals, or schemata of the reader control input from the text)? The answer hinges on many factors, not the least of which is the cohesiveness of the text base versus an individual's knowledge structure. This chapter points out that well-organized text is more likely to be assimilated by the reader.

Putting all the above into an understandable physiological discussion is left to Dr. James D. Hand of the University of Arkansas in a chapter called "Brain Functions During Learning: Implications for Text Design."

The book's second section involves "Explicit Techniques for Structuring Text." It focuses on more overt and explicit means for displaying or signaling the structure of text. This includes linguistic, spatial, and typographic cues to the form, function, sequence, content, and importance of segments in a passage. The techniques function as "discourse punctuators." A three-dimensional matrix is developed showing text characteristics versus process versus learner characteristics.

Chapters in this section discuss how text characteristics affect learning and retrieval. Included is an excellent section by Robert Waller, currently a lecturer with the Open University in England, called "Text as Diagram: Using Typography to Improve Access and Understanding."

Obviously, what makes an individual an excellent or a poor reader is dependent on general comprehension strategies and rapid, context-free word recognition. During reading, individuals are involved with decoding words, assigning meanings to them, and combining these meanings in accordance with prior conceptions and relations and associations. These overall processes are represented by a complex interaction of subprocesses that include extraction of features, spelling (orthographic),



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CIRCLE 167 ON READER CARD

vocabulary (lexical), syntactic knowledge, and semantic (therefore subjective) memory. The book's final section explores which of these processes produce individual differences in reading.

David Jonassen wrote the final chapter, not as a comprehensive review of the research in each area, but rather as an overview of exemplary research on individual differences in discourse comprehension. To organize this processing, he begins with a flowchart indicating the areas of individual difference variables, and text intervention techniques. Clearly, text writers and designers cannot assume that all readers will understand their presentations. In general he warns, "Designer, know what your reader knows before writing. What you cannot assume the reader knows, you will have to provide."

Overall, the textual display techniques discussed in this book are technologies in themselves. Based on modern theories of learning, physiology, and psychology, they are practical and useful. Each of the contributors has been active in the design and dissemination of textual materials. The lessons that these leaders provide will prove useful to a wide range of text designers, users, editors, product developers, teachers, CAI-courseware producers, and others involved in the development and utilization of text. Educational Technology Publications, Englewood Cliffs, N.J. (1982, 478pp., $32.95).

—Dr. Harvey J. Brudner

REPORTS & REFERENCES

TELE-COMMANDMENTS

The teleconferencing division of Darome Inc. recently published a guide for selecting and creating the "optimal teleconference room." Darome bills the book, *The Tele-Commandments*, as chock-full of the information that facilities planners, architects, engineers, meeting planners, and telecommunications managers will need. The 10 criteria necessary for a successful meeting room communications system are discussed. For a copy of *The Ten*—whoops—*The Tele-Commandments*, write to Darome Inc., Suite 780, 5725 East River Rd., Chicago, IL 60631. Orders must be prepaid ($25).

WEST EUROPEAN RECORD

The West European electronics industry picture appears to be in a solid state. Its compound annual average growth rate (CAAGR) is expected to increase almost 8% in 1983 to a total of $90 billion (at constant 1982 monetary values). According to the *Mackintosh Electronics Yearbook 1983*, this nearly 8% growth rate should continue through 1986 to a market total of $113 billion. Mackintosh states that the Western European electronic data processing market will be the fastest growing sector of all electronics industries through 1986. The largest single market is telecommunications, expected to grow at a CAAGR of 6% to reach $14.7 billion by 1986. The fastest growing single market is video recorders, with an increase of 20% in unit terms anticipated for 1983.

The selling price of the yearbook is $375, and it's available from Benn Electronics Publications, Ltd., P.O. Box 28, Luton, England, LU1 2NT, tel. 0582-417438, telex 826314.

OTA: A SURE BET

The Office of Technology Assessment (OTA) is a "nonpartisan analytic support agency" that helps the U.S. Congress understand and deal with technical issues. Because technology is advancing at an incredible rate, our educational needs, too, are changing and growing rapidly.

OTA believes that the government must play a greater role in education, and several specific actions are mentioned in its recent report, "Informational Technology and Its Impact on American Education." Americans have to become familiar with new technologies to keep up with the new pace, and perhaps these technologies can help us learn faster, more cheaply, and more efficiently than if conventional methods were used. The report is available for $8 from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402.

HISTORY OF COMPUTING

The Charles Babbage Institute for the History of Information Processing (CBI) and Tomash Publishers recently began a joint publishing venture. As of January, they began reprinting major books and articles on the history of computers. The CBI Reprint Series begins the new year with the rerelease of four classics: *The Preparation of Programs for an Electronic Digital Computer*, by M.V. Wilkes, D.J. Wheeler, and S. Gill; *Babbage's Calculating Engines*, a collection of Babbage's works assembled by his son, Major General H.P. Babbage; *The Handbook of the Napier Tercentenary Celebration*, edited by E.M. Horsburgh; and *High Speed Computing Devices*, by the staff of Engineering Research Associates. The dates of original publication for these volumes are 1951, 1889, 1914, and 1950, respectively. For futher information, contact Tomash Publishers, P.O. Box 49613, Los Angeles, CA 90049.

PERIODICALS

LOOK WHO'S TALKING

Speech Technology, Man/Machine Voice Communications, a new magazine, deals exclusively with the latest developments in voice synthesis and recognition for the engineer, manager, scientist, educator, and other users. According to Media Dimensions Inc., the publisher, talking machines are commonplace today, and tomorrow's machines will advance to the next level and be able to understand human speech. The magazine is fairly technical and contains articles such as "Speech Technology on Consumer Products," "Voice Recognition Boosts Command Terminal Throughput," "Synthetic Speech: Explosive Growth Ahead?" "A Real-Time, Text-to-Speech Converter," and "A Look Inside One Recognition Chip." Speech Technology is published quarterly and is priced at $50 for one year or $85 for a two-year subscription. Media Dimensions, Inc., 525 East 82 St., New York, NY 10028, (212) 680-6541.

PATENTS AT A GLANCE

The *World Technology/Patent Licensing Gazette* is a periodical that comes out every two months, listing new products and processes that are available for licensing. Each listing is "capsulized and catagorized," complete with contacts and addresses for all listees. In addition, every issue includes news stories, book reviews and reports, announcements, and meeting schedules. A four-page brochure describing the gazette is available, as are a limited number of sample issues. The annual subscription rate is $76 in North America and $82 elsewhere. Contact Techni Research Associates Inc., Professional Center Building, 41 Easton Rd., Willow Grove, PA 19090, (215) 657-1753.

SEMINARS

COMPUTER CULTURE

The New York Academy of Sciences has gathered some famous people—Robert Lucky, Marvin Minsky, and Seymour Papert, just to name a few—to discuss "Computer Culture: The Scientific, Intellectual, and Social Impact of the Computer." This conference will take place April 5-8 in New York City at the Grand Hyatt Hotel. For details, contact the Conference Department, New York Academy of Sciences, 2 East 63 St., New York, NY 10021, (212) 838-0230.

IC4GL

Cosponsored by the University of Michigan's Graduate School of Business Administration and Database Design Inc. (DDI), this conference's full title is "Information Centers and Fourth Generation Languages." During April 21-22, the University of Michigan will host the conference, which focuses on the "key success factors, pitfalls, and quantitative and qualitative benefits actually received with these techniques." Both information centers and fourth generation languages can act as valuable tools in the executive decision-making process, and there will be several user success stories discussing that very point at IC4GL. Contact DDI, 2020 Hogback Rd., Ann Arbor, MI 48104, (313) 971-5363. *

videotex

the future is here

Videotex 83 – the latest in a series of international conferences and exhibitions dedicated to the North American market. Its predecessors, Videotex 81 and 82, drew exhibitors and delegates from all over the world. At those shows videotex ventures were mostly trials and theory, now the wraps are coming off solid commercial services.

Videotex 83 will provide a definitive forum addressing the many important marketing, programming, financial, communications and technical factors which will make the difference between success and failure.

The conference program will consist of over 30 separate sessions, and feature presentations from more than 100 authoritative speakers.

Videotex 83 has been designed to meet the needs of knowledgeable delegates and decision-makers who want to deal with the practices and practicalities of videotex rather than rehashing first principals. Newcomers haven't been forgotten though, and there are some foundation sessions to get them on the learning curve.

