DATAMATION 82

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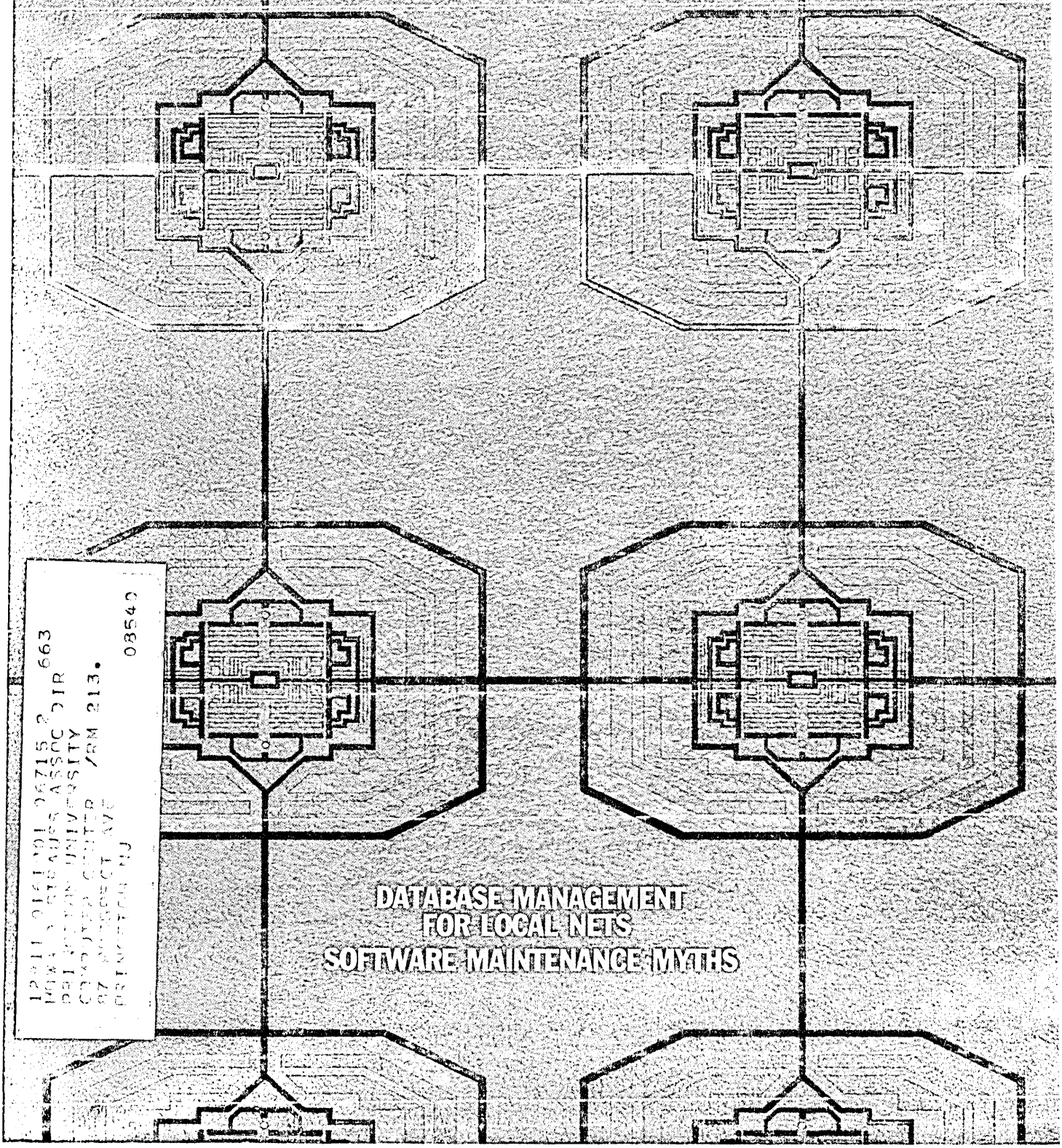
THE MICRO COMES TO PAKISTAN



DATABASE MANAGEMENT FOR LOCAL NETS

SOFTWARE MAINTENANCE MYTHS

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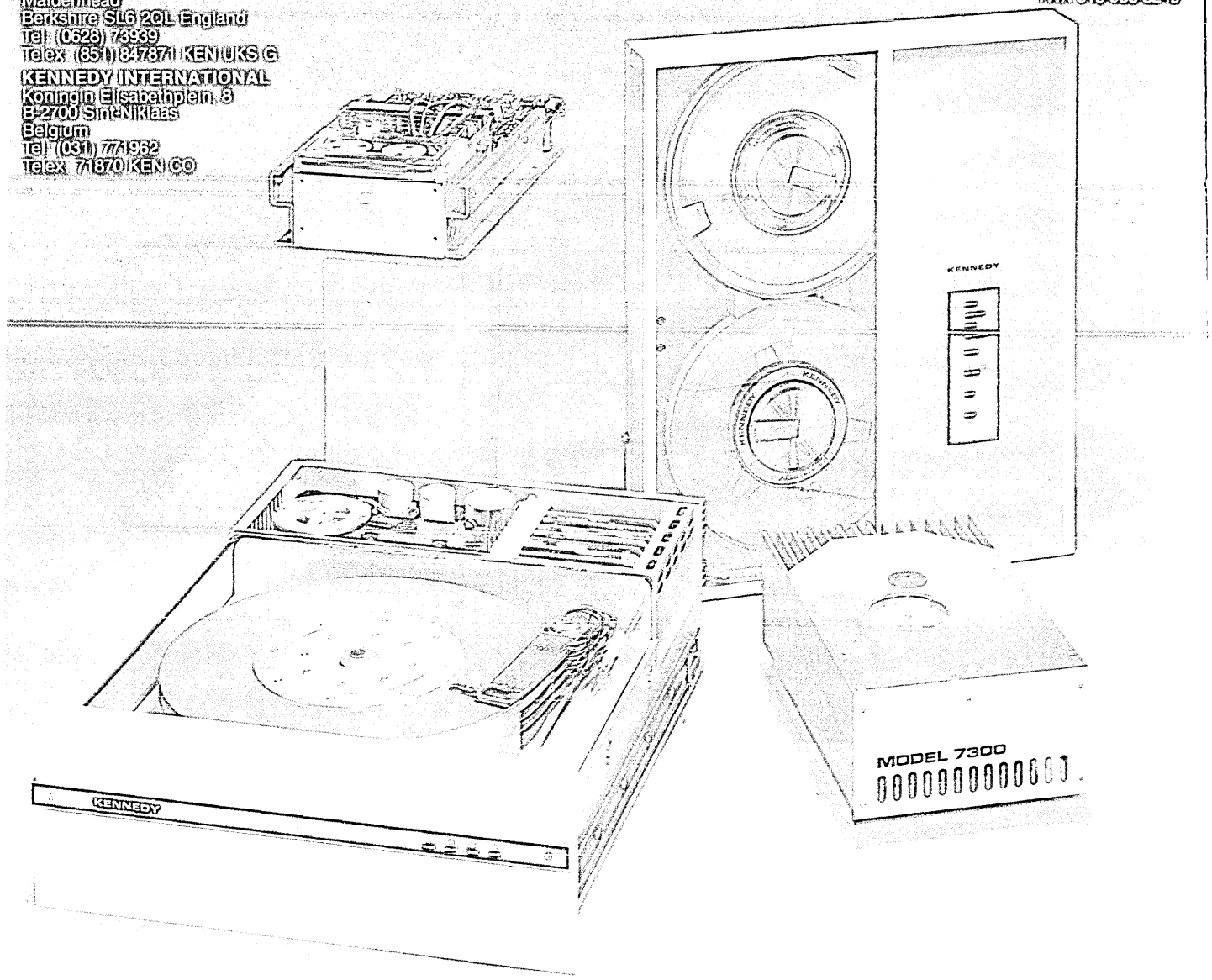

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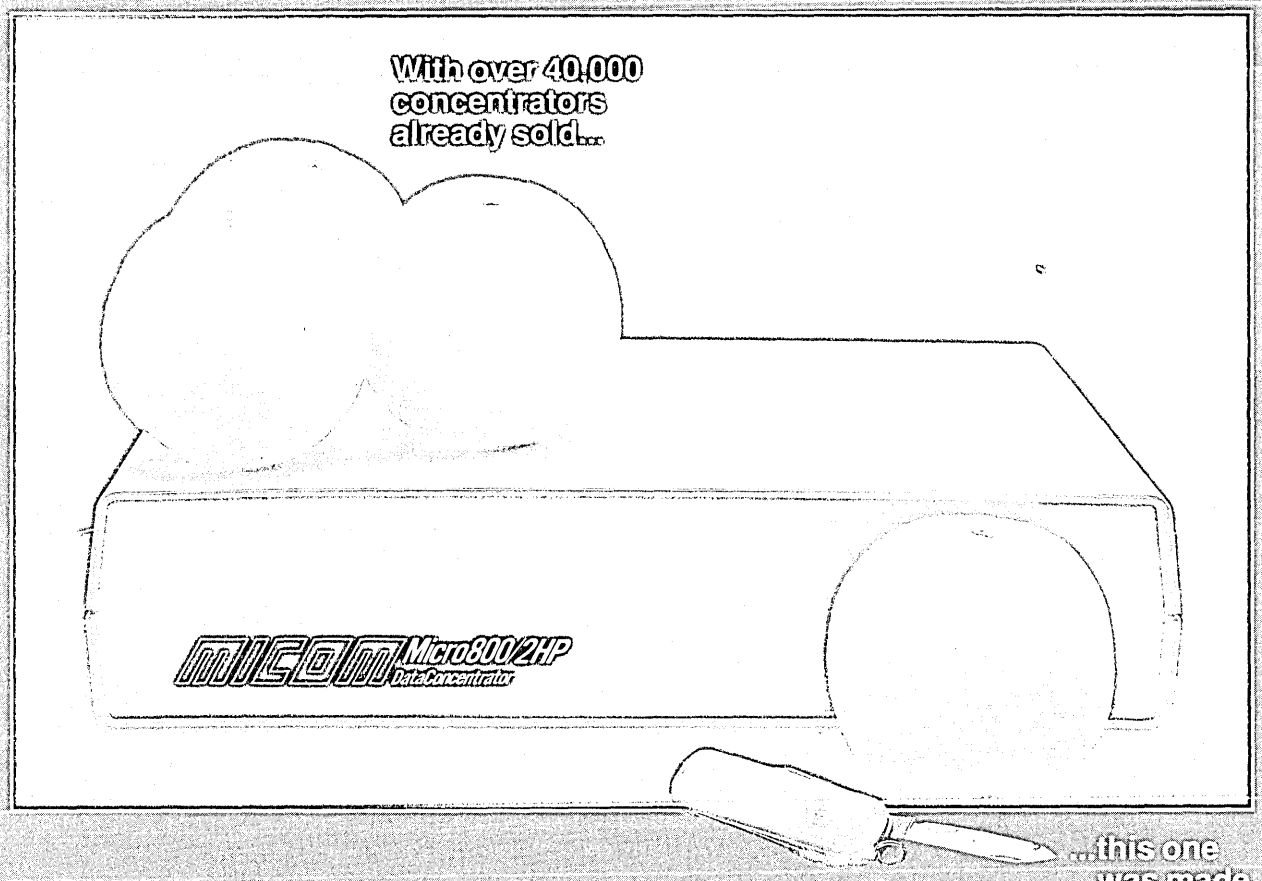
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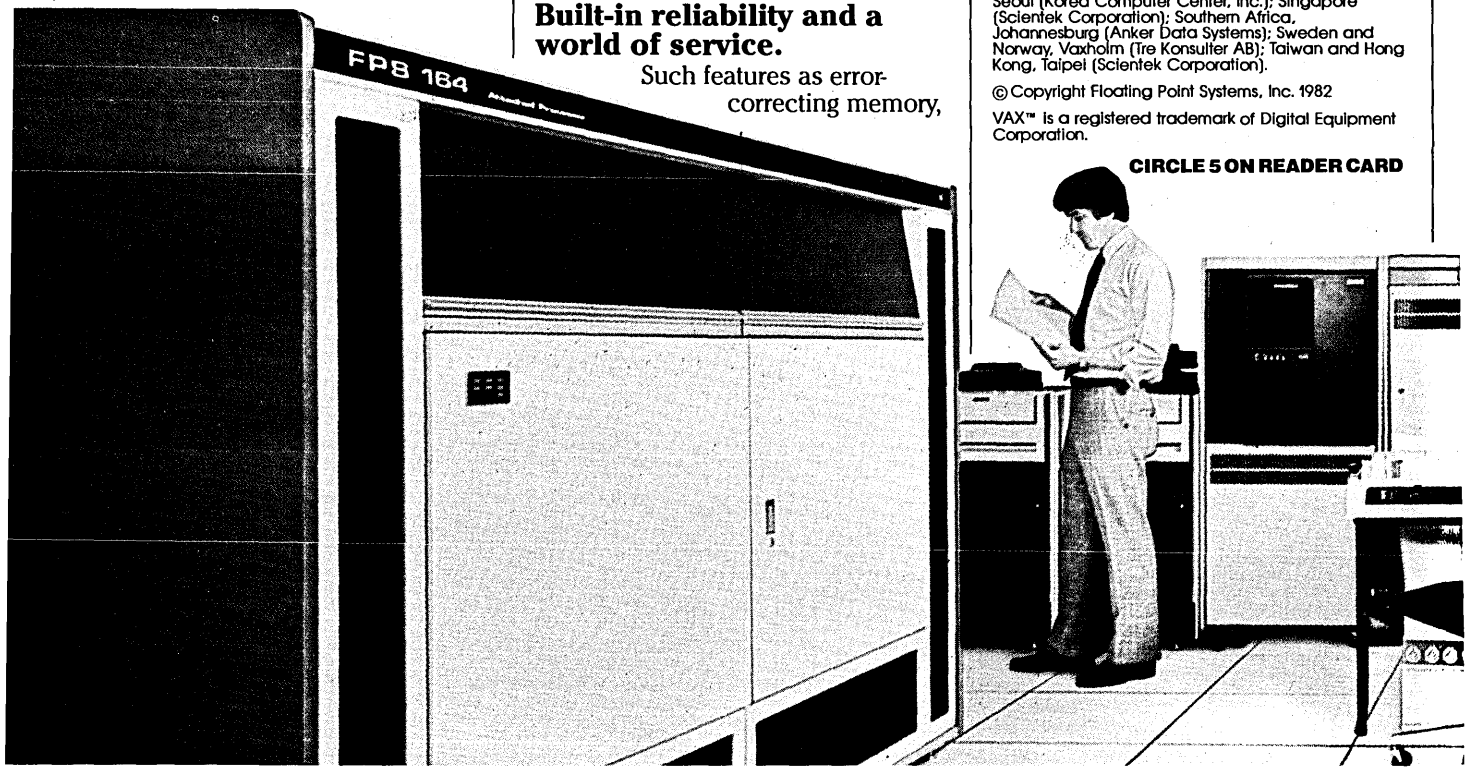

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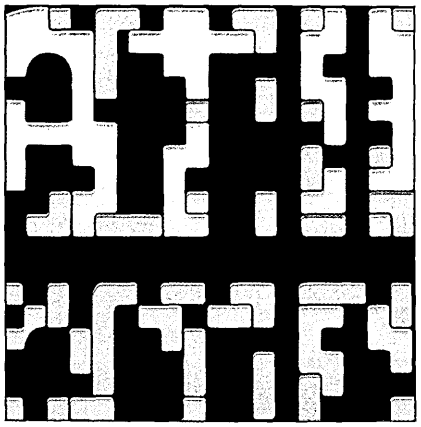
FEATURES

32
IN FOCUS
Dentists are just beginning to feel the pull of computers, reports Kenneth Klee in "Oh, Those Doubting Dentists."

86
THE MICRO COMES TO PAKISTAN
David Kline
A country with a per capita income of only hundreds of dollars has special needs and problems and its own computer application possibilities.

96
DATABASE SYSTEMS FOR LOCAL NETS
Eugene Lowenthal
Local networks will require a different kind of database management system, one that's easy to use and—as far as the office worker knows—invisible.

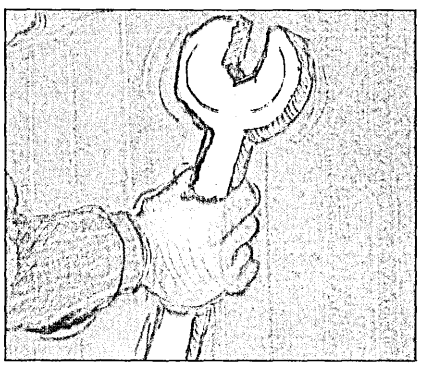
109
PRODUCTIVITY IN A DATABASE ENVIRONMENT
Howard Fosdick
The principles of sound database management philosophy, combined with software aids, produce high programmer productivity.



114
NATURAL LANGUAGE IN THE DP WORLD
S. Jerrold Kaplan and David Ferris
The technology is not a panacea, but it has its uses in specific areas, such as detecting and resolving ambiguities before they become problems.

121
A MOVING EXPERIENCE
Doug DeVries
Moving your data center? Don't panic. By following the suggestions offered here, you can end up with a better environment than you had before the move.

124
EIGHT MYTHS ABOUT SOFTWARE MAINTENANCE
Barbara Schwartz
A paean to the unsung heroes of the dp departments, the diagnostic programmers of the maintenance crews who keep the computer systems up and running.



NEWS IN PERSPECTIVE

40 **DATABASE SYSTEMS**
Eagle won't fly.
42 **DATA COMMUNICATIONS**
American Bell debuts.
52 **TRADE SECRETS**
The FBI stings Hitachi.
64 **GOVERNMENT**
GSA galls an industry.
68 **COMPUTER GRAPHICS**
Graphics move into business
72 **APPLICATIONS**
From FORTRAN to film.
76 **IN MEMORIUM**
Hamilton S. Styron.
80 **BENCHMARKS**

DEPARTMENTS

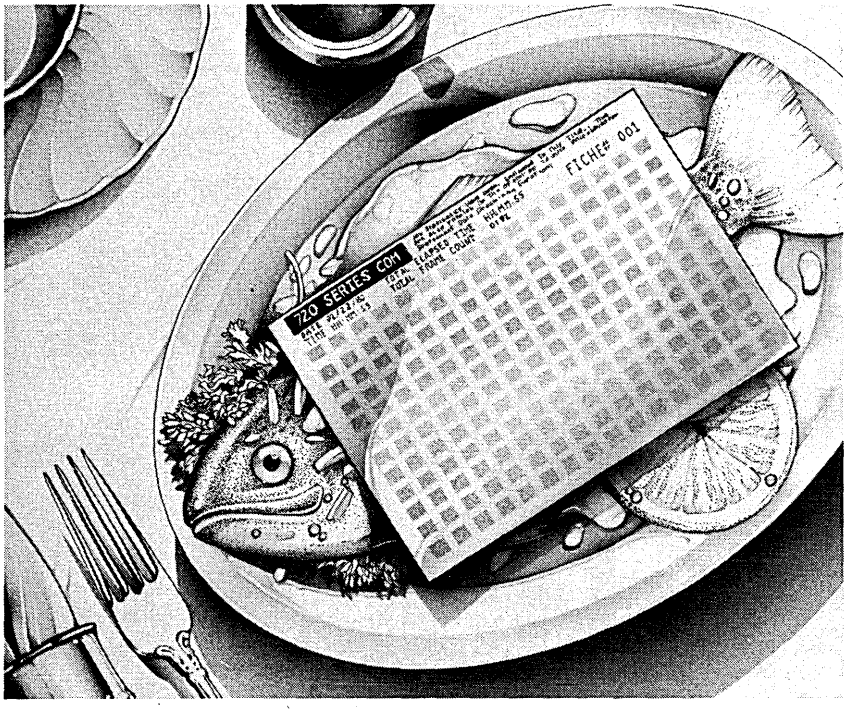
8 **LOOKING BACK**
13 **LOOK AHEAD**
18 **CALENDAR**
23 **LETTERS**
31 **EDITOR'S READOUT**
Toward a common systems architecture.

137 **HARDWARE**
145 **SOFTWARE & SERVICES**
165 **SOURCE DATA**
157 **ADVERTISERS' INDEX**
158 **MARKETPLACE**
169 **READERS' FORUM**

INTERNATIONAL 136-1

-2 **REVIEWING EUROPE'S TOP 25**
-6 **DATAMATION'S EUROPEAN TOP 25**

COVER: INTEGRATED CIRCUIT DESIGNS SUPERIMPOSED ON FABRIC SUGGEST A PAKISTANI CARPET. ILLUSTRATION BY DICKRAN PALULIAN; PHOTOGRAPH BY PETER ANGELO SIMON.



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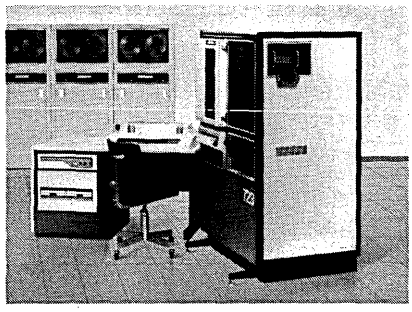

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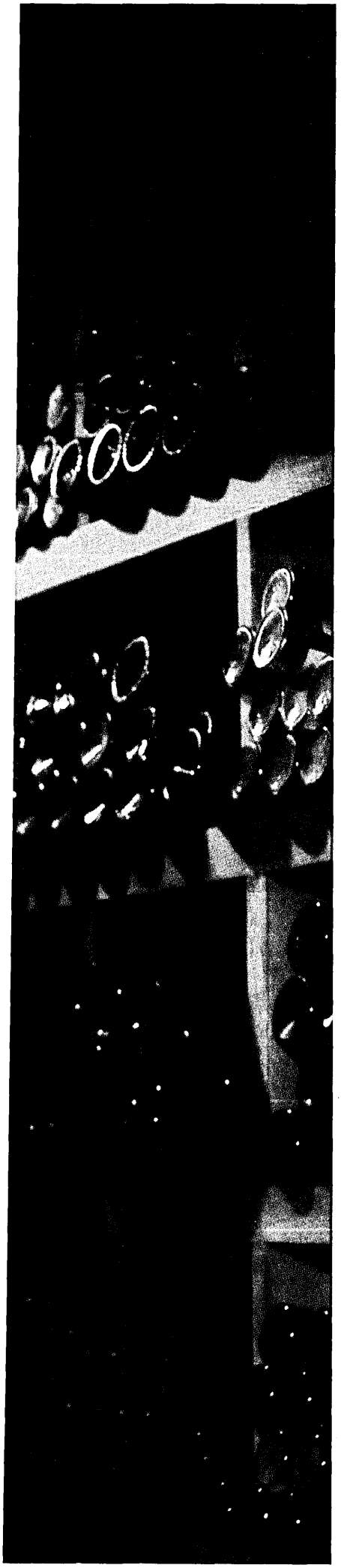

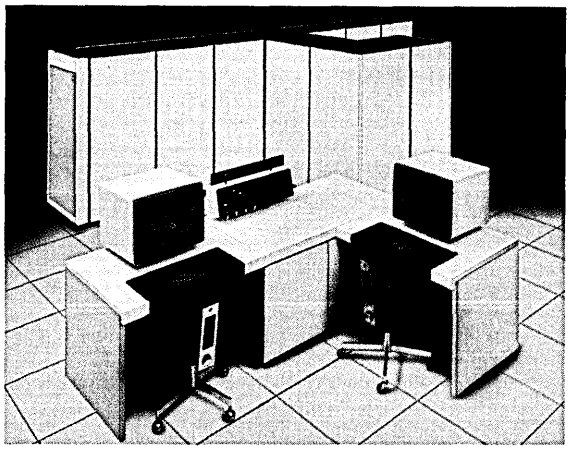

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CIRCLE 9 ON READER CARD

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LOOKING BACK

THE TIME OF ORWELL

August 1962: Foresight often pales in hindsight, but sometimes it glows. Witness DATAMATION editor Harold Bergstein's tongue-in-cheek Orwellian projections for the Year of the Big Compiler, 1984:

All life and livelihood now depend upon computers. There are 3,642,076 main and minor frames, 16 million programmers, and no operators. In 1984, third generation technology is obsolete; thanks to Burroughs's innovation, we've advanced to the eighth generation of all-ESP machines. So far, IBM hasn't come out with any compatible ESP machines, mostly because of SHARE's heavy investment in seventh generation software.

However, life in this future world is not a bowl of cherries for all computer folk. The average programmer only earns about $34,500 per year, and there have been rumors that Jimmy Hoffa's son intends to organize the SDC staff. Librascope, inventor of the world's smallest computer which cannot be seen or touched, has mislaid its prime peanut and is frantically searching for it to recover the Library of Congress stored there. On the standardization front, X3.4.5.9.0 has stopped work on the forthcoming Glossary because the Arab bloc of nations objected to many of the terms and definitions therein.

The first truly closed loop operation is finally perfected at the Hunt Foods Corp. ketchup division. Here, a TRW computer controls tomato growing and vinegar brewing. "The entire operation is on-line with a newly completed Big Inch pipe lash-up between Tampa and Seattle through which ketchup flows at the rate of 250 million computer controlled bottles daily." But the ketchup setup looks watery in comparison with the military's continued "exploration of the unknown in edp." At the United Nations, a worldwide command and control network is on 24-hour duty as each alert station asks the preceding station, "Who are you?" Total appropriation for the network is unestimated.

Certainly, this look at 1984 would not be complete without news of the university scene: "A demand is growing for an increase in grants-in-aid, scholarship funds, and other gratuities that manufacturers have been forced to provide in order to secure the acceptance of free hardware. MIT, Carnegie, and other top prestige schools have been so successful in research on self-reproducing automata that the machines originally given to them by various manufacturers have been returned in duplicate. Cornell is no longer hiring instructors."

EVERYONE WANTS A MINI

August 1972: The hot news from Creative Strategies Inc. (CSI) concerned minicomputers and money. "Shipments this year by U.S. minicomputer manufacturers will reach almost $300 million, up from $210 million last year." CSI projected annual increases in dollar revenues of 20% to 35% during the next three years, possibly reaching $800 million by 1975.

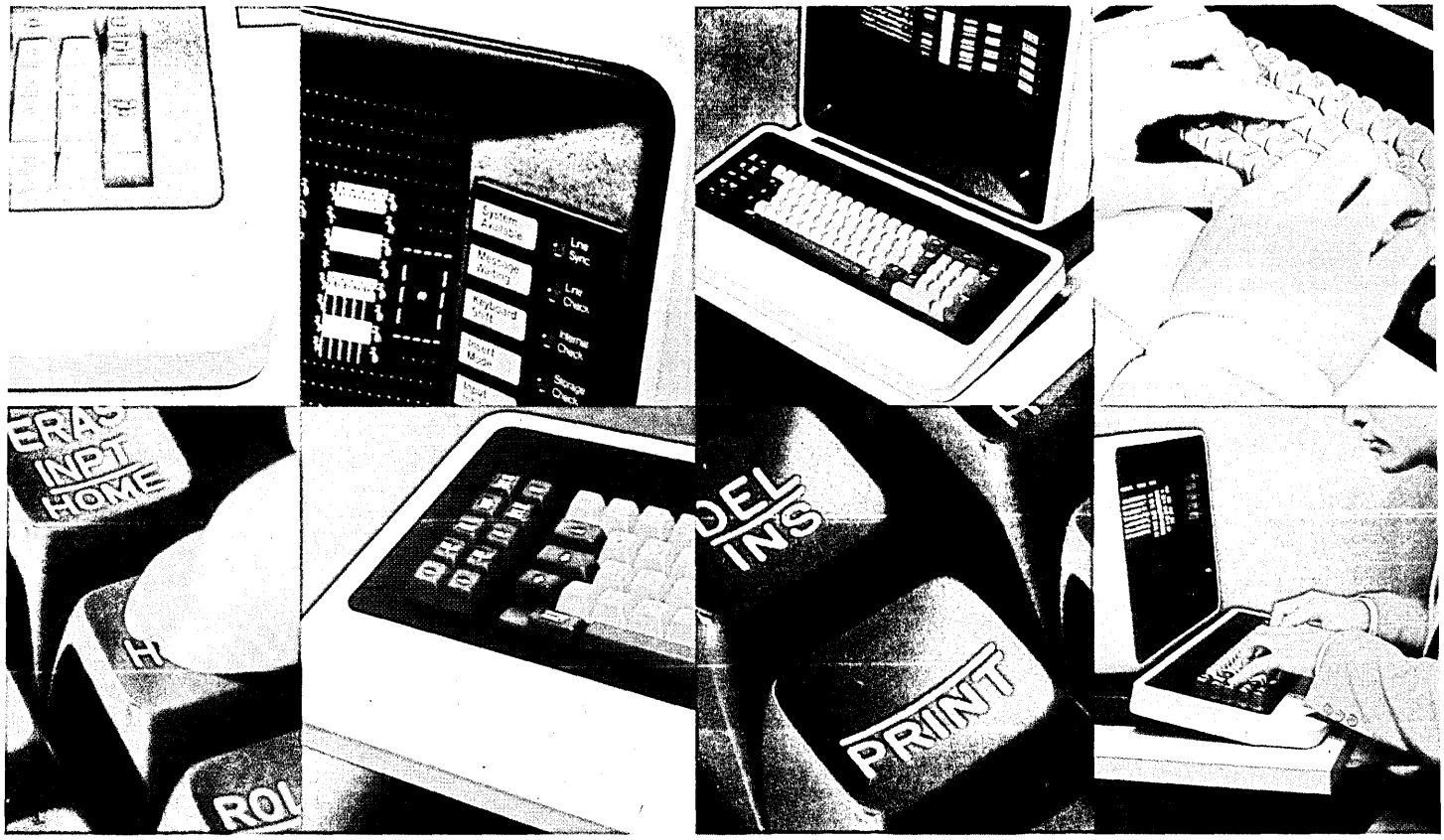
While the number of minis shipped in recent years had grown at a 47% compounded annual rate, the dollar growth rate was only about 34%. According to CSI vice president Richard Matlack, the dollar growth was slow due to the decreasing price of minis. The company's study showed that the average price of a 4K mini had fallen from $11K in 1970 to $7K in 1971, and dropped still further to $4.8K in 1972.

Matlack cited industrial automation as a major application for minis, responsible for about half of the 1971 to '72 mini sales. Another research organization, Quantum Science Corp., confirmed this, adding that "factory automation leads all industrial equipment sectors in growth potential, increasing 16% per year from $621 million in 1971 to $2.7 billion in 1981."

As the research firms were busy researching, a new company jumped onto the mini bandwagon in the Boston area—Prime Computer, Inc. opened shop in Natick, Mass. The company's president, Robert Baron, was formerly director of engineering and programming with Honeywell's Computer Control Div. Joining Prime as executive vice president was Bruce Elmblad, former head of marketing at Inforex. Jesse Aweida, president of Storage Technology, and David Dunn, a partner of Idanta Partners, the venture capital firm that backed Prime, were both on the board of directors.

Baron predicted Prime would climb "to number two in revenues in the minicomputer business within three or four years."

—Deborah Sojka



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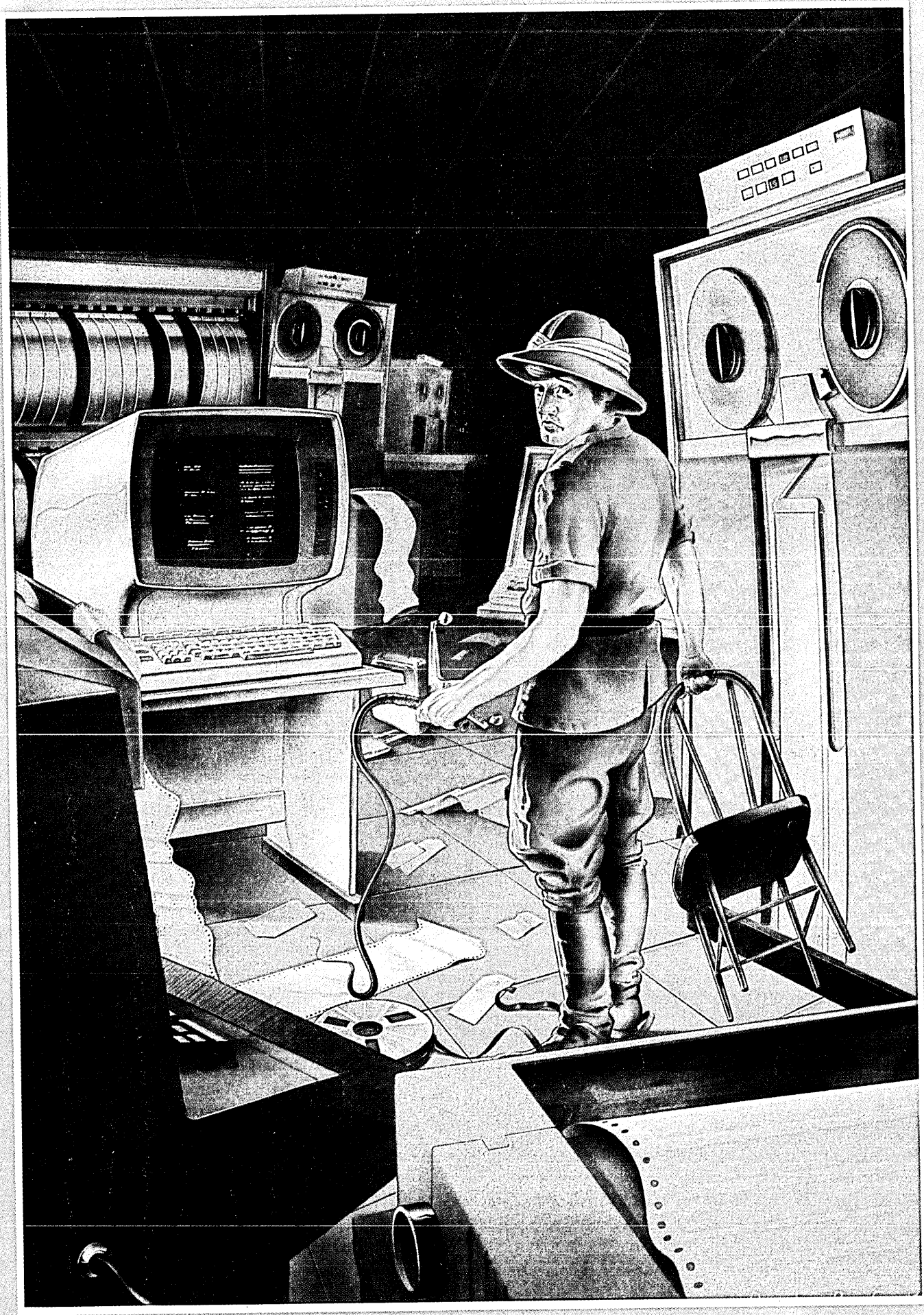

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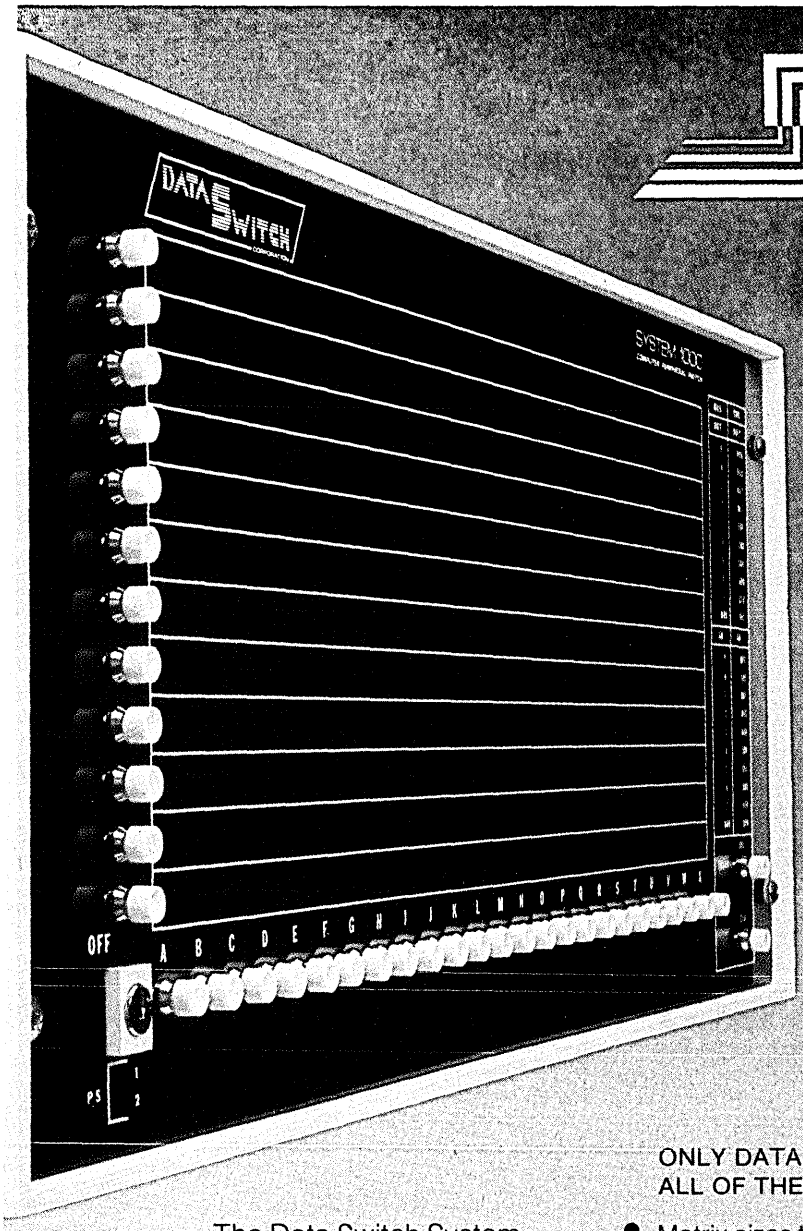

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- Price/Performance-ratio unequalled in the industry

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CIRCLE 104 ON READER CARD

LOOK AHEAD

CASH AND CARRY	Management Assistance Inc.'s Sorbus computer service arm is on the verge of entering the retail service center business. Planned are Sorbus stations where business users of popular personal computers will be able to drop off their machines for fixing. First three sites are Cherry Hill, N.J., Chicago, and Santa Ana, Calif. The new operations will be in addition to some 15 Sorbus maintenance depots that already offer carry-in services for users unable to afford on-site repairs. Says marketing vice president Marvin Venable, "After the business community we may get some consumer business. It's the peripherals, not the cpu, that usually need service. That's where we can offer something different." The company also plans to sell computer supplies at its retail stores and will expand operations if early results look promising.
STRAINED VOICES AT EXXON	Singing the oil slump, in the dump, financial blues, Exxon Enterprises is having particular problems with two of its voice-oriented companies. The parent operation just told voice recognition equipment maker Verbex that plans for an upgraded telephone-input product line would have to be shelved. The company claims to have come up with improved algorithms for handling continuous speech and reducing noise interference. Meanwhile, Delphi Communications Corp., a southern California maker of voice store-and-forward systems, is being closed down. Some 220 employees were laid off initially. Exxon is understood to have been looking for a buyer for Delphi, but no deal came through.
WHAT PRICE EFFICIENCY?	That must be the question Larry Stratten, formerly of Amdahl Corp., is asking. While at the Sunnyvale, Calif., mainframe maker, and presumable in his spare time, Stratten developed software to monitor mainframe performance and diagnose problems. Apparently Amdahl wasn't interested in the package, known as Systems Utilization Monitor (SUM), which supposedly works on any cpu. Stratten has left to form his own company in Boston, Computer Efficiency Systems, to market the package himself.
ASSAULT IN THE FALL	Although it is apparently tardy in a full-fledged assault on the office automation market, Sperry Univac is nevertheless optimistic. H. Glen Haney, vice president of strategic planning and development, says the company this fall will unveil a line of office workstations designed spe-

LOOK AHEAD

cifically for use with Univac 1100 series mainframes. Haney suggests that the matched product lines will give Univac a lead in offering integrated office systems, from personal computers through mainframes. Meanwhile, Univac claimed it had been prompted by stiff Japanese competition to introduce its high-end 1100/90 mainframe line in July rather than this fall as originally planned. As it turned out, the Blue Bell, Pa., firm unveiled the machines just three weeks after the news of the IBM-Japan sting broke.

COLOR COMING

Look for Apollo Computer, a Chelmsford, Mass., startup, to round out its virtual computer network line with a new color node featuring hardware graphics assist. The machine uses the same processor as other Apollo units, but has an added bipolar processor with 2 megabytes of RAM to handle local color functions. Backing up the new hardware will be a distributed database manager designed for scientific and engineering customers. The software is said to enable different network users to share files with little care for where they are physically stored.

REDUCING PLAN

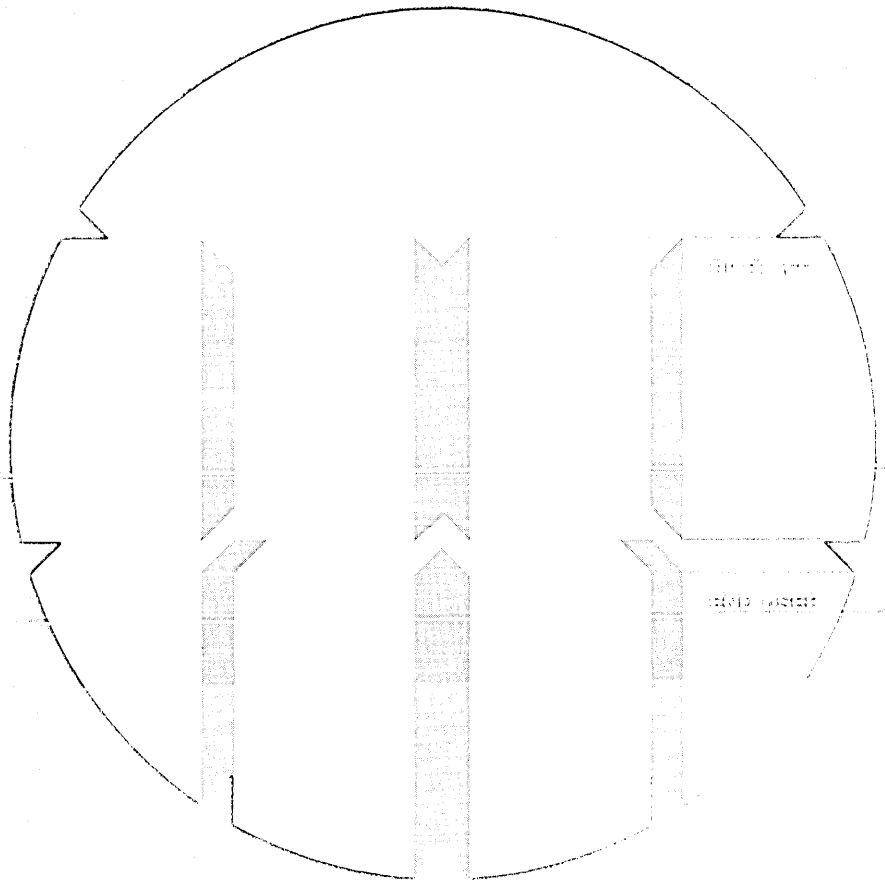
Hoping to take some business away from the local working crowd, Micom Systems of Chatsworth, Calif., is bringing out Instamux, a multiplexing line driver. Operating over a pair of standard twisted pairs, the device can handle up to eight 19.2K bps asynchronous, full-duplex bit streams. Micom hopes the device will appeal to users inundated by cabling and who need the flexibility of installed twisted-pair wires. Price, quantity one, for the four channel version is $695; eight channels is $1,050.