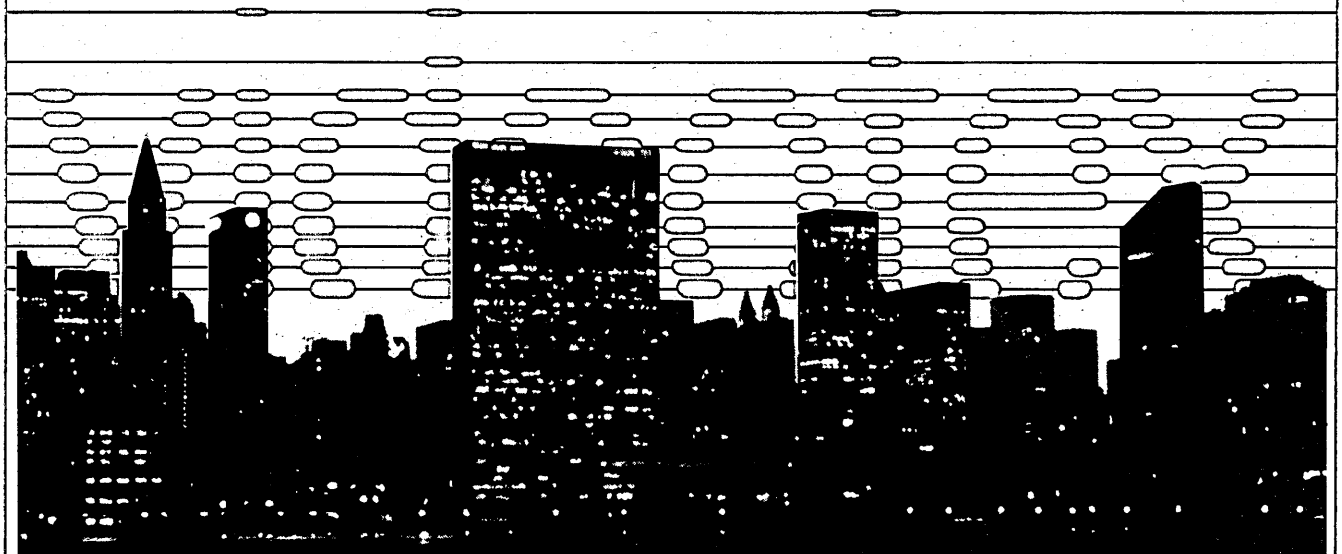
The exhibition promises to be bigger and better than ever with many organizations displaying systems and offering services that are new to the industry. Exhibitors include: RCA, Sony, Time Video Information Services, Videotex America, Viewdata Corporation of America, American Bell, IBM, Modular Computer Systems, North American Phillips, Panasonic and Radio Shack. Ring us today for your exhibition brochure, or clip the corner of this ad with your business card marked "Exhibitor" or "Delegate" and return to:-

online

London Online Inc., 4 East 43rd Street,
New York, NY 10017, USA.
Phone: (212) 692 9003, Fax: 692 9006.

VIA

Videotex '83 is organized in full cooperation with the VIA – The United States Videotex Industry Association, which represents all the major US interests within this rapidly developing industry.



International Conference and Exhibition

The New York Hilton June 27-29 1983

Advertisers' Index

Employment Scene

ON THE JOB

EXPECTATIONS UP

Unfortunately, there is no crystal ball to predict which way the dp industry's job market will turn. But, by using 1982 statistics and reviewing long-term trends, many organizations can provide a well-calculated forecast of jobs and salaries in 1983.

Two such groups are Korn/Ferry International, an executive search firm headquartered in New York and Los Angeles; and Fox-Morris Personnel Consultants, a Philadelphia, Pa.-based recruitment and executive search firm.

In its 44th quarterly National Index of Executive Vacancies, Korn/Ferry rated the electronics and aerospace industries second only to financial services (banking and insurance) in terms of the percentage of executive vacancies in the last quarter of '82. Electronics and aerospace showed a 14% vacancy rate, while financial services took the lead with a 26% rate. On the general level, the company expects executive hiring to pick up in mid-'83, with a full recovery beginning in early '84. Middle management hiring, slowed to a crawl for some time now, should also accelerate in 1984. Korn/Ferry maintains that executives will find it easier to be hired in the Eastern U.S. than anywhere else in the country, including the West Coast (by a small margin).

It appears that 1983 may be the year of the programmer. According to Fox-Morris's 1983 Professional Job/Salary Forecast Survey, the overall demand for computer experts will jump 14% above 1982 levels. Here are the job titles most in demand and the percentages they're expected to rise from '82 to '83:

Computer programmers	20.1
Software/Systems engineers	13.7
Systems analysts	9.3
MIS directors	7.9

Fox-Morris does this survey annually, and does some further polling at midyear to firm up its forecast figures. For the '83 projection, the firm worked with a base of 2,387 companies and 11,000 applicants. Some of their projections for average 1983 salaries include: $59,416 for corporate dp directors, $141,000 for chief executive officers, $30,870 for computer system analysts, and $28,381 for computer programmers with two to five years of experience. At the entry level, computer science graduates (BC/CS) can anticipate salaries around $22,980.

PROMOTIONS BECAUSE

If you ever wondered why Joe Cool got that promotion instead of you, here are some probable reasons, as unveiled in "The Newly Promoted Executive: A Study in Corporate Leadership," by the University of Michigan Graduate School of Business Administration.

- Four out of five newly promoted top executives were elevated from within the company after an average of 11.4 years with the firm.
- Approximately one in five of these executives had worked abroad for some time.
- The median amount of time spent in a previous position before promotion was 3.28 years.
- Approximately 23% of the chairmen and vice presidents and just over 19% of the presidents had worked for no other company. About half of the newly promoted executives in all three categories had worked in at least two other companies prior to promotion.

These statistics were gathered from the responses of 1,661 American executives employed by a variety of firms—not just those involved in data processing. The three major areas where these respondents began their careers were finance/accounting (25.8%), marketing/sales (22.3%) and production/operations (17.9%). In terms of moving up, marketing/sales (30.1%) and general management and administration (28.4%) were identified as the "fastest routes to the top."

The study also found that newly promoted executives tend to be highly educated—93.1% hold college degrees and another 5.5% have some college background. The university researchers say this educational level is rising every year.

One sour note is that 98.9% of these just-promoted people are men. The report states, however, that "the beginning of a new trend is clearly visible in the rising participation of women, even though current figures are small." Combined survey data from the last two years showed that there are 29 female vice presidents, two presidents, and one ceo.

—Deborah Sojka

Software Professionals

Creating Superior Software For Superior Systems

Software Systems Laboratory...the Software House for Raytheon's Equipment Development Laboratories. We bring life — and intelligence — to a wide range of real-world systems: air traffic control, weapons direction, fire control, communications, missile guidance, tracking and data gathering, space surveillance, range instrumentation, plus an emerging set of laser applications.

We're looking for software engineers who want to explore their full potential developing a wide range of applications in a highly-charged, up-to-date environment. Software applications, most of which are real-time and highly complex, run the gamut from data processing, control processing, and signal processing to such special applications as display processing, simulation, system and unit-level diagnostics, CAD, and firmware. Software engineering that encompasses: system level tradeoffs (including selection of the data processing environment), requirements definition, classical software development/test, and system integration and test.

Join our outstanding team of software professionals, and you'll be creating the state of the art, not following it. You'll work with a network of VAX computers dedicated to Software Development and to an ever-expanding array of modern tools and techniques. You'll also find the variety of assignments you need to keep you not only current in your field, but fresh and excited about working in it.

If you're the kind of software engineer we're looking for, you'll enjoy making ideas happen in a systems environment, you'll be eager to step up to the demands of defining "front end" requirements, and you'll be ready to assume a design implementation leadership role.

At Raytheon's Software Systems Laboratory, we know how to make ideas — and systems — happen. We also know how to transform your experience and ambition into a very rewarding career.

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- Requirements Analysis
- Software/Hardware Trade-offs
- Modeling of Critical Performance Characteristics
- Interface Definition
- Data Processing Architecture Definition
- Software Test Selection
- Performance Specification Preparation

Communications Systems Software Engineers

- Antenna Pointing Systems
- Ephemeris Data Processing
- Multi-Access Algorithms
- Built-in Test and Diagnostics

Air Traffic Control Software Engineers

- Radar Data Processing/Track File Management
- Flight Plan Processing
- Channel Management
- Intercomputer Communications
- Mosaicking

Assignments in the Washington, DC area also available.

Graphics Software Engineers

- Real-time Software Design (C, PASCAL, FORTRAN or Assembly Language)
- Cursive and Raster Graphics Techniques
- SIGGRAPH "CORE" Specification Experience
- Data Communications and Network Protocols
- Signal/Image Processing Technology
- Plasma Panel/Touch Entry Devices

System Programmers

- Operating Systems, especially VMS, UNIX, and RT11
- Languages, including C, Pascal, FORTRAN, JOVIAL/J73, and Ada
- Development of Microprocessor Cross-Compilers, Assemblers, and Loaders
- Performance Measurement and Prediction
- User Education and Assistance
- Real-time Operating Systems Development
- Configuration Management Tools
- Improvement of Software Development Techniques
- Hardware Selection, System Management, and Capacity Planning
- Networks and Communication Protocols

Computer Diagnostics Software Engineers

- Micro and Macro Diagnostics for fault detection and isolation
- Automatic Test Systems
- Intelligent Control Panel System Development

Radar Systems Software Engineers

- Radar Data Processing
- Object Classification and Discrimination
- Real-Time Control Systems
- Embedded Computer Systems
- System- and Unit-Level Diagnostics

Positions require a degree in engineering or computer science and at least 3 years of directly related experience. We are located in the Boston suburbs, an area that many consider to be among the finest in the country in which to live and work.