ALL-IN-ONE

A software package combining calculator functions, basic word processing, mailing list management, and personal files is to be marketed by Business Solutions Inc. of Kings Park, N.Y. Priced at under $100, the package will run on Apple personal computers and will be available in September.

RUMORS AND RAW RANDOM DATA

Look for Honeywell to go after IBM in the personal computer market using the Victor 9000 machine. Insiders say the two companies are close to signing a big oem deal. For about six months Victor has been marketing a 16-bit machine designed by Chuck Peddle, who designed Commodore's original Pet personal computer....A book by Morgan Stanley industry analyst Ulric Weil on the present state of the computer industry is to be published in a few months by Prentice-Hall.



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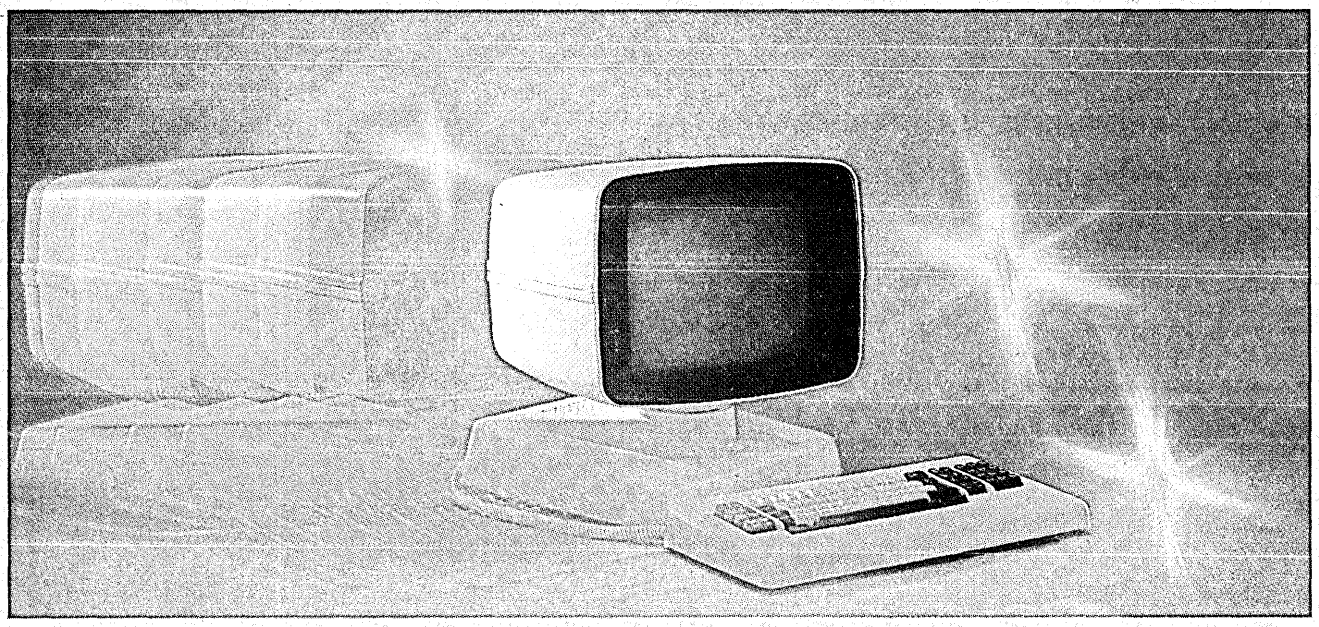

You get economy with Lee Data's Coax Eliminator™ and unsurpassed character clarity with our new high resolution All-In-One display. And you get the choice of BSC or SNA communications in either remote or local cluster systems.

DISPLAY ADVANTAGES

☐ Four 3278 compatible screen sizes in a single All-In-One display: 24, 32 and 43 lines by 80 columns and 27 by 132.
☐ Unsurpassed character clarity with no flicker achieved with a screen refresh rate of 60 times per second, twice that of similar displays.
☐ Display cabinet tilts 25 degrees vertically and rotates 180 degrees horizontally for convenient and comfortable viewing angles.
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☐ Detached and lightweight keyboard with 9′ extendable coil cable—available in five standard and many special styles.
☐ Display is lightweight, only 31 lbs.
☐ Display is also compact, with a base footprint of only 14″ x 16.″

The Lee Data Interactive Display System also includes: Model 310 Remote Controller, Model 320 Local Controller, Matrix Printer and the exclusive Coax Eliminator, Models C/8, T/1 and T/8.

SYSTEM ADVANTAGES

☐ A full range of controllers emulate IBM 3274 local and remote systems using either BSC or SNA communications.
☐ Multiple microprocessor design provides a system that easily meets the performance demands of a 32 station cluster.
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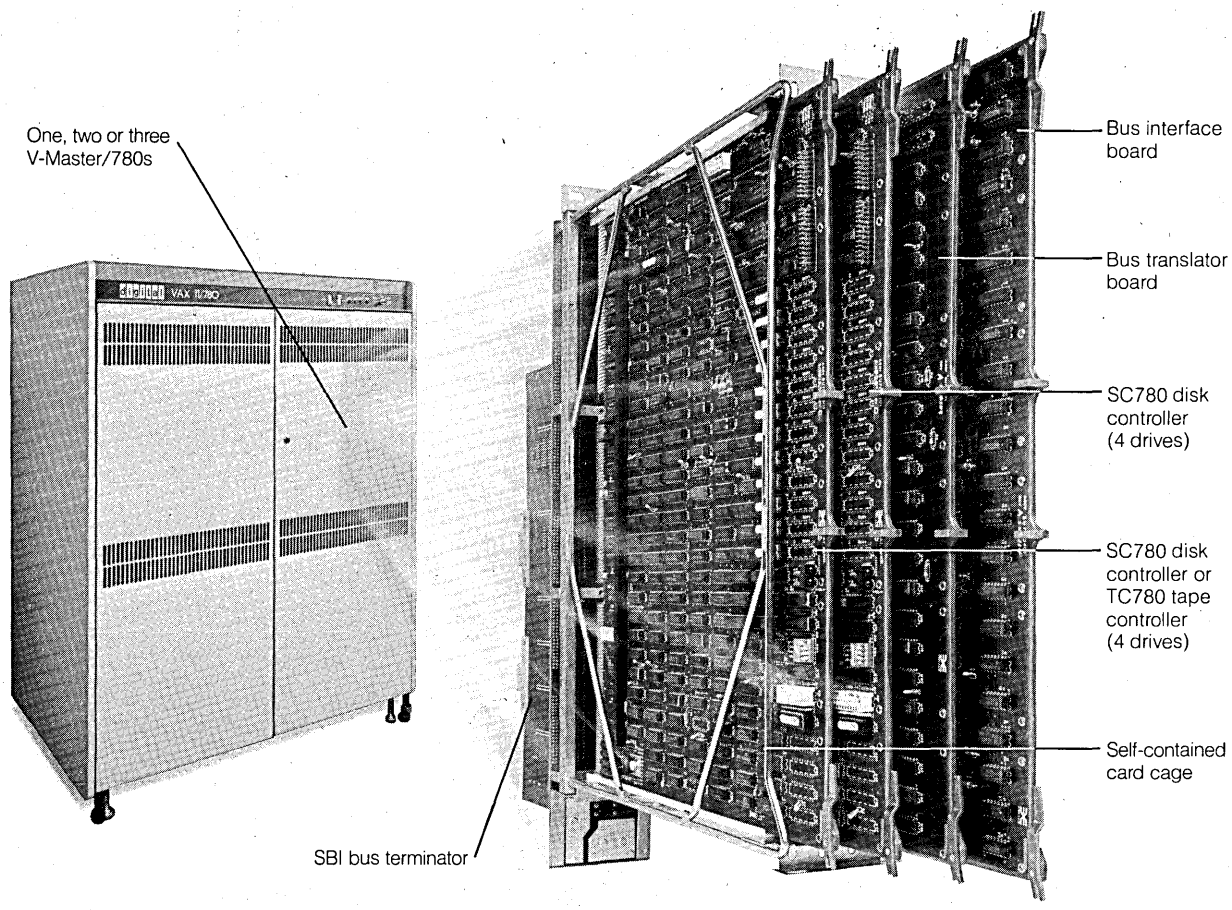
Emulex takes the inside track on VAX-11/780* mass storage.



Announcing V-Master/780. A whole new packaging concept in software transparent mass storage adapters for VAX-11/780.

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CALENDAR

AUGUST

10th IMACS World Congress, August 8-13, Montreal, Canada.

This year's theme is "Systems and Simulation and Scientific Computation." Contact Prof. S. Sankar, Concordia University, Department of Mechanical Engineering, 1455 de Maisonneuve Blvd. W., Montreal, Quebec H3G 1M8, Canada.

Second International Computer Engineering Conference and Show, August 15-19, San Diego, California.

The technical presentations will include graphics, CAD/CAM, robots, database management, and human-machine interfacing. Contact the American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th St., New York, NY 10017, (212) 644-7740.

SEPTEMBER

ICCC '82, September 7-10, London.

The Sixth International Conference on Computer Communication is hosted by British Telecom and sponsored by the International Council for Computer Communication. Contact ICCC'82, P.O. Box 23, Northwood Hills, HA6 ITT Middlesex, England, 44-9274-27511.

Eurographics '82, September 8-10, Manchester, England.

The University of Manchester Institute of Science and Technology hosts this year's conference on computer graphics. Contact Eurographics '82, c/o 170A Park Rd., Peterborough, England PE1 2UF.

Swissdata '82 and Ineltec, September 8-12, Basel, Switzerland.

These two shows are blended into an industrial electronics and computer sciences trade fair by the Foreign Commercial Service at the American Embassy in Bern. Contact Kurt Gross, American Embassy, P.O. Box 1065, 3001 Bern, Switzerland, 031-43-70-11.

COMPCON Fall '82, September 20-24, Washington, D.C.

The fall meeting concentrates on computer networking, including local area networks, value added networks, international systems, and network management. Contact COMPCON Fall '82, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

20th Annual TCA Conference, September 21-24, San Diego.

The conference program will center on the developing needs of the telecommunications professional. Contact the TCA Conference Office, 424 S. Peima Ave., W. Covina, CA 91790, (213) 919-2621.

SICOB '82, September 22-October 1, Paris.

This show, in conjunction with Convention Informatique (a European software exhibition), is one of Europe's largest dp, communications, and office automation events. Contact International Trade Exhibition, France, 8 West 40 St., New York, NY 10018, (212) 869-1720.

Federal Computer Conference, September 28-30, Washington, D.C.

Sponsored by Federal Education Programs, the conference functions primarily as a forum for information exchange by federal adp users. Contact Federal Education Programs, P.O. Box 368, Wayland, MA 01778, (617) 358-5181.

OCTOBER

INFO '82, October 11-14, New York City.

For the first time, INFO will occupy all four floors at the Coliseum and will feature a "Software Center." Information is available from Clapp & Poliak, Inc., 708 Third Ave., New York, NY 10017, (212) 661-8410

Federal Office Automation Conference, October 27-29, Washington, D.C.

This year's event is dedicated to present and future federal government planning and implementation of office automation. Contact Federal Office Institute, P.O. Box E, Wayland, MA 01778, (617) 358-5119.

ACM '82, October 25-27, Dallas.

The annual conference will cover a broad range of topics from artificial intelligence to software engineering. Contact ACM, 1133 Avenue of the Americas, New York, NY 10036. (212) 265-6300.

CAD/CAM Graphics Expo, October 26-29, Reno, Nevada.

Sponsored by Computer Aided Manufacturing-International (CAM-I), the expo will be held in conjunction with CAM-I's 11th annual meeting. Contact CAM-I, Ryan Plaza Dr., Arlington, TX 76011, (817) 265-5328.

WPOE '82, October 26-28, San Jose.

The Word Processing & Office Technology Trade Show & Conference will cover word/information processing systems, personal computers, software suppliers, telecommunications, electronic mail, etc. Contact Cartlidge & Associates, Inc., 4030 Moorpark Ave., Suite 205, San Jose, CA 95117, (408) 554-6644.

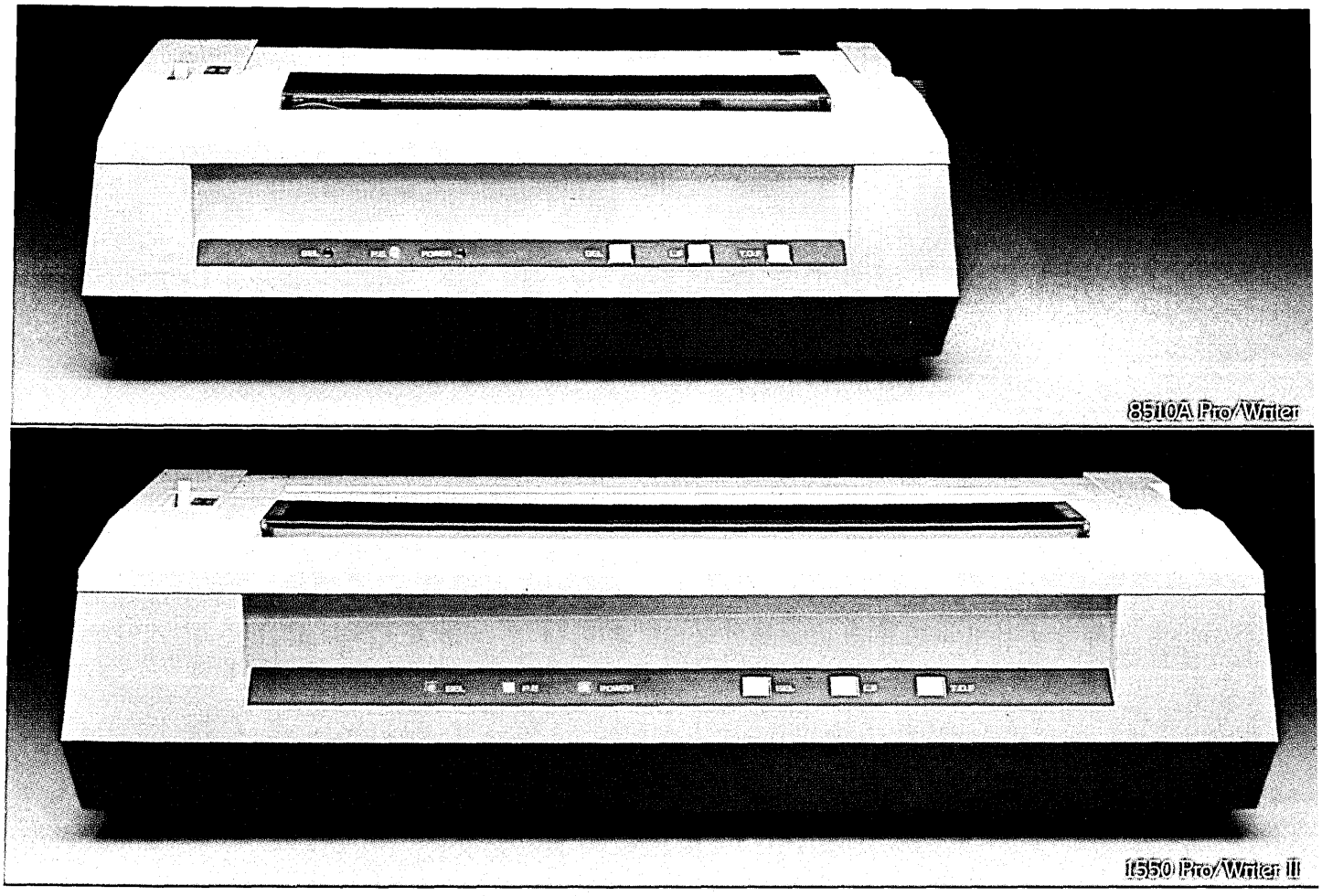
NOVEMBER

Comdex / Europe, November 8-11, Amsterdam, The Netherlands.

On its first trip abroad, Comdex will emphasize business, financial, and marketing topics of interest to independent sales organizations (ISOs). Contact The Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

Autofact 4, November 30-December 2, Philadelphia.

The Computer and Automated Systems Association of the Society of Manufacturing Engineers (CASA/SME) sponsors this three-day event, focused on CAD/CAM, computer integrated manufacturing (CIM), and the automated, integrated factory. Contact CASA/SME at One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.



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3. Mixed fonts during a single line pass
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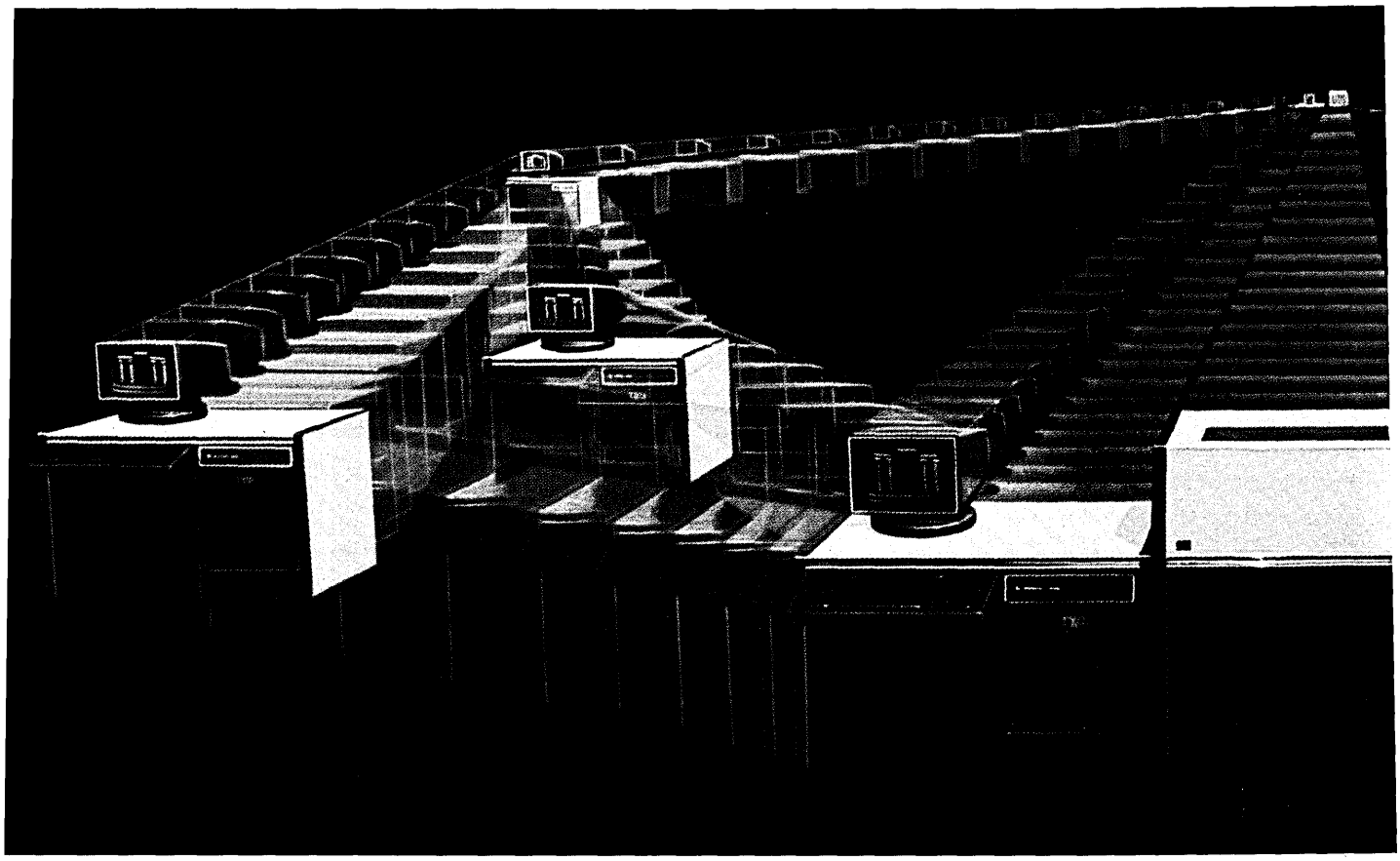

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1

Manage a variety of applications—interactive, data entry and remote batch —with one, advanced, 3270-compatible, data communications terminal system.

2

Choose from a family of modular components—CRTs, keyboards, printers —including a cluster controller that interconnects as many as 32 devices (8 of which can be printers). Displays can be located up to a mile away, printers up to 2,000 feet.

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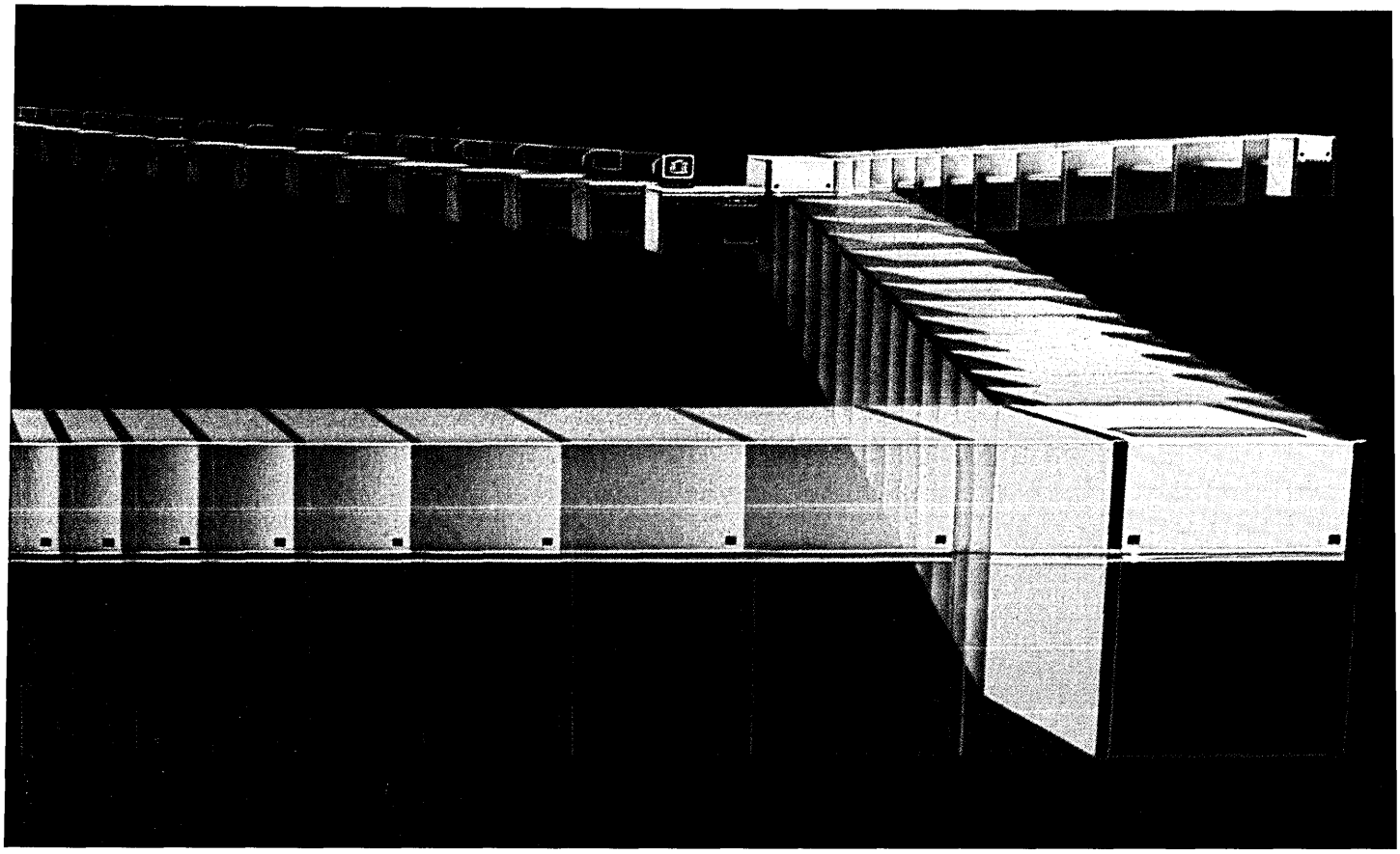

5

Count on built-in diagnostics to pinpoint troubles, from a single component in a particular terminal to a problem with communication facilities. Depend on the Bell System for fast service end to end.

6

Select from a range of printers: 300-line-per-minute printers (80 or 132 characters) and a unique forms-access printer that eliminates waste by providing easy access to each form as it is completed.

7

Reduce operator fatigue and errors with display modules that have an adjustable screen angle to eliminate glare and display crisp upper and lower case characters.

8

Tighten security with your choice of keyboard lock or magnetic stripe reader to identify authorized users.

9

Save with any one of three payment plans—month-to-month, 2-year, or 4-year service—and count on continued advances in Bell System technology to protect your system from obsolescence.

10

Call your Bell System Account Executive to discuss how our terminal system can be fitted to your needs, step by step.

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One line of compatible systems. A whole spectrum of powerful solutions.

Just a few years ago, advanced technology and system compatibility were mutually exclusive. But when Prime began making computers, technology and compatibility became one.

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If you're in a start-up mode, the perfect way to begin building your system is with the Prime 250-II. If you need more power, you'll find the solution in the Prime 550-II or the Prime 750. And if you're looking for maximum performance, the Prime 850 is the most powerful mini available today.

You should know too that any 50 Series system can be networked with any other. They can also communicate directly with mainframes. And all Prime systems support a broad band of industry-standard languages.

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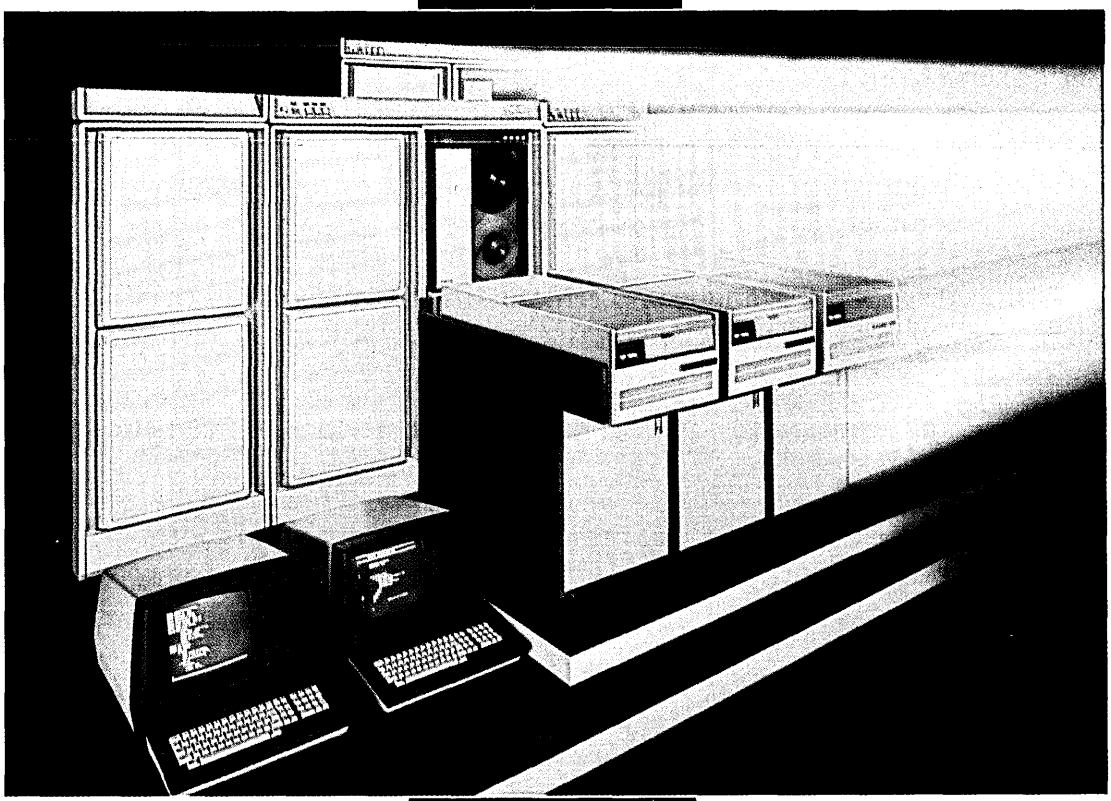


LETTERS

MORE ON GRAPEFRUIT

I hope this letter is as "right on" as my mid-'60s letter you published. That letter said that small computers would outlive big timesharing systems just as automobiles replaced the inflexible trolley cars of the past. You can see I am still a small computer advocate.

I like the McCracken article ("Maintaining a Grapefruit," April)—I know the name McCracken; it was the name Osborne that I didn't know a year ago.

Overpriced, poorly designed, and poorly serviced micros are not only a disgrace, they are unnecessary. Good, reliable, user-friendly small computers have been around since the mid-'60s. It is a shame when so many new manufacturers reinvent the wheel and it comes out flat.

My favorite small computer of the mid-'60s was Lincoln Lab/Wes Clark's LINC (4K bytes of RAM, two 262K soft sector tapes). Its operating system, LAP-6, written by Mary Ellen Wilkes Clark, conversed nicely with the single user. The rugged system could operate in such tough environments as hospital chemistry laboratories. Disappointingly, most micros on the market are not up to that 17-year-old technology as seen by the user.

If Ford, Chrysler, and GM can have staggering losses due to competition offering inexpensive, reliable, and friendly capabilities, then so can our computer industry. Let us clean out our deadwood before someone does it to us or for us.

I believe Osborne has as much chance to thrive as does IBM. There will be many micro organizations that will not survive the next five years. Overpricing, unfriendly design, and poor workmanship will accelerate their demise.

JOHN A. KEENAN
Systems Engineering Corp.
Bowie, Maryland

The grapefruit article was simply superb. I can appreciate it for at least two reasons. One is that I repair electronic equipment (chiefly televisions) as a part-time venture (no computer repairs, thank you), and the other is that I have been using computers for over 18 years. I learned programming on the ORDVAC (the second generation computer after the grandfather ENIAC) here at the Ballistic Research Laboratory. Over the years we too acquired smaller systems, but some of our experiences were better than Mr. McCracken's. I would like to relate a few facts about a minicomputer (not a home computer per se, but close enough?) that we have been using here for almost six years.

Spared Mr. McCracken's misfortunes, we have used a Wang 2200-T (with assorted peripherals such as hard-surface disks, printers, plotters, card readers, and tape reader) since 1976. Consulting a timer connected to the main on-off power source, I can advise that the cpu has been on (not necessarily being run) for over 9,400 hours; during this entire time, we have never had a failure that prevented us from inputing, computing, or outputing on the display screen. The only service call related to the cpu/screen/keyboard unit was for a failure of an IC that allowed both upper- and lower-case to be used. Since the standard lower-case was still available and is the normal mode, it was business as usual (and an upper-case programmable command was available if needed). The problem was corrected on the first service call (under warranty). We have had numerous problems with mechanical devices such as the printer, card reader, plotter, etc., but the computer itself has performed entirely dependably.

M.B. DANISH
Ballistic Research Laboratory
Aberdeen Proving Ground, Maryland

TOO MUCH INFO

Your Editor's Readout column in the December issue was certainly a good description of what all managers and most professionals are facing today—information overload.

The discovery of ABI/Inform, the largest and oldest management and business information database worldwide, has

©DATAMATION

CARTOON BY STEVE ATTOE

If your husband had a Heart Attack in bed tonight, would you know what to do?

It may go on for a little while before you notice. He may say it's indigestion. Or nerves. He may have a feeling of uncomfortable pressure, fullness, squeezing or pain in the center of his chest (that may spread to the shoulders, neck or arms) which lasts for two minutes or more.

Dizziness, fainting, sweating, nausea or shortness of breath may also occur, but these signals are not always present. Sharp, stabbing twinges of pain are usually *not* signals of a heart attack.

Call your emergency medical service immediately. Or, if you can get him to a hospital with emergency cardiac care faster in any other way, do so.

He may refuse to accept the possibility that he is having a heart attack. Many heart attack victims do just that. Don't let him make you wait. Because seconds count. Get help and get it fast.

Remember, if it isn't a heart attack, it doesn't matter. If it is, nothing matters more.

The American Heart Association

WE'RE FIGHTING FOR YOUR LIFE

CIRCLE 31 ON READER CARD

LETTERS

been a real salvation for many people in the situation you described so perfectly. By using this database on-line, containing abstracts from more than 550 journals worldwide, you can let the computer screen out unnecessary information and pinpoint the areas that are of specific interest to individuals.

A person can also search the database retrospectively for specific topics or establish a personalized profile that selects articles of specific interest as they are added to the database each month.

No single person could possibly read 550 journals. The use of a database provides savings in time and a broader perspective than is otherwise available through normal reading.

JEANNENE S. MANNING
Data Courier, Inc.
Louisville, Kentucky

WRONG PEW

Your April issue had a rather informative explanation of how virtual memory facilities operate. Under Software & Services you listed the Data General Eclipse 32-bit processor, with a large address space "consisting of 2KB pages (pages can be shred [sic] between processes or held privately by a single process)." Shouldn't such a device be listed under Hardware (after page readers)?

IRA J. FRIEDMAN
Brooklyn, New York

Yes—Ed.

MORE HELP IN LEARNING

I read "I'm Learning as Fast as I Can" (May) with great interest. You did a fine job of pointing out the dilemma facing dp executives and managers at all levels: keeping up with a fast-changing technological and managerial environment. While training is expensive in both cost and time, the alternative (technical/managment obsolescence) is even more expensive.

I do, however, believe that the listing of suppliers of outside seminars is incomplete. Yourdon, Inc. is a leading provider of educational services on a worldwide basis. Our curriculum covers both technical and management subjects. For example, our Project and Team Management Workshop has recived fine acceptance in the U.S., Europe, and Australia.

ALAN E. BRILL
Yourdon, Inc.
New York, New York

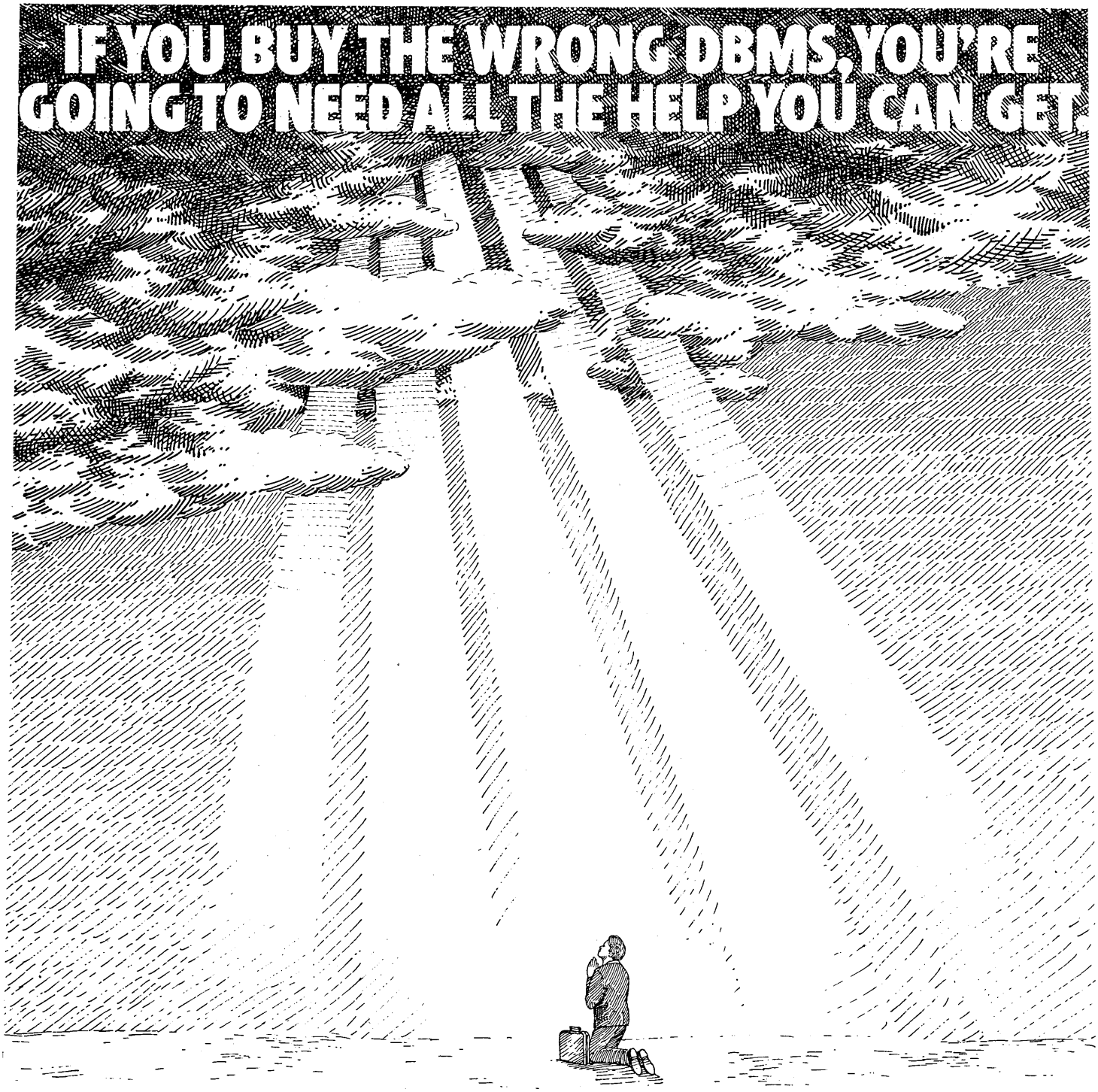
WAVING THE BATON

Was that a semiconductor on your April cover?

FRAN L. COCHRAN
Control Data Corp.
Sunnyvale, California

That was no semiconductor. That was Leonard Bernstein—Ed.

IF YOU BUY THE WRONG DBMS, YOU'RE GOING TO NEED ALL THE HELP YOU CAN GET.



WITH MODEL 204, YOU'LL NEVER BE IN THAT POSITION.

At Computer Corporation of America, we've always been considerably better at developing database management systems than talking about them.

So if it sounds like we're saying our MODEL 204 DBMS has more redeeming value that its competition – or that MODEL 204 can get a big system on-line with a minimum of manpower and grief and still perform nimbly day after day – we'd like to clarify our position a bit.

MODEL 204 isn't just better than other products in these respects. It's the best DBMS you can buy.

Does our claim lack humility? Consider this. MODEL 204 is the only commercial DBMS ever designed from scratch for an on-line IBM database environment. The only one. Every other DBMS was designed for "batch" then adapted to on-line.

Our MODEL 204 is also the only DBMS with a high-level application development language built into the nucleus. A language so powerful it actually obsoletes COBOL and PL/1.

MODEL 204 has less than linear degradation under increasingly heavy loads. Which means you can jump from 5 million records, to 10 million – without doubling or tripling your response time. And MODEL 204 can have 999 "threads" doing simultaneous updates and handle up to 513,000,000,000 records.

"So how come I haven't heard more about Computer Corporation of America?" you're probably saying. The answer is, we've been so busy working on some of the largest data bases in the world, at government sites and Fortune 500 companies, we've hardly had time to talk about it. But all that's going to change.

We're ready to benchmark your new applications against any other DBMS. Any time, any place. And we have a presentation that has made believers out of even the crustiest data processing professionals. Why don't you give us a call? After all, the right time to be a believer is before you buy a DBMS. Not afterward.

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☐ I'd like to see your presentation. ☐ Send a brochure.
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I need all the help I can get.

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CIRCLE 32 ON READER CARD

LETTERS

NO EQUIVOCATING

Re your editorial: which one of us has missed the point? It seems to me that one of two quite simple situations holds. Either the Russians are out to bury us, as Khrushchev said, or they aren't.

If they aren't, then we are clearly wasting a lot of money and effort on defense, not to mention the high risk involved in brinkmanship. If they are, then nothing less than total commitment, including the capacity for massive and aweful (no spelling mistake) retaliation will do.

It is argued in some quarters that the premise in the first paragraph is incorrect, that there is a gray area between the two situations described. I think not. Like the existence of God and the possiblity of being pregnant, in this case the bit is either on or off.

MICHAEL L. RANDALL
New York, New York

A HIT

Edith Myers's article "Behind the Scenes" (In Focus, March) told me about a new area—motion pictures—and provided me with additional information on modeling animated three-dimension forms. Her brief on video versus film was interesting since it summarized activity in this field.

Many of us appreciate Ms. Myers's special talent and effort. I thought it would be appropriate to remind her how much we look forward to reading her work.

JAMES FARMER
Systems Research Inc.
Washington, D.C.

REINTERPRETING RIFKIN

Reader response to Merrill Cherlin's article, "Waste Not, Want Not" (In Focus, February), was perhaps more interesting than the article itself. Unfortunately, I feel that the three readers whose letters were published passed over the most significant aspect of Jeremy Rifkin's argument.

Rifkin has never argued against progress, technology, or consumption. He does, however, suggest that a more meaningful, intelligent, and equitable approach be taken toward managing these pursuits. For as our technology becomes more powerful, its impact—positive or negative—on the global standard of living extends much further.

ROBERT D. KANTOR
Allied Stores Corp.
New York, New York

EVERYDAY UNIX

I was intrigued by the fact that you printed a letter (Letters, May) from one of Bell Labs' lawyers (John W. Fisher) claiming that UNIX is a trademark (unregistered!). After all, 1) the defining article on UNIX (Communications of the ACM, July '74) is copyrighted by ACM and contains no mention of a trademark nor does it follow Fisher's "correct usage" and 2) the term UNIX has entered the everyday vocabulary of computer professionals, who commonly use phrases such as "the UNIX life-style" and "UNIX-like" software. I would be interested in hearing facts and/or opinions on this matter.

R.C. HOLT
Professor and Chairman
Computer Systems Research Group
University of Toronto
Toronto, Canada

J.W. Fisher's letter complaining about your use of the name UNIX reminded me that there are a number of similar operating systems on the market, with names like "Onyxx" or "You Next". As far as I know, Bell Laboratories hasn't complained about the sound-alike names.

Which suggests a way of sidestepping the problem. Instead of "UNIX (UNIX is a trademark of Bell Laboratories)," describe it as "an operating system whose name rhymes with eunuchs."

FRANCIS PARDO
Rational Data Systems, Inc.
New York, New York

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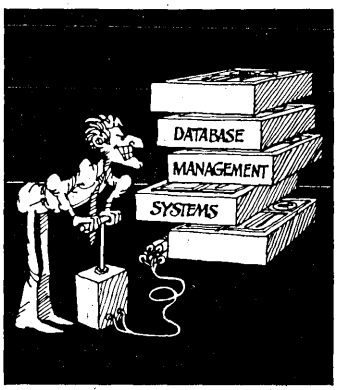

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But the HP 2622 is more than just a flashy screen personality. It has a typewriter-style keyboard with separate numeric keypad for quick and easy data entry; eight user-definable soft keys; self-diagnostics for high reliability; even an optional built-in thermal printer for hard copy at the touch of a key.