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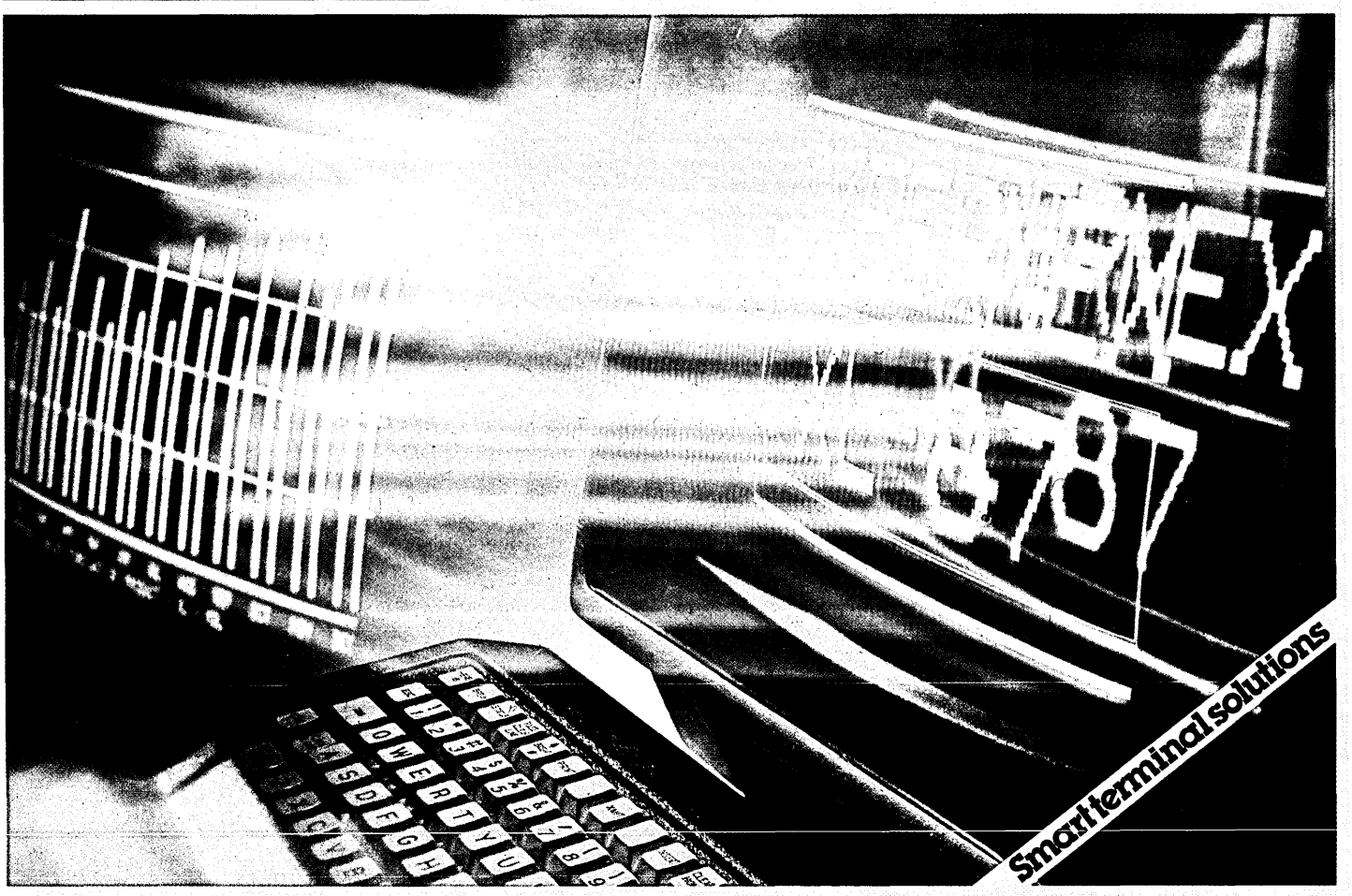
CIRCLE 172 ON READER CARD

CYBERNEX



Take a real close look. Here's why.

Over the last 8 years Cybernex video terminals have evolved around the needs of our broad base of repeat customers.

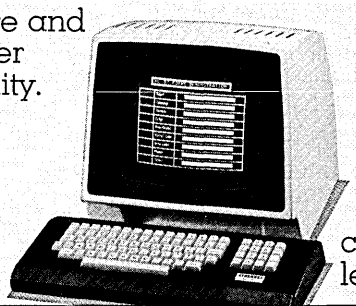
Our early exposure to the rigorous demands of the North American and International marketplaces has two important results. A high quality product and a strong commitment to customer support.

Add to this, our designed-in ergonomics and a compact attractive enclosure and you get the best of both worlds. User acceptance and long term reliability.

We now offer a wide range of standard products and enhanced emulations for compatibility with most systems available today. We also specialize in adapting our terminals to meet the unique needs of our customers.

Current models include Tektronix compatible high resolution graphics, Burroughs TD830 Series, Honeywell VIP 7800 Series, Data General Dasher, Basic-Four, Hazeltine, DEC, CDC and LSI compatible models plus our own powerful line of OEM terminals including the XL-87 pictured here.

OEMs take note. Cybernex provides a reliable product available only to value added resellers. ***This allows OEMs to profitably resell Cybernex terminals*** and to maintain a unique visual identity for their systems.



If this sounds like the kind of product and supplier you have been looking for, contact us today. Take a closer look. Then let's do business. CYBERNEX LIMITED

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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

THERE'S NO SUCCESS LIKE FAILURE

Enough has been written about how to succeed in systems development to fill several boxcars. Yet the learning process seems to be a slow one; the rate of failure is still way too high. People have repeatedly told us what to do, but, to a large extent, we haven't done it. Maybe if we found someone to tell us exactly what not to do—and we just did the opposite—we might have better luck. But where could we find an expert who had dedicated his whole life to making projects fail?

We are in Moscow. On the fifth floor of an old stone building some students sit in a high-ceilinged classroom. They shift uncomfortably in their hard chairs clutching thick sweaters and jackets around themselves, wishing someone would turn up the heat.

But these are no ordinary students, nor is this an ordinary building. It is the headquarters of the Soviet secret police, the dreaded KGB. And the students? They are here to learn how to become young racquetball-playing Americans. Their mission: to gain entry into America's data processing industry only to subvert it, not by outright sabotage but through barely detectable yet carefully planned acts of simple ineptitude. Can they be detected? Soon we will know, for today is their last day of class.

Their instructor enters the room. He immediately commands the attention of the class and begins to speak.

Young people—my comrades! Soon you set forth on your mission. Today, for the last time, we will review the 20 rules necessary to make a systems project fail.

1. Select a project that is very likely to fail. Pick the biggest, dreamiest, and least worthwhile project you can find. Make sure the user does not need it, but make him believe it would be nice, wonderful, or maybe even neat to have it.

2. Do not have a schedule. Remember the law of the American Parkinson: the time needed to complete a task will completely fill the allotted time. With no schedule you are in effect given forever for the task.

3. Do not follow a methodology or standard procedure for development. If you use such a method it would constantly guide each worker to his next task. Instead, let them come in each day and wonder for the thousandth time, "What should I do next?" They may never be able to decide, and might sit with their feet up on their desks reading their beloved sports sections.

4. Make the scope of the project gigantic. If possible, have the new system encompass every department in the entire organization. Include, as the Americans say, every "bell" and "whistle." Such a project may not even have to be sabotaged—it could be crushed by its own weight. But be constantly on the watch for those few who might press for the simple yet inelegant solution. Attack them for being unsophisticated, old-fashioned, and not state of the art!

5. Make the project as long term as possible. The longer you keep a project going, the more the need for it will change and the more likely it is that the original users and project workers will leave. As specifications have to be reworked and training and familiarization must be reviewed, the project should slow to a crawl. In fact, some of our best people have been able to actually make projects lose ground.

6. Do not phase the project. Don't gradually build up the project by making a simple, working skeleton and then enhancing it over a period of time. Some say that if you want to succeed you should have a deliverable product in a year or less. So tell the users that they will not have anything workable until the project is completed and all their desires are fulfilled. Of course, they will never see that day.

7. Do not obtain adequate resources to do the job. A large project will require considerable amounts of people, money, technical support, computer time, and facilities, etc. Be sure to shortchange yourself in all these areas.

8. Avoid capable workers. Surround yourself with people who have no idea what they are doing and have shown this through repeated failures. In America you will probably accumulate a number of drinking buddies; these people would be best. If you cannot get such ideal candidates, you may do almost as well with young and inexperienced workers. But there is a danger with this type. They are often very ambitious and might possibly learn what they should be doing as the project progresses. So absolutely do not schedule any training for them, provide them with few books or manuals, and discourage the old-timers from even talking to them.