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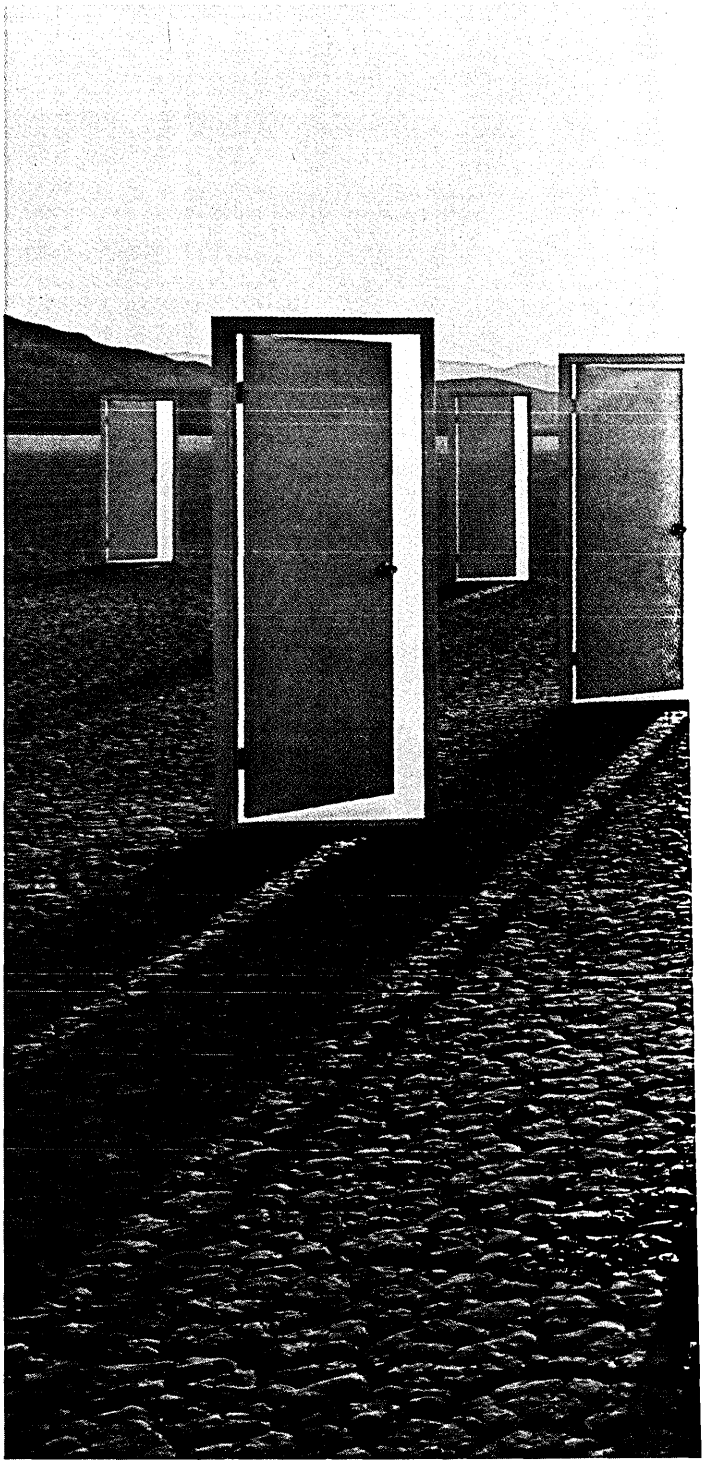
That programmability means your future equipment options are always open. You're free to choose information processing equipment based solely on capability, because with Net/One, you have the programming tools you need to assure compatibility.

WHICH STANDARDS WILL END UP BEING PREDOMINANT?

We're not sure, either. Nobody is. That's why we



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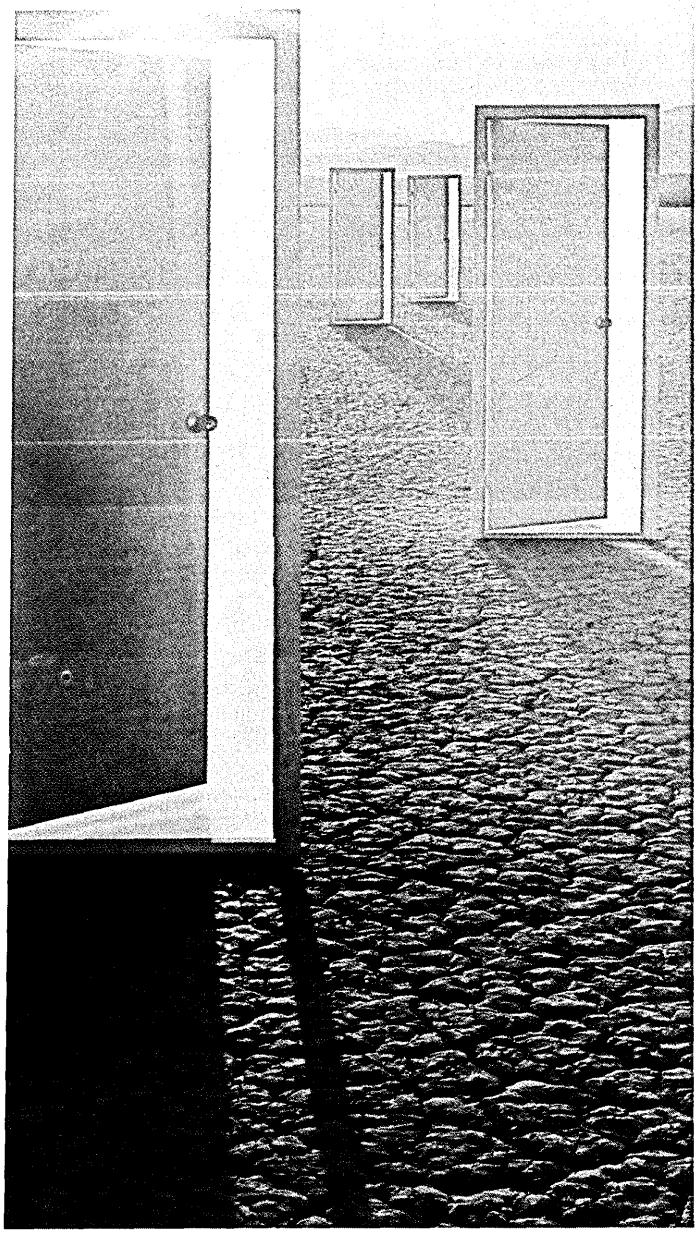

leave that option open, too. Net/One can be adapted to any standard, at any time. Simply. We're not in business to sell one communications technology or another. What we do is provide efficient solutions to make your internal data network work, with the equipment you have now, with the equipment you may want to add, with public networks, with whatever you want.

With Net/One, you also have the option to install it as a complete, "turnkey" system without writing a single line of software. It's delivered with all the communications software needed for general purpose use, including complete diagnostic and administrative services. But what you do with it beyond that is up to you. All the tools are there, all the pieces and all the flexibility you need to communicate however you want with whatever you want. Special applications. Custom interfaces. Broadband. Baseband. Whatever.

THESE OPTIONS OPEN DOORS FOR SYSTEMS INTEGRATORS

If you're enhancing or building local area communications systems for your clients, your Net/One enhancements can run on either broadband or baseband transmission. Or one now and the other later, when your client is ready to expand.

And because we've already written the interface protocols you're likely to need, your software people don't have to start from scratch.

With our new VLSI chip set, you can plan future system augmentations for your clients at decreasing costs. The chips are designed for general purpose use with any computer system, just as our systems are designed for general purpose applications. From chips to systems, you have the building blocks you need to give your clients the kinds of services they need.

Please call or write for detailed system descriptions, and for our "How to Choose a Local Area Network" brochure. Ungermann-Bass, Inc., 2560 Mission College Boulevard, Santa Clara, California 95050. Telephone (408) 496-0111.

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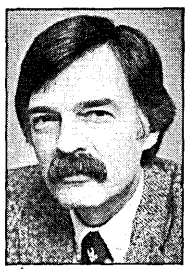
John L. Kirkley, Editor

EDITOR'S READOUT



USER FRIENDLY STANDARDS

Bring out the topic of standards and you bring out the best and the worst in people.

Some vendors become instantly hostile, fearing the loss of a competitive edge. Technologists are often irascible, claiming that standards stifle innovation. Some standards enthusiasts will talk about their pet protocol until your eyes roll back in your head. Readers of articles relating to progress on this standard or that often find themselves drifting off, rocked on a sea of profound boredom.

Bored, that is, until the day comes when the lack of standards in our industry directly affects their operation. The day, for example, when their corporate management asks them to pull together the company's far-flung divisions into one wondrous communications network and they find that none of the existing hardware and software can talk to each other. Boredom turns to frustration and rage, followed by a gnashing of teeth, beating of breast, and rending of garments. When the turmoil subsides, another convert to the world of standards has reluctantly been born.

Charlie Bachman, a vp at Cullinane and a leading authority on computer systems architecture, is one of the quiet apostles of the need for standards.

Recently he brought this message to a gathering of vendors attending a DATAMATION Institute seminar on the madcap world of minicomputers and microcomputers.

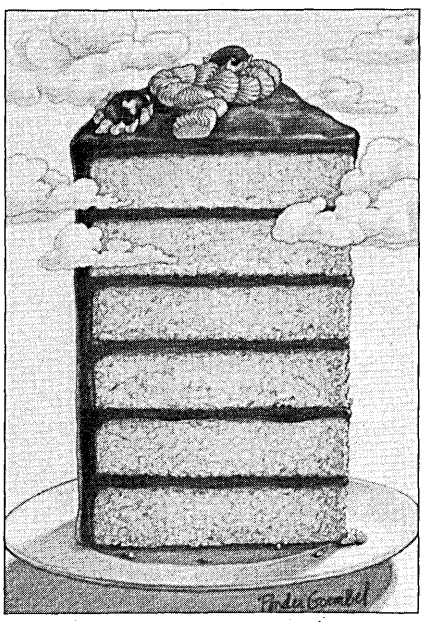


ILLUSTRATION BY PONDER GOEMBEL

He described the work that is currently going on at ISO (the International Standards Organization) on open systems interconnection, which is, as he said, ". . . of critical importance to the manufacturers of mini, and micro, and mainframe computers."

ISO has come up with a draft international standard consisting of a seven-layer architecture identifying services and protocols that will let widely varying computer gear communicate with each other. "When the standards are complete" comments Bachman, "a computer manufacturer will be able to design its hardware and software to the specifications with the confidence that its computers will be able to communicate with other computers regardless of their country of origin, their manufacturer, or their place of installation."

The standards are being developed within the context of a concept known as CSA, an acronym for Cooperating Systems Architecture. CSA calls for a *lot* of cooperation; not just from computer systems but from people, governments, and countries. It envisions placing the actual computer power at the places where the work is done through integrated networks characterized by common architecture and sets of standard protocols.

And key to making CSA work is the slow and laborious development of that ISO layered reference model.

At the top of the layers is the seventh, the icing on the cake. This is the applications protocol, probably the most difficult of all to pull together. But when complete, the total standard will allow users anywhere in the world to reliably exchange applications information. No wonder layer seven has been referred to as "seventh heaven."

There's a catch. All of this may sound wonderful but it ain't gonna happen overnight.

Standards are complex; they take time to develop and the open systems interconnection standard is no exception.

In this country, much of the work on the critical seventh layer is being done through ANSI's X3TS1 committee, headed by John Day, also of Cullinane.

He can use some help. If you agree that the development of this standard is vital to producing computer/communications systems that are dedicated to solving problems rather than creating them, we urge you to get involved. Volunteer your services by calling Day at (617) 329-7700. You can be a part of the effort that will bring order to the present computer/communications chaos, and that has to be a rewarding experience. ✻

IN FOCUS

OH, THOSE DOUBTING DENTISTS

Computerizing dentists isn't quite like pulling teeth, but it's not exactly painless, either.

It's a Monday afternoon in Atlantic City, day two of the New Jersey Dental Association's annual powwow, and the Exhibition Hall at the Golden Nugget Hotel and Casino (which is, indeed, "Replete in Lavish Degree," just as the brochures promise) is not exactly bustling. "Luck Be a Lady," implores Frank Sinatra from speakers set in the room's gaudy ceiling, and the red-jacketed fellow in the Cash and Carry Dental booth taps a pencil on a tray of upper plates in time with Nelson Riddle's orchestra. Sinatra competes with the cadence of a videocassette narrative on root canals, and the combination seems to have a soporific effect on the fellow in the Chayes Virginia booth, who dozes in the dental chair he came to demonstrate.

Many conference visitors are in the Cornwall Room listening to Dr. S. Randy Sarantos explain his "Diversified Real Estate Investment Plan that Really Works for the Prudent Dentist." Others have gone to the seminar on "Anterior Aesthetic Restorations—Use and Abuse," and the rest are perhaps downstairs feeding the slot machines or strolling the boardwalk.

This temporary dearth of dentists leaves Jim Greulich, a fortyish man sporting a Pete Rose haircut, green checked coat, and white tie with sapphire stickpin, free to talk. "It is kind of quiet now," he says, "but business has been very good." Greulich's business, which he conducts in New York, New Jersey, and eastern Pennsylvania for a Madison, Wisc.-based company called Sycom, consists of helping dentists manage their practices more efficiently. He's been at it, he says, for "many years," and he's seen some changes. For one thing, he's had to become a computer salesman. Here at the show he's demonstrating Sycom's Micro-System Data Plan, a Tandy-2 plus some software designed with dentists in mind.

Sycom began life nearly 50 years ago as Professional Budget Plan, a supplier of business forms and consultant to the health care professions. About 20 years ago PBP came up with its first computerized offering, a batch processing service bureau that 2,100 offices now use. Service Bureau Data Plan, as it's called, handles things like billing, accounts receivable/aging, and—

ILLUSTRATIONS BY HENRY R. MARTIN

most important—insurance forms processing. It also provides the dentist with a "monthly activity analysis" and "quarterly practice profile" so he can evaluate the way he's been spending his time.

In 1979 PBP changed its name to Sycom. The year after that, the company introduced its standalone system, which costs about $16,000 with a floppy disk and $22,00 with a hard one. Hardware is serviced by Tandy, software by Sycom, and Greulich says that about 125 of the systems have been sold. Besides billing, accounting, insurance forms, and activity analysis, the micro system can be used for scheduling and word processing. The wp package features letters precomposed by Neil Brahe, DDS, "the respected practice management lecturer and clinician," and dentists can use it to produce, at the touch of a button, a 125-word holiday missive that thanks customers for being "the nicest and best patients in the world" and mentions oral hygiene only in passing. The package also features automatic dunning.

Why did a 50-year-old service company change its name and start selling computer systems? A stroll around the exhibition room provides the answer. Of the 73 companies exhibiting at this dental conference, eight are selling computers and one, a consulting firm, is selling advice on how to choose among the offerings. As computers got smaller and cheaper, a good many salesmen got to thinking about what a boon they could be for the busy dentist. Sycom couldn't affort to be left behind.

Dentists are not yet responding with unabashed enthusiasm, but they're certainly listening. Like all small businessmen, they feel pressured to work more productively in economically hard times. And in recent years, paperwork logjams and stagnated cash flows have plagued the profession. Says Charles J. Felmeister, DMD, MBA, a practice consultant, "The two biggest reasons for dentists to move to comput-

In a sense, the doctors have begun to computerize in self-defense.

ers are the tremendous growth of third-party payments in the last 10 years and the need for patient follow-up."

Those "third-party payments" are the key. Dental insurance may send more people to the dentist, but it also means that dentists have to wait longer to get paid. Worst of all, paraprofessionals who ought to be cleaning teeth and earning the practice some money are forced to spend many hours filling out forms. It's a situation that almost seems to demand computers, and there's some irony in that fact since computers make it possible for the insurance companies to administer all those policies in the first place. In a sense, the doctors have begun to computerize in self-defense.

But no matter how apparent it is to vendors that the need is there, the dentists themselves may need some convincing. They tend to be methodical, careful men who care first about practicing their art and only secondarily about managing a business. Watching them kick tires and chat with salesmen provides some interesting lessons in how to sell to a vertical market.

"The patient's pain and anxiety must be reduced to a comfortable level," says the narrator of the educational videocassette, and it's advice that John Amoroso in the Diacon booth seems to have taken to heart. It's Tuesday morning, and activity in the exhibition room is picking up. Amoroso is approached by two middle-aged dentists from Philadelphia, one of whom is smoking a cigar.

"Can I help you doctors?" inquires Amoroso.

"I hope so," says the cigar-smoker. "Our girl spends all her time filling out forms."

"What's the size of your practice?"

"Three hundred fifty."

"Patients a month?"

"Thousand dollars a year."

Amoroso gives the briefest of rundowns on the equipment they're looking at—"Okay, just to start with, this is a minicomputer from Data General, one of the biggest names in computing"—and then

proceeds to draw the pair into a discussion of their practice. When he mentions that the system is menu-driven they shrug, but when he provides the names of a couple of Philadelphia dentists who are using the system they nod approvingly; referrals are crucial in this business. At this moment the Golden Nugget's estimable sound system starts to blast "Luck Be a Lady" for the second time that morning, making conversation difficult.

Two-year-old Diacon is in the health-care systems business, marketing its microNova-based system to dentists and physicians. The Columbus, Ohio, firm started out selling a micro-based system with a floppy disk but moved up to the microNova last year. Like several other systems in the room it uses the CP/M operating system and handles billing, third-party payments, correspondence, etc., as well as providing a "practice activities analysis." It sells for about $25,000 with a single terminal and printer, and Amoroso describes it as "the Cadillac of the business." So far Diacon has sold about 75 of these Cadillacs, plus another 80 of the earlier, micro-based systems. The company has 30 employees and expects to do about $2 million in sales this year.

Amoroso's background is not in computers but in health administration and marketing, so he's very comfortable talking to dentists about their practices. Several companies seem to find it useful to have someone with this kind of expertise on hand. In fact, just around the corner from the Diacon display, Mitex of Englewood Cliffs, N.J., has an actual dentist selling its systems.

This is Arthur Strassberg, DDS, an easygoing man who must have had a pleasant chairside manner back when he practiced dentistry. He did so for 25 years, and then put in a couple more teaching the subject. Then he met Ted Skripzac.

Skripzac and a partner founded Mitex six years ago, after casting about for an entrepreneurial opportunity involving computers. Skripzac's background included two and a half years as a senior systems analyst at RCA. He describes the situation this way: "I saw all these people approaching this large computer and not getting what they wanted. The solutions always seemed to cost another $5 million, and they still wouldn't get what they wanted. I wanted to be involved in something different."

Mitex is different. Skripzac spent a year doing research and design and came up with the system he's demonstrating today, based on a Pertec micro. Depending on the number of terminals and type of disk desired, the system ranges in price from $10,000 to $35,000. Mitex has sold some 55 of them and expects to do a $1 million business this year.

Of the 73 companies exhibiting at the dental conference, eight were selling computers and one, a consulting firm, was selling advice on how to choose among the offerings.

Why did Skripzac choose dental systems? "It just looked like the best entrepreneurial opportunity," he says. "You know," says Dr. Strassberg, "only about 1% or 2% of dentists have standalone computer systems right now. And do you realize that only 20% of the people who need to go to the dentist actually go? There's a lot of dentistry that needs doing out there."

"And," chimes in Skripzac, "we figure there are 18,000 dentists in the New York area alone." Skripzac says he has about 50 competitors nationwide, with a concentration of firms in California. But he adds that most of the firms sell regionally, not nationally, partly because referrals are such an important part of the business.

How do dentists react to the idea of spending $25,000 for something they probably don't understand? "Well, it is going to be their largest capital expense," says Strassberg. "The next largest would be the X-ray machine, which would run . . ." He ducks around the corner to quickly price the machine displayed there. "Around $13,000, according to that guy. But we stress that it's something that's going to free them to do their people work, which is what they ought to be doing. That's their profession; it's where they make their money."

Just a few paces past Dr. Strassberg's booth is a counter where some drills with fiber-optic illumination attachments are being demonstrated. Across the aisle, J&R Novelties of Far Rockaway, N.Y., displays its line of plastic swans, smiling teeth, sugarless candies, and other rewards for children who've sat still under the drill.

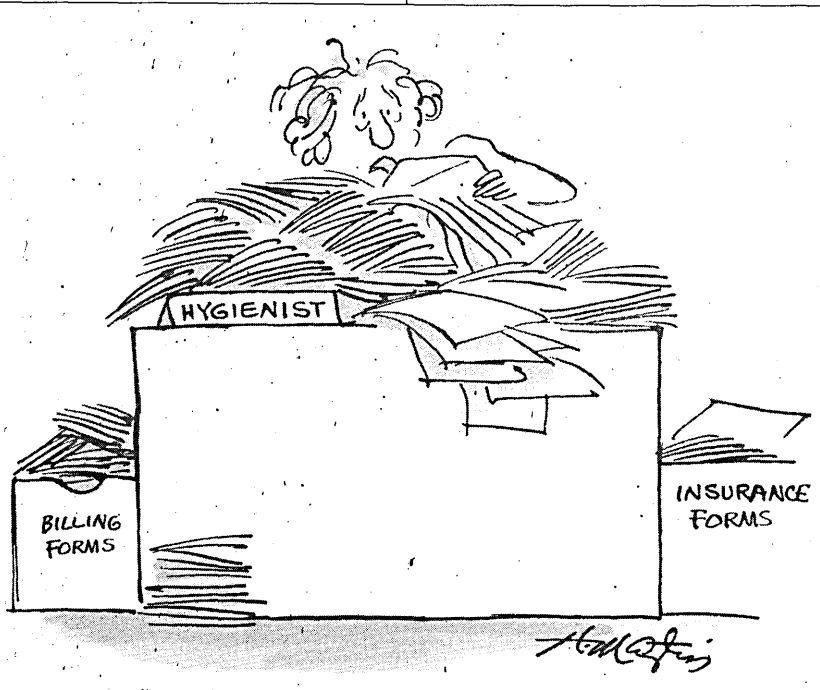
A few booths further down, Dr. Dominick J. Di Frisco of the Bronx is attesting to the merits of MPI's Practice Manager System. That he believes in the product is not surprising; he participated in its design, and wrote an article describing it for *Dental Management* magazine. The MPI booth is decorated with pictures of Dr. Di Frisco using the system.

Management Perceptions, Inc. is a 10-year-old New York firm that sells computer services to small businesses. The company introduced its Data General microNova-based system nine months ago, and has sold 10 of them at a base price of $27,900.

In his *Dental Management* article, Di Frisco reported that he and his partner had used the system to achieve a 10% increase in dentist productivity, as well as a 10% boost in cash flow. He said he expected the practice's investment to be recouped in two or three years.

If that's not enough to persuade a doubting dentist, Robert Szego, MPI's president, is on hand with some other reasons. "The dentist is a nice guy," he explains. "He helps you out. Then it's the computer that sends the bill." Szego also feels that a computer can burnish a dentist's image. "It makes him look professional," he says.

Across from the Teledyne Water-Pik booth, which offers free samples of an unusual kind of toothbrush that has a barrel-shaped handle and only a few bristles, three men in business suits—none of whom is a dentist—demonstrate Moore Business Systems' dental offering. MBS was started in



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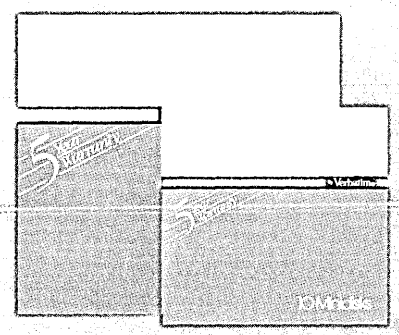

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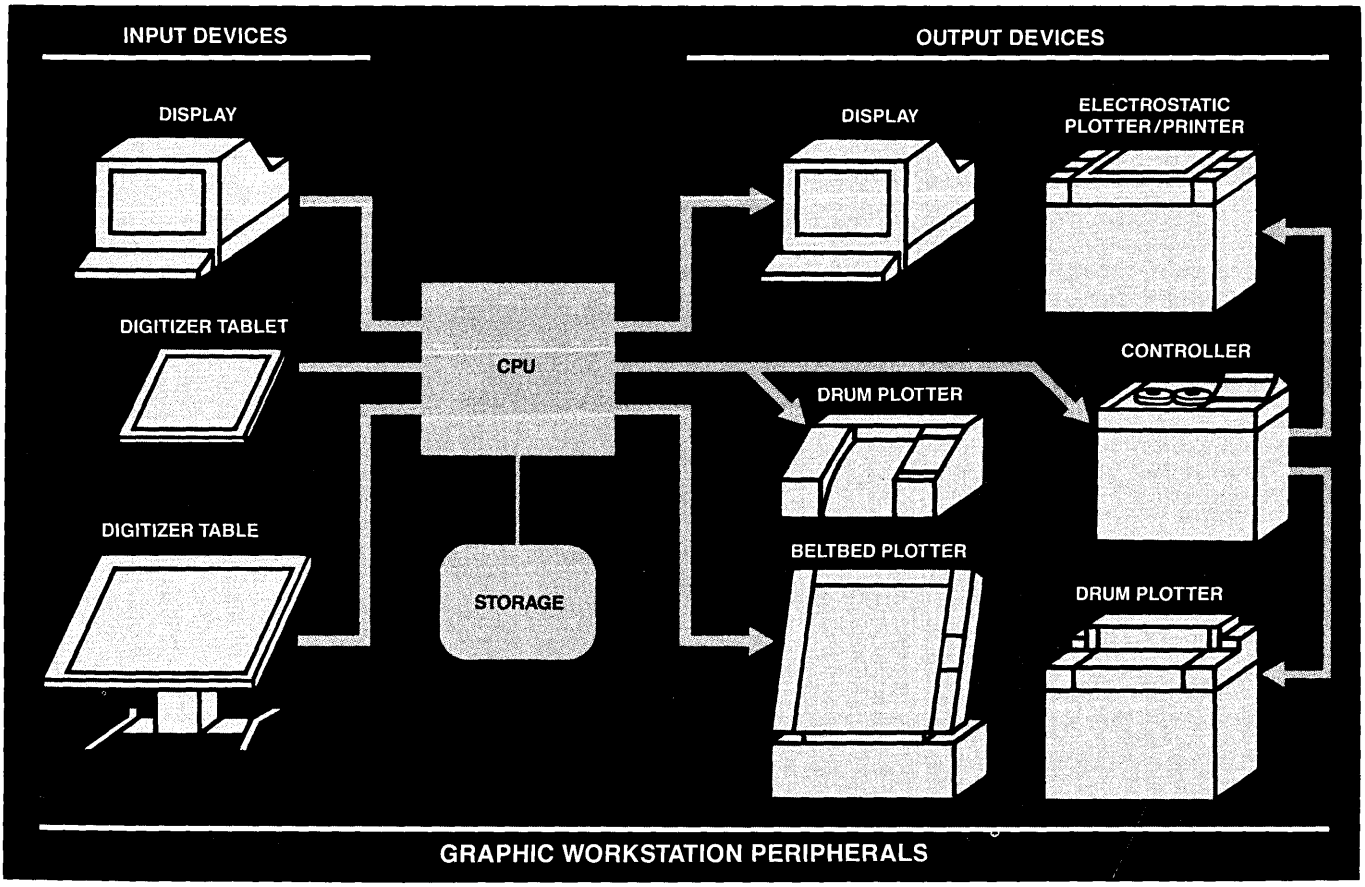

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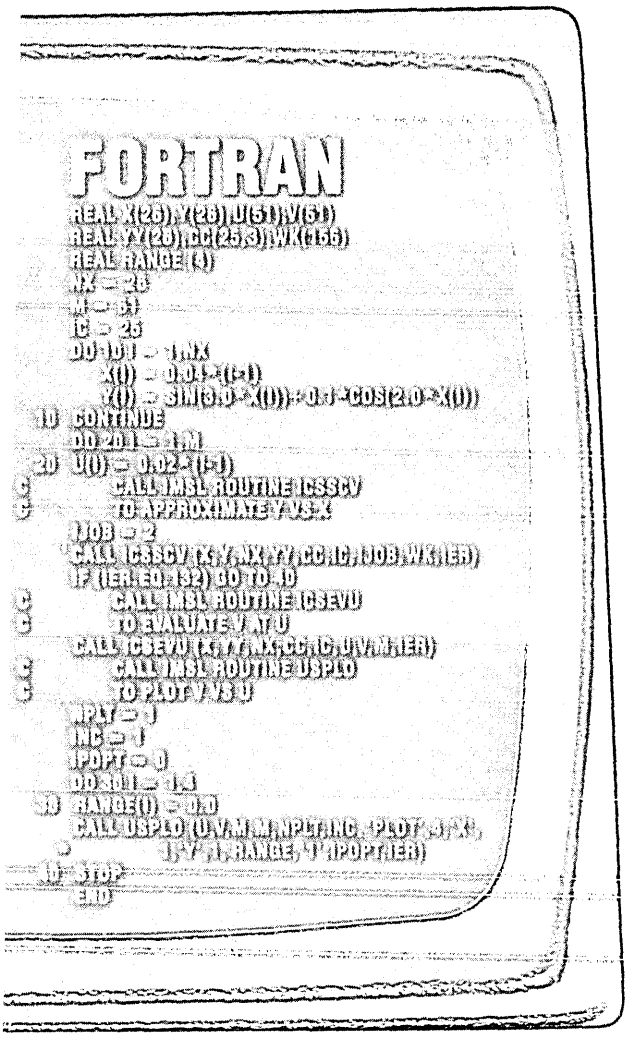

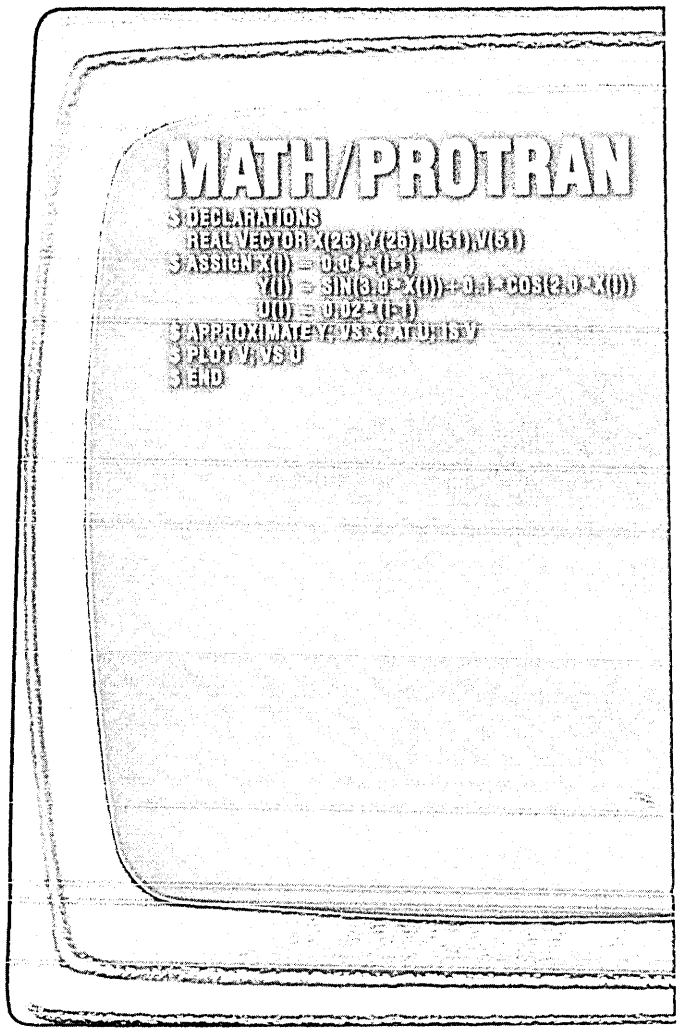

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IN FOCUS

1978 as a division of Moore Corp., formerly Moore Business Forms, a 100-year-old supplier of business forms and expertise to small businesses. The Toronto-based Moore Corp. did a $2 billion business last year, so MBS is easily the largest vendor at the show.

MBS's dental system uses the Oasis operating system and runs on an 8- or 16-bit micro from Altos, in which parent Moore Corp. has a sizable stake. In fact, Moore is the national service organization for Altos and has about 100 service depots around the country. Thus, when John Shepard, resident New York sales manager for MBS, talks about his $16,000 to $27,000 offering, he stresses service. "We guarantee a four-hour turnaround time," he says.

MBS's Dental Practice Manager is two years old. Shepard says the company has sold "close to 500" of them, and reports that the packages are currently moving at the rate of 50 to 75 a month.

MBS also offers a system for truck-

"The dentist is a nice guy. He helps you out. Then it's the computer that sends the bill."

ers. "In two weeks," says Shepard, "I'm going to Secaucus [N.J.] for the Motor Freight Show."

Like the other vendors, Shepard reports that business at the dental show has been good. Right now, however, there seems to be another lull. This is perhaps owing to the fact that the Navy Capsule Clinic is being offered at no charge in the Oxford Room. Topics include "Comparison of Mandibular Anesthesia Techniques," with Lt. Comdr. James E. Krochmal, D.C., and "When? Why? How? TMJ Exam!" with Lt. Michael Morrel, D.C., of the Naval Reserve.

The next day, consultant Charles Felmeister will conduct a program on "Selecting a Computer for the Dental Practice," which will perhaps stir some interest. But if a conversation with a fiftyish dentist accosted on his way out of the Cornwall Room is any indication, it may take a while for widespread enthusiasm to develop. The doctor has been listening to Maryann Szostak, MBA, discourse on "Improving Collections and Insurance Management."

"Are you in private practice, doctor?" he's asked.

"Oh yes."

"Do you do much thinking about productivity and practice management?"

"Oh yes."

"Have you talked to any of the people selling computers here?"

"Computers?"

"Yes, they're selling computer systems, for practice management."

"Oh, computers. No. I'm not orientated that way."

—Kenneth Klee

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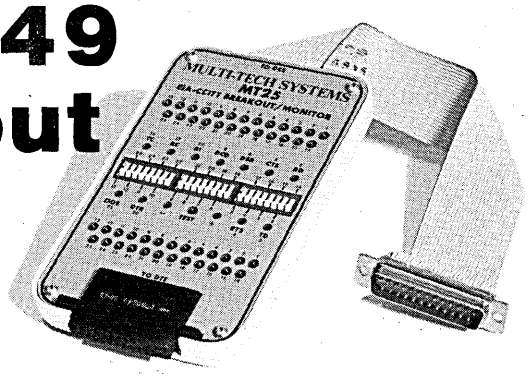

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NEWS IN PERSPECTIVE

EAGLE WON'T FLY

Sources say IBM's System R will move into center stage next year while IMS will drop back to bit player status.

IBM's large database customers face an uncertain future following the failure of a major software project, sources claim. According to their accounts, IBM has abandoned its efforts to build these users a bigger and better version of the IMS (Integrated Management System) software that sits at the core of much of their operational data.

The project to build "IMS 2" has continued for a number of years at IBM's Santa Teresa research center in California. The idea was to sculpt a database that was both hierarchical and relational—the two conflicting approaches to DBMS design. Workers on the project, who dubbed it "Eagle," were attempting to do this by building a bridge from IMS to IBM's other DBMS and data communications subsystems, such as its DL 1 language and the new relational query software, SQL/DS (usually called "Sequel").

IBM's plan, according to sources, was that with IMS 2 these subsystems could all share a common database which users could interrogate in both structured and unstructured ways. Currently IBM's customers cannot query their IMS database in an ad hoc or unpredictable manner, even though Sequel was introduced for just that purpose.

Sources claim that Eagle was just one of several attempts to build bridges to IMS—an earlier project was dubbed "Ampersand"—and all of them have been dogged by problems.

According to sources, personnel assigned to the Eagle project were purged late last year and IBM, "convinced that the task was impossible," instigated a new strategy. Starting next year, the still mysterious parent of Sequel, IBM's System R, will move into center stage while IMS will drop to bit player status, sources predict.

Although System R has spawned several DBMS thrusts outside IBM—including the popular Oracle offering from Relational Systems Inc., Menlo Park, Calif.—it has been sidelined by IBM as still too experimental. This is despite the fact that it has been running at IBM internal sites for several years and has already given birth to Sequel, sources point out.

Furthermore, IBM is believed to have told its large database customers, such as GM and its Chevrolet division, that it is now "committed" to offering Sequel for their MVS and VM operating systems.

Sources close to Santa Teresa say that with the help of System R's development team, the IBM San Jose (Calif.) research center, Big Blue is working full tilt to get Sequel MVS and VM ready for announcement in the first quarter of next year, with the formal introduction to follow in the fourth quarter—"though dates are very flexible," they say. (IBM declined to comment on the claims.)

"IBM dares not throw its whole weight behind Sequel/System R at this point," says one insider, "so it will have to coexist with IMS for a while."

(Sequel was announced on the 4300s, even though those machines can't be used with IMS, so that customers could get the feel of the product.)

If IMS users are beginning to despair and once again are resurrecting painful memories of former DBMS conversions, "they won't just have to rip IMS out and put Sequel in," said one observer soothingly. "They can begin by transferring personal applications into Sequel databases and get the feel of the product. But inevitably there will be some pain and unpleasantness when they begin to transfer large volumes of data out of IMS in the mid-'80s."

Sources claim that Eagle, or IMS 2, was just one of several attempts by IBM to build bridges to IMS.

But why bother at all? According to one source, Santa Teresa will continue to enhance IMS and is even preparing to announce a powerful new data dictionary to boost IMS's lackluster record as an applications generator. While IBM would not comment on this, the company did allude to it indirectly by saying that IMS will change and evolve as customer requirements change. "Despite this evolution," said an IBM spokesman, "the DL 1 applications interface will continue, but the IMS will now have more powerful, easier to install and easier to use functions."

The spokesman stressed that external interfaces to IMS will be supported and expanded while internal implementation changes. "The system will be expanded to support multiple data models and many ways of managing data." So why not keep adding new releases and stripping out old modules for replacement with better modules?

"The price you would pay in overhead and in complexity would be too high," answers Arthur D. Little computer expert Frederic G. Withington. "If you keep on adding more IMS capability in bits, your overhead grows. If you take this to extremes, your software requires an infinite operating time and gives you back little or no output."

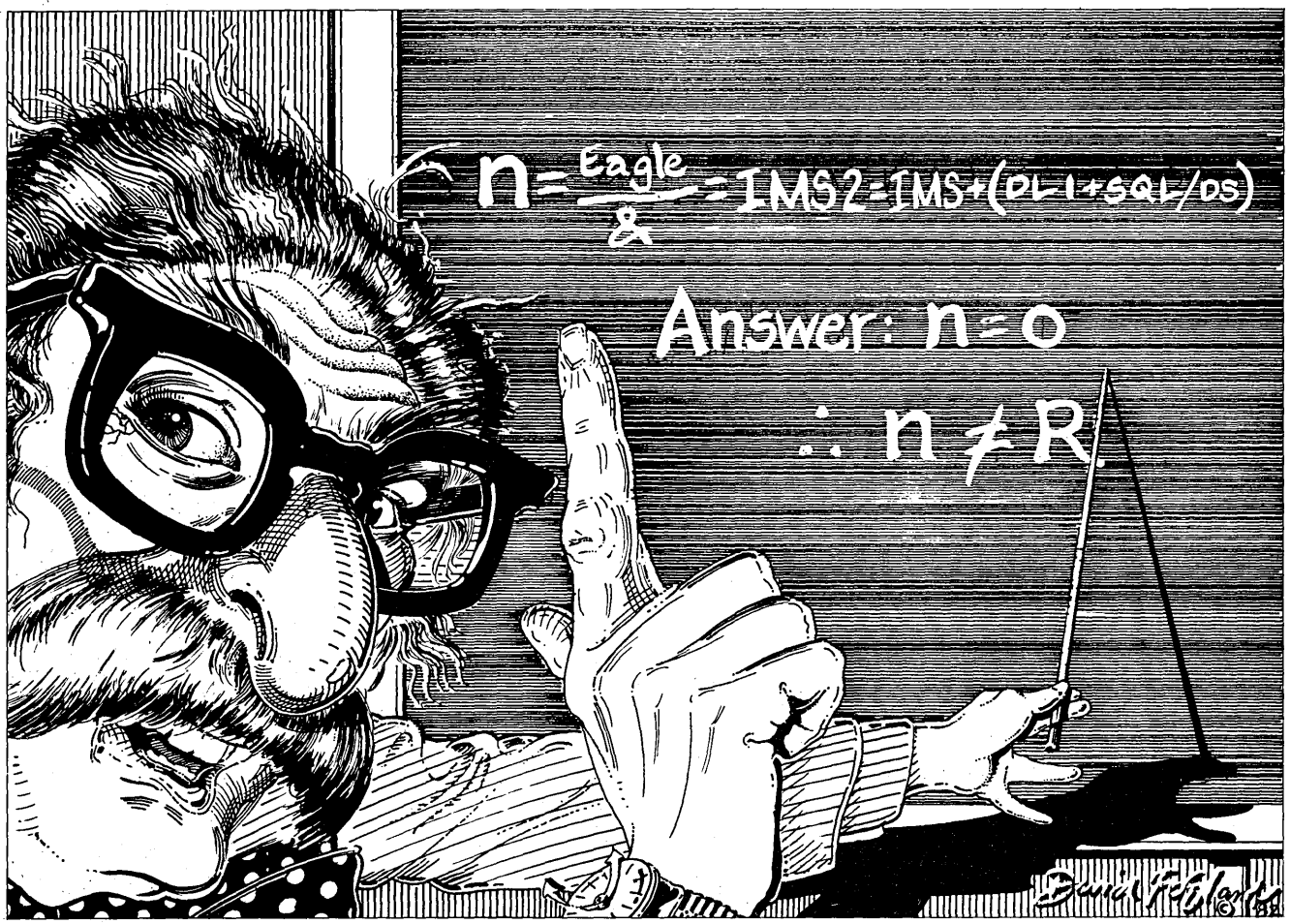


ILLUSTRATION BY DAVID FEBLAND

The Boston-based consultant added that trying to program the "general case" into IMS would be just as treacherous. "You have to cater to the unpredictable and sometimes irrational demands that managers make on their databases these days. So all IBM could do would be to add yet more code. You end up with a poorer structure and, just as before, more overhead and less performance."

Withington senses that IBM is caught in a frustrating bind. "IMS is okay for handling operational data on production databases, but it's simply not flexible enough for decision support, office automation, and the other unstructured applications that are emerging."

Such flexibility was to have been Eagle's contribution to IMS. The question of whether such a bridging venture would ever be mounted again remains unanswered by IBM, which refused to talk about Eagle.

So now the key question is whether System R would fare any better? "It's an elegant concept," says Robert Goldman, senior vp at Cullinane Database Systems, Westwood, Mass., "but it doesn't fit into the reality of IBM's user base. So far IBM's approach with IMS has been characterized by its 'bittiness.' Pieces keep being added which don't fit together—you've got IMS, DL 1, CICS, GS, SQL/DS, two TP monitors and on, and on."

Goldman says the reverse has happened with System R. "Here you have one big elegant piece which solves the database problem in the abstract, in a pure way. And that doesn't fit either."

Withington had some sympathy with this view. "Offering its customers the full System R treatment is a bit like hitting them with a 600-pound marshmallow that suits all tastes and sizes." He continued, "IBM apparently lacks the insight to be able to find a proper set of modules and a foundation to build on—something integral that flows and changes with the customer."

One insider claims the Santa Teresa team is preparing to announce a powerful new data dictionary to boost IMS's lackluster record as an applications generator.

If this tailored approach is the ideal from the customer's point of view, his reality is that he finds himself caught between two warring sides. He seems to be trapped between "bitty" extensions to his hierarchical IMS system and what sources predict will be a proliferation of new System R subsets. "And neither approach is really tolerable from a user's perspective," ADL's Withington concludes.

Tolerable or not the "war" will continue, observers point out. Until recently IBM had done nothing with System R during the eight-year life of the product. That fact, coupled with the company's tendency to classify the project merely as ongoing "research," has provided much fuel for its detractors. The feeling has spread across the industry that "R" was doomed never to see the light of day, and that IBM could not squeeze out the necessary performance from the relational software.

Following the successful implementation of the System R code on medium-scale machines by IBM's Endicott center, that view has hastily been revised to read: "R" will never see the light of day at large IMS sites because of lack of performance. An example offered by detractors is that the recovery system on the Sequel/4300s does not work well. "It requires tons of disk space and offers only slow execution," said one IBM database competitor.

According to sources close to the System R development, the relational concept is now moving from an "outplan" to an "inplan"—from a research project to a production reality within IBM. "They are beginning to throw the 'Mongolian hordes' [an insider's term for 'programming weight'] behind System R, and they are busily rewriting the whole recovery system for Sequel on MVS and VM," one insider revealed.

In addition to IBM's own efforts, other forces are at work in the marketplace to move the relational database into ascendancy. Sources claim that Relational Systems Inc. will offer its own version of Sequel on MVS and VM by year-end, and that the company is talking to three large IBM pcms (plug-compatible manufacturers) about offering the software on their mainframes.

Sources also claim that RSI's product will be at least twice as fast as the IBM development and could force Big Blue to delay its Sequel MVS/VM introduction while it benchmarks the challenger.

An added complication, sources reveal, could come from the fact that IBM's Boca Raton, Fla., personal computers division is known to be interested in offering RSI's Oracle on its machines and has been talking to the Menlo Park company.

According to some sources, Relational Systems Inc. will offer its own version of Sequel on MVS and VM by year-end.

RSI's Larry Ellison confirmed that his company would offer Oracle/Sequel to MVS and VM users, the former this month and the latter in September. He also divulged that big performance boosts had been added through new indexing and optimization techniques, as well as a new data clustering technique that would allow users to access all related data on the same page. "The user won't have to go through several input/output routines to retrieve related data from different blocks as he does with System R," Ellison explained.

Ellison said he isn't out to hammer System R and convince IBM to use his product, but rather his intent is "to put the lie to critics of relational systems who claim these systems won't perform at large IBM user sites."

For IBM's part, a total commitment to System R does have its dangers. That is, apart from the possible embarrassment of having to offer its customers two competing versions, namely System R Sequel and Oracle Sequel. Sources explain that when System R research at San Jose went into limbo in 1980, the project had divided into three "future" development streams: database machines, distributed database and text processing.

"They [System R's research team] don't expect the majority of their ideal to be implemented until the late 1980s," said one insider. "For example, distributed databases on workstations and minis currently threaten to break up IBM's big central database machine plans. So one project in this area—known internally as R Star—won't be implemented until at least 1985 or '86."

The source said that distributed database projects from such firms as Tandem Computers, as well as the growth of main memory and storage on distributed workstations, will "eventually force IBM's hand." The result, he said, would be a full flowering of the total System R design.

For the present, at least, such distributed and personal database offerings are taboo, and one back-end database machines project within IBM has been smothered and rekindled repeatedly because it falls into the distributed domain, the sources point out.

Of course such projections into the future are of little comfort to the IBM DBMS customer of today. His feeling is that IMS as a "bit" does its job, but that it can't be worked into his demands for decision support and office automation. On the other hand, System R/Sequel has the modern appeal of catering to his demands for unstructured applications, but is still part of a sketchy "dream" that IBM intends to force into his scheme of things.

"Such a move would certainly confound critics of System R who said it would never see the light of day," said one database consultant. "The trouble is that it could also confound IBM's own customers too, who once again will face the painful task of further conversions."

"In a sense," said one IBMer, "you can't migrate database systems—at least not without being bruised. At best," he added, referring to the conversion, "you are betting your company on a weekend."

—**Ralph Emmett**

DATA COMMUNICATIONS

AMERICAN BELL DEBUTS

Its first offering, Net 1, is said to be the "cornerstone" for most future offerings.

AT&T's entry into the computing services market signals the beginning of the end for the data communications business as it has come to be known over the past few decades. The corporation has set its sights on dominating this fast-growing market as thoroughly as it has controlled the telephone business for the past 100 years.

The new American Bell subsidiary threatens to pull the rug out from under any number of smaller firms, despite AT&T chairman Charlie Brown's humble assertion that the corporation, the world's largest, is only now on an "equal footing" with competitors. Its late entry notwithstanding, AT&T is playing a game it knows how to win, just as it won almost every competitive battle it fought in its first century.

How it will go about winning market share from well-entrenched competitors is not entirely clear, but it is obvious that AT&T intends to compete vigorously, attacking IBM and other computer vendors as well as pure data communications firms. It must develop a strong market presence quickly in order to fend off further inroads from such vendors as GTE Telenet, Tymshare's Tymnet, and a host of hardware suppliers that have grown by offering solutions to what is one of the stickiest problems in computing—making different computers communicate in an orderly fashion.

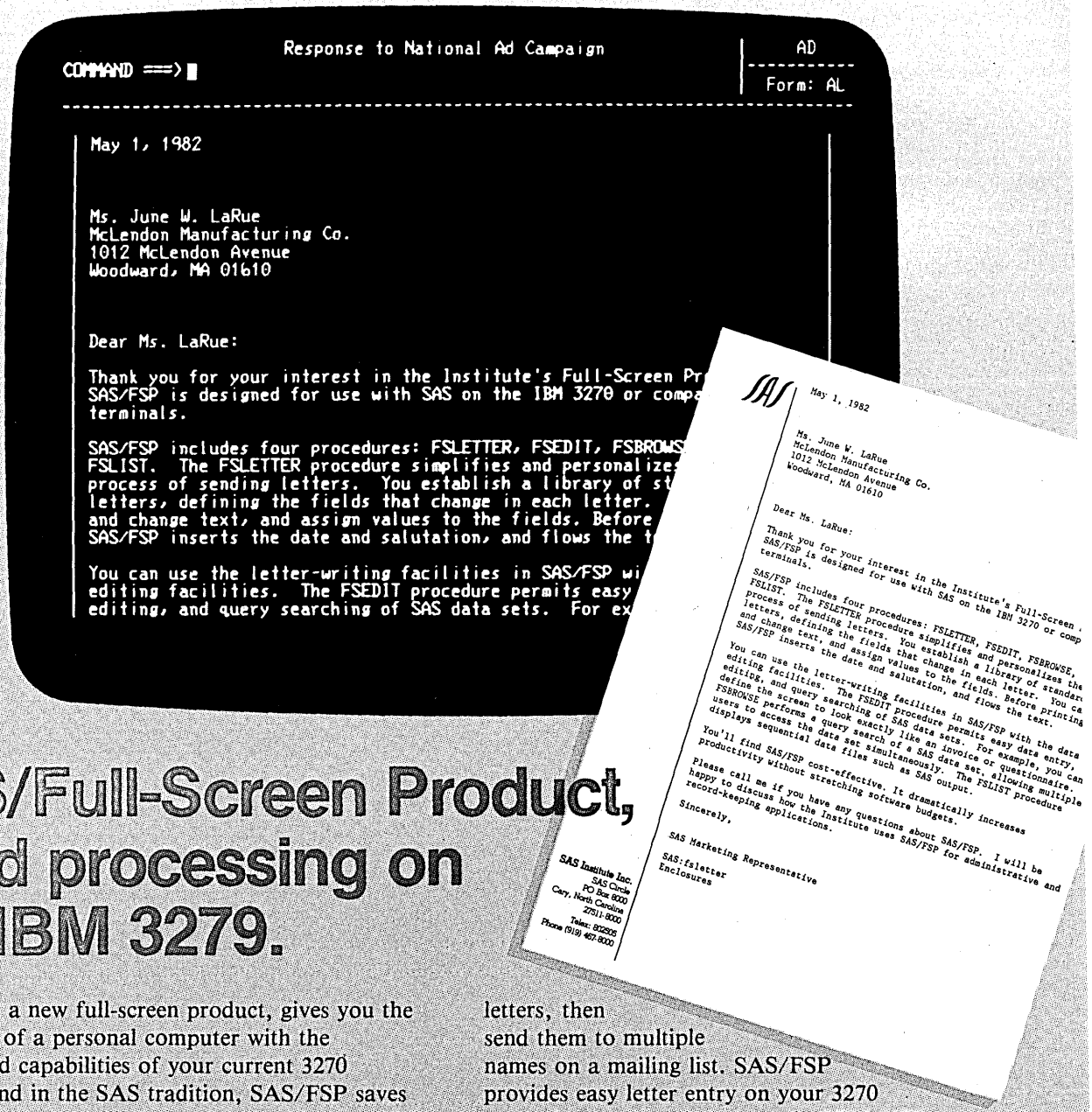
American Bell's first offering, said to be the "cornerstone" for most future offerings, is Net 1, a public computing network designed to interconnect the vast majority of different terminals and computers installed today. Based on IBM Series/1 minicomputers and Digital Equipment VAX machines, the network is designed to enable hardware to be connected on both an intercompany and an intracompany basis. Indeed, over the past few years of planning for and designing Net 1, AT&T has developed a long list of intercompany services that are bound to establish new ways of doing business in America, according to well-informed sources. The networked nation is not far away, many claim.

In a late breaking development, AT&T proposed to the FCC that it shift $440 million of capital assets to American Bell from other Bell System units to prepare for the offering of hardware. AT&T said in its proposal that it would like to infuse the subsidiary with an additional $4.3 billion through 1985, giving it the resources needed to offer what it calls customer premise equipment (CPE). American Bell's initial capitalization was $678 million.

Most likely to come from American Bell would be terminal equipment such as that offered by the AT&T unit, Teletype Corp. Also, industry observers say, the firm is likely to eventually offer some kind of computing hardware, perhaps microprocessor-based systems also developed by Teletype or a VAX-like machine understood to be operational behind closed doors at Bell Laboratories. In any case, the offering of hardware by American Bell would put AT&T squarely in competition with IBM, fighting desk by desk for control of corporate and small business computing sales.

"I want to stress that [further capitalization] is necessary if we are to remain in the customer premises equipment and enhanced services business after next Jan. 1," said Charles Marshall, executive vice president of AT&T, in a prepared statement. He added that the new venture, nicknamed Baby Bell by industry observers, is expected to be profitable "very soon," but will show some deficits "in the early years as it starts up operations."

Net 1 will help reduce much of the headaches and costs involved in running private networks. Customers will contract



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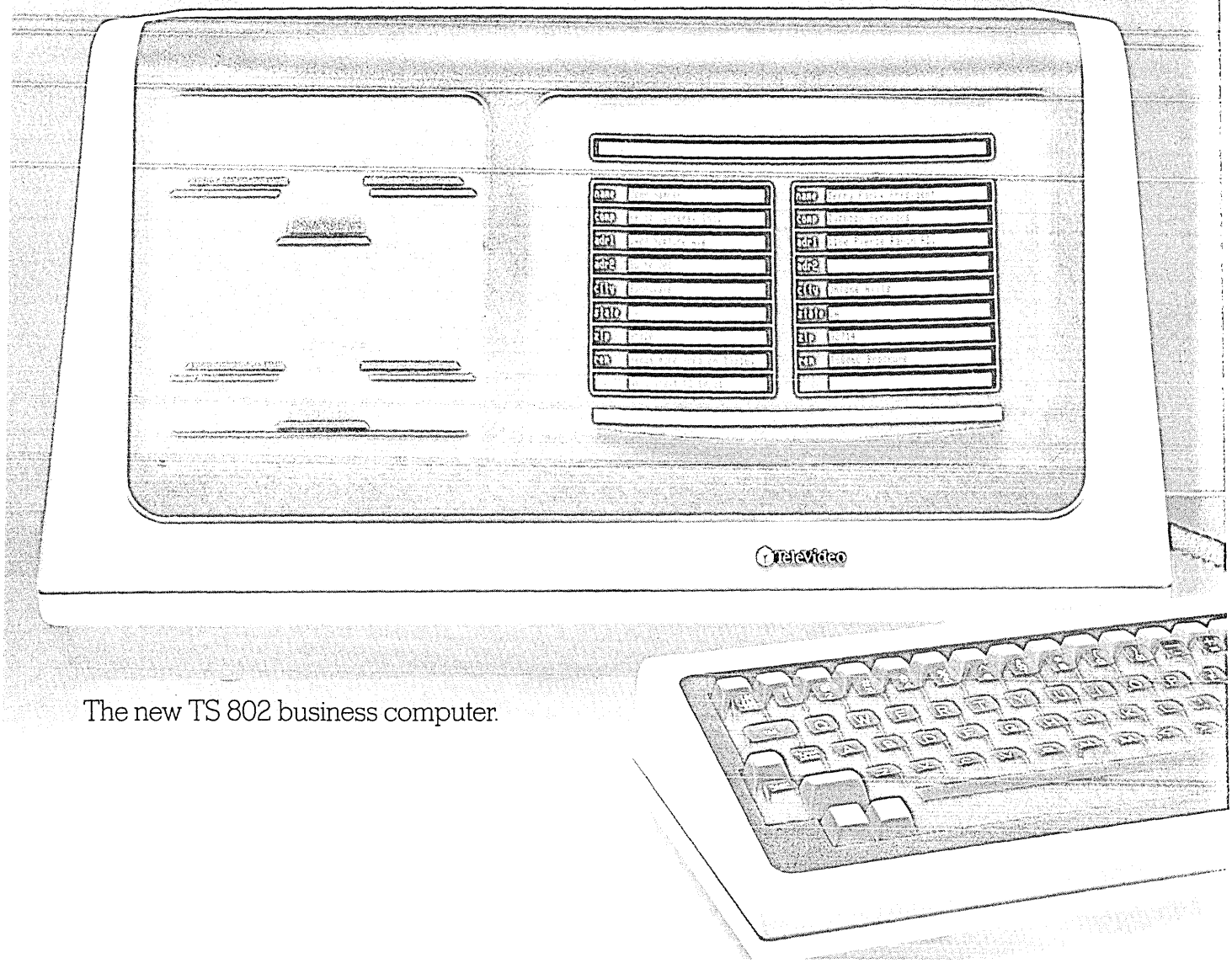

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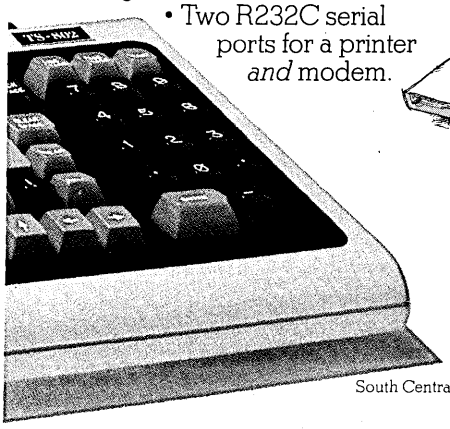

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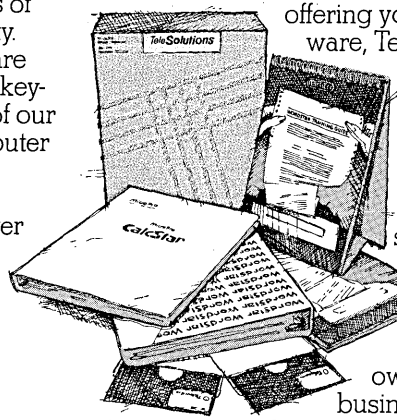

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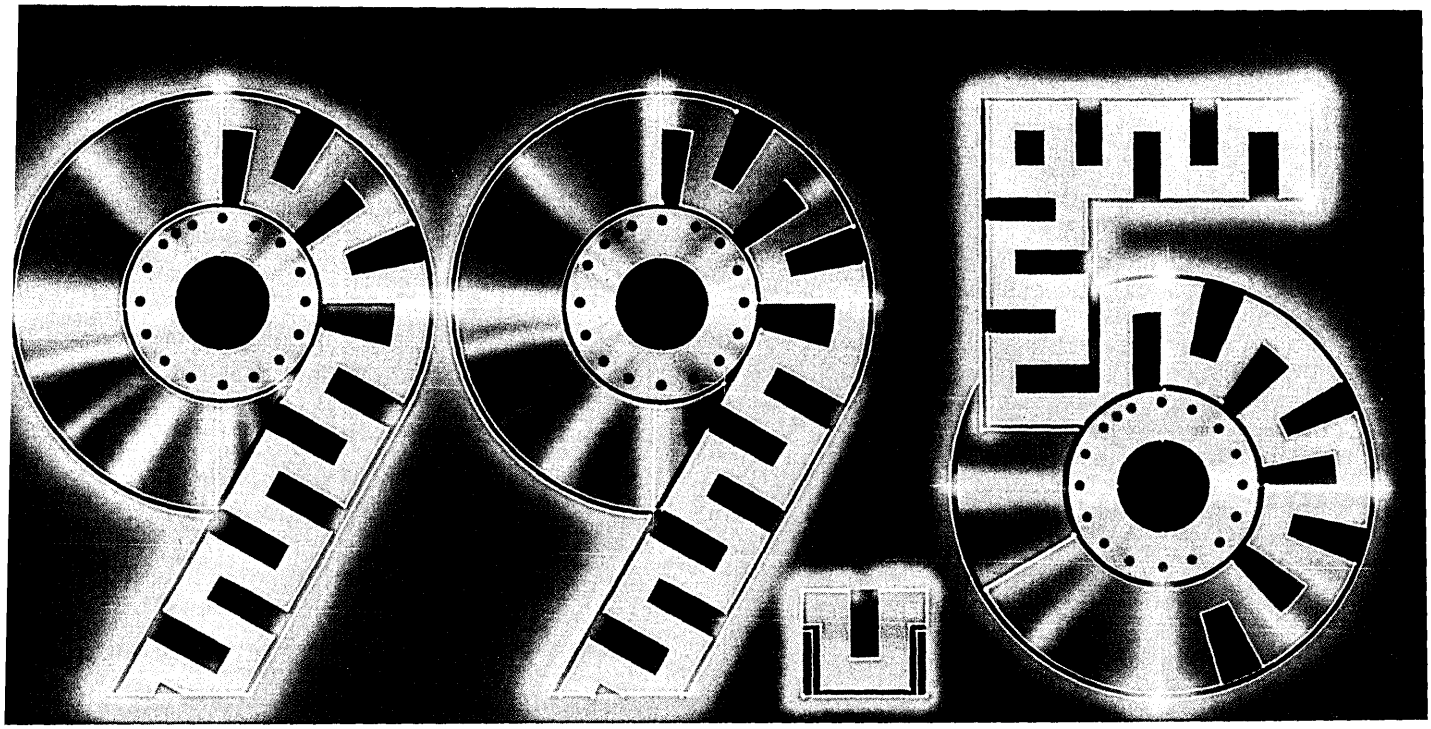

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NEWS IN PERSPECTIVE

for a package of network services which to their eyes will appear as a private network dedicated to their needs and wants. Gone will be the hassles of figuring out whether an XYZ modem is faulty or if the ABC leased line is down. No longer will the corporation have to hire costly networking specialists to design, troubleshoot, and manage their operations. AT&T is selling solutions, bundled packages of hardware, software, and expertise, that will satisfy a broad range of customer requirements.

If it all works, that is. The service was originally introduced in 1978 as the Advanced Communications System (ACS). Filings were made with the Federal Communications Commission for tariffing, and the industry was rife with speculation as to ACS's impact on business. It was all for naught, however, since AT&T withdrew its application, claiming that unforeseen software problems had arisen that would force a delay in ACS's actual debut. Several years of regulatory battles, antitrust action, and ACS development work followed until last November, when a capitalization plan for a deregulated AT&T subsidiary was filed with the FCC. Upon the plan's acceptance by the FCC in mid-June, American Bell was christened and Net 1 unveiled. It is an upgraded version of ACS, Bell officials say.

Sal Barbera, the subsidiary's chief executive, pointed out that Net 1's usage

American Bell will encourage independent software houses to tailor their software packages for operation on Net 1 nodes.

pricing and flexibility in connecting differing terminals and computers will make the system attractive to large and small data processing shops. Large users won't have to discard installed equipment or write complex software to interface disparate machines, and small users can gain benefits of data communications without much upfront investment, he claimed. Moreover, the system will not require the usual investment in trained communications specialists needed to run complex private networks.

"We designed it to offer low risk and small capital investment for the small guy," says Joe Cortese, district manager of headquarters technical support at American Bell. "We'll be offering standard application programs now and give the customers the ability to tailor and modify those programs."

The programs are written in COBOL and run under the VMS operating system on 32-bit VAX computers, according to Bell. Industry observers were mildly surprised that the network's machines were not running the Unix operating system, a package AT&T's Western Electric subsidiary has promulgated lately and which has been seen by some as a possible de facto standard for office systems. While Bell officials wouldn't comment, observers say it is very likely Unix, along with a number of other

ALL THINGS CONSIDERED

AT&T isn't the only company bringing new communications offerings to the corporate data processing user. Western Union recently introduced a means by which hard-copy documents can be transmitted throughout its worldwide network. National Public Radio said it would enter the data communications business with a system using local FM radio. And Vitalink, a Silicon Valley startup, has begun marketing satellite-based private data networks.

The Access system from Western Union is essentially a conglomeration of the firm's various networking capabilities bundled into a single pricing structure so that a business can choose between several priorities of delivery times. The user can now connect his own terminals—Telex, TWX, or any small computer with store-and-forward capability—into the Western Union network and move messages such as telegrams, cablegrams, Mailgrams, and electronic mail. He is billed on a per-message basis. The system takes advantage of computer-based switches at various locations in the U.S. that help convert information from one protocol to another, Western Union said.

The firm said a terminal connected into Access must have five characteristics: off-line storage, asynchronous transmission mode, even parity ASCII code (110 to 1,200 bps), at least one of four transmission speeds, and an acoustic coupler to modem, compatible with Bell 103/113 or 212A and the Racal Vadic 3400.

In an attempt to provide future funding for its traditional radio programming, National Public Radio is entering into a joint venture with National Information Utilities Corp. The new company, INC Telecommunications, will provide a nationwide capability to transmit data and software to government, business, home subscribers, and public institutions such as schools and hospitals. A spokesman said the firm will specialize in last mile distribution, that is, connecting the termination points of long-haul lines to end users.

The transmissions take place in unused frequencies of the FM radio band (88 to 108 MHz) known as subcarriers. Local NPR stations will tie into national satellite networks and deliver messages to subscribers within a radius of about 50 miles. NPR currently has 267 member stations, a spokesman said.

"Studies comparing transmission between land lines and FM subchannels revealed savings of as much 50% for those using FM subchannels," said Jack Ault, NIU president. "And current land line charges are anticipated to increase substantially in the near future.

"In terms of accuracy, tests prove that our current FM/SCA equipment transmits fewer than one error in a million bits of information," Ault added. "NIU engineers have designed a system which will use transmission speeds of 9,600 bps, and we expect to incorporate these speeds into the INC network."

Primary markets foreseen by the joint venture include electronic mail and messaging services for retail stores, manufacturers, and business; financial communications for banks, brokerage houses, and other institutions; software distribution; electronic news delivery; and educational services for schools, government, and business.

The first part of the system is scheduled to be operational by next year. Board members of National Information Utilities Corp. in Virginia include Steven Wozniak, cofounder of Apple Computer, and Kemmons Wilson, founder of Holiday Inns.

Vitalink Communications Corp. in Mountain View, Calif., is hoping to find success in selling satellite-based private data networks. The firm has developed a proprietary earth station that cost-effectively transmits data at rates as low as 9,600 bps, thus enabling its offerings to appeal to users with relatively small data transmission requirements. Vitalink president Albert Horley says his firm's scheme will compete well with satellite offerings from Satellite Business Systems (SBS) and others whose systems require a much larger earth station that is cost-effective only at rates of 56K bps and up.

Vitalink was formed in 1980 with venture capital funding, including an $11 million investment by Western Union, and has just begun its marketing efforts. It recently signed a contract for just under $2 million to supply Tymnet with 27 earth stations.

Vitalink also has signed an oem agreement to supply Tandem Computers with earth station equipment that Tandem will incorporate into a data networking package it intends to offer its customers. Installations of the Vitalink equipment are under way, Horley says, noting that several contracts have been signed with companies he declines to identify.

Noting that the average annual growth rate of high-speed data circuits will be 30% through 1985, Vitalink senior marketing vice president Brig. Gen. H.R. Johnson, USAF (Ret.) says the firm has targeted its services to customers currently using AT&T leased lines. Vitalink claims that customers with even a small, four-station network will spend less than they would using AT&T's Digital Data Service (DDS) lines.

—J.W.V.

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programming languages, will be offered on Net 1 in the future.

Barbera said at the Net 1 unveiling that while AT&T itself doesn't want to get into the business of writing software directly, it will be encouraging independent software houses to tailor their packages for operation on Net 1 nodes. Thus, AT&T takes on the role of a software distributor, matching up customers to software developers; it is a business many say will be one of the most profitable in years to come.

There is the possibility that Net 1 could become a nationwide distribution channel for software, delivering it wherever and whenever it is needed, to whatever machine requires it. As such, AT&T would essentially be a distributor, perhaps even "stocking" others' software packages in its

Net 1's usage pricing and flexibility in connecting differing terminals and computers should make it attractive to both large and small dp shops.

machines, just as a book distributor now stocks books from a number of publishers.

Ken Bosomworth, head of International Resource Development in Norwalk, Conn., sees the Net 1 offering as particularly damaging to companies such as Paradyne, Codex, NCR Comten, and Computer Communications Inc., which have made money selling private networking hardware.

"The IBM computer user has had a lot of headaches running networks over the years," says Bosomworth. "There were software hassles, inefficient access methods, large machine overheads on IBM front ends, and most of all, the need for a large number of specially trained people to maintain the network. The large data communications user has been paying too much for what he's been getting.

"Many of the competing firms have been quite successful," he adds. "AT&T is now, however, attacking the same problems with a service solution. The customer won't have to worry about much except his own equipment."

Bosomworth sees the motivation behind Net 1 as being the attractive high growth expected in value-added data communications services. "The pitch from Telenet and Tymnet has been to sell a packet-switching service to replace leased lines, but AT&T can't do that. It would be taking money from one pocket and putting it in another."

Instead, Bosomworth explains, AT&T is striving to take money away from IBM, whose customers with SNA/CICS networks based on mainframes are the primary users of data communications. AT&T's Net 1 service can replace not only costly leased lines but also the mainframes. In a typical order entry system, for instance, Net 1 can interconnect as many 3270 and ASCII terminals as required, process transactions, and deliver the end results to whatever site needs it. Not only IBM but all other computer makers would seem to be threatened by the new service if it does what its creators claim it can.

Sources say a hefty marketing research budget at AT&T has produced ideas for a wide range of intercompany services that would essentially create an electronic marketplace by which companies could place orders and determine availability of product.

For instance, industrial electronics distributors could make their inventory information available in a common Net 1 database. Customers looking for 64K RAMs, say, could browse through the database from their own Net 1-connected terminal and find the best source for the parts. AT&T, of course, would collect on every transaction performed.

Cash management is another area where the Net 1 service seems likely to have impact. Companies such as National Data in Atlanta have made a large business out of helping widely dispersed corporations keep track of cash at the end of each working day. Banking, brokerage services, and electronics are some of the industry areas at which American Bell's marketing staff has looked closely.

The firm is particularly anxious to provide value-added services beyond plain vanilla data communications links. In doing so, it will become a major force for all vendors to contend with.

Most immediately threatened by American Bell's entry into the value-added

IBM and other computer makers would seem to be threatened by the new service if it does what it creators claim it can.

network services business are Telenet and Tymnet, two operations that have had the public network business to themselves for the past several years. Neither has done spectacularly well, particularly since neither has reached that critical mass of customers to ensure profitability. Industry observers say Tymnet is growing at close to 60% a year, but reliability problems have kept it from being as much of a success as it could be.

Telenet, through a spokesman, said it expects Net 1 to stimulate the market, just as IBM's entry into new businesses often stimulates growth for those firms already there. Telenet, started in 1975 and now owned by GTE, is not yet profitable but provides links to 250 cities and 40 countries for more than 800 customers, the spokesman claimed.

—John W. Verity

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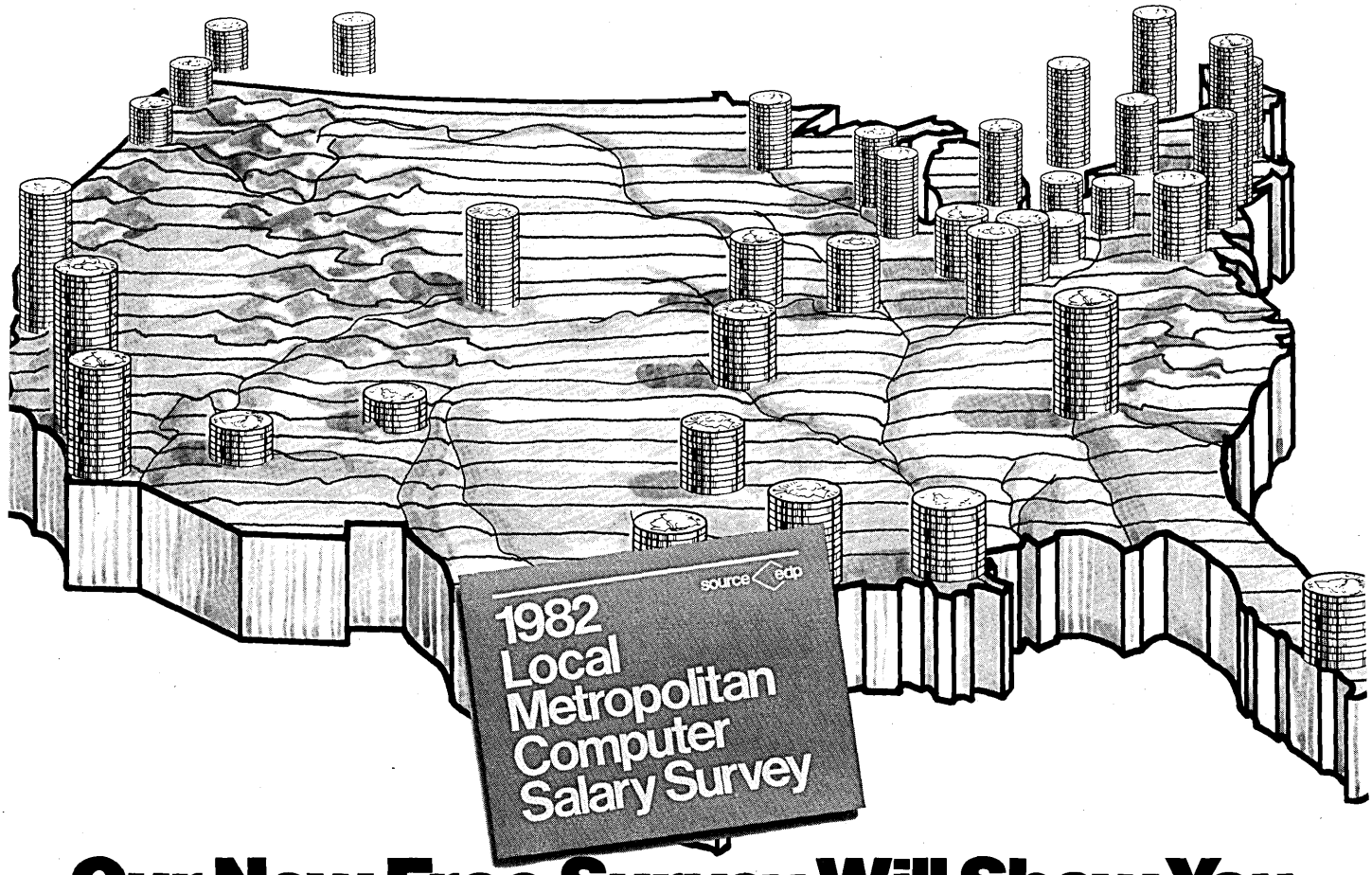

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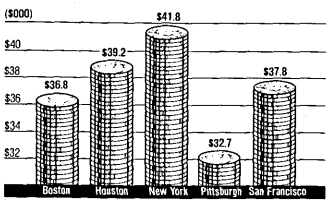

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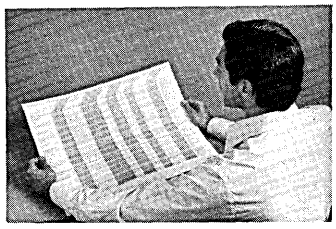

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TRADE SECRETS

THE FBI STINGS HITACHI

Undercover operations reveal that employees of the Japanese firm purchased "stolen" IBM secrets.

It's all happened before, but IBM once again finds itself the victim of a scheme to steal design secrets, and again the culprits have been caught in the act. The current allegations against two Japanese corporations are similar to the charges leveled against Telex Corp. in the 1960s. In that case, the respected maker of plug-compatible peripherals was discredited when it was publicized that Telex had acquired IBM design secrets through illegal means.

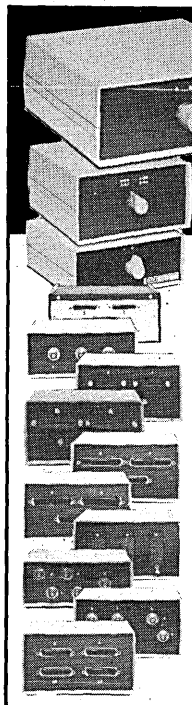
Now, the prestigious Japanese firm Hitachi Ltd., whose large-scale M-Series mainframes are sold in the U.S. and abroad by National Advanced Systems as IBM software-compatible processors, has been indicted by a federal grand jury in California. The charge: conspiring to transport to Japan stolen merchandise belonging to IBM. Twelve Hitachi employees, two former employees of NAS, the Japanese-American head of a trading company, an Iranian, and a Haitian national were also indicted. The top Hitachi executive named is the general manager of the Kanagawa Works, where mainframes are built.

Four employees of Mitsubishi Electric Corp. were implicated on similar charges in an earlier indictment. Mitsubishi is scheduled to announce in late 1983 the first processor in a family of new IBM software-compatible mainframes, which are expected to span the IBM line from the 4300 to the 3081 and above. This company's experience, however, has been with small and medium-scale hardware. It is thought to be the market leader in small business systems in Japan, with a 15% to 18% market share.

The charge against the Japanese is conspiracy to transport stolen goods in interstate and foreign commerce, a crime that carries a maximum sentence of a $10,000 fine and five years in prison. The defendants allegedly were caught up in an FBI sting operation said to have been initiated shortly after IBM discovered that a senior engineer at the Hitachi mainframe works possessed several volumes of the Adirondack Hardware Design Workbook. The workbook contains highly confidential and proprietary internal documents belonging to IBM. Joseph P. Russoniello, the U.S. attorney for the Northern District of California, said that this discovery by IBM in August 1981 was followed by its own internal investigation before the matter was turned over to the FBI in October.

The FBI described the workbooks as containing "some of the design information for the IBM 3081." They presumably contain notes of the systems architects and designers as they went through the design cycle, including items needed for patent protection. This would represent a thorough record of the thinking that went on during the design phase, as well as documentation on alternative designs that were rejected. (In his book *The Mythical Man-Month*, Prof. Fred Brooks describes the workbook he devised when he headed the OS 360 design team at IBM, and shows how possession of such workbooks could save a pcm actual man-months in design and develop-

The stolen workbooks would represent a thorough record of the thinking that went on during the design stage, as well as alternative designs that were rejected.



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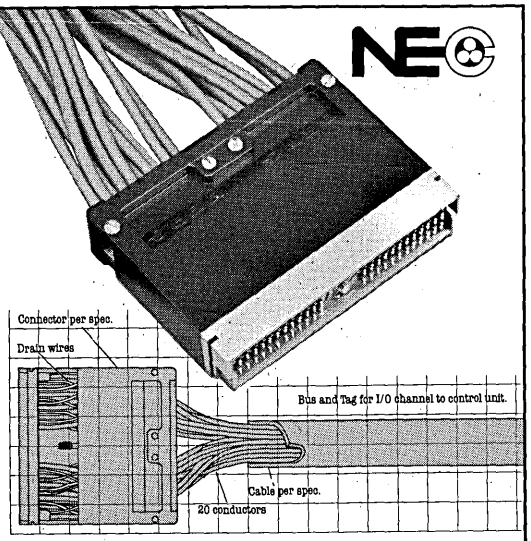

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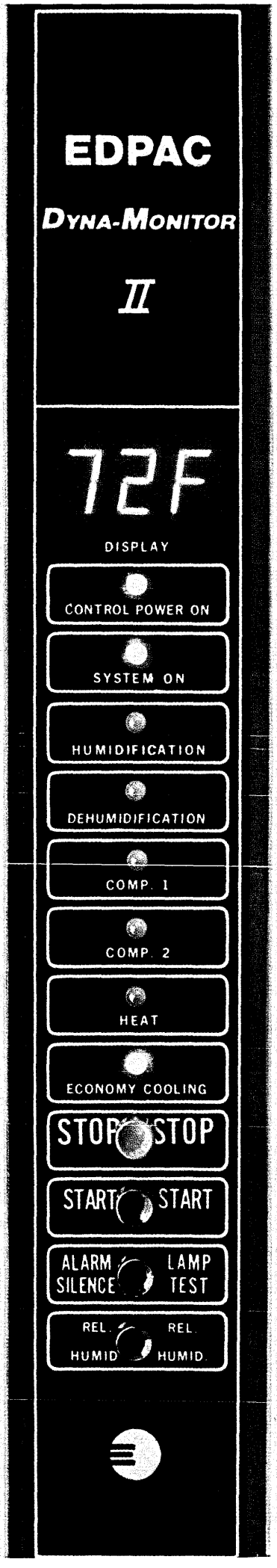

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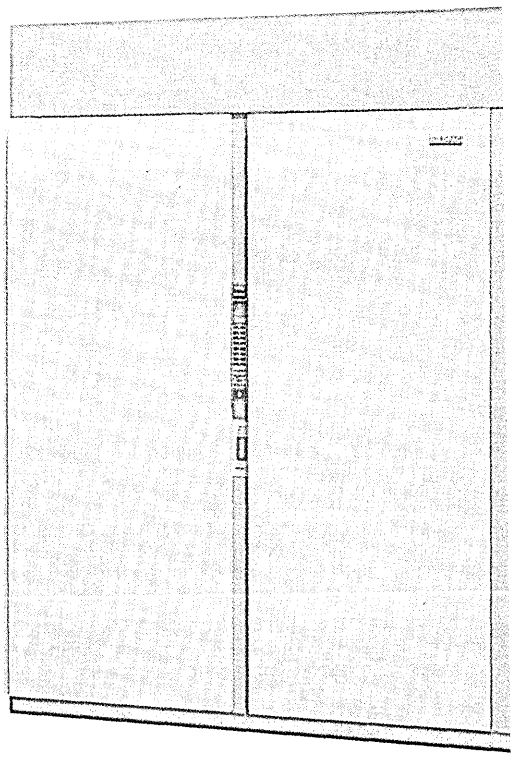

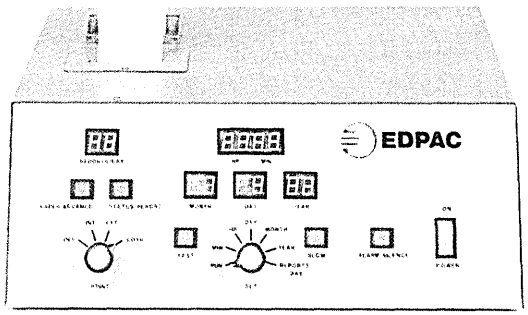

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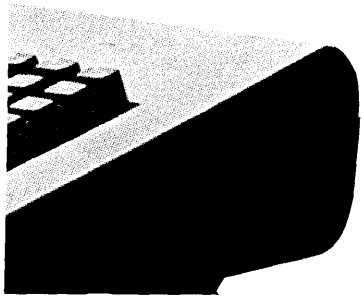

NEWS IN PERSPECTIVE

FROM JAPAN'S PERSPECTIVE

This editorial, which appeared in the June 29, 1982 issue of The Japan Economic Journal, *published in Tokyo, is reprinted with permission of the editor and general manager, Susumu Ohara.*

INDUSTRIAL ESPIONAGE

A strong shock wave is now running throughout Japan from news that employees of Hitachi, Ltd. and Mitsubishi Electric Corp. have been arrested in the United States on charges of stealing corporate secrets from International Business Machines Corp. (IBM). The final outcome of the incident is awaited with great concern here as it involves one of the most important high technology industries at a time when the economic relations between Japan and the U.S. are in a high-strung state.

The incident occurred against the background of the keen worldwide attention glued on IBM's new products. Japanese electronic computer manufacturers were particularly interested in knowing what the giant U.S. computer corporation would come up with next. IBM is widely believed to have been committed to the idea of unrivaled supremacy in the field of electronic computers, always keeping itself far above its competitors in many countries of the world.

Along with aircraft and space industries, the U.S. takes great pride in this field akin to national prestige. It is highly likely that IBM—and the U.S. itself, for that matter—has been head over heels in defending its corporate secrets from foreign competitors, especially the Japanese, as Japanese computer makers are rapidly catching up with the U.S. company.

By far the most important thing to be done to put an end to the latest incident is to bring all the facts about the incident into the open. Many Japanese observers say that they simply cannot fathom the Americans' true intention in having Japanese nationals arrested by going so far as to employ "sting operations." There is no denying that the whole action has the look of something done for demonstration effects. Publication of the photos picturing the downcast "culprits" with their hands tied behind like murderers is unusual to say the least, and the situation is highly unpleasant in the Japanese eye.

There are, of course, much for Japanese corporations and corporate workers to reflect about on the occasion of the latest incident. In order to survive the stiff competition, Japanese corporations have long been engrossed in improving their efficiency even by a single iota in all their sectors of activity, running from production to sales and to research and development. Strongly identifying themselves with the corporations they work for, Japanese often show extraordinary loyalty to them. It is not rare for Japanese employees to go beyond what is proper in feverish search for the benefits of the corporations they belong to.

It has also to be pointed out that in the world of business, infringements on economic laws and regulations are often made light of.