9. Ignore the users. If you can get away with it, do not involve them at all. Just determine on your own what you think the new system should do. Since there is no way that you can possibly know their end of the business as they do, your project is apt to fail.

10. Allow for no emergencies or contingencies. In whatever planning you are forced to do, simply assume that everything will work out excellently. Assume that every task will be finished on schedule, every program will run the first time, and every item of equipment will be delivered on the day it is promised.

11. Do not provide for communication between project team members. The best way to do this is to have absolutely no documentation. Just say, "Why document this? We all understand what's going on here." This technique will pay off especially well if you can get some project members to quit, since it will be extremely difficult for their replacements to catch up.

However, if you are forced to have documentation, document everything. Keep notes of every comment made at even the most informal meetings. Make bubble charts showing how the clerks in the user offices go to the bathroom. This can produce the same effect as having no documentation, since now there will be

mountains of it to wade through to find out what is going on. Also, think of all the time you can waste drawing it up!

12. The project should consist of every new gadget and theory available. Whenever hardware, software, development, or analysis techniques must be chosen, waste as many months as possible agonizing over which of them is the best. Then, when you finally do choose, reject any tried and proven alternatives—always pick the newest and most recently introduced things. You will be backed by the hardware and software vendors because you'll be helping them test their products to find all the remaining problems.

As for development methods and analysis techniques, choose them from the hottest new books so that nobody has had a chance to find out if they really do work. And, when the project has been grinding along for a while, suddenly announce that the techniques previously selected are no longer the most up to date; after all, they're several months old by now. Explain that you must switch to newer techniques to again be using the best approach. Think of the chaos this will create! You may be able to discard much of the work done up to this point, since it is not compatible with the new approach. Of course, everyone will have to be retrained in the new methods, which can only lead to further confusion and frustration.

By now you should have laid a good foundation for failure. But here are some additional things you can do when you are, as the Americans say, "coming down the home stretch."

13. Make no demands on your workers. Don't insist that schedules be met. Don't insist that things be done properly. Don't insist that procedures be followed. No one will complain; remember, in this land each person likes to "do his own thing."

Allow everyone to come in late, leave early, and take two-hour lunches. Keep a similar schedule yourself to set a proper example. For the small amount of time that people are actually in the office, encourage socializing and discussion of sporting events and tv shows. By doing these things you should reduce the amount of time spent working to virtually zero!

14. Start lying to users and managers. Things should be going very poorly now. Of course, you will tell everyone that things are fine, or you may allude to some problems. This should increase their disillusionment when the truth is revealed.

15. Turn the project into an armed camp. Refuse to arbitrarily decide anything; throw even the most minute matters up for general discussion. Also, get people involved in matters they do not care about and have no expertise in anyway; for instance, make the users decide what sort of file structure you are going to have, and so on. After you have done all this, angrily insist that everything be done your way. Soon the landscape will resemble World War III, with all the participants fighting each other.

16. Identify all events that could delay the project, and help them occur. For example, something as small as the late delivery of a crucial new form can bring everything to a screeching halt. In a case like this, of course, you would have the form delivered by way of the South Pole!

Many times, however, you will not have to go out of your way to cause these delays. This is because you will be depending on vendors and others who, unlike yourself, have no stake in whether the project succeeds or fails. Just neglect to pressure them, and the chances are that they will come through behind schedule.

17. Get all your workers to quit. This is much easier than it seems, and can be done in several ways that will never arouse suspicion. It is not necessary to cut the workers' salaries—just neglect to raise them, and after a short time they will be able to get substantial raises by leaving to do the same work for another employer. Next treat all workers the same. Employ our sacred Russian tradition of making sure that all are being treated equally by treating all miserably. Create a hostile atmosphere in the work place—yell and shout a lot; have old, beat-up furniture; keep the temperature at 55° in the winter and 95° in the summer, and cover up any ventilation ducts that you might have. If, despite your best efforts, the workers are still trying hard to make the project succeed, repeatedly tell them what a poor job they are doing.

18. Drag the project on as long as possible. There should no longer be any question that the project is going to fail. However, you can still waste much more of the company's time, money, and personnel resources by making it die a slow and agonizing death. Do everything to hide your true lack of progress. Keep coming up with revised new optimistic estimates that promise success to be just around the corner. Never determine what your to-date costs have been, use alibis for your lack of progress, and blame all the problems on others. When they start to find you out, come up with new approaches that are certain to save the project. Of course, these new approaches will just be disguised versions of all your past successful techniques.

And, in case you see that you may be forced to actually implement the project:

19. Do not test, or test as little as possible. This may be easy because when a project is way behind schedule there is usually extreme pressure at the user end to get things up and running. It should make everyone happy when you shorten the project's last phase—which is testing. This may cause so many problems in the first runs of the system that the users will throw up their hands and give up completely.

20. Lastly, make the system unmaintainable. The next best thing to no system is one that will only last a few months. The user's situation is constantly changing, and as a result of this and the poor programming you did during the developmental stages, there should be many requests for maintenance changes. Make implementation of these changes difficult (if not impossible) by using massive programs employing "spaghetti" code which no one can possibly decipher. Also, make no use of tables, follow no consistent standards or rules of style, and make each program a unique work of art. Most importantly, leave no documentation—if anyone wants to make changes, let them fight through every line of code.

It won't be long until the new system becomes an unworkable old system. Then the users will once again start screaming for relief. Your answer? We need a bigger and better new system!

As he finishes his speech, the instructor leans forward on his heavy wooden lectern and nods. He reflects back on the advice he has just given and smiles contentedly; here is a man who truly enjoys his work.

Several seconds pass. Then, an apprehensive student speaks:

"Colonel," he says, "we have heard that our agents have enjoyed moderate success with these methods. But there was one, Major Bubinsky, who rose to a high position in America. Yet, no one seems to know if he was ultimately successful. Can you tell us what happened to him?"

The instructor's face reddens. "I had considered telling the story of Bubinsky today," he responds, "but I did not want to mar this most happy of occasions. Since you ask, I will tell.

"Bubinsky's story shows the potential—but also the peril—of our mission. He melted into the American landscape with ease and soon reached a position of great responsibility in their data processing. This created a problem for him because, as he informed us, he was forced to adopt a certain life style. He had to have several expensive cars, eat at the best restaurants, drink the finest of wines, and so on. Even his high salary was not enough to pay for all this; we had to supply him with considerable extra funding.

"Despite all these efforts, something—we still do not know what—went wrong and he was seized by the enemy. The last time we saw him, two female agents were forcing him to speed down a highway in their 'Silicon Valley.' They must have drugged him, of course. I am certain of this because not only did he seem to be submitting most passively but he was doing something that in our many years of working together I had never seen him do—he was grinning broadly."

—Gerome Schulz
Milwaukee, Wisconsin

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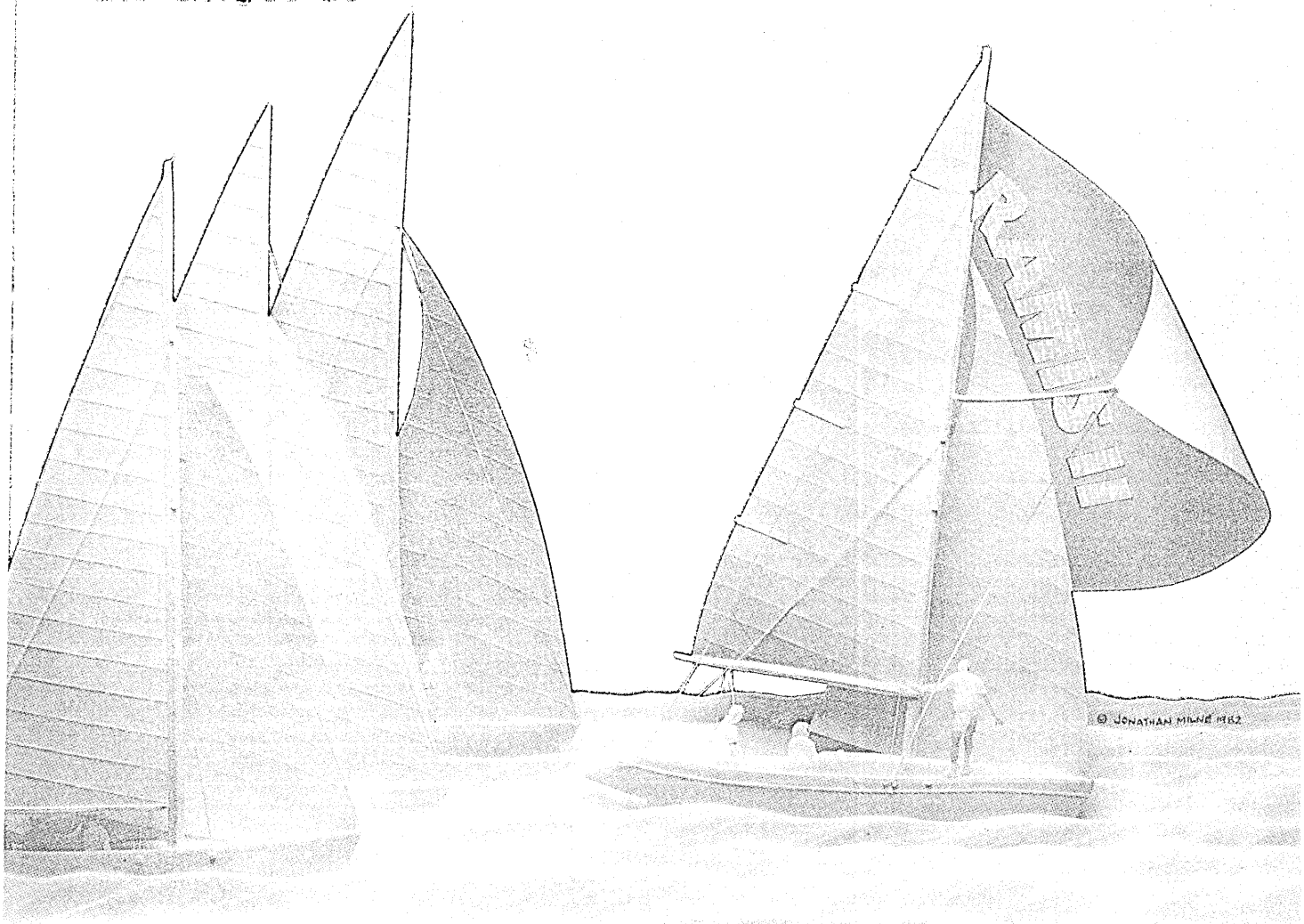

RAMIS® II...The Leader by Design

CIRCLE 175 ON READER CARD

NEWS FROM HAL CORP.

HAL Corporation presents the highlights of its new System/369—available April 1, 1984.

General description: the System/369's combination of revolutionary hardware, liberal update policy, conservative software, and a Marxist microprogram provides users with exciting and unusual operating conditions.

Hardware: a special 3801 Coffee Delivery Subsystem, used in conjunction with BLIEMCHEN Software Support, caters to operators' and programmers' needs. Available extensions are a Cigarette and Cigar Delivery Subsubsystem, an Ash Removal Subsubsystem, and an Iron Lung Subsubsystem.

The following new Opcodes are processed by the cpu, adding significant program power and flexibility:

HCF—Halt and Catch Fire
BMY—Branch Maybe
BMYR—Branch Maybe Register
MRZ—Make Random Zap
MLP—Make Lousy Program
RPM—Read Programmer's Mind
EX—Execute Operation
EXI—Execute Invalid Operation
EXO—Execute Ignorant Operator

New Channel Command Codes are supported by hardware and software in six categories:

- Disks:

RWD—Rewind Disk
SDD—Seek and Destroy Data
RWF—Read Wrong File

- Tapes:

RRT—Rewind and Rip Tape
STO—Strangle Tape Operator
PPR—Play Punk Rock

- Printers:

KP—Krunch Paper
DDWB—Deposit Directly in Wastepaper Basket
PTP—Produce Toilet Paper

- Controllers:

SWU—Select Wrong Unit
LAC—Lose All Communication
FD—Forget Data
CFE—Call Field Engineer

- Diskette readers/writers:

SP—Staple and Punch new center hole
RG—Record Garbage
RF—Read Fingerprints

- Communication controllers:

TTL—Tap Trunk Line
SAF—Switch to AFN Frankfurt
TC—Transmit Colors (but avoid red)
BCU—Burn out the cpu
DPR—Distribute Packages Randomly

Software: The software is excellent. You can spend your money on projects and never fulfill the needs of any application. There are two extraordinary programming languages as well as three superfluous utilities. If your programmers (especially systems programmers) still have spare time, there are also games available.

There are several programming languages available:

BUNCH, which stands for Binary Unusable Nonsense Computer Hazard, is especially designed to damage structured programs. Various features make programs unreadable and provide for excellent security. There are powerful language constructs like BRANCH BY DEFAULT, HIDE FROM PROGRAMMER, WASTE STORAGE, LOOP INFINITELY, JUMP SOMEWHERE, and CLEAR ON MONDAY.

BABBAGE is the language of the future. Since Ada wasn't available as early as needed, BABBAGE was developed.

BABBAGE (as explained by Tony Karp in DATAMATION, Oct. '81) is based on language elements that were discovered after the design of Ada was completed. For instance, C.A.R. Hoare, in his 1980 ACM Turing award lecture, told of two ways to design software: "One way is to make it so simple that there are obviously no deficiencies and the other way is to make it so complicated that there are no obvious deficiencies." The designers of BABBAGE have chosen a third alternative—a language that has only obvious deficiencies. BABBAGE programs are so unreadable that maintenance can begin before system integration is completed. This guarantees a steady increase in the dp marketplace.

Structured languages banned GOTOs and multiway conditional branches by replacing them with the simpler If-Then-Else structure. BABBAGE has a number of new conditional statements that act like termites in the structure of your program. WHAT IF, for example, is used in simulation languages. It branches before evaluation of the test conditions. Or WHY NOT? which executes the code that follows in a devil-may-care fashion.

BABBAGE also offers a variety of case statements. Some examples: the JUST IN CASE statement is for handling afterthoughts and fudge factors. It allows you to multiply by zero to correct for accidentally dividing by zero. Then there is the BRIEFCASE statement, which encourages portable software.

We hope this announcement has helped your understanding of HAL's product policy. We look forward to selling the System/369 to you next April.

—K. Doube
Zurich, Switzerland

FUTURE STORAGE TECHNOLOGIES

Due largely to the advent of computer assisted retrieval techniques, microfilm has become a practical medium for filing active records, a marked change from microfilm's past archival storage role.

Today, both microfilm and magnetic tape are commonly used as long-term storage media in dp operations. Each of these technologies will improve in the coming year. In addition, they will be joined by optical disks, a promising partner for the storage of information that should become practical in the second half of this decade. Film, disk, and magnetics should be viewed as compatible alternatives for the storage and retrieval of information.

Underlying this compatibility is an important point. Despite the rapid growth of electronically generated data, experience has shown us that paper documents continue to grow in both volume and importance. Paper documents are originating records, containing more information than typically converted to digital form. Because of the cost of data entry, only essential data are entered into a computer system. The document, or its image, remains a repository of associated information that may be required from time to time.

Quite simply, document images are going to be around for a long time. The documents themselves may be dispensed with, but their images will be retained in some form that permits low-cost, rapid, and remote retrieval whenever necessary.

Such a future system would require computer indexing of the images, central storage, and retrieval from remote display consoles, necessitating electronic transmission. In all three technologies (see Fig. 1), scanning devices are used at some point to

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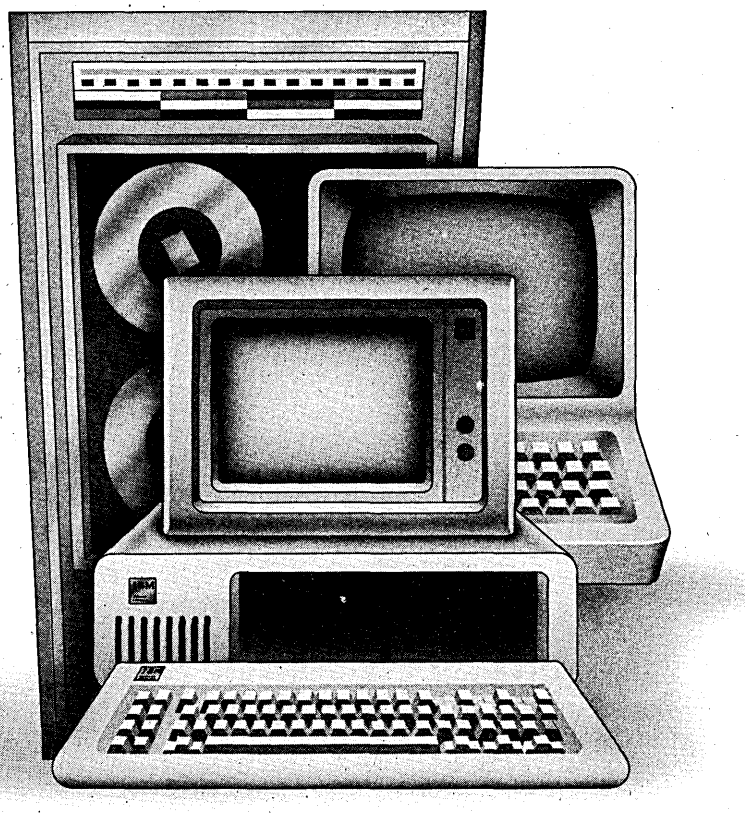

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CIRCLE 174 ON READER CARD

FIG. 1

COMPARISON OF THE THREE RECORDING MEDIA

	MICROFILM	HIGH-DENSITY MAGNETICS	OPTICAL DISK
1 Unit	215' Roll	225' Roll	12" x ¼" Disk
2 Volume	16 in^3	16 in^3	25 in^3
3 Storage capacity	10,000 8.5" × 11" documents	Same	Same
4 Unit price	$15	$15	$30
5 Time to verification	Minutes	Immediate	Immediate
6 Within-unit access time	12 Seconds	12 Seconds	1 Second
7 Access to image in large file	1-3 Minutes	Same	Same
8 No. of read cycles before failure	No practical limit	100-1,000 Cycles	No practical limit
9 Destruction by rewrite	No	Possible	Possible
10 Archival keeping	Yes	Limited	Metal films or polymers —unknown
11 Replication	Optical print on diazo or vesicular film— $10 (High-speed optical printing)	Rewrite on new tape— $15 (Real-time recording)	Rewrite on new disk— $30 (Real-time recording)

convert, in facsimile, an image to electonic signals. The film system would use a scanner to convert a pictorial image on microfilm to an electronic signal and transmit it to a display console. The other two systems would use scanners to transform the source documents to electronic facsimile signals, recording these signals on magnetics or optical disk. The image would then be retrieved from the tape or disk and transmitted to a display console.