There is no denying the fact, moreover, that the Japanese corporate community tends to believe that money is all that counts. Japan's postwar economic growth has been overwhelmingly supported by brisk introduction of advanced technologies from foreign countries. Japanese corporations paid far greater emphasis to outright purchases of advanced foreign technologies than to development of their own technologies. The latest incident sounds like a strong warning to such an attitude of the Japanese corporate society.

The incident is truly a regrettable one both for Japan and the U.S. It has come out of the economic frictions between the two countries and can even be construed as a new form of economic friction. But every effort should be exerted on both sides of the Pacific to prevent the incident from ballooning into a true monster to mar the friendly relationships between Japan and the United States. Many Japanese observers cannot but harbor a sense of being slightly cheated by the incident as it is clear that the U.S. authorities are in a complete tandem with IBM in uncovering it. This is all the more reason every fact concerning the incident should be brought into the open at the earliest possible date.

ment time by avoiding any dead-end paths that an IBM designer had trod earlier.)

According to one version, Hitachi was allegedly drawn into the scam when it asked one of its U.S. consultants, Palyn Associates of San Jose, about acquiring additional volumes of the workbook. Maxwell O. Paley, Palyn's president and a former IBM executive, was aware of the proprietary nature of these volumes and became alarmed that some copies were already in Japanese hands. He allegedly notified IBM about the request, and the FBI sting was subsequently devised.

A phony consulting firm called Glenmar Associates was established in Santa Clara by the FBI, and was supplied by IBM with merchandise for bait. According to FBI affidavits, this storefront establishment was visited by a number of Japanese allegedly intent on purchasing trade secrets they thought had been stolen from IBM. Hitachi purchases were alleged to have exceeded $600,000, and Mitsubishi purchases were said to be more than $25,000.

"The conspiracy charge does not require that the material itself be stolen," Russoniello explains. "In other words, persons can conspire if the expectation in their own minds is that what they are dealing

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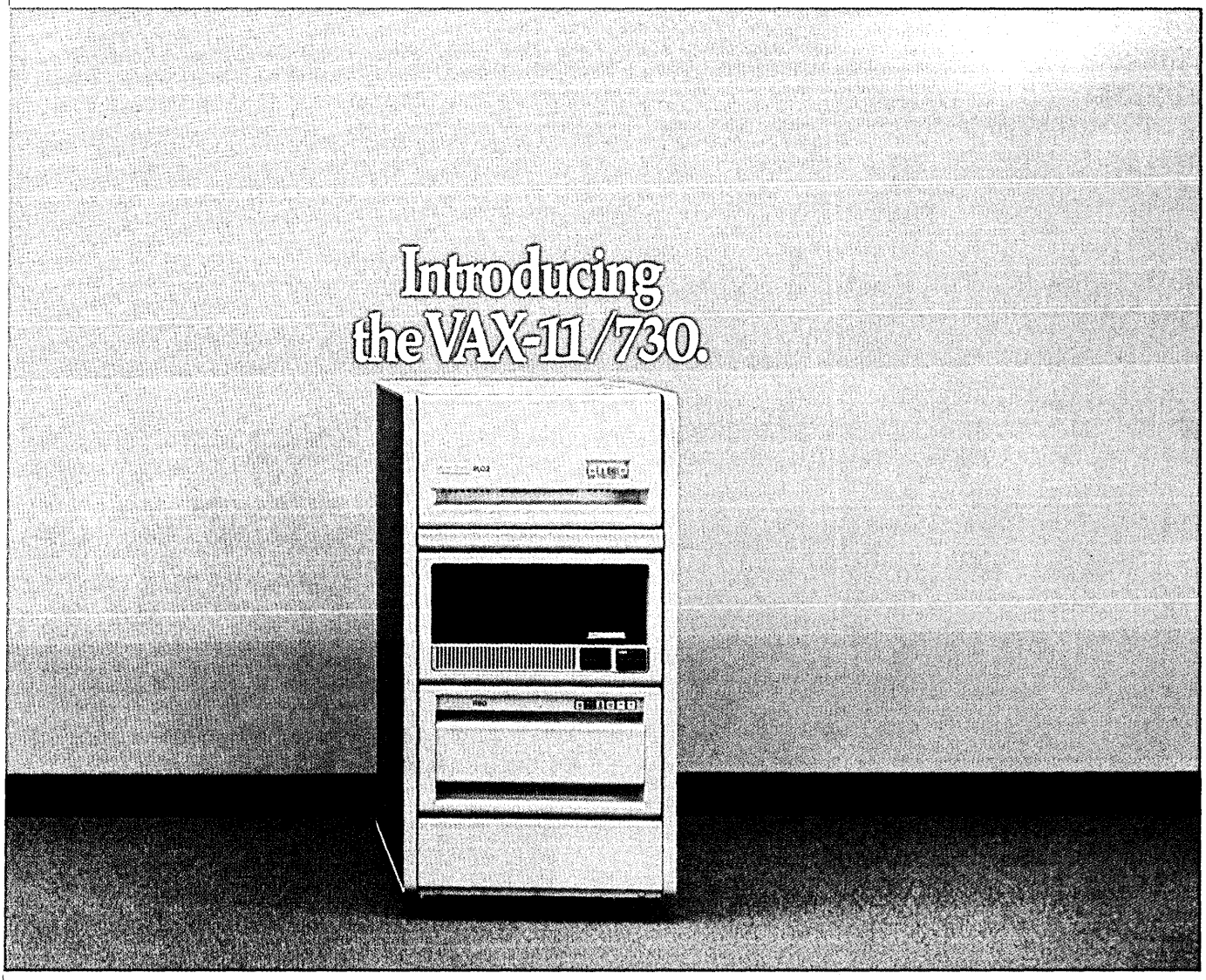

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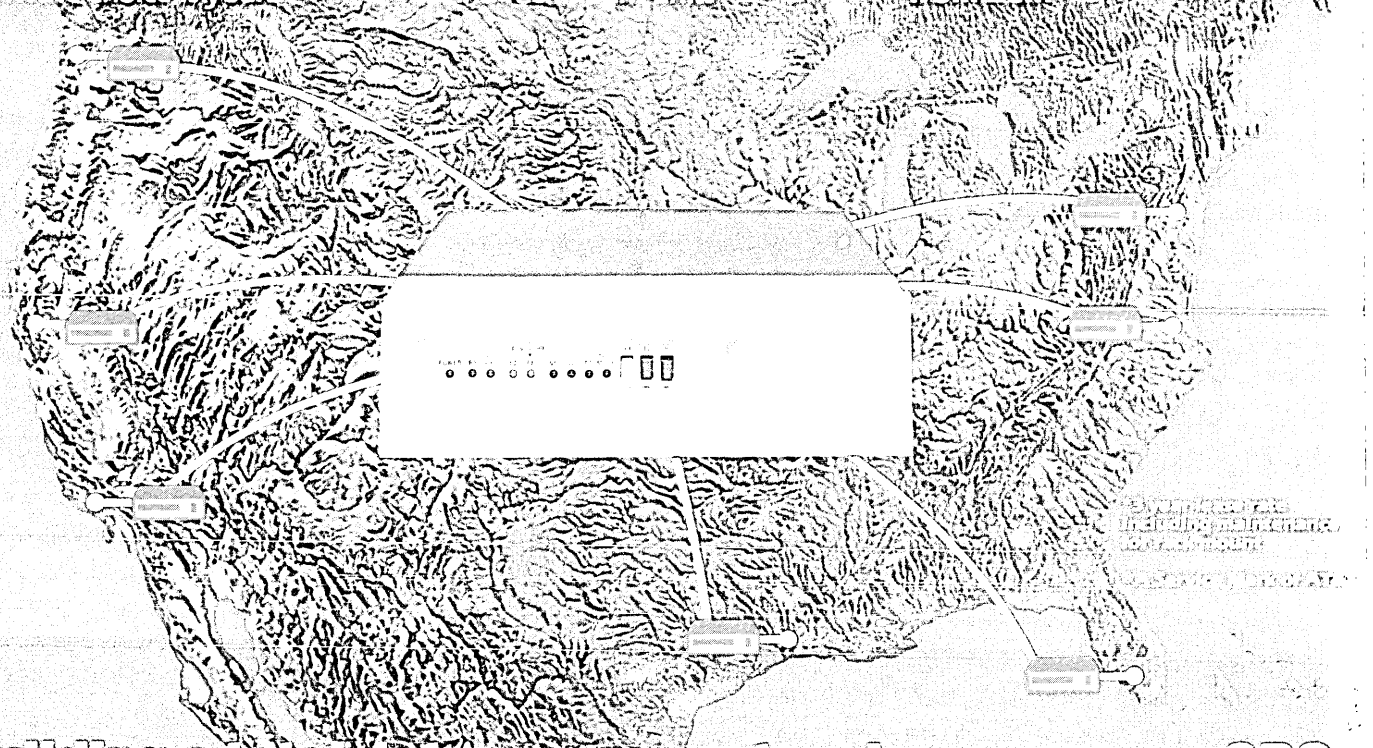

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with is property which is stolen." The charge thus applies even though IBM provided the FBI with the material.

The Japanese have denied knowing the material was "stolen," and insist that they never asked the people at Glenmar to steal anything from IBM. But sprinkled throughout the FBI affidavits are references to occasions when an undercover FBI agent explains to a Hitachi employee that the merchandise requested would have to be stolen from IBM and that someone could "get in serious trouble" if caught. The Japanese subsequently have said they thought this was a ploy to get them to pay more than their original offering price.

"How could anyone pay that much and not know the stuff was stolen?" exclaims a consultant who asks not to be named. But others think the Japanese in some instances paid too much and in others paid unnecessarily. In late January 1982, for example, someone from Hitachi allegedly paid $10,000 for a disk from an IBM 3380 drive and an additional $10,000 for a head and arm assembly. And yet during that same month a few companies in the U.S. that are in business to compete with IBM had acquired a 3380 drive through legal channels. A month and a half before this, however, an engineer from Hitachi allegedly was being escorted into a Pratt & Whitney facility in Connecticut, merely to photograph a 3380 from a distance. The price paid for this privilege: $7,000.

While one might be able to understand the purchase of a 3380 head and arm assembly, one could be skeptical about the $10,000 valuation for a disk. But an expert in the field explains that one cannot study the aerodynamics of a head withut the disk. "There's a lot of spook art with the disk," he explains. The head designer must examine things like the amount of lubricant on the disk surface, the degree to which it is burnished, and the coating. The head and the disk, he adds, must match.

"It would appear to me that all they [Hitachi] were trying to buy was time," says one observer. He explains that Hitachi's approach to compatibility has been to take IBM's logic design and implement it in its own chip technology. This requires a detailed knowledge of the processor being copied, and the earlier this knowledge can be acquired, the earlier the vendor can bring its product to the marketplace. "They were simply trying to jump the gun," he says, by allegedly purchasing some information not yet released by IBM.

Among the items Hitachi allegedly purchased from the FBI were those relating to the IBM 3033 EF [Extended Features] mainframe, which was announced in June 1980 and shipped initially to customers in November '81. In January '82, it was alleged, a Hitachi employee got source microcode for the 3033 EF for $12,000. In March of '82 it is alleged to have paid an additional $5,000 for the source microcode for the channel director, and during April and May they got test and maintenance programs for $10,000.

By February '82, according to an FBI affidavit, Hitachi came up with a shopping list that included the remainder of the 3033 EF microcodes, three volumes of 3081 workbooks "relating to channel architecture," for which a price of $20,000 was offered; "product design information relating to 3081 extended architecture [$30,000], microcode for 3081 with extended architecture...identification of other documents at IBM or 'in the field' relating to the 3081; actuator assembly for 3380 HDA [head and disk assembly]; logic diagrams and microcode flowchart for 3380 and 3880 [controller]; production drawings for 3380 HDA and actuator assembly; source code and instructions for MVS/SP Version 2," which is the extended architecture (XA) version of the MVS operating system. First cus-

"It would appear to me all they [the Japanese] were trying to buy was time."

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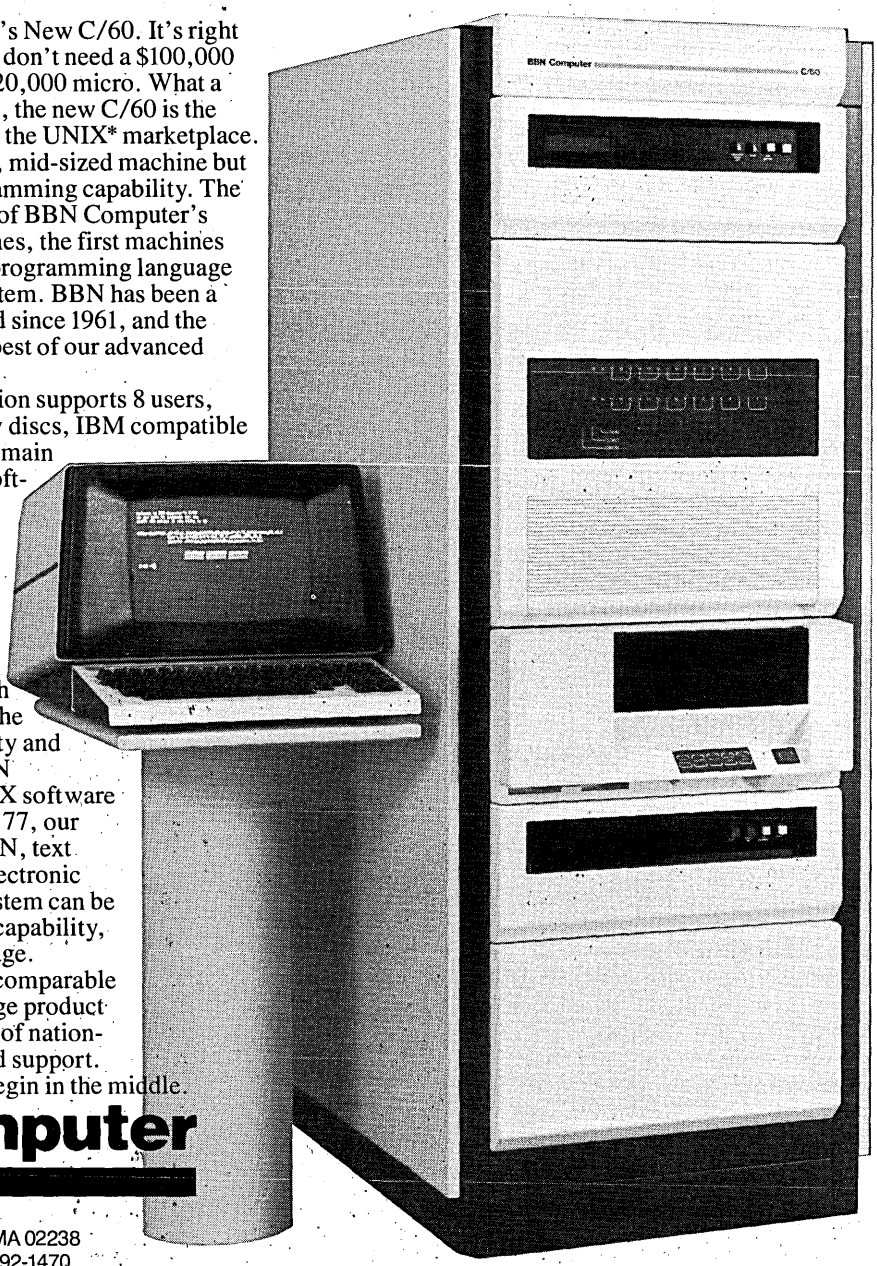

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tomer shipment of MVS/SP Version 2 is scheduled for the first quarter of next year.

It is alleged that Hitachi claimed to have had some of the source code for MVS/SP Version 2 and was seeking more. The FBI affidavit relates how "three of the four modules" of MVS/SP Version 2 source code were copied by a Hitachi employee in March '82 and the fourth module in April. Subsequent reference to "additional modules," however, would indicate that what Hitachi received was not the complete operating system, which has yet to reach the stage of customer shipment. The price for what the Japanese allegedly got, however, was apparently $15,000.

The FBI affidavit also outlines preparations to close the sting operation, following the delivery on June 21 of design documents for the 3081 XA ($300,000), a thermal conduction module board ($25,000), source code for the MVS/SP Version 2 ($150,000), and source microcodes for the 3380 disk drive and 3880 controller ($50,000). The arrests were made June 22.

Hitachi is also alleged to have expressed interest in hiring a retired IBM executive as a consultant for at least two years, if one could be found. His services, it was said, would be required for 25 to 30 days a year at pay of $30,000 to $40,000.

Employees of Mitsubishi, too, are alleged to have drawn up a shopping list, unaware that Glenmar was also dealing with folks from Hitachi. The list is said to

Sprinkled throughout the FBI affidavits are references to occasions when an undercover agent explains to a Hitachi employee that the merchandise would have to be stolen.

have included a "detailed description of IBM 3880 architecture and microcode," source microcode for the 3880, and source code for IBM 370 diagnostic programs. The FBI affidavit, however, describes only some diagnostic programs being handed over and the payment of almost $26,000. This transaction, too, was consummated on June 21.

The question arises whether the sting operation had anything to do with current trade discussions between the U.S. and Japan. This is denied by the Justice Department's Russoniello, who said other departments of the government were not informed of the operation until shortly before the arrests were made.

But he added that the FBI has made a commitment to ensure that U.S. technology is protected. "The fact that there have been arrests, the fact that the Justice Department is pursuing these cases, should provide some signal to others who may be similarly disposed that we are out there looking for those persons who may be engaged in this kind of nefarious activity."

In at least some quarters in Japan, however, the attitude seems to be that Americans, by calling in the FBI, are overreacting, and that the offenses the Japanese are charged with committing do not justify the use of undercover operations. Becoming ever more defensive after being accused

The sting is just one more abuse, say some Japanese.

of engaging in unfair trade tactics, of having erected nontarriff barriers in their own country, the Japanese seem convinced that this sting operation is but one more abuse being heaped upon them. But many Americans, even those sympathetic with the defensive posture being assumed by the Japanese, say they are concerned that foreigners may not understand the severity of industrial espionage, and that Americans, while perhaps cavalier about one American stealing from another, can become livid when a technology-strong foreign company is accused of stealing technology from an American company. At that point, they say, the technology becomes a national resource.

—Edward K. Yasaki

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CIRCLE 55 ON READER CARD

GOVERNMENT

GSA GALLS AN INDUSTRY

A new procurement policy proposed by the General Services Administration has the entire industry up in arms.

There is a growing feeling in the computer industry that Louis XIV is alive, well, and reincarnated in the form of the General Services Administration.

You remember Louis. He was the perspicacious gent who informed France "*l'etat, c'est moi.*" A few years later his listeners handed him his head. Now comes GSA figuratively telling vendors "procurement, it's us." Some think the agency has already lost its head, to be followed shortly by its wallet.

Cause of the conflagration is GSA's "Policy Statement on Multiple Award Schedule." The rhetoric therein is hardly as flowing or familiar as the Declaration of Independence, but the computer and communication industries hold GSA administrator Gerald Carmen's message in the same esteem that King George III held Thomas Jefferson's.

The Multiple Award Schedule (MAS) program governs small-scale GSA purchasing below $300,000. When GSA provides supplies through the program, it acts as the contracting agent for all government organizations authorized to use the MAS contracts. Customer agencies theoretically should be able to buy MAS items at prices that are better than those they could obtain from any other source under similar circumstances. It is GSA's job to hem and haw and haggle over the best possible discount from commercial price lists. The agency's carrot has long been the government's purchase of mass quantities.

It is GSA's job to hem and haw and haggle over the best possible discount from commercial price lists.

The latest stick? Give us all you've got, then toss in a little something extra because we are who we are.

"The government's goal when negotiating MAS contract pricing arrangements is to obtain a discount from a firm's established catalog or commercial price list which is equal to or greater than the discount given to that firm's most favored customer," GSA said. "The most favored customer [MFC] discount is equal to the best actual discount given by a firm to any entity with which that firm conducts business, including original equipment manufacturers [oems], dealers, distributors, and others.

"GSA will not award an MAS contract to a firm that does not give the government a price equal to the best price given to its large volume end-user customers with comparable terms and conditions except where the government's overall volume of purchases does not warrant the best price given to end-user customers."

If the agency proceeds to promulgate this philosophy, a decision it was to have made by July 30, its contracting officers will expire from terminal boredom.

"They're implying 'we are the government, we are entitled,' " contends Dave Burke, procurement policy advisor for Digital Equipment Corp.'s Government Development Office. DEC, the other 38 members of the Computer and Business Equipment Manufacturers Association (CBEMA), the American Electronics Association, the Coalition for Common Sense in Government Procurement, the Computer and Communications Industry Association (CCIA), the National Micrographics Association, and the Scientific Apparatus Makers Association sent a joint letter to Carmen telling him the agency's statement "provides insufficient background discussion about the basic premises from which the document's guidelines are derived." The writers also postulated four assumptions about the MAS program.

- The (MAS) is a procurement method for relatively small quantities of commercial items purchased separately at many different locations;
- Government users of the MAS program function as a class of customers referred to as "end users";
- The government is entitled to terms and conditions within the customer class in which it actually functions;
- The MAS does not obviate the need for free and open competition for large quantity acquisitions. The existence of an MOL (Maximum Order Limitation) is fundamental to this process.

All comments addressed to Carmen by the June 24 deadline echoed CBEMA's "We cannot support the 'Policy Statement on Multiple Award Schedule' as presently written." A source within GSA said CBEMA's comments would "not be welcomed" and that Carmen "was not happy" with many of the responses.

"If this goes through, the impact would be any discount that a vendor offers to any customer would be fair game for GSA," Burke says. "That would level out any difference between the oems and one-two customers. Negotiations would be stalemated unless you wanted to blow your price schedule and take the government's offer. It's an absolutely intolerable position. I'm not saying we'd tell GSA to stick it, but it's an option we would entertain."

"If they want to negotiate, we will too," promises Bill Schmick, Hewlett-Packard's government relations administrator. "But if they're going to make hard and fast rules and not bend them, we'll walk away.

"What they're doing is not at all in agreement with commercial policy or practice. They want to change the terms and conditions, then get more than's available anywhere else. GSA looks upon itself as being your biggest customer, when all they really do is negotiate contracts. And those are only a license to compete. Government business is 10.4% of our total sales. We're not about to do something special for that market. They have no right asking for special treatment."

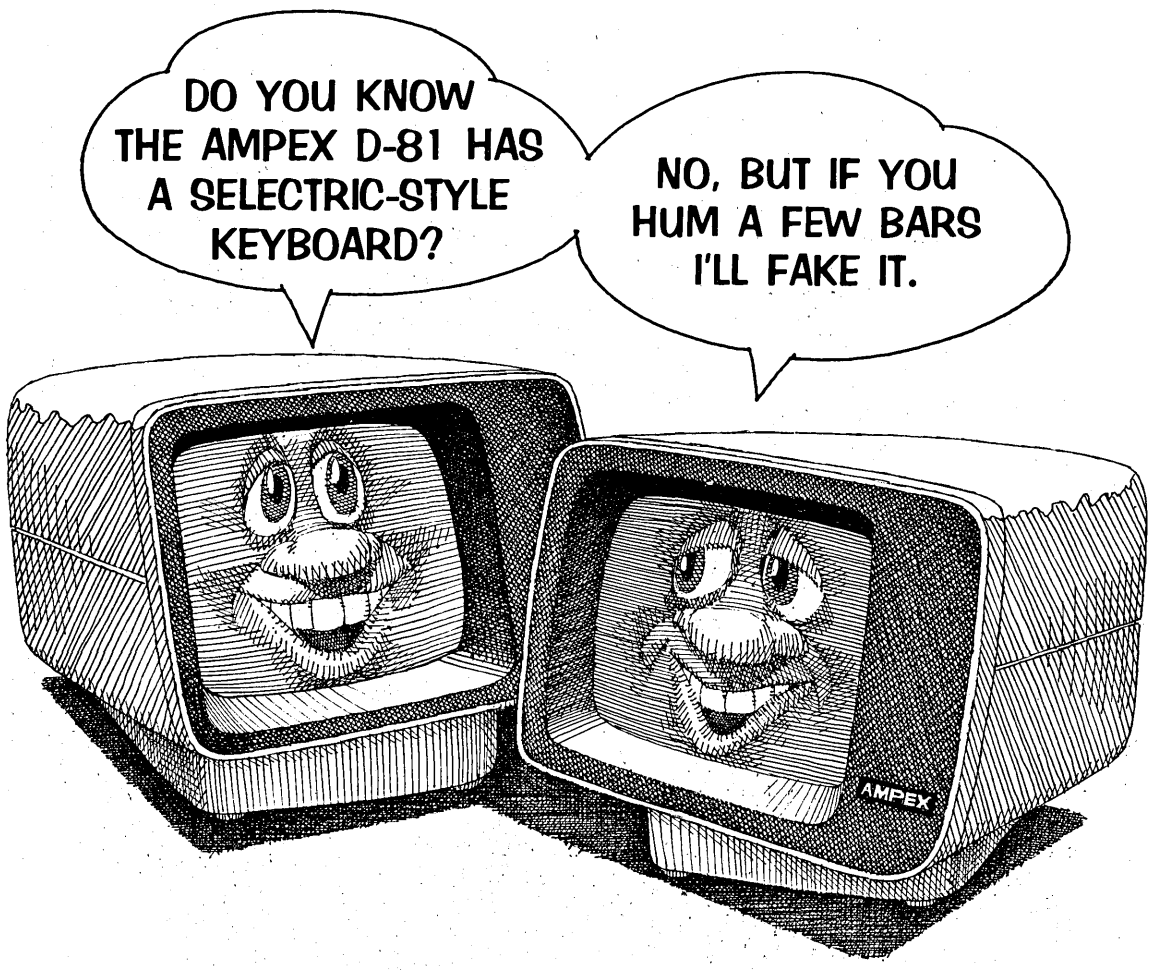
Perhaps not. But GSA clearly feels it has a duty to request the red carpet, if for no other reason than to disarm its congressional critics. In these times that try the government's pocketbook, Capitol Hill harpies in both houses of Congress never miss an opportunity to zing their favorite whipping boy. So what's a poor agency to do?

"If this goes through, the impact would be any discount that a vendor offers to any customer [including an oem] would be fair game for GSA."

For one, industry members insist, GSA could display a modicum of comprehension about what goes on in the real world. Oems and dealers/distributors provide services and support beyond the ken of GSA. The former adds value to its equipment purchase by using it as a component to a larger product, increasing its performance parameters, or enhancing its worth to prospective buyers. The latter provides training, storage, service, repair, and a host of other benefits that don't always appear in the balance sheet. In return for services rendered, the oem or dealer/distributor receives a significant price reduction.

The problem, industry members say, is that GSA wants equal time without equal work. The agency would apply its MFC theory across the three procurement schedules: TSP (Teleprocessing Services Program), FSS (Federal Supply Schedule), and ADP. In FY '81, sales under the MAS program were about $3 billion. More than 4 million items were offered through 8,000 contracts. ADP schedule sales totaled $940 million. Total sales volume, however, accounted for only 2% of the government's $134 billion procurement. Most participating contractors receive 1% to 5% of their revenue from MAS contracts.

The typical MAS discount is from 5% to 10%. Pursuant to the MAS policy statement, if a vendor offered a customer 25%, GSA would seek 26%. If the vendor



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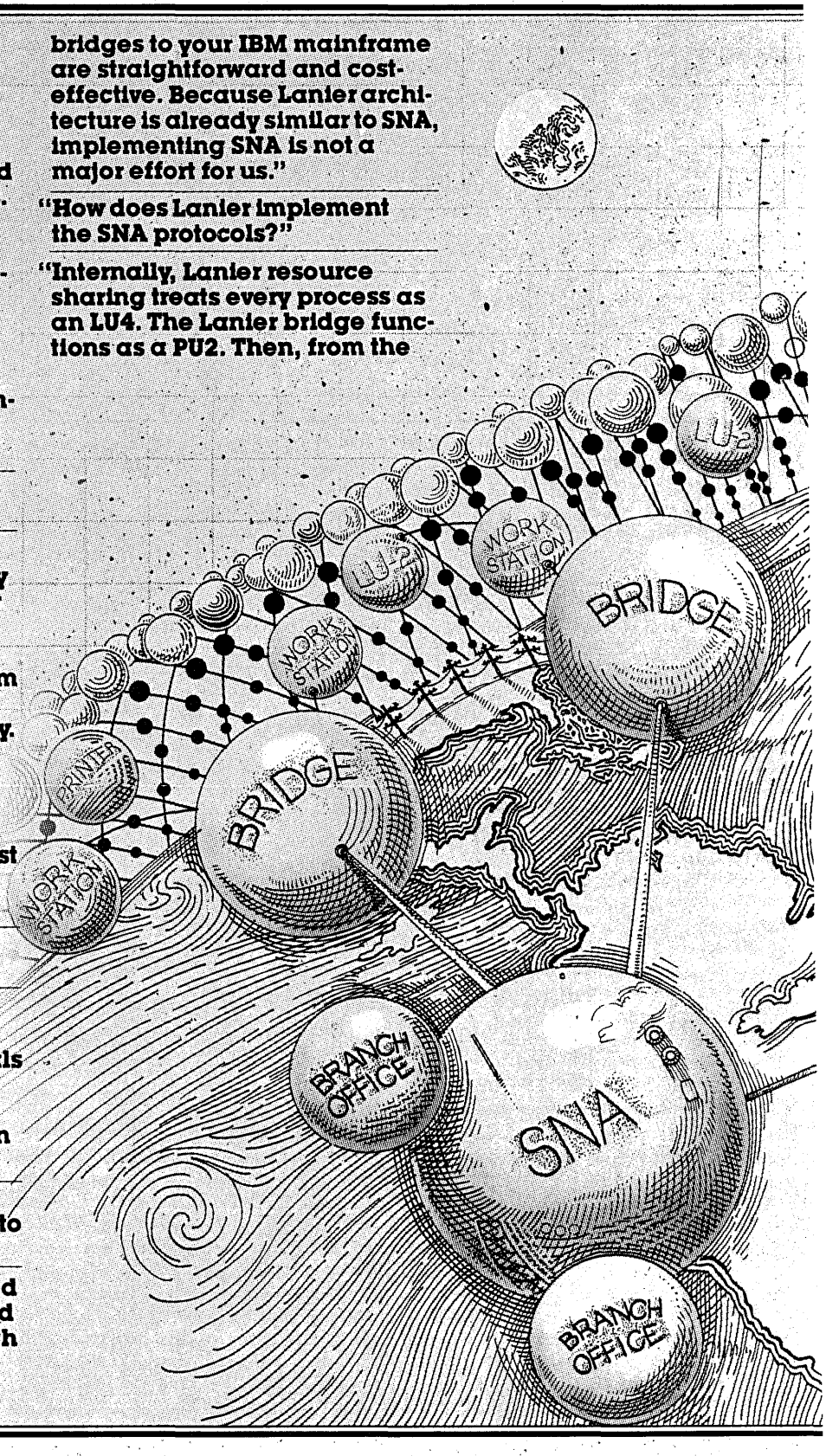

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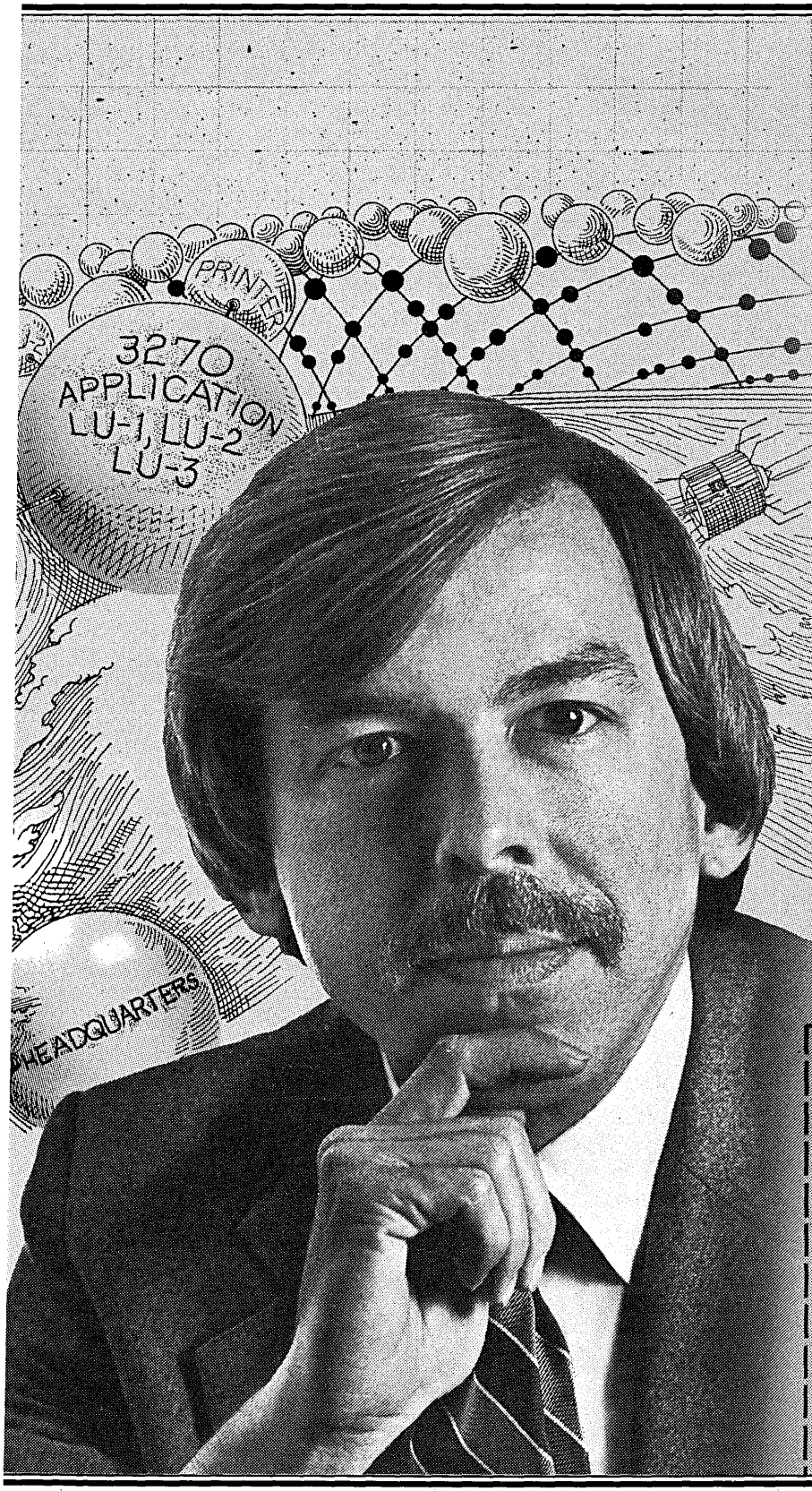

host computer's point of view, your Lanier terminals are LU2s and the printers are LU1s or LU3s."

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refused, GSA would settle for 25% or know the reason why. Rather than justify receiving MFC treatment other than by being what it is, GSA places the burden of proof on the vendor. Those who would sell to the agency must demonstrate to GSA's satisfaction why they are not giving the agency equality with the private sector. And in making that determination, no page shall be left unturned.

"Information will be obtained from a prospective MAS contractor concerning any pricing or discount arrangement that the prospective contractor has with any oem and dealer/distributor, regardless of whether these entities will participate under the schedule contract," GSA writes. "This information is to be used in the price analysis leading to the establishment of the negotiation objectives.

"When a firm's MFC pricing arrangement is given to dealers/distributors, consideration may be given to factors that the offeror claims makes the government different from these entities. Offerors will be asked to provide information supporting their claim."

The GSA isn't asking for much. Just the life history of the sale. Among items cited as supporting information are inventory and warehousing, selling expenses, warranties, prompt payment discounts, advertising allowances, installation, free service, and free training. A vendor offering a dealer a 40% discount and the government a measly 5% off the list price is required to justify the 35% gap. That's line by line, item by item, penny by penny. The pricing data piece of the "Discount Schedule & Marketing Data" submission that must accompany the offer would confound a phalanx of MIT doctoral candidates.

GSA explains that "the most favored customer [MFC] discount is equal to the best actual discount given by a firm" to any customer, including oems, dealers, distributors, and others.

"Scheduling is the sinkhole of procurement," says Terry Miller, president of Government Services Inc., a leading Washington consulting firm. "GSA is asked to defend the indefensible. At least in this statement they have price reduction clauses for all three classes, rather than separate ones for each class. But they have an absolutely unrealistic point of view. They have a terrible fear of Congress, which is all they think about. They don't take into account anybody's commercial selling practices."

Well, they do, but it's not on the schedule. The government does purchase mass quantities, for which it is rewarded with a significant discount. But schedule purchases are for minute quantities, destination of which not even the government knows. Getting on the MAS lineup makes it easier to bid on a potential sale, but vendors still have to hustle to consummate the deal just as they would in the commercial marketplace.

Once the deal goes down, service and repair, as well as training, automatically follow. It is these elements that the industry believes places GSA in a different league than oems and dealers/distributors.

"What they're asking for is an extension of the most favored nation concept," says Jack Biddle, executive director of CCIA. "They're doing nothing to justify getting the vendors' best price. You can't give the government your best price when it can't commit to quantity and can't tell you where to install the equipment. There's too much of a gun held to the vendor's head. A lot of them won't deal on this basis."

They may not have to. The hue and cry has been so loud and anguished that GSA may not proceed with implementation of the statement. CBEMA is using its considerable influence on the Hill to convince legislators of the error of GSA's ways. The group is also developing a pamphlet on why the GSA prescription is bad for business. And rarely, according to sources, has the industry been so united on any issue.

"They never had a statement before, and they wanted to develop one that dictates how the program should be run," says CBEMA vice president Bob Coyer. His last job was assistant commissioner of GSA's Automated Data and Telecommunications Service (ADTS), so he knows whereof he speaks.

"It was going to be a general guideline for government and industry," he explains. "But this will only prolong the process over what and what not to reveal. We all thought, in a naive way, this would be a total solution. Now we see it won't be. Our industry is exorcised."

"GSA's biggest flaw is thinking of the government as a single buyer," Government Consulting's Miller says. "That's absolute hogwash. There's no evidence to support what GSA is doing. But they're saying, 'We are the government. We can ask for anything. If you don't like it, don't do business with us.' That's driving 90% of the vendors into a box.

"This means GSA is going to look harder at large volume and oem deals. It will force vendors to justify in more voluminous ways than ever. I think r. any companies will be very tough, especially if they don't have that much government business. Vendors just won't be able to afford it anymore. I think 35% of those with a schedule this year won't have one next year. "I'm not optimistic at all. They should all tell GSA to go to hell and blow the whole program."

That's what the peasants eventually told Louis XIV.

—Willie Schatz

COMPUTER GRAPHICS

GRAPHICS MOVE INTO BUSINESS

Computer graphics vendors are striving to make their technology easy for the executive to use.

The world of computer graphics, long alien and hostile to all but the most dedicated data processing professionals, is on the verge of establishing a fast friendship with the world of business, thanks to the vigorous efforts of several graphics firms. These hardware and software vendors are concentrating increasingly on making their technology easy to use and accessible to the businessman.

One incentive is that business accounts for an increasing slice of the graphics pie—up to 36% of the total graphics market in 1981, or a $515 million business, according to International Data Corp. Moreover, the New York graphics consulting firm Machover and Associates reports that the field is growing at more than a 40% annual clip. Many of these vendors believe that graphics for the executive suite—where financial, manufacturing, sales, and other information can be converted into color slides or hardcopy on demand—is poised for an explosive boom.

Machover sets computer graphics sales volume at more than $2.6 billion this year, excluding tv games and other relatively simple consumer products. Another New York-based research firm, Frost & Sullivan, projects a graphics sales volume of $14.5 billion by 1990. Several vendors have designed their newest products to establish a niche in the business side of this market.

Among these vendors is InfoGraphics Inc., a new firm that produces computer generated graphs on a service bureau basis. The Newport Beach, Calif., company offers 24 different color and design combinations developed by a graphics artist.

The InfoGraphics user can choose among hardcopy, transparencies, 35mm slides, or a combination thereof. At that point the user steps aside and the Design Intelligence software package finishes the task. The software analyzes the input data and selects from 120 decisions the most effective way to present the information needed. Among the factors considered by the system in deciding among bar, line, pie, or other graphs are some concerning aesthetics. By leaving all these decisions to the software package, the business user can

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Amherst, NY *September 2*	Indianapolis, IN *September 9*
Andover, MA *October 13*	Jacksonville, FL *September 28*
Arlington, VA *October 7*	Kansas City, MO *October 26*
Atlanta, GA *October 5*	Miami, FL *October 19*
Baltimore, MD *September 21*	Milwaukee, WI *September 23*
Beachwood, OH *September 30*	Minneapolis, MN *September 28*
Cincinnati, OH *September 16*	Nashville, TN *September 23*
Columbus, OH *October 13*	New Orleans, LA *September 16*
Costa Mesa, CA *September 30*	New York, NY *September 29*
Dallas, TX *October 21*	Oak Brook, IL *September 24, October 29*
Dearborn, MI *October 21*	Omaha, NE *October 7*
Denver, CO *September 22*	Philadelphia, PA *September 16*
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have computer graphics capabilities without mastering another complex system.

"If a customer insists on a certain kind of graph, we'll do it, but we won't put our name on it, nor will we guarantee accuracy," says Dr. Stephen Slingsby, the founder and president of InfoGraphics. "We prefer to formulate a graph from ground zero."

Slingsby founded InfoGraphics in October 1981, following 18 months of research into the company's initial offering. He plans to set up a network of franchise service bureaus throughout the U.S. and Canada and to market the firm's graphics software in integrated turnkey systems through a network of independent sales organizations.

The system is built around a DEC LSI-11/23 microcomputer using either a Terak or Chromatics color graphics crt and a Xerox 6500 color laser printer. It can support up to 40 megabytes of hard disk as well as standard BASIC and Pascal compilers.

The business graphics field is growing at more than a 40% annual clip.

Integrated Software Systems Corp. is also striving for what it terms "device intelligence" and "layout intelligence." Computer graphics users, says Anders Vinberg, vice president of development for ISSCO, "may be expert in a variety of fields, but typically they are not artists. Yet the more these users work with graphics and gain sophistication, the more they will demand high artistic quality from their graphics devices. If the industry is to meet user demands, the software that drives these devices will not only have to adapt intelligently to the technical idiosyncracies of each device but also to the qualities of the final viewing medium—pen plot, slide, printer output, transparency—and how it will be used."

Vinberg defines device intelligence as "the ability of the graphics software not only to interface with but to adapt to and take advantage of the technical characteristics of the output device. This goes hand in hand with layout intelligence, which means that the software is also sensitive to the aesthetic qualities of the final output medium of the plot, even if it is being previewed on a different device."

ISSCO's products in the business graphics arena are designed to meet these demands for software "intelligence." The firm feels it has made progress in this area with Cuechart, introduced at the National Computer Conference. Cuechart is used with ISSCO's Tell-a-Graf software package and consists of a library of generic charts and graphs that can easily be customized to a company's specific needs and added to or modified at any time; a processor coupled to Tell-a-Graf that acts as a prompter for the untrained user of the Cuechart library and as a Tell-a-Graf development tool for creating prompting for new Cuechart graphics;

"The software that drives these [graphics] devices will have to adapt to the qualities of the final viewing medium and how it will be used."

and user notebooks that picture a company's own Cuecharts and their assigned numbers. These capabilities, says ISSCO president Peter Preuss, should make Cuechart user friendly.

But James Warner, president of Precision Visuals in Boulder, Colo., does not believe that any systems, including his own, are user friendly yet.

Precision Visuals' latest offering, introduced at the National Computer Graphics Association (NCGA) conference in Anaheim in June, is a "time independent" picture preview system that accepts English-like commands for picture previewing, selective hardcopy, and picture composition. Warner hopes to achieve a true user friendly state with another business graphics software package currently in the works.

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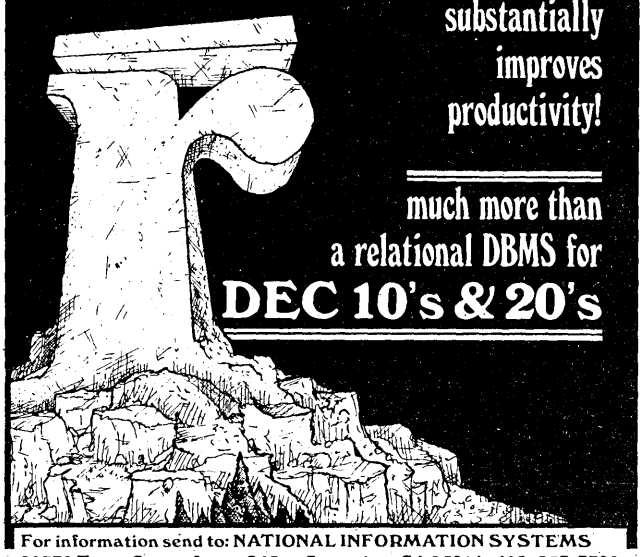

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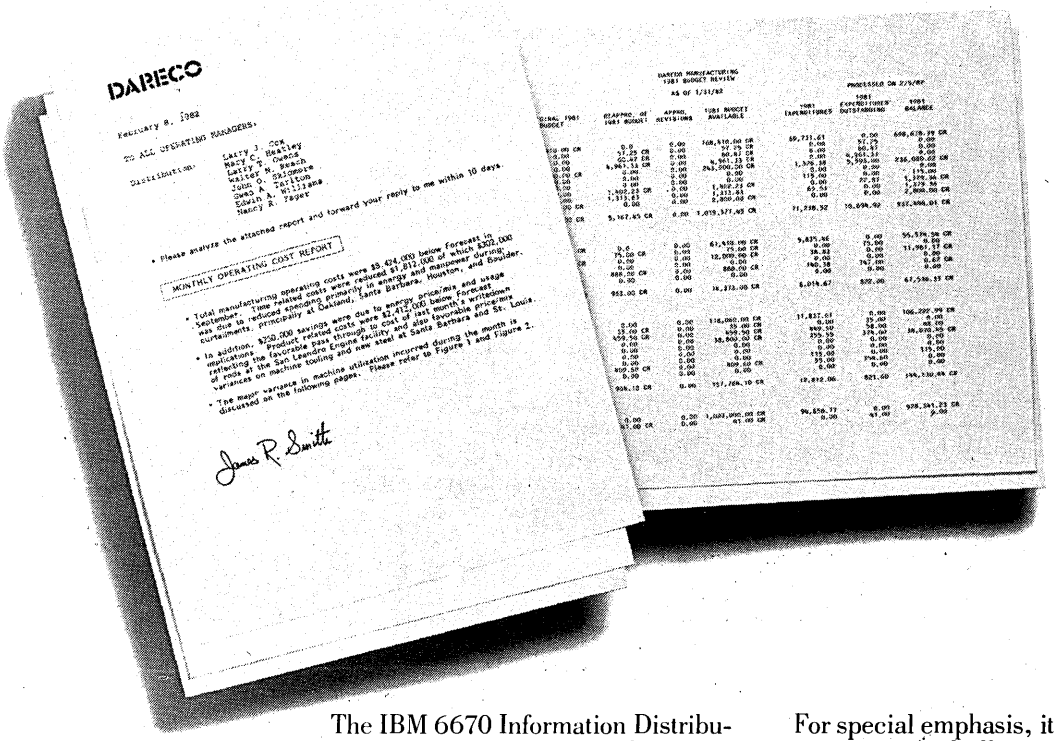

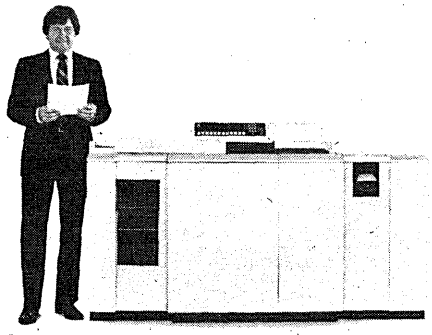

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Data-Type Inc. has approached the elusive goal of user friendliness by adding the AutoGraph Touchpen to its line of low-cost expansion equipment providing medium resolution graphics capabilities for TeleVideo alphanumeric terminals. The Touchpen was developed by Sun-Flex Co. Inc., Novato, Calif.

"Because the Touchpen uses no electronics in the stylus, it's very accurate and simple to operate," says Avery Blake, president of Data-Type. "The user can interact directly with the host processor, rather than with a slower keyboard. The cursor appears on the screen at the point of contact with the stylus, so the user doesn't have to waste time searching for or positioning the cursor."

Sun-Flex's Touchpen system includes a transparent polymer mesh that stretches to fit over the surface of the terminal display tube. The mesh conducts a low voltage energy field across the tube surface. The Touchpen pointing stylus has a soft, conductive tip that allows a user to "draw" on the surface of the display through the mesh.

Veteran graphics maker Tektronix Inc. is also marketing a new business graphics system designed to be user friendly. The Beaverton, Ore., firm is incorporating graphics software directly into its compatible hardware. Speeds of the enhanced versions of Tek's 4052 and 4054 desktop computers that incorporate this change have increased tenfold, the company claims.

And Hewlett-Packard, which spreads its graphics capabilities over several divisions from Boise to Cupertino to San Diego, is aiming its latest offering at the business graphics market. Priced at $9,950, the HP 2647F is a multifunction intelligent graphics terminal capable of being used as an on-line intelligent terminal, an off-line graphics workstation, or both.

But not everyone is banking on business graphics. For now, the biggest force in computer graphics is still CAD/CAM. According to International Data Corp., CAD/CAM accounted for 64% of the computer graphics market in 1981, with $920 million in sales.

And that is the target at which companies such as Megatek Corp., California Computer Products (CalComp), and Manufacturing and Consulting Services, Inc. (MCS) are aiming their big guns.

"We'll leave business graphics to companies with cheaper display devices than ours," says Hiram T. French, vice president of marketing for Megatek, based in San Diego. He ranks CAD/CAM as Megatek's prime market, followed by simulation and training, data display and analysis at universities and in research and development environments, and process control. He notes that Megatek's software arm, Template, has a software package that is useful for business applications as well as for engineering graphics, but concedes that other, cheaper packages can do the same things just as well.

Newest in Megatek's Whizzard line of graphics systems, first introduced in 1979, is the 7600, which sells for $55,000 and includes an Intel 8086-based local intelligent front-end processor, a 3-D surface processor, Megatek's proprietary 32-bit microprocessor graphics engine capabilities, and more than 512K bytes of usable RAM in addition to 192K bytes of display memory. Prices can go above $100,000 when the 7600 is equipped with dual workstations, 16-color raster graphics capability, remote longline driver, data tablet or digitizer, and additional hardware to support dual operations.

CalComp's newest offering is a $78,000 color graphics workstation for its ITS 400 and 500 computer aided design systems. It permits use of 16 colors at one time, selected from a 4,096-color palette. Resolution is 832 by 624 pixels on a 19-inch diagonal screen with an image refresh rate of 60Hz, noninterlaced. Operator prompts and menu lists are displayed on a second, alphanumeric screen.

MCS, which bills itself as "CAD/CAM supplier to the world," introduced an interactive drafting system called Anvil-3000D at the NCGA show, saying it is the fastest, most comprehensive 2-D drafting system in the world. "It can propel the user into the world of CAD in a few days," boasts Dr. Patrick Hanratty, president of MCS. Offered as a turnkey system with a Hewlett-Packard 1000 and two display workstations, the Anvil-3000D goes for $105,000.

—Edith Myers

APPLICATIONS

FROM FORTRAN TO FILM

Digital Productions is working on what it calls "the future culture of sophisticated entertainment technologies."

Cable tv is to the entertainment world what a black hole is to the universe—an insatiable realm. Think about it: 64 channels at the viewer's beck and call, 24 hours a day. It's a thought that gives cable company managers nervous cramps. Where are they going to find enough talent to fill all that airspace?

"Computers," suggests John Whitney Jr., president and cofounder of a unique Los Angeles-based filmmaking company, Digital Productions Inc.

"What we are doing is laying the groundwork for the future culture of sophisticated entertainment technologies," said Whitney. What he and longtime partner Gary Demose are working toward is creating a computer-based system that will produce scripts, scenes, people, and most intriguing of all, behavior. Demose is the main mind on the technical side and vice president of Digital Productions. He and Whitney both foresee the day when a director will sit down at a terminal, punch in the latest ingredients for producing a first-run hit, connect a port to a cable channel, pop the "go" button, and boom! A continuous running movie begins, complete with a "crew" of writers and actors that don't take holidays, go on strike, get bored, or get burned out.

While all that sounds like an H.G. Wells fantasy, Whitney and Demose take their work seriously. They've even coined a new phrase for it: "digital scene simulation." The less informed still refer to it as computer animation. But there's more than just movies in the long-term plan at Digital. The two believe their special graphics algorithms can also be applied to the business world in such fields as oil exploration or engineering design and simulation.

For instance, Digital Productions is currently working with Ramtek, its major investor, to develop a special graphics software package that will run the VAX. Doing complex graphics on a mid-size computer is frustrating to many users because of slow response time. The Ramtek/DEC/Digital Productions system attacks the time limitation by sharing the computing task—some of the processing is done on the Ramtek terminal and some is done on the VAX.

Another potential business area is capturing Digital Productions' graphics expertise in software packages. The company has been doing work in the area of hidden surface and rendering algorithms. "This algorithm, which has been designed to perform well with Cray-1's vector architecture, will be supported by artificial intelligence structures developed in the LISP language," according to a Cray Research publication. The goal is to create an algorithm capable of producing moving scenes complete with full lighting transparency and solids simulation.

Cray explains it like this: "Solids transparency and surface transparency will both be models, leading into refraction modeling. Thus a ray of light emitting from a transparent medium will follow the laws of physics appropriate to the index of refraction, as well as the opacity, translucency, specularity, and internal structures of a transparent medium. In addition, reflection, texture, complex model coloration, shadows with penumbras, and full lighting will be developed."

But that's for the long term. For the near future, automating Hollywood is the

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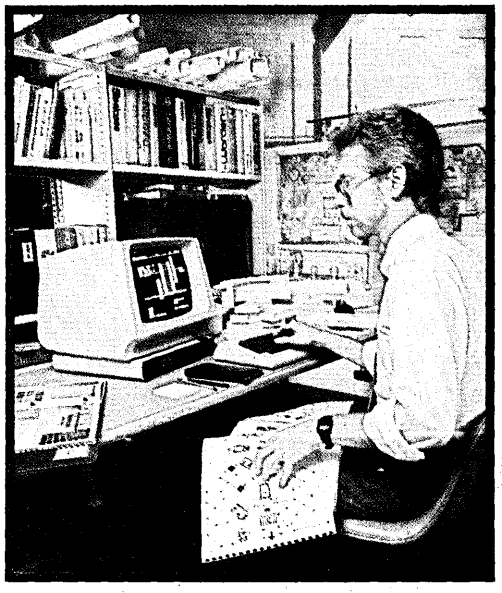

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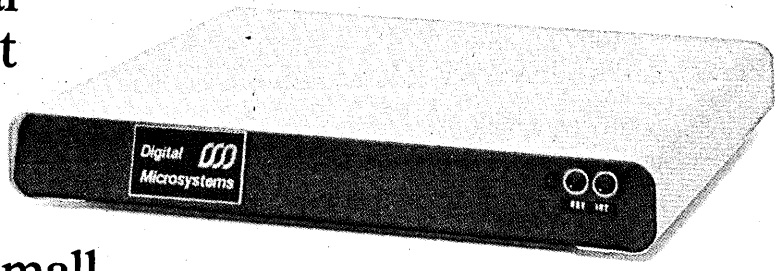

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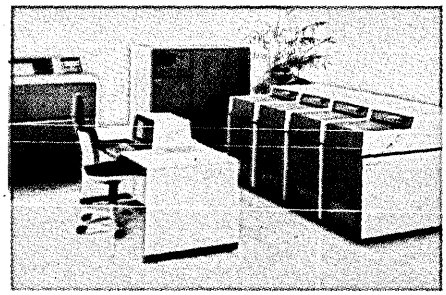

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prime target. It's been a dream of the duo since the mid-'70s. The roots of that dream go back even farther. Whitney, whose father, John Sr., is credited by many as the father of computer generated art, began making films using computers when he was 15. "I wouldn't be interested in making films any other way," he claims. Demose, who was something of a child prodigy—graduating from the California Institute of Technology at age 20—was influenced by John Sr., who taught humanities at Cal Tech. "That's how I first got to know Gary, as a student of my father's," recalls the younger Whitney.

The company leased a Cray computer, an investment it thinks will put Digital Productions way ahead of its nearest creative competitor.

The two first joined forces in late 1973 in an ill-fated business deal with the sage old graphics firm of Evans and Sutherland. The deal was turned down but, recounts Whitney, "We found in each other great support and a mutual belief that the time had come to use advanced high-performance computer engines to create graphics for scenes in feature films." From there the duo said they went to Information International Inc. (Triple I), where they formed a division called the motion picture project.

Their handiwork is everywhere:

- A computer-generated human-like character, Adam Powers, who juggles a cone, a sphere, and a cube during a 10-minute experimental film (DATAMATION, March, p. 36).
- A computer generated picture of an IC chip on the cover of the August 1979 IEEE magazine. "To this day no one has generated an object as complex as that chip," claims Whitney.
- The movie *Westworld*, where they simulated the world as seen through the eyes of a robot gunfighter.
- The movie *Futureworld*, in which they created a lifelike picture of an actor's face for the movie.
- The movie *Looker*, where they digitized a human body.
- The new movie *Tron*, considered by Whitney to be the "most important" piece of computer simulation in feature films to date with one half to one third of the movie generated by computer. While at Triple I, the two worked with the director of *Tron* on script development during the two years prior to the property being sold to Walt Disney Productions.

According to sources close to Triple I, a "radical disagreement" about computing power needed to produce *Tron*, in addition to other points of friction, launched Demose and Whitney out on their own. Now, with the financial backing of Ramtek, Digital Productions has leased a Cray-1 worth $6.5 million—the first Cray delivered in the Los Angeles area and the first to be dedicated to graphics.

An unassuming industrial building where they occupy 17,000 square feet vacated by Lyon Van & Storage last December is presently home for the year-old company. The Lyon sign still hangs on the outside of the building and visitors are greeted by a mural of lions in the otherwise near-empty waiting room. The only area fixed up to their specs is the computer room, which houses the Cray and four VAX machines. In addition to remodeling and carpeting, plans include increasing the staff of 40 to between 200 and 300 over the next five years. By 1987 they hope to be successful enough to build their own building.

"What we're doing is going to become the driving force in how pictures are made," predicts an optimistic, certainly enthusiastic Whitney. So much braggadocio? Sure, but there's also a kernel of truth. Digital Productions is not populated with neophytes. It comes with a track record and Demose, who is on his third round of writing his own brand of algorithms. "Every time we leave a company we have to reinvent everything," moaned Demose. This time around he's writing for the Cray, an investment that Demose figures will put Digital Productions way ahead of its nearest creative competitor. "The real problem in the industry is volume, which is a function of computing power," explained Demose. "More computing power means higher volume and better quality."

Even using a Cray-1, the ratio of computing time to realistic images on screen is about 40 minutes to produce one second of film. Demose figures Digital Productions can produce about four minutes of film each month, or 48 minutes per year. "That's about half a feature, which is about the same rate Disney produces features," he added. Quality is what bogs the computer down, especially something like a human face. "Human beings are very difficult to simulate partly because people are so critical of how well you do that part," said Demose.

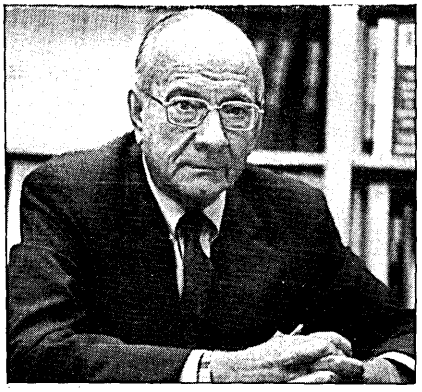
"Digital scene simulation" is what Demose and Whitney call their work.

But image simulation is only a part of the picture, so to speak. Demose has grander plans and more complex algorithms he is working on, such as teaching a computer how to tell a story. The main source of information about what people like to see comes from research done at the film schools, said Demose. For advice and guidance on how to tell a story and develop character, Digital is working with the "top people" in the industry. That's all Demose would divulge on that deal.

—Jan Johnson

IN MEMORIUM

HAMILTON S. STYRON



His competitors called him the Silver Fox, but to his multitudes of friends, both in and out of the computer industry, Hamilton S. Styron was simply Ham. Styron, who died last month in Pasadena, Calif., at the age of 71, is remembered for his sense of humor, his infectious laugh, and his intimate knowledge of the industry he served as western sales manager for DATAMATION until his retirement in 1976.

Tall, southern-bred Styron and DATAMATION grew up with this industry. In 1958, when the one-time New York *Sun* reporter left an East Coast direct mail house to join DATAMATION in Los Angeles, the magazine was a skinny, 48-page bimonthly with a circulation of 24,000.

The fledgling computer industry was short of advertising managers and ad budgets. Styron became a marketing consultant, helping companies get the money they needed to get their operations going and, not incidentally, to advertise. Growth for many of these firms came fast, but they did not forget his help.

Ham was born in Maine but grew up in New Bern, N.C. His first job, in 1930, was with the *Sun*. Next was a 10-year stint with a real estate management company. He joined the army in 1942, was taken prisoner during fighting near the Rhine, and spent eight months in a German prison camp until he was freed in spring 1944.

Following his discharge, he joined the direct mail house, W.P. Woodall Co. A partner there was Gardner S. Landon, who later became the publisher of DATAMATION and the executive vp of Technical Publishing Co. Landon was responsible for bringing Ham into the computer industry.

Ham never lost touch with his old friends in the industry nor with his "protégés"—younger salesmen whom he trained in a profession he always proudly called "space peddling."

He defined the qualifications for the profession: "Get along with people. Know your product and keep in touch with developments in the industry. Read the trade papers and learn how to read between the lines." He did, he was, and he did.

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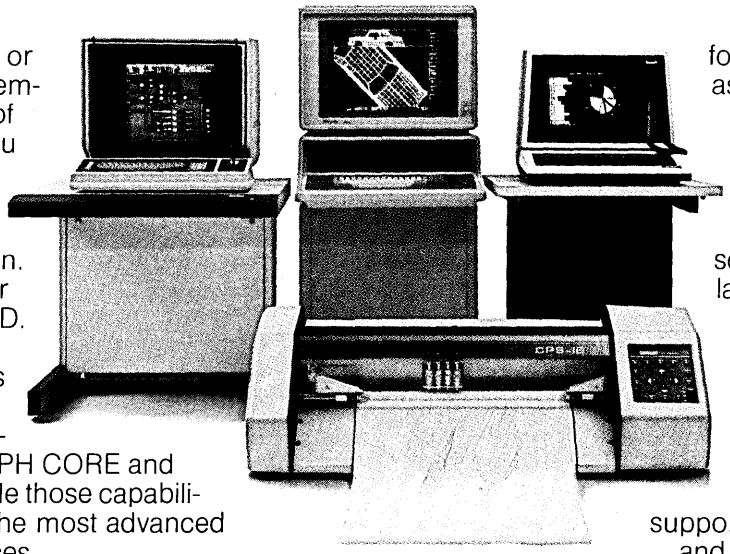

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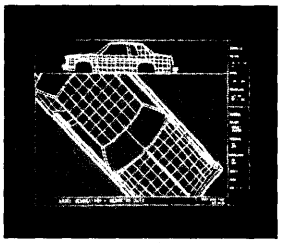

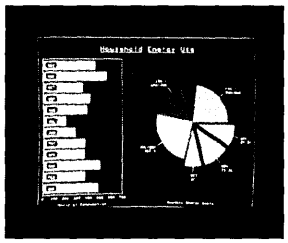

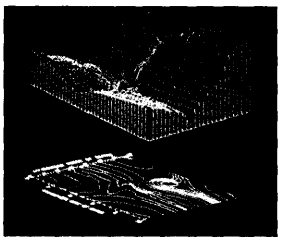

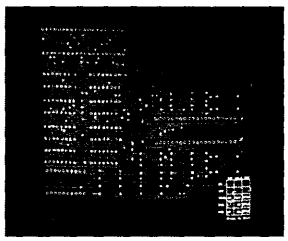

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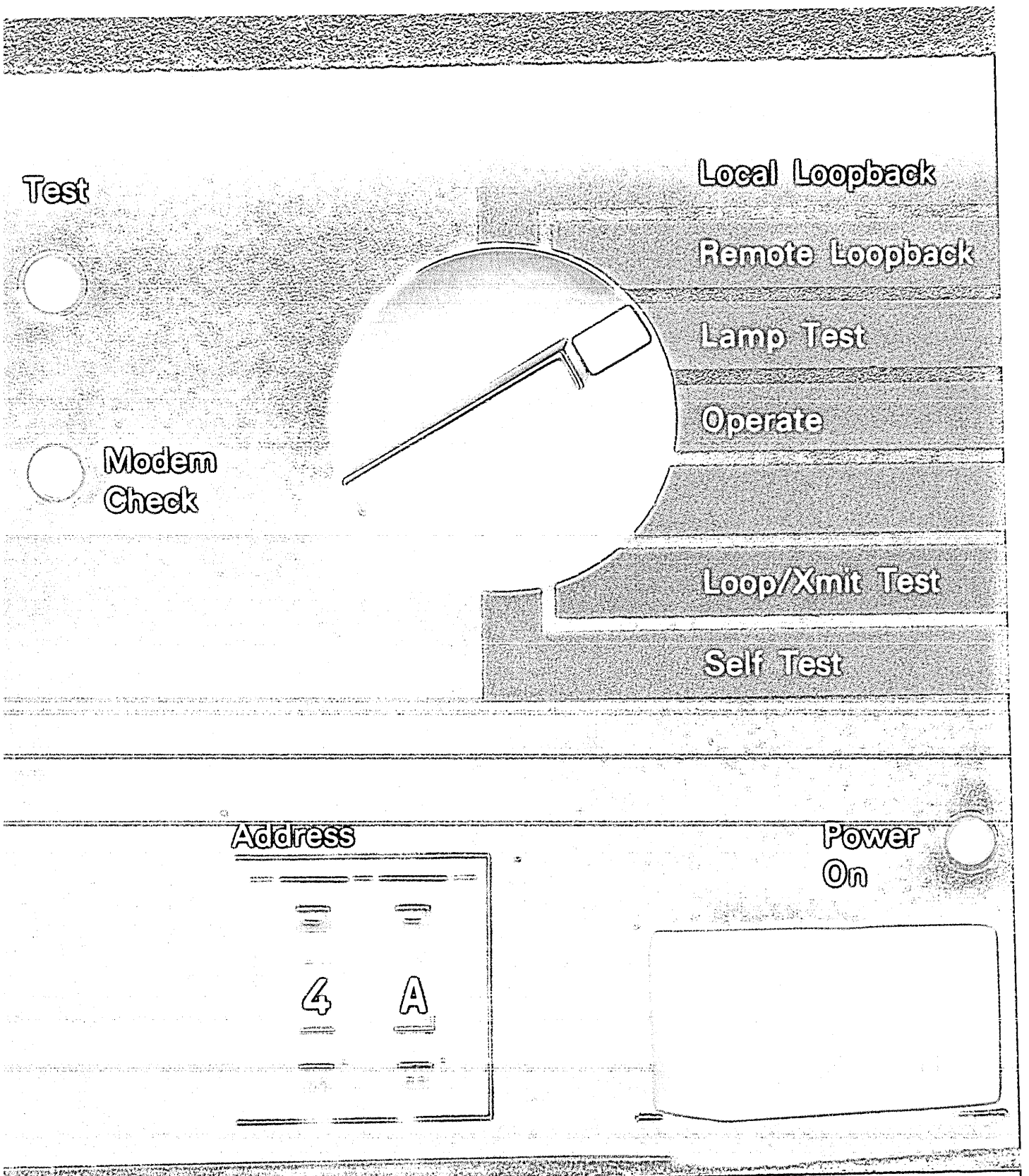
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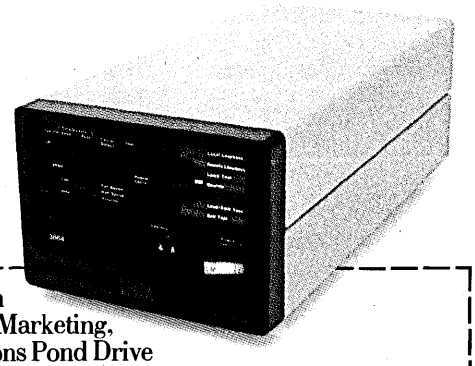

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NEWS IN PERSPECTIVE

BENCHMARKS

TWILIGHT: The System/3, IBM's small mainframe and perhaps the most popular machine the firm ever produced (before the personal computer), is being withdrawn from the market. The company gave notice in late June that the last two models — the 12 and 15 — would no longer be marketed after Oct. 15 this year. Machines will be available on a limited basis until then, along with spare parts, special features, and model changes. Industry sources estimate some 50,000 System/3 machines were sold worldwide since 1969, surprising many who had originally seen the system as an oddity with its nonstandard punch cards. IBM also said it is withdrawing from the market the relatively successful System/32, which was introduced in 1975 as an entry-level machine. The System/34 and 38 replaced that system in subsequent years, as did the company's variety of microprocessor-based systems. Nevertheless, observers expect many installed System/3s and 32s to continue operating for years to come.

A DOWNER: Profits at Data General, the beleaguered minicomputer maker, plunged 64% to $3.5 million for the third quarter, ending June 5. Revenues for the quarter were up 8.5% to $189 million. The firm also said it would close its U.S. manufacturing facilities for nine days in July, idling about 4,000 of the total 14,945 employees. Employees who want to be paid for the planned shutdown reportedly had to take the time as vacation. The shutdown was prompted by an order slowdown that resulted in excess inventory. The firm's 32-bit computer products have not been as slow moving as the older 16-bit lines. Ever optimistic, Edson D. deCastro, president, said the company is encouraged about "long-term prospects" because of early shipments of the microEclipse, a new line of systems unveiled earlier this year. In the comparable third quarter last year, Data General reported a profit of $9.7 million on revenues of $174.2 million.

BATTLE LOOMING: IBM has thrown its hat into the U.S. videotex ring with a system based on its Series/1 minicomputer and designed to provide private information networks with videotex services. More significant than the firm's entering the market is its choice of a protocol incompatible with the one AT&T has chosen for public and private systems. While it's not clear which firm will evenutally win out — some say there is room for incompatibility since the overall market is so large — AT&T would seem to have the upper hand so far since it's had a few years' head start in testing its system in conjunction with the Knight-Ridder newspaper publishing firm. For its part, IBM made a point of stating it is not supporting only one videotex standard but said it wanted to see one international standard that "best meets the needs of our customers." Essentially, the new IBM product is a software package that runs on the Series/1 and transmits pages of information to IBM personal computers or standard television monitors with adapters. Available in Europe since October, the IBM package is similar to British Telecom's Prestel system.

LET'S MAKE A DEAL: Sperry Corp. and Mitsubishi Electric Corp. of Japan have signed an agreement to work more closely together in the future. A generally worded statement is seen by observers to open the way to future agreements that would have the companies help each other in designing and marketing computers and peripherals. Sperry Univac is understood to be particularly interested in the Japanese firm's LSI semiconductor technology and certain peripherals, while Mitsubishi is eager for Univac's mainframe expertise. As part of the initial agreement Mitsubishi has upped its interest in Nippon Univac Kaisha, Ltd., a local sales company. Industry sources indicated that Univac is interested in selling in the U.S. Nippon-Univac's Series 80-65 computer, which is built by Mitsubishi. The deal may also be the first step towards Univac's getting into the IBM-compatible computer market, since Mitsubishi is known to be working on such machines.

CASE DISMISSED: A U.S. court of appeals ordered Judge David Edelstein to stop bothering IBM and the Justice Dept. with his inquiries into the 13-year IBM antitrust case that was dropped in January. The decision came after IBM went to the appeals court and asked that the judge be barred from any post-trial proceedings. Edelstein had been pursuing charges that Justice Dept. antitrust chief William F. Baxter had been negligent in not revealing work he had done in support of IBM previous to his current post and the issue of whether or not the Tunney Act for public scrutiny of antitrust settlements applied to the IBM suit's dismissal. Meanwhile, the Justice Dept. concluded in its own investigation that Baxter could have been more open about his previous dealings with IBM, but sought no punitive action.

IN AND OUT: Savin Corp., a strong contender in the low-end copier market, is aborting its efforts to enter the small computer market. The firm last year had set up Savin Associates, funded to the tune of about $10 million, which was to have sold machines built by Convergent Technologies. Savin says it's trying to sell the computer arm but will fold it if no buyer is found. No impact on Savin's earnings is expected because the venture never got very far, officials said. "Several hundred" systems were shipped by the 50-employee Savin Information Systems Division, which was set up last year to broaden the firm's product line into electronics. Savin Associates was disbanded as a tax-sheltered limited partnership when a controlling interest was bought by Canadian Development Corp. Meanwhile, Convergent does not expect too much impact from the possible loss of Savin business. Sales to Savin were said to represent 12% of 1981 revenues and 16% of revenues for the first quarter of 1982.

THE DATING GAME: Storage Technology and Control Data each disclosed initial and volume shipment dates for its copies of IBM's big 3380 disk drive. CDC came out slightly ahead, claiming it would make first shipments of its 33800 drive in the first quarter of next year and volume shipments the following quarter. Storage Tech said it would ship its 8380 product for the first time in the first quarter of 1983, followed by production shipments early in the third quarter. The schedules coincided with a disclosure by IBM to financial analysts that by late June it had shipped approximately 1,500 of the 3380 drives since deliveries began in late 1981. First shipments from IBM were delayed about nine months due to unspecified production problems. Meanwhile, Memorex, now a subsidiary of Burroughs, said only that it will ship its 3380-type product for field testing in early 1983. And startup Ibis Systems Inc., of Duarte, Calif., says it hopes to begin production of its bigger-than-3380 drive also in early 1983. In what may be a related development, IBM said it would offer volume discounts on the older 3350 disk drive for orders of 50 units or more. Those leasing or renting the drives have until December to convert to purchase and take advantage of the discounts.

BRIEF RELIEF: Charges against Computer Sciences of mail and wire fraud and filing false claims, dismissed last year, have been reinstated by a Washington appeals court as part of a case filed in late 1980. Computer Sciences won some relief from the court, which upheld a lower court's ruling that charges of racketeering and bribery be dismissed. As a result of that dismissal, the government won't be able to seek a forfeiture by Computer Sciences of its Infonet timesharing division, which was originally indicted on 57 counts of illegally gaining a $100 million General Services Administration contract and then inflating costs. While no estimate of a trial date was available, Computer Sciences and three related individuals will face charges that were dropped by a lower court early last year. The El Segundo, Calif., company can still appeal the matter and continues to state the charges are without any factual basis. Industry sources say the government was defrauded of about $3 million during the years 1972 through 1977 due to illegal actions by Computer Sciences. ✻

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The 950 is equipped with twenty-two user-definable function keys. The operator can short-cut to desired programs and save a lot of time.

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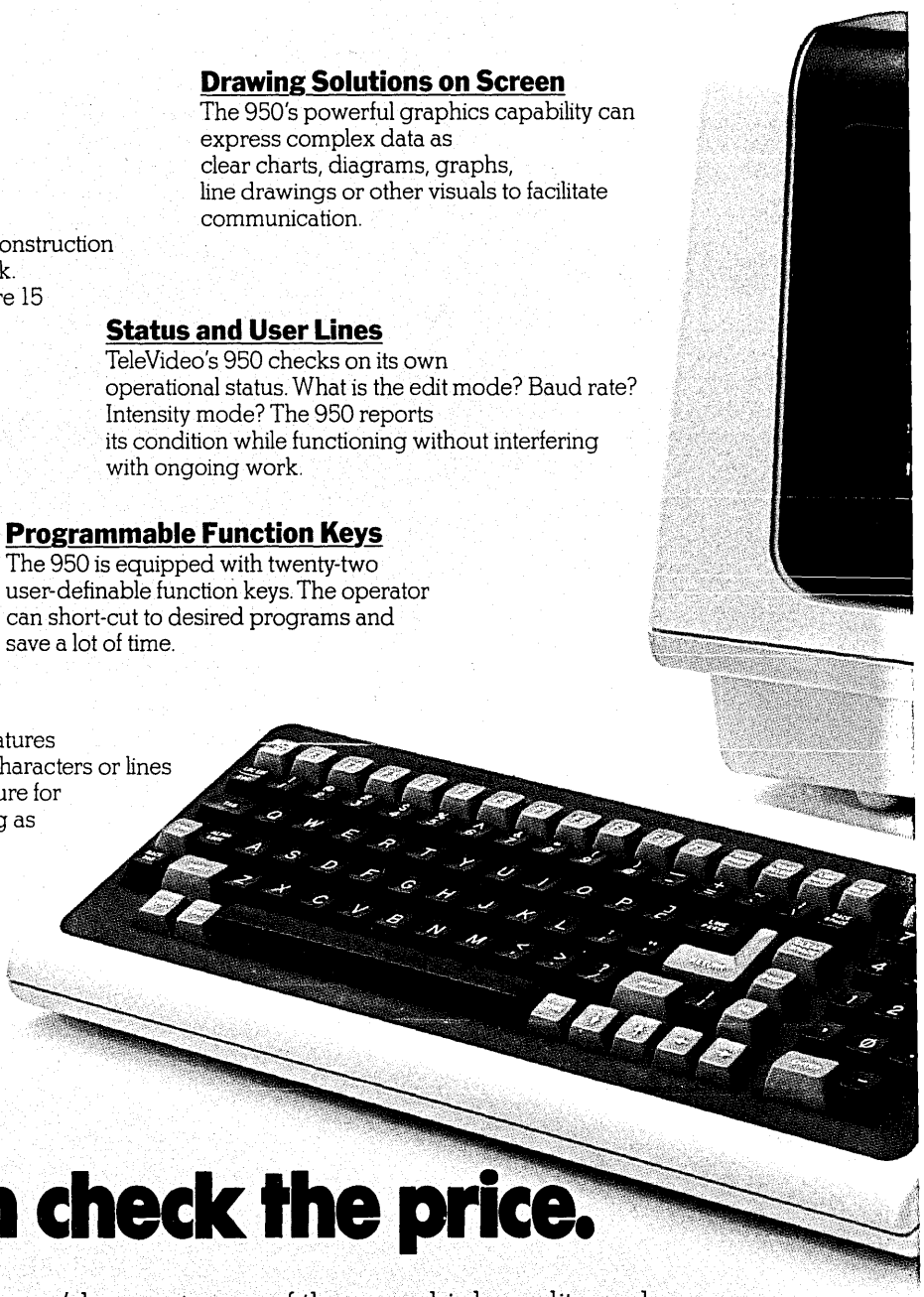
Ergonomic Keyboard
The 950's detachable keyboard is made for operator comfort. Work close to the screen, or place it on your lap. You decide what is more comfortable and productive.



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TeleVideo's 950 offers the features you'd expect in terminals costing much more than ours. And most of these features are also offered in our 925, at even a lower price. Both terminals are built with TeleVideo reliability, both engineered for high performance.

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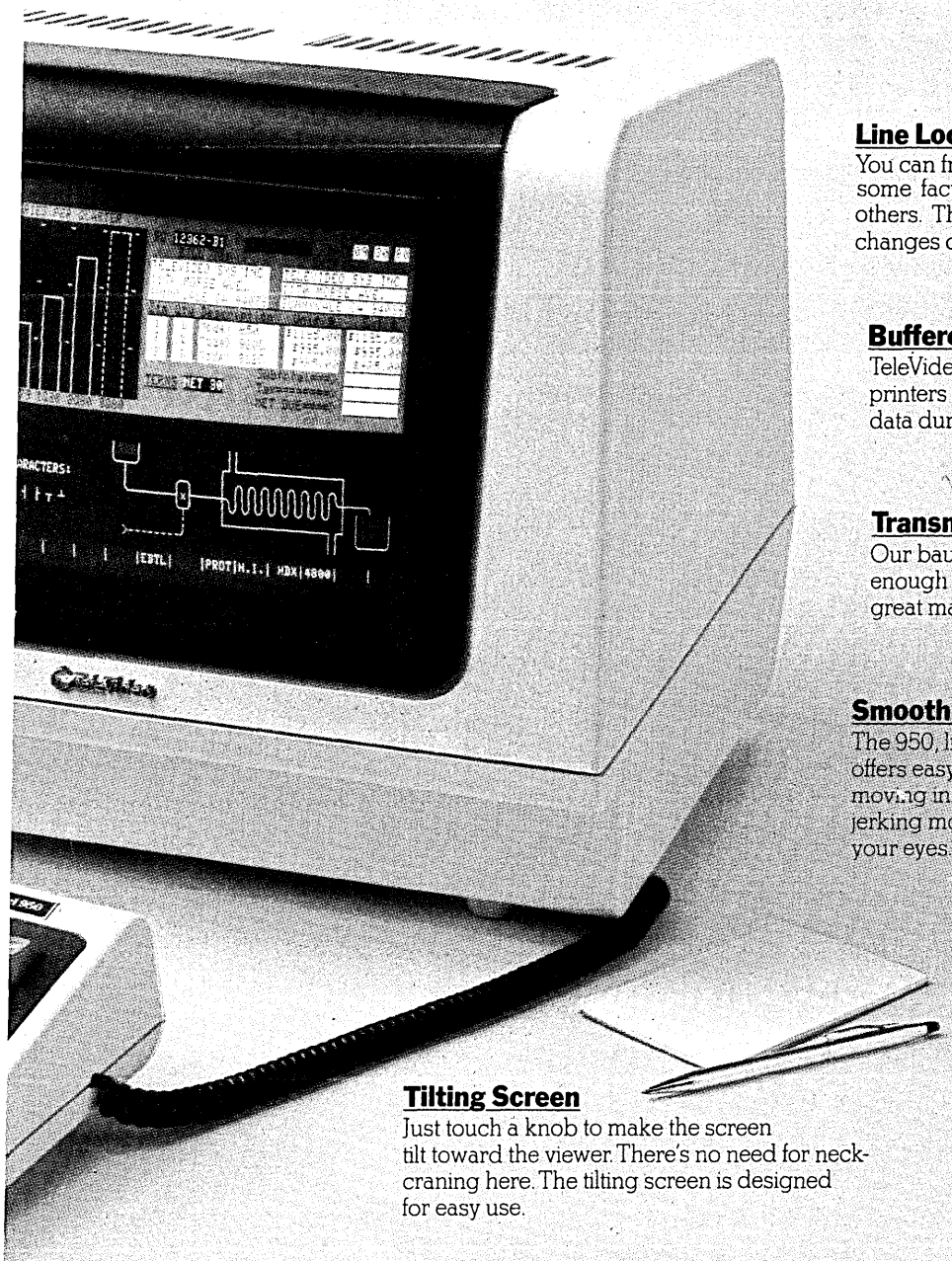
smart terminal, check TeleVideo's 950.



Line Lock
You can frequently reserve data by freezing some facts on screen while changing others. This feature eliminates inadvertent changes of field.

Buffered Print Port
TeleVideo's 950 can be used with printers of various speeds, so you won't lose data during slower peripheral cycles.

Transmission Speed
Our baud range is 50B to 19.2Kb, broad enough to accept data for the great majority of applications.

Smooth Scrolling
The 950, like all TeleVideo terminals, offers easy reading of fast-moving information, without those jerking movements that strain your eyes.

Self-testing
Remote troubleshooting feature determines if a service call is really needed, or if the operator can handle the problem. That saves time and money.

Tilting Screen
Just touch a knob to make the screen tilt toward the viewer. There's no need for neck-craning here. The tilting screen is designed for easy use.

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THE MICRO COMES TO PAKISTAN

Slowly but surely, a third-world nation is computerizing—and learning that small machines are sometimes more appropriate than large ones.