To understand how these systems will scan and transmit an image, assume that an 8 × 10-inch photograph is scanned at 200 points, or pixels, per inch. At every pixel, three bits of data are used to represent the gray-scale information present. Therefore, a picture can be converted to about 10 million bits of data, electronically transmitted and displayed on a console with satisfactory resolution. This scanning would be common to images stored on microfilm, magnetics, or optical disk.

But each storage medium has its own characteristics that might affect packing density—the amount of information that can be stored on a given unit of the medium—and price/performance. This warrants examination and comparison.

In examining microfilm, at a 50:1 reduction ratio, an 8½ × 11-inch document is imaged into an area of only 1/25 of a square inch. At 10 million bits per document, a 215-foot roll of 16mm microfilm can store 10,000 images, or a total of 100 billion bits per roll. Since this roll occupies 16 cubic inches, the volumetric packing density of microfilm is 6 billion bits per cubic inch.

The storage cost of 1.5×10^{-8} cents per bit can be calculated by assuming $15 for a processed roll of microfilm.

Steady improvements in the packing densities of magnetics, plus recent projections within the industry, indicate that in the coming years improved packing densities can be expected. For the purposes of this comparison, it is reasonable to assume that magnetics will achieve recording densities of greater than 10 million bits per square inch in the near future. In the long term, we might expect to achieve a density of 50 million bits per square inch through the use of ultrahigh-density magnetic tape. Given this development, a 200-foot roll of ½-inch magnetic tape would be capable of storing 100 billion bits. This density would be equivalent to that of microfilm. And at roughly $15 for a 200-foot roll of tape, the storage cost would be comparable.

The third storage medium mentioned above is optical disk. The disk itself is a rigid glass substrate. It is first coated with a reflective layer, then either a metallic or organic layer. To record information, a laser burns tiny windows, or pits, through the top layer, opening up the reflective layer below. Each pit is only a micron or so in size.

To play back the data, a low-power laser "reads" the disk, sensing the presence or absence of holes. Where a pit has been created, the undercoat reflects light back to the device. This pattern is converted to an electronic bit stream and transmitted to a console where the image is displayed.

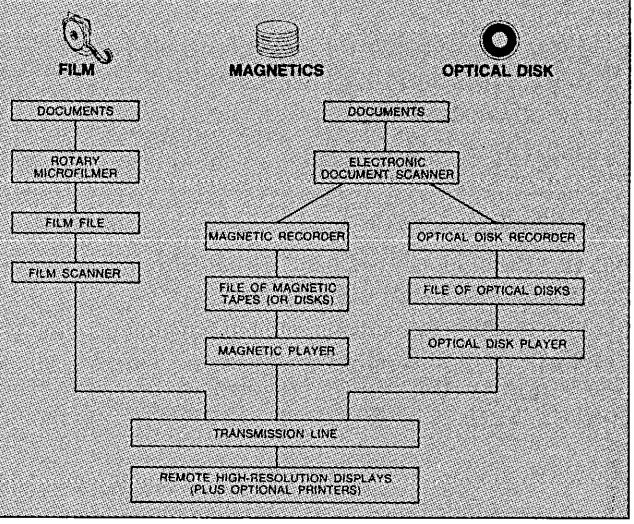
It is estimated today that a 12-inch diameter disk can be made to store about 100 billion bits. Such a disk would occupy about 25 cubic inches, so its volumetric packing density would equate to about 4 billion bits per cubic inch. This is slightly less than the 6 billion bits for film or magnetics, but still within the same relative magnitude. Calculating the cost per bit involves a bit of guesswork, as current estimates place the cost of a single disk—when they become commercially available—anywhere between $10 and $50. So, let's assume a mid-range price of $30 per disk. That would lead to a per-bit storage cost of roughly twice that of film or magnetics.

It should be noted that these comparisons of potential storage density and probable price levels are simple estimates, based on current research indications. Technology could alter any and all combinations. Data compression techniques could lead to lower prices and improved storage density for optical disk. Film could be pushed to even greater reduction ratios. And there is some latitude between the fundamental limit for super paramagnetic particles and the packing density outlined here for magnetic tape. But what has been established, even by this simple analysis, is that when all these technologies become available, parity will exist.

Realistically, the choice of a storage medium will not be made solely on the basis of packing density or per-bit storage cost. The specific needs of the individual application being served will

FIG. 2

THE STEPS INVOLVED WHEN USING RECORDING MEDIA



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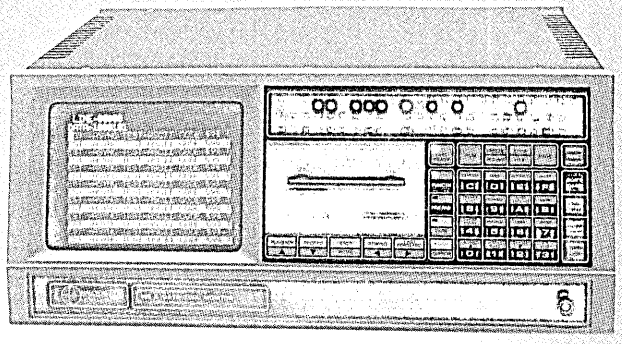