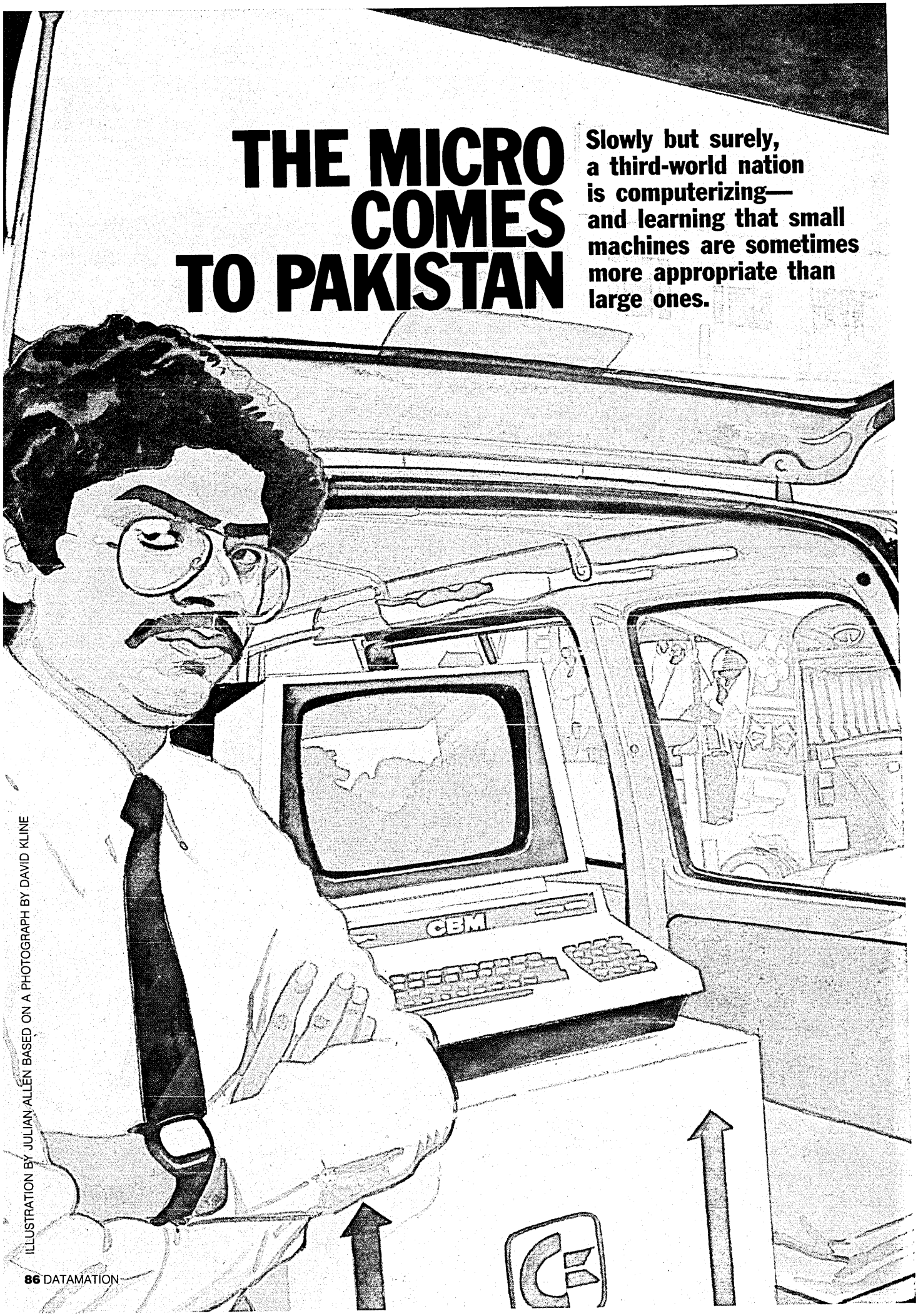
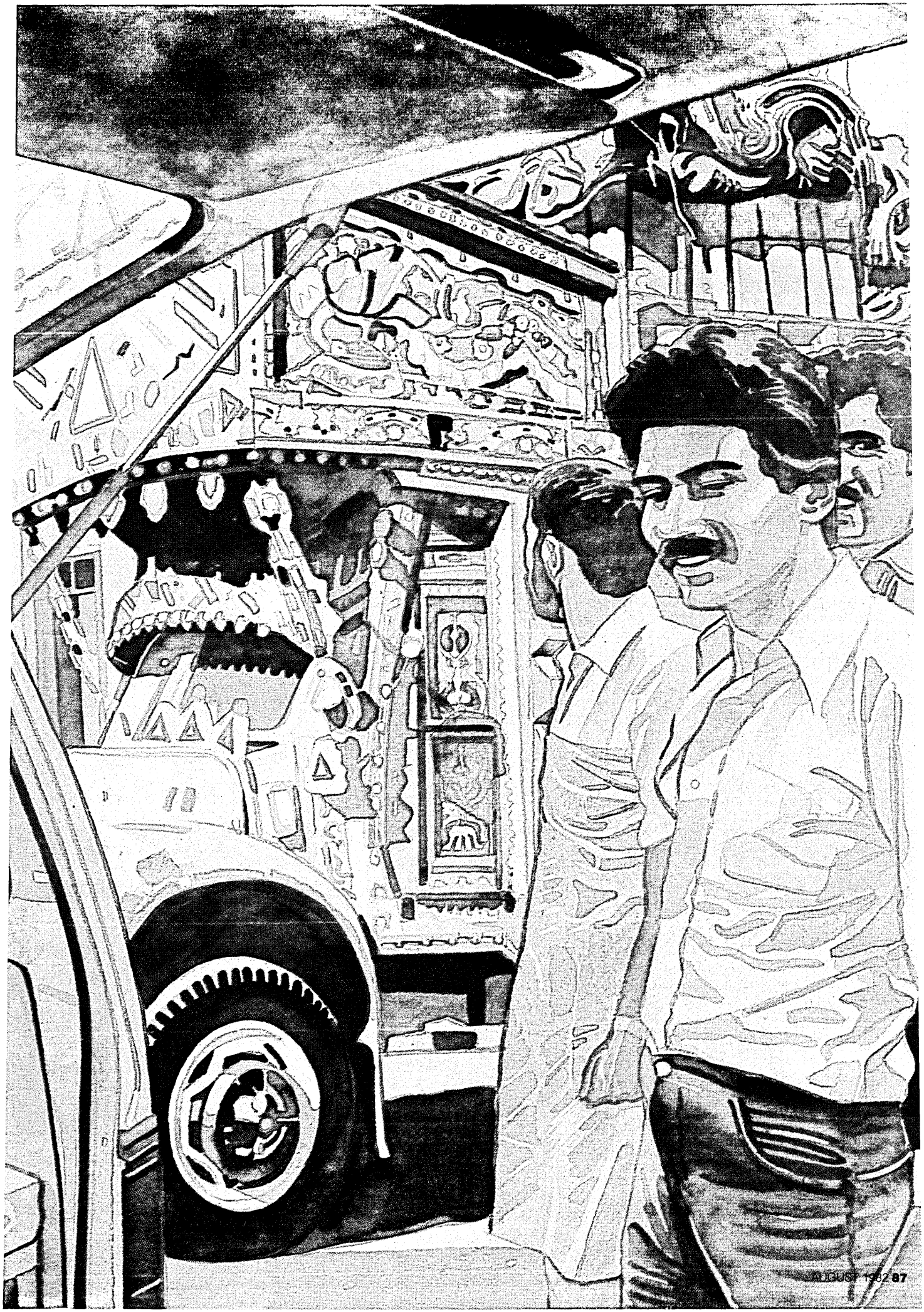


ILLUSTRATION BY JULIAN ALLEN BASED ON A PHOTOGRAPH BY DAVID KLINE



Micros can well serve the needs of Pakistani banks, manufacturers, professional offices, educational institutions, and some retailers.

by David Kline

KARACHI—Just a few miles south of the steaming slums of Pakistan's largest metropolis, giant oceangoing vessels lie beached on a broad expanse of sand. Hundreds of groaning and sweating laborers dressed in pajama-like Kalwar Shamis cut and haul and then cut away again at rows of rusting tanker hulks weighing thousands of tons.

From a distance, one is reminded of a dig at the site of the beached remains of some giant species of prehistoric whale. But these men are not paleontologists; they are "ship-breakers" employed by a firm that sells scrap steel from cut-up old ships. And this is not science; it's the sweat of the third world, the underdeveloped world, where nothing is wasted, least of all labor power, in the race against famine.

Anywhere along the coast of underdeveloped Asia this shipbreaking operation would be a typical, if still fascinating, sight. But there's more than meets the eye here. For one thing, the business is run by one Salma Ahmed, possibly the most beautiful and definitely the most powerful woman in Pakistan. But rare as it is for a woman to hold such an important commercial position in an Islamic country, even rarer is the fact that Ms. Ahmed uses a computer to evaluate scrap metal prices and manage inventories.

Yes, indeed, computers are coming to the third world, slowly at first but inexorably. Underdeveloped nations have begun to realize the potential of computer technology to their struggle for modernization, and beyond that, have begun to develop their own unique applications of computing equipment.

Pakistan, a poor nation with per capita income of barely several hundred dollars annually for its 84 million inhabitants, is a case in point. A market survey compiled by the American consulate in Karachi one year ago indicated that there were approximately 50 computers of various sizes in use in the country. Imports of such technology for military, commercial, and scientific uses averaged a mere $5 million annually for the previous three years, noted the report, which went on to project an increase in sales of some $7 million to $10 million annually through fiscal year 1983.

That was the thinking just a year ago. Now, however, the consulate's commercial officer, David Brantley, thinks the outlook is even brighter. "I believe we've really underestimated the growth potential for computer applications here," he says. "The market is getting ready to take off."

Up to now, that market has been heavily mainframe oriented, and American equipment, especially IBM equipment, has accounted for nearly 70% of all computers sold. Most users, furthermore, have been either government and military agencies or the very largest, often multinational companies.

But watch out, IBM, for the microcomputer has come to Pakistan. Just last September the government lifted its ban on the import of micros. (Why were they banned? Nobody seems to know for certain, but the government may have regarded them as luxury items that would add to the country's foreign exchange problems.) Already Apple, Radio Shack, and Commodore have made cautious but firm entries into the market, signing up those few local firms trained in micro systems to represent them and offering extensive training and support at their American or European facilities. Without a doubt, this new species of micro dealer regards the plush Karachi headquarters of IBM as a citadel ready for storming.

JUST PAST THE CAMEL HITCH

Leading the charge are the five Rashid brothers, who have just added a new company, Alrashid Microcomputers, Ltd., to their diversified group of businesses. Housed on the third floor of a dusty, nondescript old building barely two blocks from IBM's offices—just past the camel hitch and the sidewalk barber chairs on Altaf Hussain Road, to be precise—Alrashid is the exclusive Pakistani dealer for Commodore's full line of microcomputers. Since deliveries began in mid-February, it's sold some 15 units to local businesses.

Shahzad Ali Rashid, marketing manager, is the brains behind the firm's aggressive push into the market—or rather, the firm's aggressive expansion and tapping of that latent market. A well-educated man in his late twenties, Rashid looks like a smaller, bespectacled, and slightly scruffier version of Omar Shariff. As an old-fashioned ceiling fan whirls slowly overhead in its futile challenge to Karachi's oppressive heat, he sits in his small office and, accompanied by software manager Fareed Husain, describes the firm's approach to marketing computers in Pakistan.

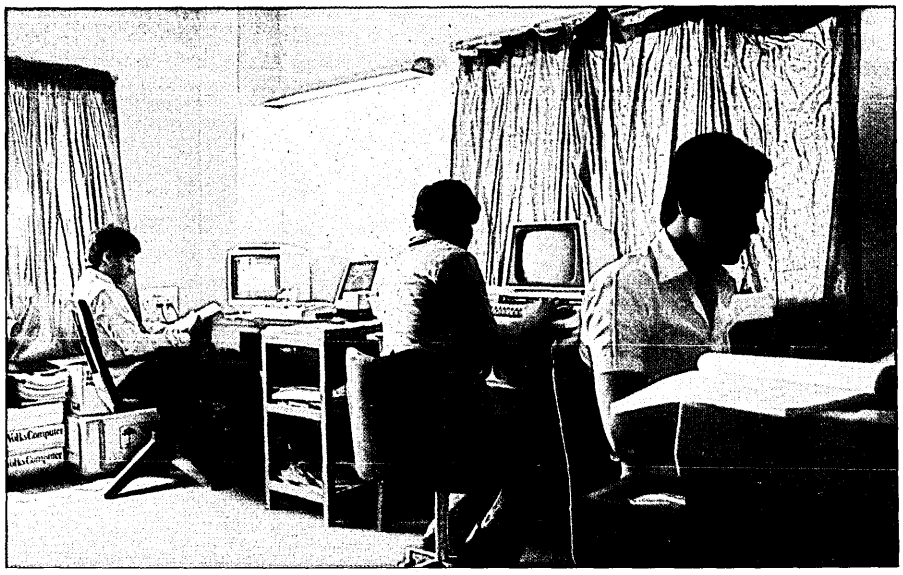
"I don't believe that selling computers in an underdeveloped country like ours means simply doing what you do in the West, only on a smaller scale," explains Rashid, thrusting his hand in the air for emphasis. "You have to recognize that while computers and what they can do are generally similar all over the world, our country has special needs, special problems, and its own unique application possibilities."

He notes, for example, that the market for home or personal business use is at the moment practically nonexistent in Pakistan, at least in the sense that it exists in the U.S. Further, consumer understanding of the technology is far below what it is in the West. But micros, he insists, can well serve the needs of that section of commerce and industry that in America might be considered small business but in Pakistan represents the medium-sized, nonmultinational commercial community.

"These businesses—Pakistani banks, manufacturers, professional offices, educational institutions, and in some cases retailers—these are our targets," Rashid explains. "But while Commodore's hardware is usable as is," he adds, eyebrows narrowing, "the software is often not."

Software Manager Fareed Hosain then gives some examples: "We sold a CBM 8032 to Kay's Poultry Farm here recently on the strength, really, of our custom-modified inventory control software," recalls the mild-mannered Hosain, who received his master's in electrical engineering at Ohio State University.

The poultry farm, it seems, needed a



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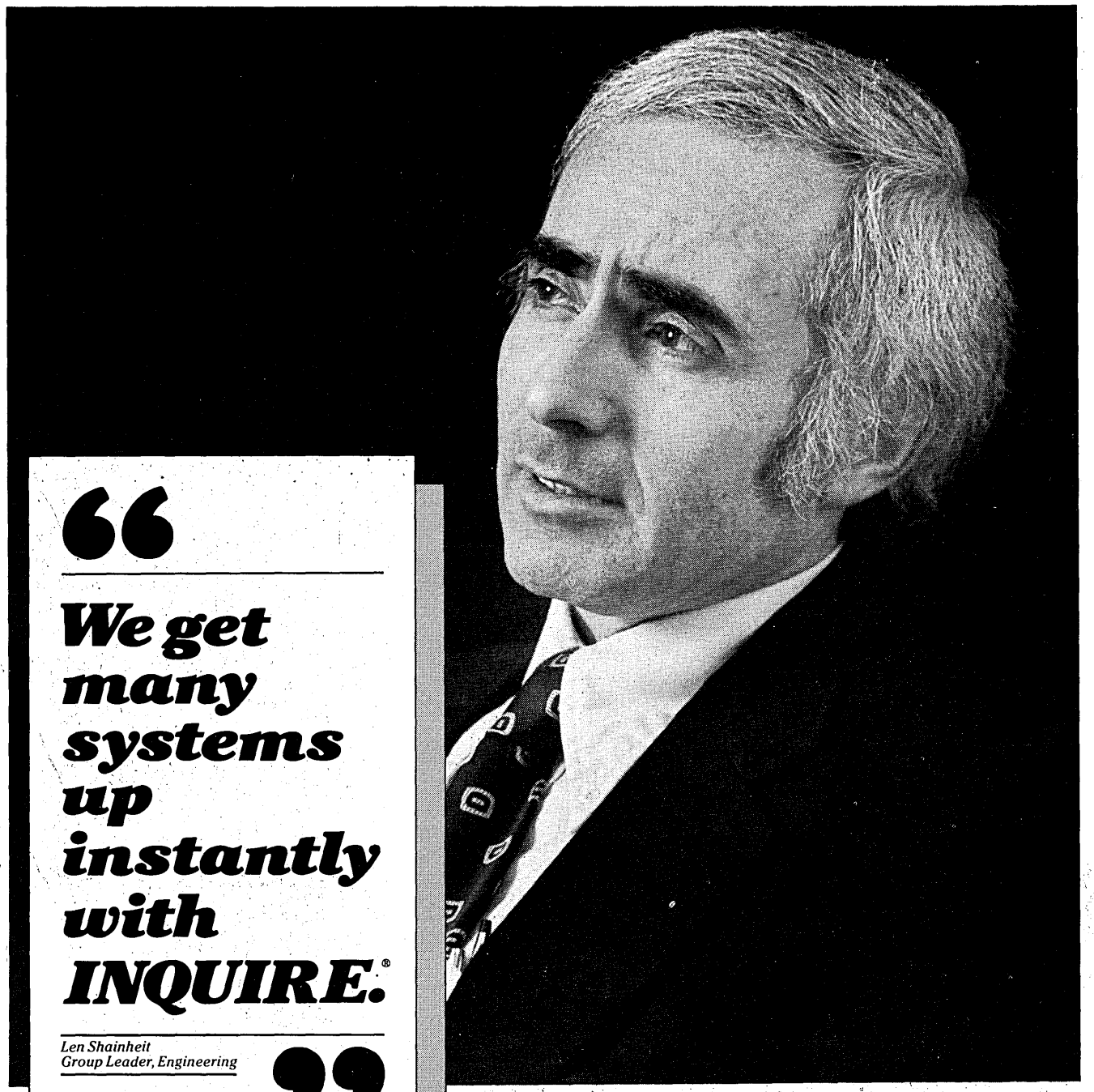

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A bank's main office may have an IBM System/34, but its branches must messenger bags full of numbers to the central office for processing.

computerized system for determining inventory reorder levels and amounts, much like any inventory control program sold over the counter in the U.S. The program also had to determine the ways in which 15 separate feeds could be combined to meet the nutritional requirements of a healthy clucker.

Complicating the whole business, however, was the fact that in Pakistan, unlike the U.S., prices and supplies are rarely stable. In fact, they fluctuate wildly from week to week. Ingredients 1 and 7 and 10, for example, may be all that's available of the 15 separate feeds one week—at prices, incidentally, 30% higher or lower than they might have been when last available—whereas the next week these three might be the only ingredients not found on the market.

Thus, the problem was to control inventories for a 20th century million-dollar business in a system where prices are determined by the 2,000-year-old bazaar practice of haggling between buyer and seller. As for supplies, well, let's just say that the most common word in Pakistani speech is "Insh'allah"—meaning "If God wills." Deliveries carry none of the fast-paced, Rock-of-Gibraltar assurances we in the West are used to; indeed, the only things that are "absolutely, positively" guaranteed in Pakistan are headaches and ulcers for inventory managers.

Sums up software manager Hosain: "Basically, we're talking about a very dynamic rather than static inventory control program." No kidding.

TWIST ON CHICKEN-EGG POSER

Hosain cites another example of the type of modifications needed on standard software in Pakistan. It seems that a Mr. A. Kavasji, harried plant manager for a medium-sized electrical equipment manufacturer, came to Hosain and his four software assistants with a problem similar to that faced by the poultry farm, though with a slight twist. Unlike the chicken and egg merchants, Kavasji's raw material supplies are always available and at steady prices to boot. However, as these supplies are generally imported from the West—and therefore must pass through Pakistan's unbelievably bureaucratic government customs and import procedures—a dynamic inventory control program also had to be developed. But whereas in the chicken and egg business the question is one of supply, price and nutritional components, here the challenge was to keep abreast of weekly and monthly changes in the bureaucracy that can have a radical effect upon the cost and level of production—and from all this, to determine inventory levels and reorder amounts.

Since introducing the Commodore computer with its custom-designed software, Mr. Kavasji has seen his inventory levels reduced by one third, while production has increased. He also has reduced his personal inventory of antacids.

These examples only point up the fact that most of what in the West is considered standard software has to be customized to some extent. General ledger and accounting packages, for instance, must be redesigned to take into account the various and complicated taxes and surcharges imposed by the government upon every transaction. Even word processing, when it is eventually introduced in the national language of Urdu, will be far more complicated than Western text-editing systems, requiring hardware as well as software customization. The 32 characters in the Arabic alphabet, for instance, can change form dramatically when written or printed, depending on how they are used in a sentence.

To be sure, we have been speaking only of commercial or other public uses, and quite a large share of this country's computer market lies in the fast-growing military field (half of Washington's new $3.2 billion aid package to Pakistan is earmarked for the modernization of the armed forces). Since Pakistan, however, is currently ruled by a martial law government with rather strong views on such issues as secrecy and censorship—and since this reporter had no wish to spend a few weeks in a Karachi hoosegow receiving a demonstration of the fundamentals of electrical current theory—this account of the local computer market is limited to the commercial arena.

Speaking commercially, then, Alrashid, Ltd. believes strongly that, because of the relative backwardness of Pakistan's economic and communications infrastructure, the microcomputer is far more suitable for the business community at large than are larger computer systems.

"Take the average bank," urges Shahzad Ali. "It may have one central office with an IBM System/34 or even a larger machine. But for its 50 or 100 local branches, there may be only some rudimentary calculating systems. These branches must dispatch twice weekly by messenger a bag full of numbers to the central office for processing.

"Why is that?" he continues. "It's because our telephone and communication systems are simply so rudimentary that communications terminals cannot be linked to that mainframe with any guarantee that they will work from one day to the next. Even local phone calls are full of static and are liable to be disconnected at any moment." This lack of computerization in branch bank offices means that rarely do account holders receive statements of their balance and account activity, even those with commercial or private deposits of several million dollars. If you want to know what you have in the bank in this part of the world, you call them up (providing the line is clear enough) and ask.

"So you see, microcomputers using floppies are the most economical way until our communications system is more advanced," Rashid declares. "Since hardly any bank can afford a mainframe or mini in every branch, why not put in a Commodore and, if the phones don't work, rush a floppy over to central headquarters."

COMPUTERS TAXED 50%-60%

Typically, computers are assessed duties and taxes averaging 50% to 60% of the original price. Thus Alrashid, Ltd. must sell its Commodore 8096 (96K memory) for 44,300 rupees (about $4,430). If you want the model 8050 mini-floppy disk drives with storage capacity of 1 Mbyte, figure on spending another $3,900 or so. The 8024, the 132-column dot-matrix printer, will take another $4,000 out of your bank account. Add it up, and this top-of-the-line system will cost $11,330 in Pakistan, at least twice what it would be in the States. Even the basic 5K VIC 20 sells for $770 here as opposed to about $300 in the U.S.

That kind of markup applies equally to mainframes, making them very expensive indeed. Because Pakistani businessmen have a lot less money to spend on computers than their Western counterparts, price is another strong argument for the introduction of micros rather than larger units.

If all this seems to argue well for a micro stampede in Pakistan, IBM executives are not about to leap from their executive office windows in desperation. Although the IBM Personal Computer is not yet sold outside the U.S., they welcome the introduction of computers of any size to Pakistan. They regard the key issue as one of developing and expanding the total market for high technology equipment, rather than one of battling for market share at this point. And, let's face it, with close to 70% of the current mainframe and mini market already in its hands and every likelihood of maintaining that share as the market expands, IBM does not have a whole lot to worry about.

Siraj H. Syed, director of staff services at IBM World Trade Corporation in Karachi, has been with the firm since it started here in May 1953. A portly man in his fifties, Syed agrees that the most rapid growth locally is in their smaller systems, especially the System/34 and, more recently, the System/23. But whether one is dealing with mainframes or micros or a combination of the two, the problems that must be overcome in advancing computer availability in Pakistan are the same, insists Syed.

Price, of course, is one problem. The severe lack of highly trained people is anoth-

SCIENCE/SCOPE

A new infrared radiation source has been developed at Hughes using a standard polysilicon gate MOS process. The thermal IR source is intended for use inside a dewar without optical windows for testing monolithic focal plane arrays at temperatures as low as 4°K. It illuminates at wavelengths from 4 to 6 millimeters with pulse rise and fall times of 1 microsecond. The source is a tiny, heavily-doped silicon resistor isolated from a thermally sunk silicon substrate by 400 nanometers of silicon dioxide. The resistor can be heated electrically to 50°K with about 100 milliwatts of power. A sapphire filter absorbs wavelengths longer than 6 micrometers; the source is not hot enough to produce many photons with wavelengths shorter than 4 micrometers.

Colleges and universities receive over $8 million a year in support from Hughes through various programs. Most stems from support through the Hughes Fellowship Program, 100% tuition reimbursement for employees enrolled in job-related courses or degree-directed studies, student co-op programs, and engineering classes held via interactive TV. Under a gift-matching program, Hughes matches employee contributions to schools of their choice.

Computer-aided manufacturing is improving productivity in the electronics business, sometimes by as much as a factor of 10 or more. Computers help do production planning efficiently by retrieving proven techniques and testing new situations through simulation. By controlling fabrication, process, and assembly operations, computers assure that each operation will be done right the first time. Such control also permits small runs to be handled with efficiency approaching that of a single-setup run. Hughes is spending $240 million over five years on computer-aided manufacturing. This capital investment is part of a $1.5 billion program for expansion and modernization to improve productivity.

Testing of the first portion of North America's new air defense system has begun at Tyndall Air Force Base in Florida. The system, called the Joint Surveillance System (JSS), spans the continent from Alaska and Canada to the southern borders of the U.S. It will operate from seven regional control centers, each keeping command over an area of about 2,000 nautical miles square. In the event of an air attack, each center will use data from civilian and military radars to provide surveillance, identification, and interceptor control functions. JSS also can relay data to E-3A AWACS (Airborne Warning and Control System) aircraft. The Hughes-developed JSS is due to be fully operational in 1983.

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The low cost of labor is perhaps the key source of resistance to computerization within the business community.

er, compounded by the steady emigration of those people who are trained to other countries where salary levels are many times higher than in Pakistan. Furthermore, up to now no educational institution in Pakistan has offered degrees or advanced training in systems analysis or programming—only the general field of computer science is taught. However, IBM and Alrashid, Ltd. are currently negotiating with several colleges and training institutes to begin courses in dp as well as interactive computing, BASIC, and a variety of other languages and skills.

EXPLOSION OF INTEREST

Even with these problems, interest in computers seems already to have exploded. Alrashid, Ltd. sponsored a computer exhibition in mid-March that was attended by over 300 people—a phenomenal attendance record here. Interestingly, however, reducing labor costs is not the objective of managers considering computerization. With the average salary of a bank teller or clerk something like $1,000 a year, the attractiveness of a computer lies solely in its ability to raise productivity in an operation and reduce the gargantuan paper load. Indeed, the low cost of labor is perhaps the key source of resistance within the business community to computerization.

Although the future appears bright for a rapid expansion of computer use in third world countries like Pakistan, there are likely to be certain political controversies surrounding such growth. Indeed, the fact that the computer industry is poised to become one of the world's largest economic sectors may ironically even widen the gulf between the rich nations and the poor, at least temporarily.

According to *South* magazine, some leaders of third world countries are deeply concerned about several trends:

- About 85% of the world supply of computers and computer data is in the hands of 10 Western companies, and IBM provides half of that amount.
- The direct use of computers by the third world is not growing as fast as the trend of a few supplying companies first gathering data in the third world, processing them in the West, and then reselling them to the country or origin.
- Vast amounts of crucial information on third world nations is already being stored in the United States. This is seen as a threat to the national sovereignty of these countries.

As a result of these trends, there are increasing demands in the third world to contain the flow of computer-handled information across frontiers, information that is now largely in the hands of multinational companies that, to say the least, are not fully trusted. But if some of these concerns can be eased—if equitable guarantees regarding information access and transmission between the rich and poor nations can be arrived at—the computer boom is likely to dwarf all previous advances of science and technology in the third world.

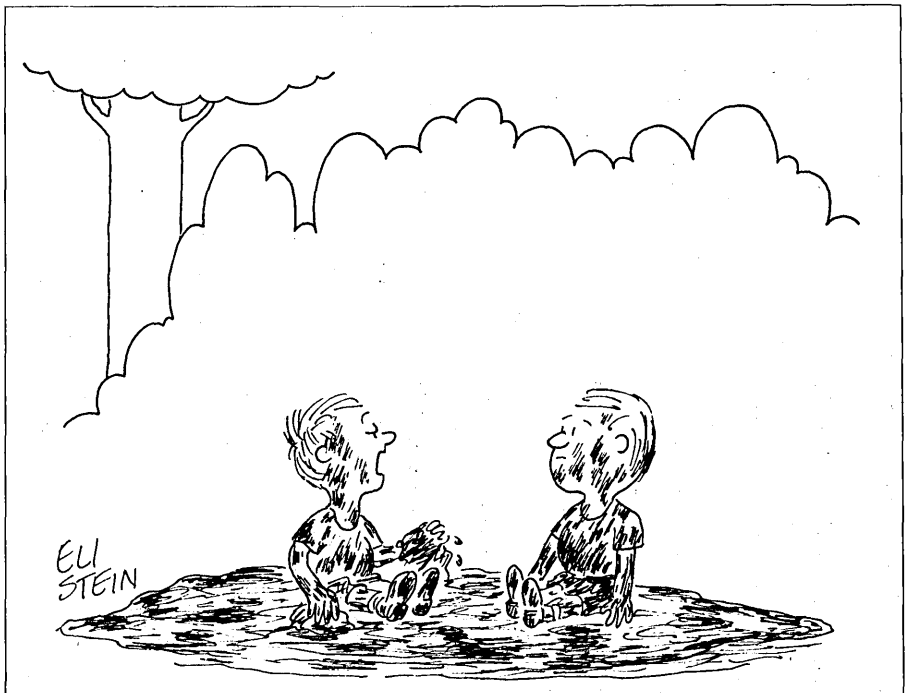
Arthur C. Clarke, writing in the November 1981 issue of *South*, speaks of the potential of underdeveloped countries like Pakistan to "leapfrog" some of the stages of development and modernization that the West had to pass through over the course of some 150 years. He suggests that computer-related equipment and associated technologies may not simply have to wait for a modern industrial, scientific and commercial base to arise, but may in fact rapidly speed up the creation of this type of modern infrastructure.

Says Clarke: "To many developing countries, satellites [for example] are essential; they will make it unnecessary to build the elaborate and expensive [telephone] ground systems required in the past."

No one agrees more with Clarke than Sarij Syed of IBM, who in his nearly 30 years with the company has already witnessed vast changes. The first computer ever introduced in Pakistan, he recalls, was placed with the Atomic Energy Commission in 1962 in the city of Dacca (now part of Bangladesh). The first commercial use of a computer—an IBM 1401—was at the headquarters of Pakistan International Airlines, also in 1962.

Just to show how far things have already come, Syed tells how he recently stopped at a small shop in the local bazaar to buy some poultry: "The shop owner was literally wearing rags, and I can tell you I wondered if the chicken was too dirty to eat. But when I asked the price, this man—completely illiterate, mind you—pulled out a calculator and figured it up. There he was using the multiplication button without even knowing what multiplication was. That's how deeply this sort of technology has integrated itself even into Pakistan."

One doesn't have to be a science prophet like Arthur C. Clarke to see that the computer revolution will be to the underdeveloped world of the 1980s and 1990s what the green revolution was in the 1960s and early 1970s (before it was discovered that more rice didn't do much good if all the rice was still owned by feudal landlords). This revolution won't necessarily mean that camels, ox-driven labor, and human sweat will be things of the past. But it could very well mean that in the not-too-distant future the third-world farmer may count his wealth in sons, oxen, and—believe it or not—computers. ✻



"Do you know of any recent advances in mud technology?"

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CARTOON BY ELI STEIN

David Kline is director of Impact Features, a Chicago-based agency for free-lance journalists. His articles have appeared in the *New York Times Magazine*, the *Christian Science Monitor*, *Rolling Stone*, and other major publications.

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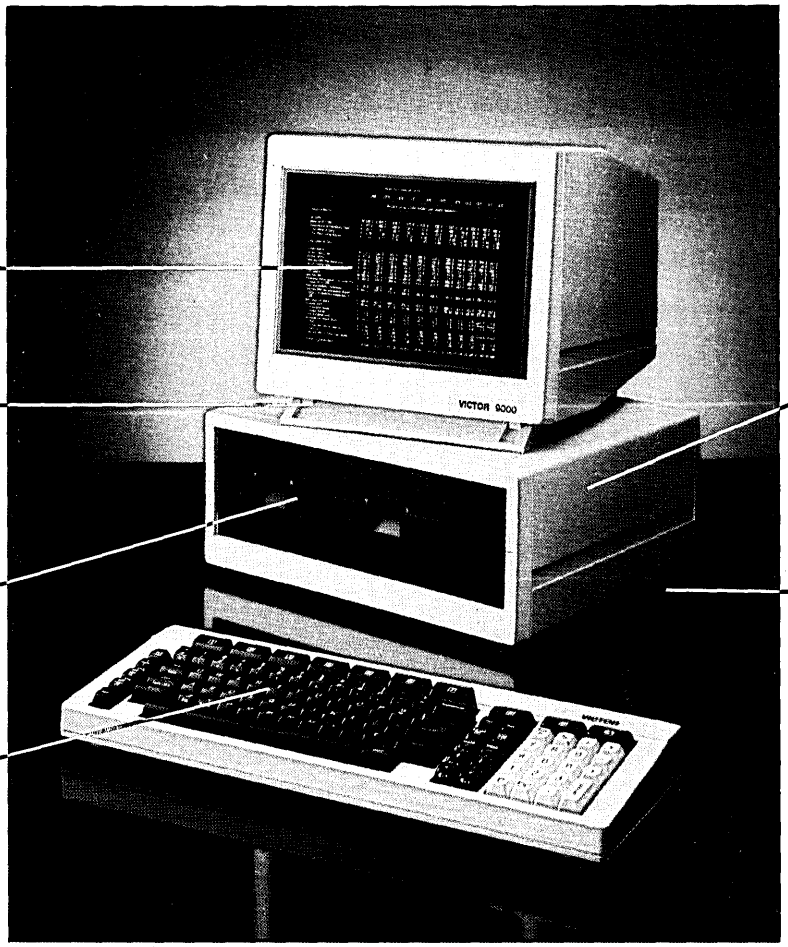

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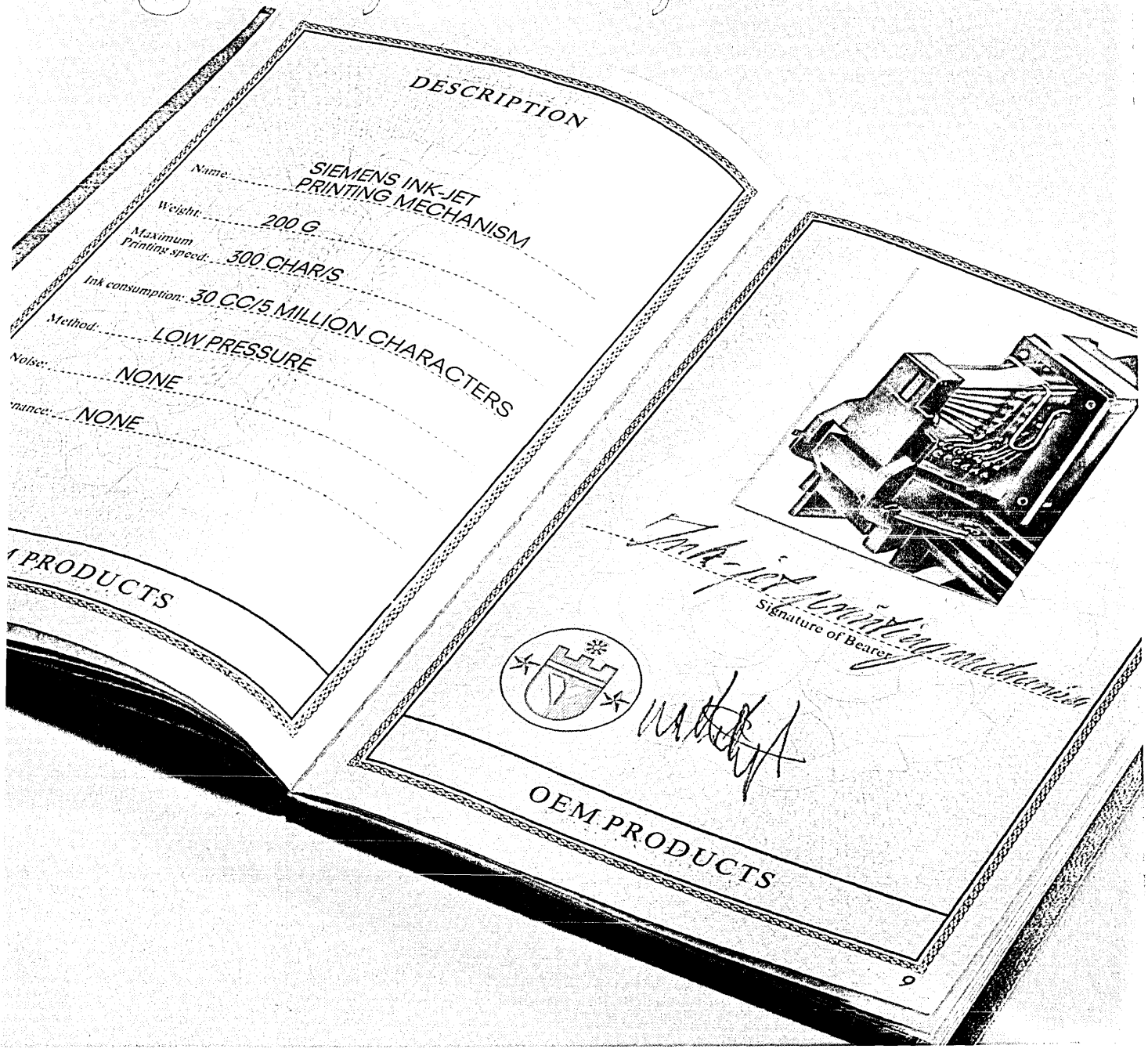

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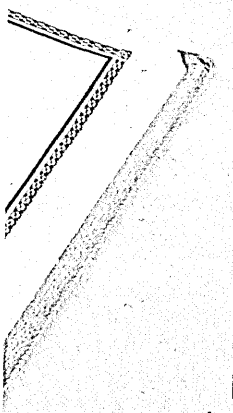

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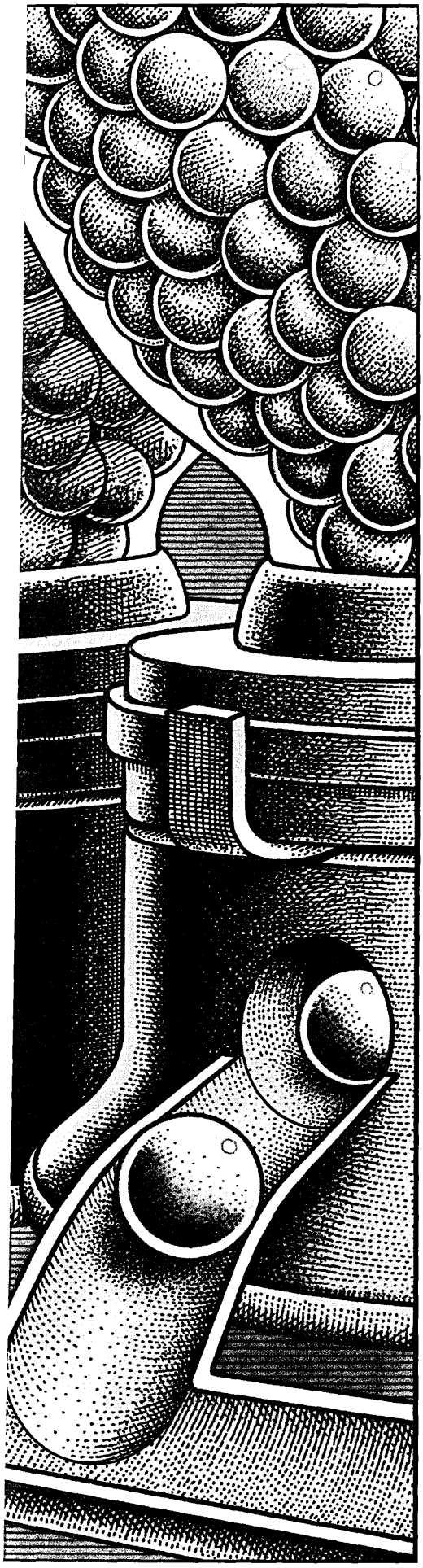

Users don't care how data are stored or sorted. They just want to choose a flavor.

DATABASE SYSTEMS FOR LOCAL NETS

by Eugene Lowenthal

A variety of forces have moved distributed data processing (ddp) from wishful thinking to reality. Among these are advances in the communication and human factors technologies coupled with rapid decreases in the cost of computing power and storage. The latent territorial instincts of the consumers of information, who want to own data and control what happens to it, have served as catalysts. Consumers have come to require a measure of independence from a central data processing (cdp) facility.

But ddp is not the nimble mammal to cdp's lumbering dinosaur, as some early visionaries proclaimed. The market for large mainframes is growing. Increasingly, ddp and cdp are viewed as solutions to somewhat different problems, and in most large enterprises there is an alliance of the two.

If it is true that ddp and cdp facilities play different roles or that they are optimized for different applications, then it is likely that their constituent building blocks will evolve differently. For instance, we would expect to see different directions taken with respect to editing languages, the styles of operator interfaces, and the attention to aesthetics in mechanical design.

Database management systems (DBMS) will also have to be different from traditional dp-oriented products if they are to be responsive to the special requirements of the distributed environment. This will be most evident in the context of the distribution vehicle known as the local area network (LAN). Important changes are needed both in the service provided by a DBMS in a LAN and its implementation, i.e., the way the service is packaged and delivered.

For purposes of this discussion it is sufficient to define a LAN as an interconnection medium characterized by:

- maximum node distances measured in meters rather than in kilometers or centimeters.
- bandwidths on the order of 1 to 20 megabits a second, and
- global addressability such that one node can potentially communicate with any other node at any time.

A well-known example of the LAN approach is the Ethernet, originated by Xerox and developed further in collaboration with Intel and DEC. The Ethernet envisions a federation of microcomputer- or minicomputer-driven elements communicating with one another through a coaxial cable. No node is in control of the network and there is no notion of master or slave implicit in the network architecture itself. Systems built on LANs, however, (including those that are Ethernet-based) will tend to be dominated by two general classes of nodes: workstations, which are operated by people and from which requests for access to global resources originated, and servers, which directly control the various global resources on behalf of all the network users. The servers field the requests and satisfy them.

In most instances a workstation is designed around a terminal (human interface) with a display and keyboard stylized for a particular application such as word processing. In the spirit of distributed processing, the workstation has some processing capability—say, for screen formatting and editing—and may have some complement of small peripherals including a floppy disk or character printer.

The central feature of a server is that it is a system resource that cannot be dedicated to a single workstation. The reason for sharing the resource may be simply economic. For instance, given the price and performance characteristics of a large laser printer, it makes sense to attach it to the network rather than make it the private property of a workstation. The big printer would be managed by a print server that has sufficient intel-

Because it is a DBMS in a box, the database server is likely to be confused with other types of database machines.

ligence to schedule the device among contending users.

Another reason for sharing a resource may be the need to make common information accessible from multiple workstations. Thus a file server serves the twofold purpose of sharing a relatively large, expensive disk and also the information that is stored on the disk. Small, private files might be maintained on a workstation's flexible disk, but large or public files would be owned by the file server. A file server must at least coordinate concurrent access to a given file from multiple requestors; a sophisticated facility would support such additional services as file sorting, catalog management, archiving, and index searching.

A database server is a file server that has gone to college. It handles not only files but databases (i.e., collections of interrelated files). It is a network node that contains a multi-user DBMS. As such, the database server represents a substantial investment in complex software and hardware. But once in place, its services and the databases themselves may be shared by all of the workstations and possibly other servers. For instance, large print files might be spooled to a database server and requested by the print server when it is ready for the job.

SPECIAL NEEDS OF SERVERS

The special requirements of database servers clearly differentiate them from other classes of DBMS products. Later on we'll focus on the contrast with conventional database systems, but some differences are worth emphasizing at the outset. In the typical DBMS environment, a single software package running on a single computer comprises the complete facility, with the end user or programmer interfacing at the top and the storage interfacing at the bottom. In the LAN environment, however, such functions as language processing and output formatting are the domain of the workstations, and they may differ greatly depending upon the application. A word processing terminal, data entry terminal, and BASIC terminal all need access to files, but each receives requests and formats output in a unique way. The objective of the database server is to provide as much of the DBMS function as possible without including the human interface or limiting what that interface can be. It must be a general purpose DBMS engine that deals with the semantics of database management but leaves the syntax to workstations. And, unlike a software DBMS, the database server must also handle conventional files and access methods so that there is no need to have both a file server and a database server (with their own sets of expensive disks) on the same network.