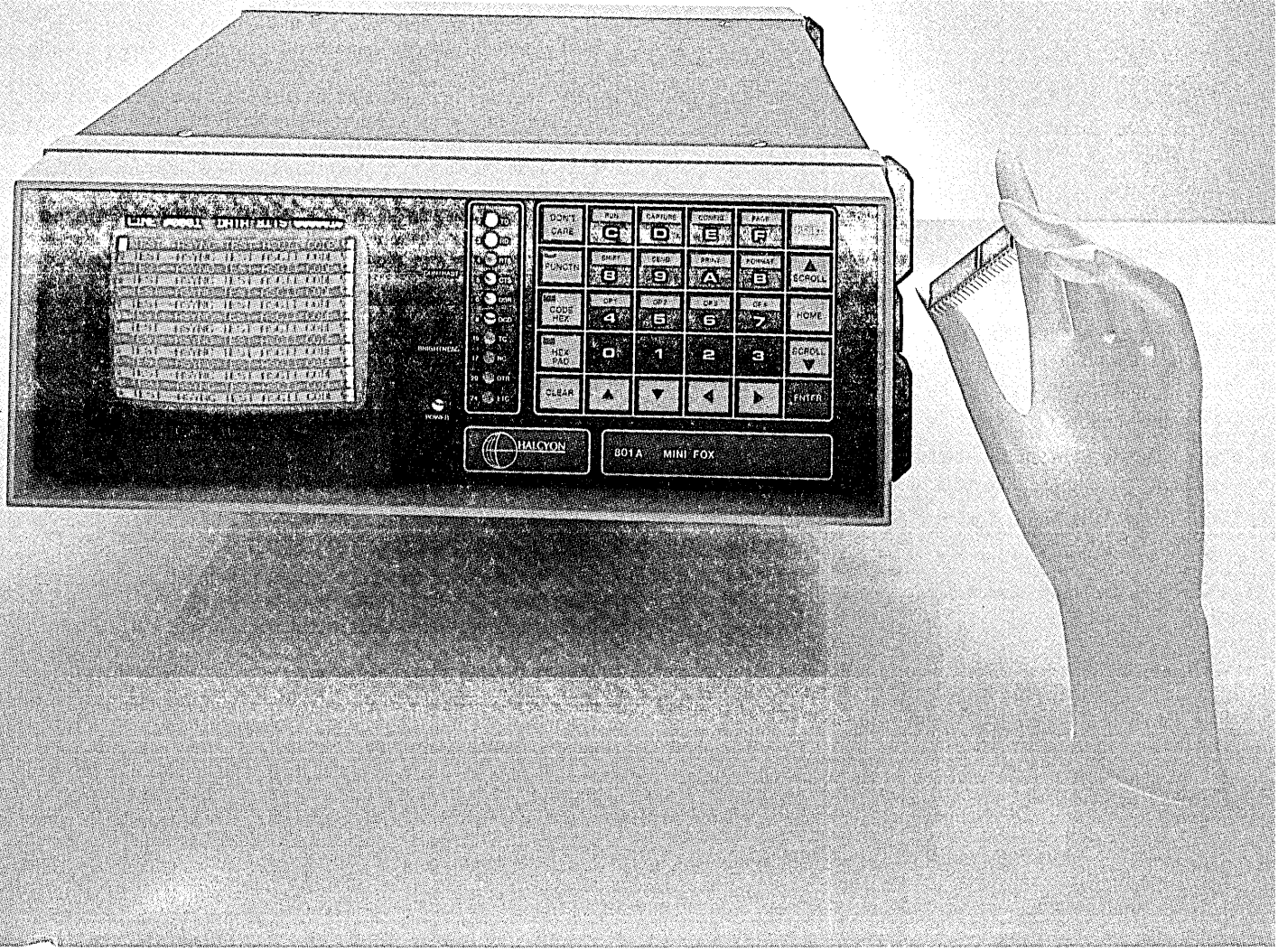

READERS' FORUM

probably be the decisive factor. Indeed, since all three storage media involve optical scanning and electronic transmission of data, they will be interactive and compatible. The strengths and advantages of each will come into play in the user's system.

Fig. 2 shows the various considerations for microfilm, high-density magnetics, and optical disk. The first four rows of the chart summarize what is noted concerning packing density and anticipated price performance.

Row 5 shows a clear strength of optical disk and magnetics—their ability to perform instantaneous verification of the recording process.

The next two rows deal with a very important aspect of any information storage system: its retrieval time. Row 6 shows the retrieval time for a specific image contained within film magazine, reel of tape, or disk already in the device. Optical disk is the fastest in this case, with a retrieval speed of one second, compared to 12 seconds, for film or tape. But when the image is located in a large file made up of many film magazines, disks, or tapes—a more likely "real world" situation—retrieval speed becomes virtually identical for all. Regardless of the medium used, a picker mechanism is needed to select the appropriate unit, place it in either a player or scanner device, and then find the individual image. Speed gained within the disk is largely negated by the need to bring the disk up to speed.

Row 8 indicates a potential problem with tape: repeated use might cause some damage. Unless the head can be made to fly a very small distance above the tape, wear can become a problem for a highly active file.

The next two rows deal with file permanence, a clear strength of microfilm. Both disk and magnetics are vulnerable to over-write, and the current data on the image permanence of either medium indicate a superiority for film.

The last row of the chart shows an advantage of film when replicate copies of the image filed are required. Copying from film is both faster and less costly.

Microfilm, optical disk, and high-density magnetics have their individual advantages. All will undoubtedly have a place in the future as information storage media.

Perhaps in many cases the answer for individual users will lie in a hybrid system, one drawing on the specific strengths of each technology. The compatiblity of all three will permit users to effectively integrate microfilm, optical disk, and high-density magnetics within the same information storage system.

—Dr. L. J. Thomas
Rochester, New York

RTL/2 VERSUS PASCAL

Lately, there's been a lot of talk about using Pascal for micros, yet almost everyone foresees problems in adapting the language to real-time programming. Why look for problems with Pascal when RTL/2 with its many advantages is presently available? Let's consider the comparative merits of RTL/2 and Pascal.

RTL/2 was designed and implemented by Imperial Chemical Industries in about 1971. Its initial applications were data acquisition, communication, and control. Pascal got its start at ETH Zurich at about the same time. It was designed as a simple language to teach and explore the fundamentals of programming. RTL/2 is an engineered product, based on the successful features of many other languages; it only includes new features where no proven model exists. Algol 68 was probably the greatest influence on RTL/2 and, in some ways, RTL/2 can be thought of as a simplified "sensible" form of that language.

But Pascal is clearly not an engineered product. There are

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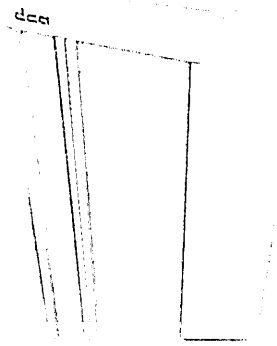

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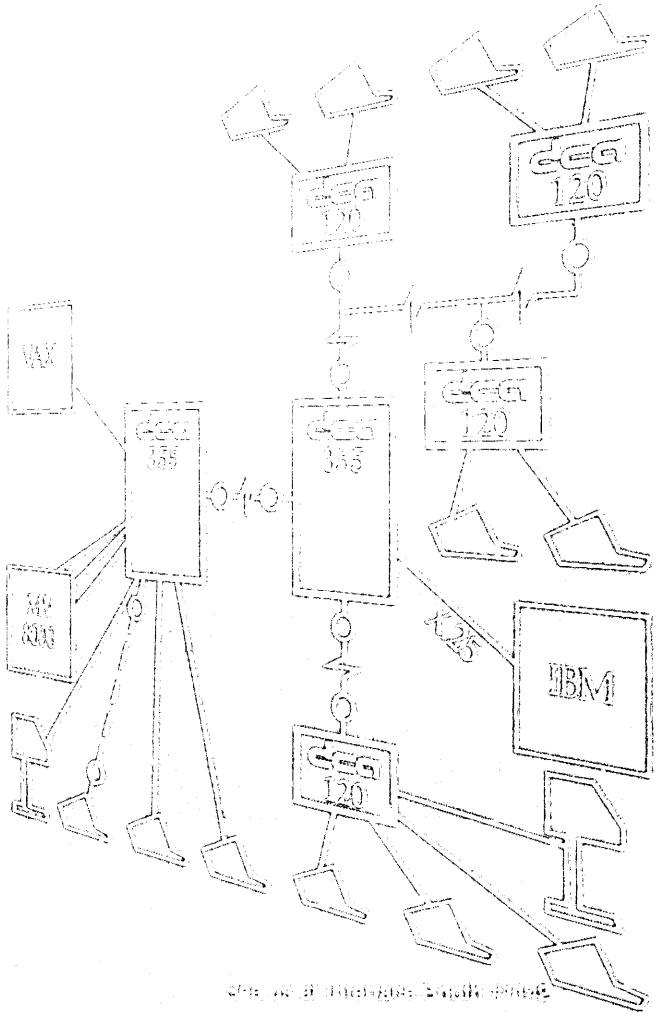

inconsistencies between the user manual and the language specification, causing considerable variation between implementations. Of course, an imprecise language is good for exploratory academic purposes since it encourages innovation within a common framework. What a pity that in reacting against the vastness of Algol 68, Pascal rejected the good with the bad.

An RTL/2 module is composed of a group of "bricks"—procedures, stacks, and data. These bricks are the building blocks of an RTL/2 system. Procedures may not be nested within each other nor may they have local arrays. Local variables are dynamic, however, and are obtained, placed on, and retrieved from a stack. Nonlocal data are grouped into named data bricks. The module is the unit of compilation and several modules may be linked together to form a complete complex. The cross-linkage is at the level of the names of the procedures, data bricks, and stacks that are declared external.

A Pascal program follows the traditional Algol 60 structure and comprises a main block with embedded declarations. Procedures may be nested and have local arrays but, surprisingly, there are no local blocks. The language contains no facilities for separate compilation and does not address such issues as multitasking. Pascal's simplification of Algol 60 is inappropriate for the industrial or commercial user. Its features have—for the business user—only a theoretical value. Nested procedures, for example, entail substantial implementation overhead while having limited practical value. Nesting also makes Pascal listings far less readable. On the other hand, some of the features Pascal rejected are precisely those of interest to the typical real-time and control user. One example would be the local blocks that control name scopes and entail no inplementation overhead.

The basic data types in RTL/2 are byte, integer, fraction, real, label, procedure, and stack. In Pascal they are char, integer, boolean, real, enumeration, and subrange. Byte and char correspond roughly, although the Pascal characters are machine dependent. Integers and reals correspond. Only RTL/2 has the fraction capability for fixed-point arithmetic. Pascal's boolean type is logically useful, but not much missed from RTL/2.

An interesting development in Pascal is the introduction of enumeration and subrange. The use of enumeration rather than a set of integer values can increase the clarity and integrity of programs. In RTL/2, the LET statement is used to improve clarity but it cannot provide the integrity of enumeration types. Subranges are more of a problem. It is not clear whether they are a type or a constraint. In fact, the whole question of the rules of type equivalence in Pascal is not addressed in its documentation, and this causes portability problems. Pascal has nothing corresponding to the control types, label, procedure, and stack of RTL/2. Pascal is therefore not able to handle error recovery or stream control in the natural manner of RTL/2.

Both languages have arrays with static bounds. Pascal, however, includes the bounds of an array in its type, making it impossible to write a procedure that will manipulate an array of any size. This is a serious defect. Pascal enthusiasts say that since Pascal contains named constants, it is easy enough to change the array sizes in such a procedure at compile time. But this isn't good enough because arrays of different sizes may be encountered in the same program. With strings that are treated (as in RTL/2) as arrays of chars, the problem is even worse. It is not possible to write a Pascal procedure to handle strings of different lengths; the user would have to pad them to the same length.

The languages take different approaches to the vexing question of pointers. RTL/2 provides Algol 68-style typed references of one level only. Although not fully secure against scope errors, the restraint to one level and the absence of local (stack allocated) arrays and records greatly reduces the possibility of error. In Pascal, pointers may refer only to dynamically (and anonymously) created data. Such data are created by the built-in procedure NEW. Disposal of the data varies with implementation and there are opportunities for misuse. Pascal seems to sttempt to provide a cheap

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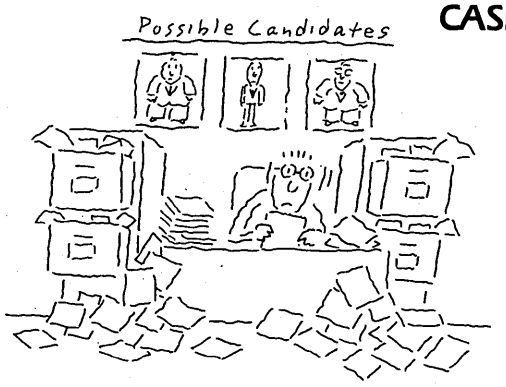

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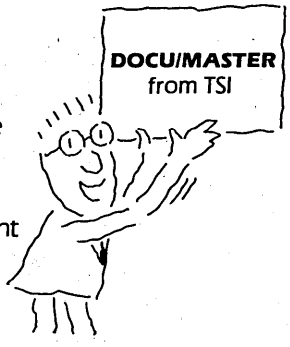

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storage mechanism but fails to do the job properly. RTL/2 has flexibility in use of pointers, but the structures are static. Pascal has more freedom in the allocation of structures but severe constraints on the use of pointers. Pascal also has "set" types. Set types are a useful concept and careful use of them can greatly increase program clarity while replacing a lot of "bitty" programming. Unfortunately, many implementations of Pascal impose constraints on the cardinality of set types, thereby restricting their usefulness. If portable programs are to be written, then set types of all but the smallest cardinality should be avoided. There is much debate over whether the set type is more trouble than it is worth.

The statement structure of Pascal is generally poor. Open control statements are used for conditional and iterative statements with all the resultant dangling "else" confusion of Algol 60. The only really closed form is the case statement, which is an obvious improvement over the RTL/2 switch. Nevertheless, the Pascal case statement is not complete since it lacks an exempt clause. Pascal provides a WITH statement to handle the details of a record without repeatedly referring to the record. This is a poor substitute for a local reference or rename facility. For example, it cannot be used to manipulate the components of two records of the same type. Pascal allows whole array and record assignment—RTL/2 does not.

The procedure structure of Pascal is similar to that of Algol 60 and continues many of its mistakes. The method of returning function results is poor. The handling of formal procedures is slipshod with full detail of the formal type omitted. In practice, however, formal procedures are not implemented and this important feature is not available. RTL/2 does, of course, provide formal procedures automatically—procedures are treated as a full type.

The parameter mechanism of Pascal functions by value of simple reference. In RTL/2, the mechanism works by value. Reference is provided through the use of values of reference mode. The handling of array parameters in Pascal is either obscure or inefficient (depending on implementation) and compares poorly with the simple and explicit array reference mechanism of RTL/2.

Variables in RTL/2 can be initialized. The syntax for the initialization of arrays and records allows the repetition of groups of values where appropriate and gives a clear indication of the shape of the structure being initialized. Pascal does not allow data to be initialized. All the valuable techniques associated with data tables initialized at compile time are therefore not available in Pascal. Such techniques have been found to be of great value in RTL/2 since they greatly increase program legibility and reduce the computation to be prepared at execution time.

RTL/2 has a notation for real, fraction, binary, octal, hexadecimal, and decimal integer constants. Pascal provides only for real and decimal integer constants. Pascal strings are unsatisfactory. A string of length 1 is a char constant. RTL/2 uses different constants for these so that arrays of length 1 are allowed. The character set is implementation dependent in Pascal but it is fully defined in RTL/2. RTL/2 provides a neat notation for the embedding of control characters and also enables the compiler to cope with missing closing quotes satisfactorily.

Both languages provide access to their environments via the use of standard procedures, but RTL/2 handles Stream I/O better than Pascal. In RTL/2 such procedures are written in RTL/2 (though the user can write code inserts too) and they follow the language's normal rules. In Pascal, many of these procedures are merely built-in facilities with a procedure-type syntax. They are not and could not be written in Pascal. The difficulties arise from the type constraints, which are worse in Pascal, thereby causing inadequacies in the normal parameter mechanism.

—Alan Titchmarsh
Secaucus, New Jersey

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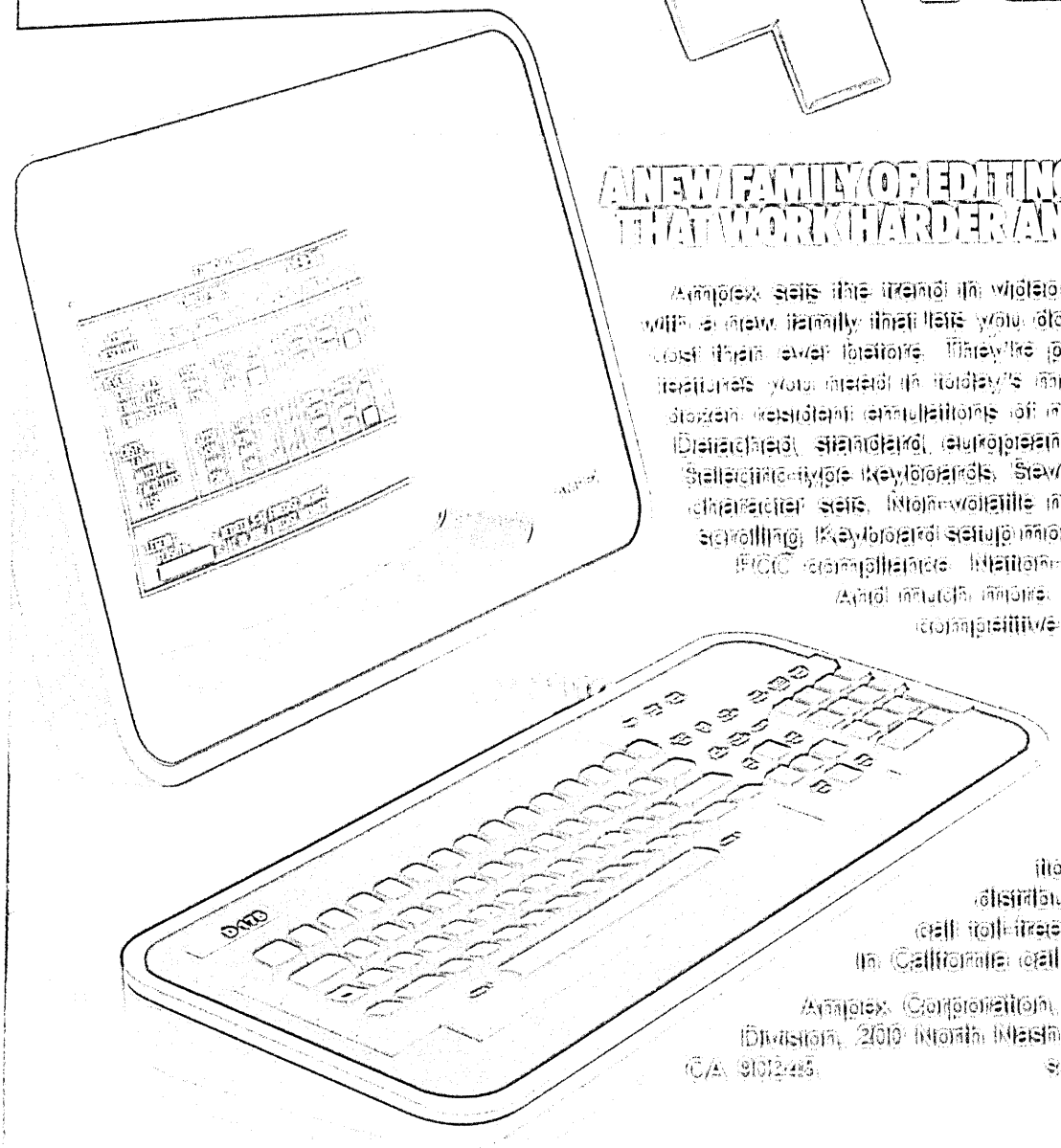

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