Because it is a DBMS in a box, the database server is likely to be confused with other types of database machines that have received a lot of attention in the past few years. But the database server is very different from the large, architecturally radical machines that have been proposed. Both rely on distributed intelligence, based on the separation of the human interface from the DBMS engine. But the design of the large database machine is motivated almost entirely by considerations of price and performance relative to mainframe software DBMS. The result may be a back end that offloads the mainframe, providing the same database bandwidth at lower cost. Or perhaps the product employs set-associative hardware to achieve transaction rates that even the largest mainframe cannot approach. Accordingly, these products are viewed as major subsystems in a slave-to-master relationship with a small number of similar large hosts to which they are connected through high-speed parallel channels.

With respect to a database server in a LAN, cost is definitely a constraining factor, performance requirements are modest, and hardware efficiency is not a burning issue. The emphasis in design is on achieving low cost for function rather than accelerating transaction rates. Furthermore, the database server is a somewhat autonomous node in a nonhomogeneous network rather than a peripheral attached to a host's I/O channel. As such, the interface to the user processes requires a complex communications protocol (instead of a specialized channel or bus protocol) to accommodate more flexible node-to-node relationships, assure reliable delivery of packets, allocate a single serial line among multiple conversations, and so on.

The overhead associated with this loose coupling, together with the relatively low bandwidth of the network medium itself (compared to an I/O channel), mandates that the interface to the database server be as con-

"Sorry, folks! While you were at the movies we seized your house and changed the locks. See you in court!"

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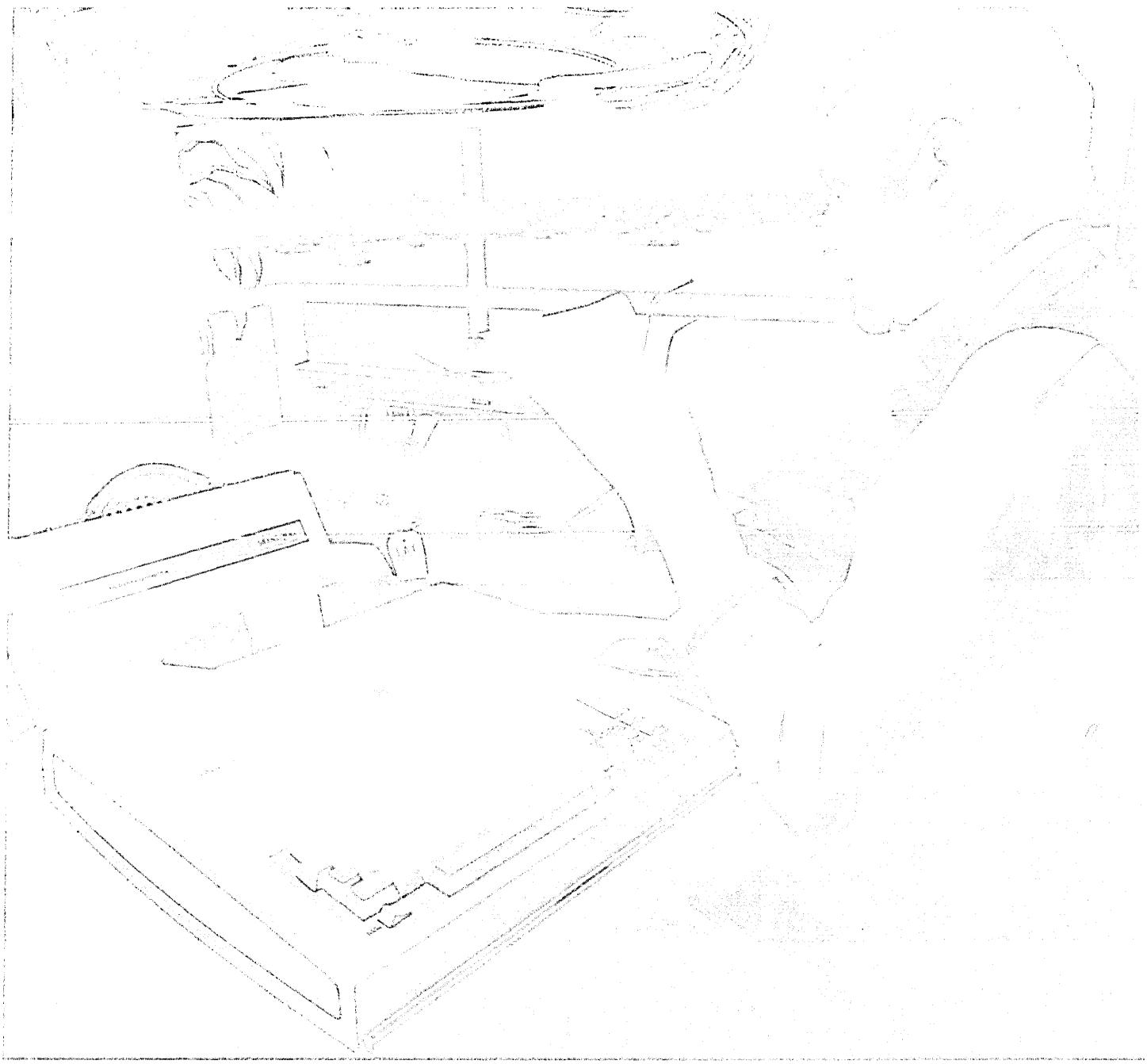

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The integration of word processing and data processing, is, like salvation, an objective many wish to attain without quite knowing how to get there.

cise and at as high a level as possible in order to minimize network traffic. This principle was clearly understood by the designers of the Datacomputer, a large experimental database server built for a large geographically distributed network—the ARPANET. The need for a high-level database interface is also obvious in the LAN environment, and militates strongly in favor of using set-oriented data manipulation languages instead of the more primitive navigational (record-at-a-time) languages. In particular, the language proposed by the CODASYL Database task group would be inappropriate as a database server interface, because it would result in more intense interaction between the server and the workstations than is necessary given alternative higher-level approaches.

USE OF MULTIPLE SERVERS

Does it make sense to attach more than one database server to a single LAN? If the objective is simply to add capacity or increase reliability, this might be accomplished by putting two or more database servers close together so that the same disks can be shared or switched among them.

But is it ever advantageous to have truly independent database servers on the same LAN? The need is not clear unless it is to take provincialism to the bitter end: I have my database server and you have yours. In contrast to a long distance network there is no cost or response-time advantage, since within a LAN it costs just as much and takes just as long to access one node as any other. If the requirement for multiple servers is not obvious, then it is even less clear that these servers have to communicate with each other to implement a distributed database. As far as intra-LAN distributed databases are concerned, the only clear signal from the marketplace is that it is desirable to support transport of file or database subsets between the database servers and the floppies on the workstations. For instance, a page of a document can be edited at the workstation to minimize network delays and traffic.

The situation gets more interesting when the LAN includes a gateway. The gateway is a special communications server that allows nodes in the LAN to communicate with computers or terminals that are external to the LAN. For instance, the gateway may provide a link to one or more mainframes or even to the gateways of other LANs. The responsibility of the gateway is to manage these external links and translate messages between the LAN protocol and the protocols native to the remote hosts or networks.

One can envision a large central processing complex with connections to several local area networks in various departments or buildings. The cdp facility would be the residence of the corporate database, perhaps as it evolved well before the intrusion of ddp. At least two features will have to be provided in the next few years: the ability of a LAN workstation to access central files, and the ability of a database server to request subsets of central files for local retrieval, updating, and finally remerging. Similarly, we can anticipate a need to stage database subsets among communicating LANs, although today there is less market data to support this prediction.

Database subset staging is an aspect of distributed database management that is no longer technologically interesting. Most of the research today focuses on what are sometimes called transparently distributed databases, whereby a user at a workstation issues a query and the system is capable of going to any node that has data relevant to satisfying the query and formulating an answer for the user as if all the data were always at his node. The technical problems associated with implementing such a system are very complex, particularly when updating is taken into account. Moreover, the preponderance of users view transparency as blue-sky technology that will be nice to have when it works and when it's cheap. The practical requirements for the near term will be satisfied by simpler approaches. For this reason, a widely accepted commercial solution for transparently distributed databases shouldn't be expected any time soon.

All of the commercially successful database systems developed in the '60s and '70s were designed to satisfy the needs of the cdp function. The question arises as to whether new products for small machines should be clones of these earlier products. The natural response seems to be that only a subset is required. In fact the opposite is true: the DBMS for a small system must provide more services than the current generation of mainframe DBMS.

A more profound step forward is taken when the server is programmed to do something more than simple storage and retrieval for nondatabase files. For example, consider a feature whereby a file can be described to the database server as containing a document in some standard representation. Suppose further that the server is endowed with the ability to search document files in response to commands such as FIND ALL PARAGRAPHS IN DOCUMENT X THAT CONTAIN THE PHRASE ATOMIC ENERGY.

A database server that can also manipulate text becomes a far more effective building block for integrated office systems. Such a departure from strict database management is appropriate since information in the office is much richer and less structured than it is in the dp environment. For most of their history, computers have been required to deal with user data almost exclusively as formatted *records*, starting with punched cards and ending with databases. Certainly much of the information in the office can be represented as structured records, but even more can only be expressed as *streams* of text, digitized images, graphics, voice encodings, and other unbounded forms.

ONE BOX FOR TWO JOBS

The integration of word processing and data processing is, like salvation, an objective many wish to attain without quite knowing how to get there. The only clear-cut commandment at this point is that the same physical devices should be used for both kinds of jobs. Thus, the wastefulness of having a word processing terminal next to a BASIC terminal, for example, would be eliminated with new products capable of supporting both functions as needed. Likewise, the development of a database server that is able to handle both words (or pictures) and data is desirable for the same reason—minimum hardware redundancy.

The design objective of the Intel Database Processor (iDBP) was to achieve something considerably more ambitious than just getting double duty from the same tool. A key feature is the ability of the user to establish relationships between stream-oriented files and record-oriented files. Both kinds of information can coexist in the same database. In other words, the notion of database has been enlarged to accommodate new classes of data and new ways of combining data.

The iDBP is a computer that provides file and database management services to other machines (hosts) that are connected to it. The product can be configured as a back end or as a database server. In neither case is it a standalone facility; it can communicate with machines but not people.

The iDBP is positioned as a high-level building block to be incorporated as a subsystem within a complete system. It is marketed on an oem basis, primarily to manufacturers, system integrators, and software houses. It is intended for use in small multi-user systems and networks rather than in large mainframe or personal computer environments. Within these limits, any machine capable of communicating with iDBP is potentially a host. The host hardware, firmware, and software that implement the bridge between the end user and the iDBP is the customer's responsibility. The human interface thus can be tailored to the needs of the application.

The heart of the iDBP is an 8MHz 8086 microprocessor associated with up to 1 megabyte of ECC-protected random access memory. The system will accommodate up to four disk controllers, each containing its own 8089 microprocessor, and each capable of controlling up to four hard disks for a system

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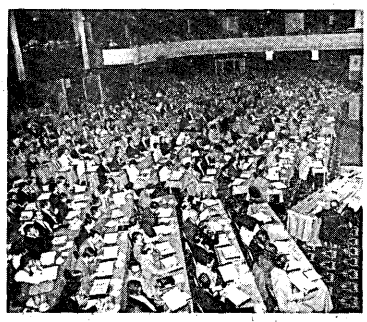

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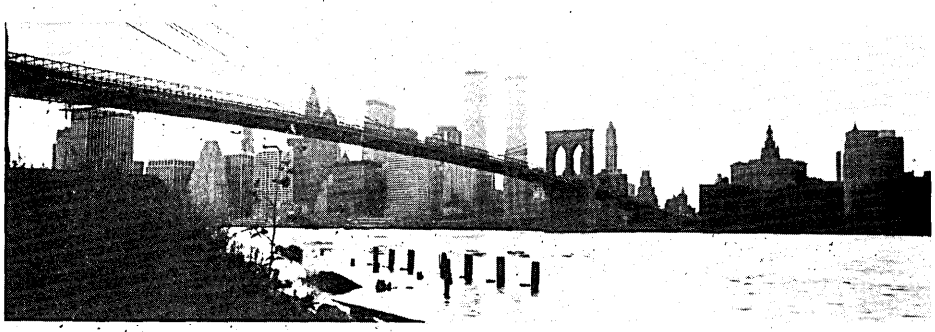

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A strong dose of human engineering must be applied to database systems in order to make them safe for ddp.

The argument for equality has become something of a litany for computing in the '80s. The cost of hardware has plummeted to the extent that today's small systems already have more computational power, central memory, and auxiliary storage than the mainframes that originally executed today's operating systems, languages, DBMS, etc. As a consequence of Parkinson's Law, users are demanding commensurately more utility from their small systems, and are developing larger, more complex applications and databases. At the same time, the cost of application development continues to go up, particularly as a proportion of total dp costs. Therefore, programmer productivity is a vital concern that sparks the demand for ever more powerful tools and prepackaged building blocks. Personal computers aside, there really is no justification for designing only half of a DBMS.

BEYOND THE DBMS

In what ways must the DBMS for a small system go beyond conventional DBMS? It's frequently noted that the user interfaces for today's systems require the expertise of data processing professionals. Even the use of query languages requires considerable technical skill. Such demands upon the user become unattractive in the ddp environment, and totally unacceptable in the office. A strong dose of human engineering must be applied to database systems in order to make them safe for ddp.

Nonetheless, this conclusion is misleading in that it ignores a more important requirement: in order to make database systems safe for ddp, they must disappear—at least as far as the end user is concerned. Professional programmers in the ddp environment will remain comfortable with the concept of database, and they are satisfied if the vendors provide good tools and solid incremental advances in the state of the art. But database management must be invisible to end users. They will interact with their workstations to do word processing, data entry, electronic mail, or electronic filing. The DBMS that supports these functions will be absolutely vital, but hidden from view. The ultimate consumers of information will take advantage of database systems without being aware of them.

The requisite division of labor in a LAN now becomes clear. The objective for nonprogrammer workstation design is to provide the most user-friendly command language and the most palatable presentation of information. The objective for database server design is to provide a functionally rich DBMS engine. But it also must be versatile enough to successfully support the diverse information storage and retrieval needs of a variety of workstations. It is in this respect that a database server must surpass the capabilities of a traditional dp-oriented DBMS.

For instance, it was pointed out earlier that a database server is expected to manage ordinary files as well as structured databases. Thus the server can handle nondatabase objects such as program libraries, spooled printer output, message store-and-forward queues, and BASIC work files. The server need not be sensitive to the content of such files; its responsibility ends with providing logical file storage and retrieval services. File management, then, does not necessarily represent a technical achievement so much as a simple recognition that a database server has more to worry about than databases.
maximum of 16 spindles. An optional tape drive controller is also available. Rounding out the electronics is an 8086-based communications controller capable of driving up to 16 serial lines. Several packaging alternatives are available, ranging from a kit of printed circuit boards to a completely assembled subsystem in a desk-high cabinet suitable for the office environment.

The host to iDBP communications protocol is sufficiently rich to accommodate:

- The use of a single physical line for independent conversations between iDBP and multiple applications in the host.
- The use of multiple lines when iDBP backends multiple hosts.
- The deployment of iDBP as a database server in a remote network or an Ethernet-like local network.
- Extensive error detection and correction so that, for example, a telephone line can be the communications medium.

The messages that a host sends to an iDBP are actually encoded sequences of commands for defining, manipulating, and administering data. At this level, the iDBP can be regarded as a functionally comprehensive relational DBMS, supporting the definition of relations, through an active integrated data dictionary, manipulation through extremely powerful set-oriented operators, and their control through a variety of integrity, security, and recovery mechanisms. The use of high-level set operators is essential to minimizing the communication between a host and an iDBP. Traffic is further reduced through the use of a macro facility that permits any frequently used sequences of commands to be cataloged as a unit within the iDBP.

While lacking a human interface, the iDBP database facility otherwise compares favorably with commercial DBMS software products designed for mainframes and large minis. This characterization applies to internal sophistication as well. For example, database sharing by multiple on-line users is provided through a multitasking executive that interleaves command execution, a file system that coordinates concurrent access to stored data, and a recovery system that guarantees the application of interdependent sequences of updates on an all-or-nothing basis.

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New DBMS products for local area networks will be very different from their predecessors.

CONNECT AND JOIN

Where iDBP departs noticeably from conventional DBMS is in its ability to handle files of arbitrary structure, including streams of text, voice/image encodings, etc. Complementing this extension to the data model are a very flexible pattern-search facility and a means for relating such files within databases. Specifically, we have coined a new relational operator called Connect. Like the relational Join function, Connect defines an associative link between two files. But where Join relates records of one file to records of another file, Connect relates records to substrings within a stream-oriented file. The substrings can be retrieved and manipulated as if they were arbitrarily long fields in the formatted record.

The ability to relate records to text (or other stream-oriented data) greatly simplifies the design of a wide variety of applications. Consider, for example:

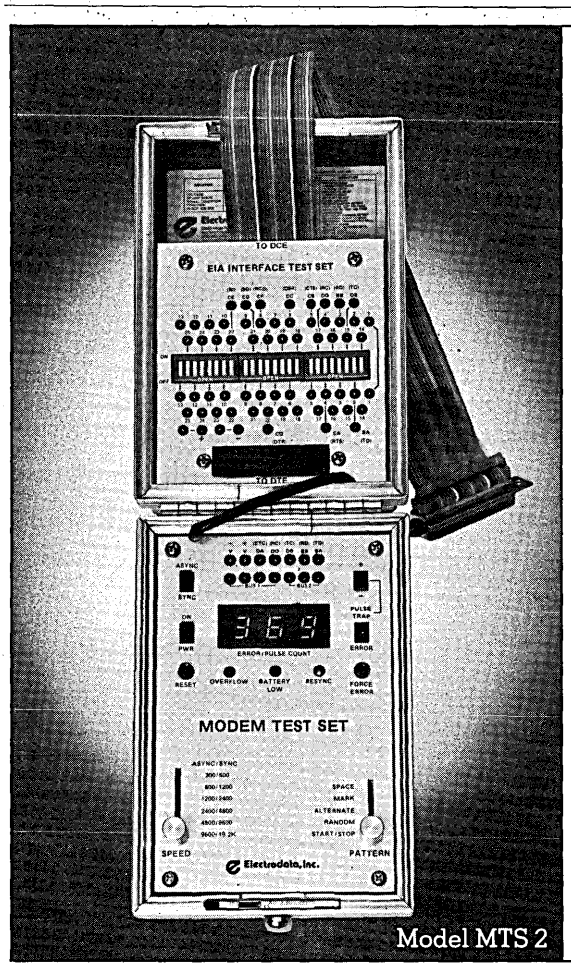
- The use of records to represent the modular structure of a manuscript in a word processing system, such that paragraphs (and even figures) are related, sequenced, and updated through the database facility.
- The unified management of both key word indexes and text in a document retrieval system.
- The ability to merge graphics information with records to facilitate CAD/CAM applications.
- The merging of text and database data to produce reports and form letters.
- The opportunities for enhancing electronic mail when individual messages (including voice or facsimile segments) are integrated into an organized database.

Elaborating on the last example, iDBP practically forces the system designer to think about electronic mail in new ways, because the solution is perceived in database terms. For example, it is easy to see how the end product could allow the user to search for past memos written by a particular author and pertaining to a certain subject. Providing a way for the user to add marginal notations also becomes evident. Issues such as security, integrity, and recovery, which are just as important in the office as they are in the data processing shop, are already taken care of.

New DBMS products for local area networks will be very different from their predecessors, both in the manner of implementation and the way they are applied. They will play a key role in unifying data processing and office functions by providing a holistic approach to managing and sharing all classes of information.

As integrated office systems become more sophisticated, the need for powerful underlying database tools will become increasingly obvious. But while database technology as such is approaching maturity, there is little understanding today of how it must adapt to the emerging office environment. As we learn the role of database servers and back ends as building blocks for the electronic office, that should change. ❋

In 1970 Eugene Lowenthal joined MRI Systems Corp., where he was chief architect of the System 2000 DBMS and ultimately became vice president of advanced development. After Intel Corp. acquired MRI in 1979, he initiated the database processor program, which he continues to direct. He has a bachelor's degree from the University of Chicago and a doctorate in computer science from the University of Texas.



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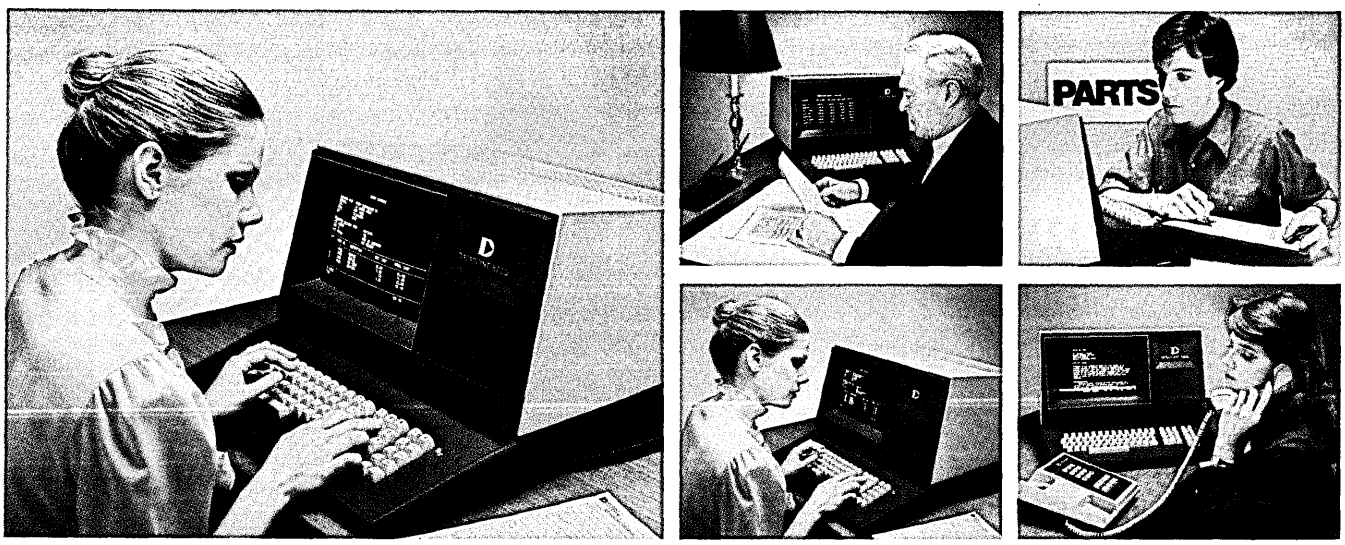

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How modern software development techniques combined with sound management practices to yield . . .

PRODUCTIVITY IN A DATABASE ENVIRONMENT

by Howard Fosdick

How does one manage for high programmer and staff productivity? More specifically, how can dp managers create a work situation where high programmer productivity occurs? Generally, there are two approaches to this problem. The first stresses modern software development techniques as the key to success. Top-down design methodologies, structured programming, high-level and nonprocedural languages, and software aids are but a few of these developmental tools.

The second approach to promoting productivity emphasizes the principles of management. The theory here is that programmers of equal background or experience will display productivity rates that vary by a significant factor. These variances are attributed to that intangible human factor called attitude or motivation.

Unfortunately, few studies relate the above techniques specifically to programmer productivity in database environments. Database packages have been offered for more than a decade, and we all seem to agree on their benefits. Certainly, it's time to explore the relationship between project management and programmer productivity in this area.

The productivity-enhancing methodologies discussed here are based on experiences and statistics gathered in a database project of unusually high productivity. Factors relating to both the value of software aids and managerial philosophy are analyzed, as are considerations peculiar to database programming.

First, a little background on the project. The applications system developed was oriented toward online use and included interactive data entry and update. The system was small to medium in size, consisting of some 54 programs; 85K source lines were produced, resulting in 34K lines of executable PL/1 statements and unexpanded assembly macros for control blocks generation.* This required 44 man-months of effort for a project duration of 13 months. The database system software was IMS/DB-DC.

In this project, all the aids of a typical large-system MVS environment were available, including TSO, SPF, Panvalet Online, Script, the PL/1 optimizing and checkout compilers, and other MVS facilities. The availability of a good text editor was particularly important because all programmers were responsible for extensive documentation of their programs. In our case, SPF offered full-screen editing, menu-driven utilities, automatic dataset recovery, and full support for power typing.

All project participants agreed that PL/1 was a major productivity-enhancing tool. Most installations would have used COBOL for such an application, but PL/1's block structure, its economy of code, and its systems programming capabilities made it a good choice. The language also offers strong string manipulation abilities. For example, the string functions conveniently handled data entered to the on-line programs by terminal users. This was useful, even though control blocks in the teleprocessing monitor provided input editing support.

Data dictionary software is also important to database productivity. For us, the Lexicon Data Dictionary provided various database control blocks and segment (or record) masks. Unfortunately, it lacked the ability to update control blocks interactively, which would have enhanced productivity further.

Finally, the value of interactive debugging was considerable. Database support software should allow program testing with programmer-specified "trapping" of database and TP monitor message calls. Call parameters should be available for programmer inspection. The Batch Terminal Simulator (BTSII) performs these functions for users of IMS/DB-DC.

Extensive documentation of the system was another important factor in achieving high productivity. Documentation facilitated project management and control. For example, program design specifications written by the applications programmer included pseudocode logic. The project leader and management reviewed this document prior to the coding phase to ensure comprehension of the programming task. The user's guide produced with the program contributed to its intelligibility, and full internal program documentation was another plus. Name, function, inputs, outputs, notes, and processing logic were required for each routine encoded.

Documentation was a major force for continuity in the project as well. Personnel came and went, as with any project, but extensive documentation blunted the otherwise severe effects of staff turnover.

Documentation's most vital contribution however, was at the system design level, where it helped preserve the conceptual integrity of the original design. The fact that the project team was small also helped. One large loose-leaf volume contained copies of all documents from the analysis and design phase of the project. Newer team members could refer to this book for project history and database design questions. Other volumes contained up-to-date copies of the database generations, subschema control-block listings, screen control-block generations, and segment masks. Requiring that all such documentation be kept up-to-date and in a central location solved control change problems while ensuring that all project members had enough current system information.

With database systems, the data dictionary provides a central repository for data documentation. The availability of an on-line interrogation facility to retrieve this information can maximize the data dictionary's role.

LESS IS MORE

Staff quality and motivation are as critical to a project's success as they are immeasurable. To achieve the highest productivity, small staff size is crucial. The common formula for expressing the increase in communications complexity as a function of staff size is (n (n - 1)) / 2, where "n" is the number of people involved. This means that high productivity in absolute terms is not possible on the largest projects. The statistics used as a

* These figures exclude database generations and JCL. They include unexpanded Program Specification Blocks generations, Message Format Services screen utility generations, and a small amount of reused code.

Staff quality and motivation are as critical to a project's success as they are immeasurable.

basis here indicate an astounding 770 executable statements delivered per man-month. This could only be believable when one knows that only nine people were ever involved in the project. In view of the fact that the installation involved had two large 370-class computers, the implication is that small independent projects are the optimal form of dp organization, even at larger sites.

Within the small developmental group, however, there should be a proper division of labor. Our project had one individual, designated a Local Database Administrator (LDBA), who was responsible for the full-time performance of DBA duties such as backup and recovery. This ensured that these problems were handled by a specialist. Obviously, few persons could qualify in this respect if they were divided between programmer/analyst and DBA duties. Secondly, it meant that project programmers were totally free of the distractions DBA duties would normally represent. When an IMS system-related bug surfaced, for example, programmers did not have to break stride in current development to rehash their earlier efforts. The LDBA handled such problems.

Finally, the local DBA served as the sole interface to the larger installation, assuming responsibility for communications with installation personnel concerning various systems considerations. This minimized communications complexity because the function was delegated to a centrally positioned, identifiable individual.

Another aspect of the project's labor division was that applications were considered in a broader sense than just the development of an individual program. One part of applications development was the design, development, and testing of an individual program. An associated aspect was the writing of relevant program documentation. This included both the internal program documentation mentioned earlier and the program design specification and user's guide. A third part of the applications development performed by the programmer is the generation of control blocks associated with the program. In the IMS/VS environment, this refers to the Program Specification Block (PSB) and Message Format Services (MFS) generations. Other database systems have corresponding subschema views and screen formatting utilities. The point here is that all activities relevant to the completion of the individual application program were handled by one person, avoiding communications time lags and multiplied interdependencies.

Contrast this to the standard procedures and organization of most large database installations, where a programmer may wait several days for a harried DBA to generate the subschema for his program. And if a modification is later required, the programmer may lose another day or two while the DBA makes necessary changes. As the philosophy of PERT charting shows, interdependencies apply a multiplier effect to schedule slippage.

FIG. 1

ON-LINE ENVIRONMENT RESTRICTS PROGRAM SIZE

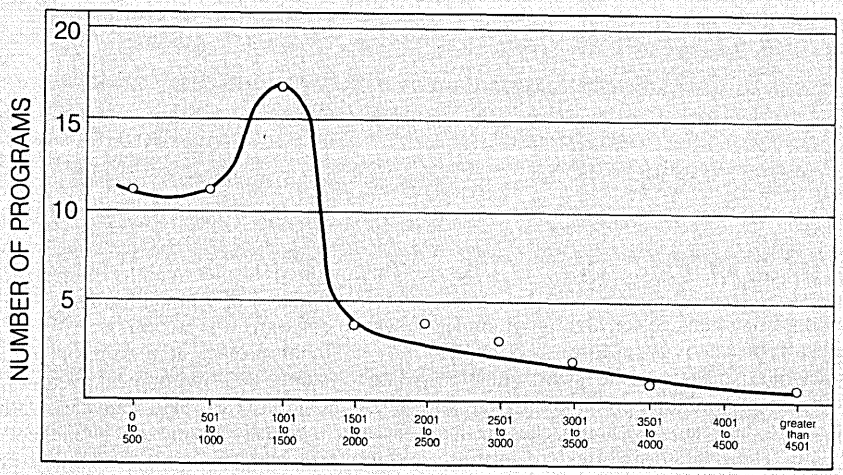


CHART BY CYNTHIA STODDARD

The rationale for this common division of duties is that security and project control are at stake. But what really happens in most shops is that the programmer tells the DBA what sort of subschema access is required to develop his program anyway. As for the suggestion that such PSB generations are too complicated for the applications programmer, any individual who can handle database programming can certainly create a control block requiring the knowledge of four different macro instructions.

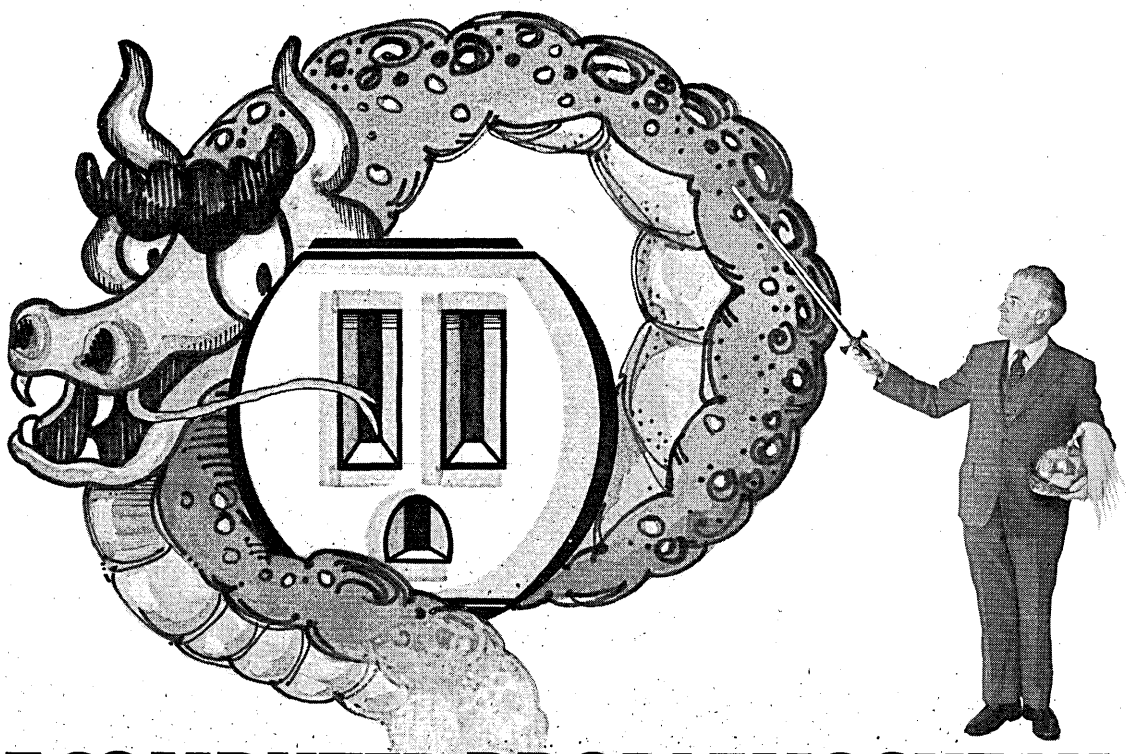
EFFECTS OF DESIGN

The effects of various system design methodologies on programmer productivity are overlooked too often. Modular design should be used to limit the size and complexity of programs in the system, and program interfaces should be kept to a minimum. As with interstaff communications, excessive communication between applications programs can only lead to increased interdependencies. A necessary modification in one program could otherwise reverberate in undesirable ways through any interfaced programs.

In the database environment, these principles can be applied by designing programs as individual modules selectable from menus presented to the user. The modules themselves should not be interrelated unless absolutely necessary. Ideally, each program should correspond to a small set of screen formats and should not utilize screen control blocks used by other modules. Program to program message switching and other such mechanisms should be avoided.

Statistics from the project upon which this paper is based show that the very nature of on-line database programming tends to promote modularity. In IMS, the concept of transaction carries strict connotations concerning the processing time and number of database calls of the on-line program. Fig. 1 illustrates the impact of these constraints on program size and complexity. The smaller programs shown were the menu programs and simple inquiries. The crest of the curve represents the more substantial inquiries. The largest on-line programs (or in IMS terminology, Message Processing Programs) are located on the initial downturn of the curve. These were the interactive database update modules. Finally, the few largest programs of the system were either the batch-type programs (BMP) or the database load program. Thus, IMS system software clearly reinforces modularization through the processing constraints inherent in its on-line message processing environment. Other database systems offer similar performance incentives. System designers should note that programmer productivity and system performance considerations are complementary in this respect—both are enhanced by modularity.

Within the same context, modularity can be carried over to the assignment of programs among members of the programming team. A programmer might be given responsibility for the group of programs that process particular databases or database portions. By focusing the programmer's attention on programs that process particular database rec-



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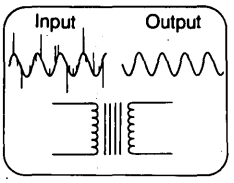
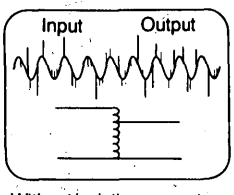
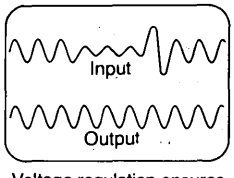


Line-to-load isolation shields computer from sharp, destructive voltage spikes.

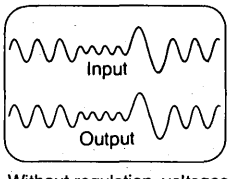


Without isolation computer is exposed to spikes even when power is supplied by voltage regulator.

WHY REGULATE?



Voltage regulation ensures stable voltage during brown-outs or voltage surges.



Without regulation, voltages sag and surge even when power is supplied by isolation transformer.

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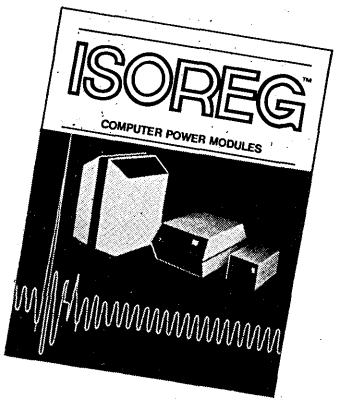

CIRCLE 84 ON READER CARD

Modular design should be used to limit the size and complexity of programs in the system.

ords, he or she then has the advantage of familiarity with those records.

Similarly, programmers' learning curves can be foreshortened when they concentrate on programs of logically similar natures. For example, one programmer might be assigned all the on-line cross-reference display programs in a system. The high-level logical infrastructure of all these programs might be the same. As another example, on our project programmers were assigned pairs of programs for "data entry" and "data change/delete" in the on-line maintenance subsystem. The project statistics indicate that raw productivity doubled for many of the data change/delete programs. Not surprisingly, these programs were written after the corresponding data entry programs. It was obvious that in writing the latter programs, the programmers knew the kinds of data validation required and were familiar with the data and database structures involved.

Logic and code reuse are closely associated with the above principle. Literature on this topic states that reusing code from existing production systems may retard productivity. But, dividing new program assignments in such a way as to facilitate code reuse among newly written programs can greatly increase programmer productivity. One should keep in mind that logic and code reuse are two different aspects of the same principle. Even when a program's requirements prevent direct reuse of code from another module, employing the processing logic from that other module might still result in significant time savings. Various nonprocedural development systems, such as IBM's Application Development Facility, seek to capitalize on this principle by reducing coding requirements for those logical functions common to most programs.

"Easy does it. We don't want to nick a corporate vice president, do we?"

© DATAMATION

CARTOON BY HENRY MARTIN

DON'T OVER-MANAGE

Many readers will notice that extensive walkthroughs and program reviews are not advocated. Several studies have shown that in large developmental projects 10% to 20% of staff time may be spent in various design and code reviews. This is undoubtedly desirable in the development of large or real-time critical software systems. In such situations, program and code reviews are considered essential to ensure module compatibility. Applications projects of the type described here, however, permit a trade-off between structured management and the productivity methodologies presented here.

Finally, the element of flexibility should be mentioned. There are all too many installations where excessive regulations are the unhappy fruits of overmanagement. In such situations, truly productive people become too frustrated and discouraged to maintain high performance levels. Good standards have the opposite effect—they increase programmer productivity. They are only initiated as the result of calculated judgments concerning their impacts on efficiency. Since the frustration level in computer programming is naturally high, managers must strive to limit bureaucratization of their programmers' work situations. Standards should be implemented only in so far as they have identifiable purposes and justified rationale.

Clearly, not all of the above techniques will apply to every database project. Certain of them, in fact, may only be relevant to small project teams working on database projects similar to the one discussed here. But by consciously considering these concepts in their relationship to database programming, managers can positively influence productivity in database environments.

Howard Fosdick is an independent consultant based in Glen Ellyn, Ill., who has authored many technical papers as well as two books. His most recent book is *Structured PL/1 Programming for Text Processing*. Mr. Fosdick received masters' degrees from the University of Illinois and Northern Illinois University.

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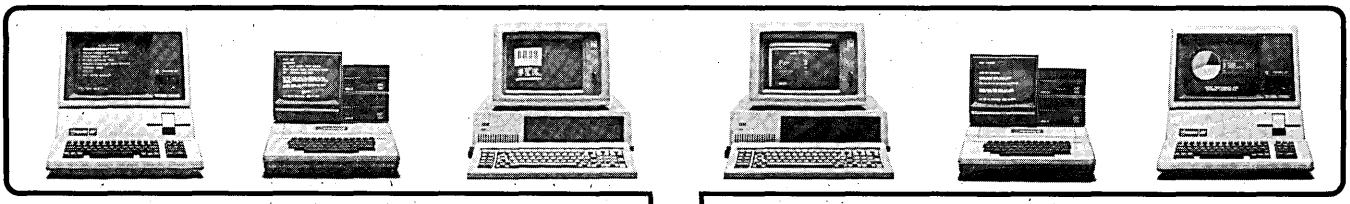

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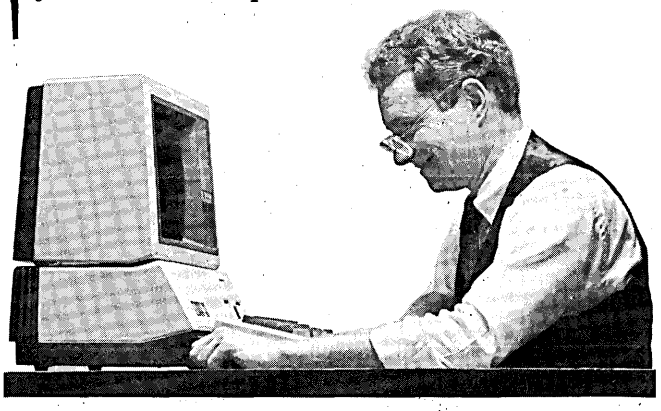

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COBOL is not about to go the way of Latin, but English is becoming a bit more widely understood.

NATURAL LANGUAGE IN THE DP WORLD

by S. Jerrold Kaplan and David Ferris

Artificial intelligence has been getting a lot of attention lately, and much of it has focused on the field's successes in natural language processing—the ability to communicate with computers in ordinary languages such as English. A lot of research has taken place over the last 10 years, and commercial products are beginning to become available. The Japanese are interested, too: they hope to use the technology as an integral component of their projected fifth generation machines.

The reasons for the interest in natural language processing aren't hard to find. We are all familiar with the increasing proportion of budgets taken up by software development and maintenance. In real terms, software costs have been rising since the first program was written, and as a result, easier ways of communicating with computers have been sought. At first, programs were written in machine code. Then assembly languages arrived, and later were joined by higher-level languages such as COBOL and FORTRAN. The pressure for more abstract ways of stating what was needed continued, and report writers such as Pansophic's Easytrieve and Cullinane's Culprit came into widespread use. More recently, the pressure has also been on providing the program instructions interactively rather than in batch, and interactive query/update products like Cincom's TASK and DEC's Datatrieve have been marketed.

It is reasonable to ask what the culmination of such developments will be. Will ever-higher-level languages be developed, making software development progressively easier, or is there some ultimate limit to the expressiveness and ease of use that such languages can have? A common view is that natural languages—the languages that people use to communicate among themselves—are the ultimate programming languages. Unfortunately, there is much evidence that this is not the case.

A natural language system (NLS) is a program that allows a computer user to interact with the machine in an ordinary language such as English or French. The program accepts (or should accept) as inputs the normal phraseology and conventions people use when communicating with other people, and responds in accordance with the expectations of normal native speakers. Thus, an NLS provides a way of programming a computer while remaining far removed from technical detail. This offers the potential to reduce software development and maintenance time. For example, "Print a report of actual vs. projected sales for each division broken down by state" can replace several pages of complex COBOL code.

Significant research effort has gone into developing such systems. These efforts date back at least to the "mechanical translation" programs of the 1950s, which attempted to automatically translate between natural languages. (The programs are widely perceived as having failed.) Today, a thriving scientific society, The Association for Computational Linguistics, holds regular meetings and publishes journals about work in natural language processing. (For information, contact Don Walker, Artificial Intelligence Center, SRI International, Menlo Park, Calif.) Modern research has its intellectual roots in a blend of linguistics, psychology, and the philosophy of language. Some of the recent results are impressive, particularly in the area of database query systems, where questions expressed in English are answered based on information in an underlying database. For example, some systems allow normal (but typed through a keyboard) conversation about topics like naval operations or moon rock samples. Some even utilize standard database management systems of the CODASYL or relational variety.

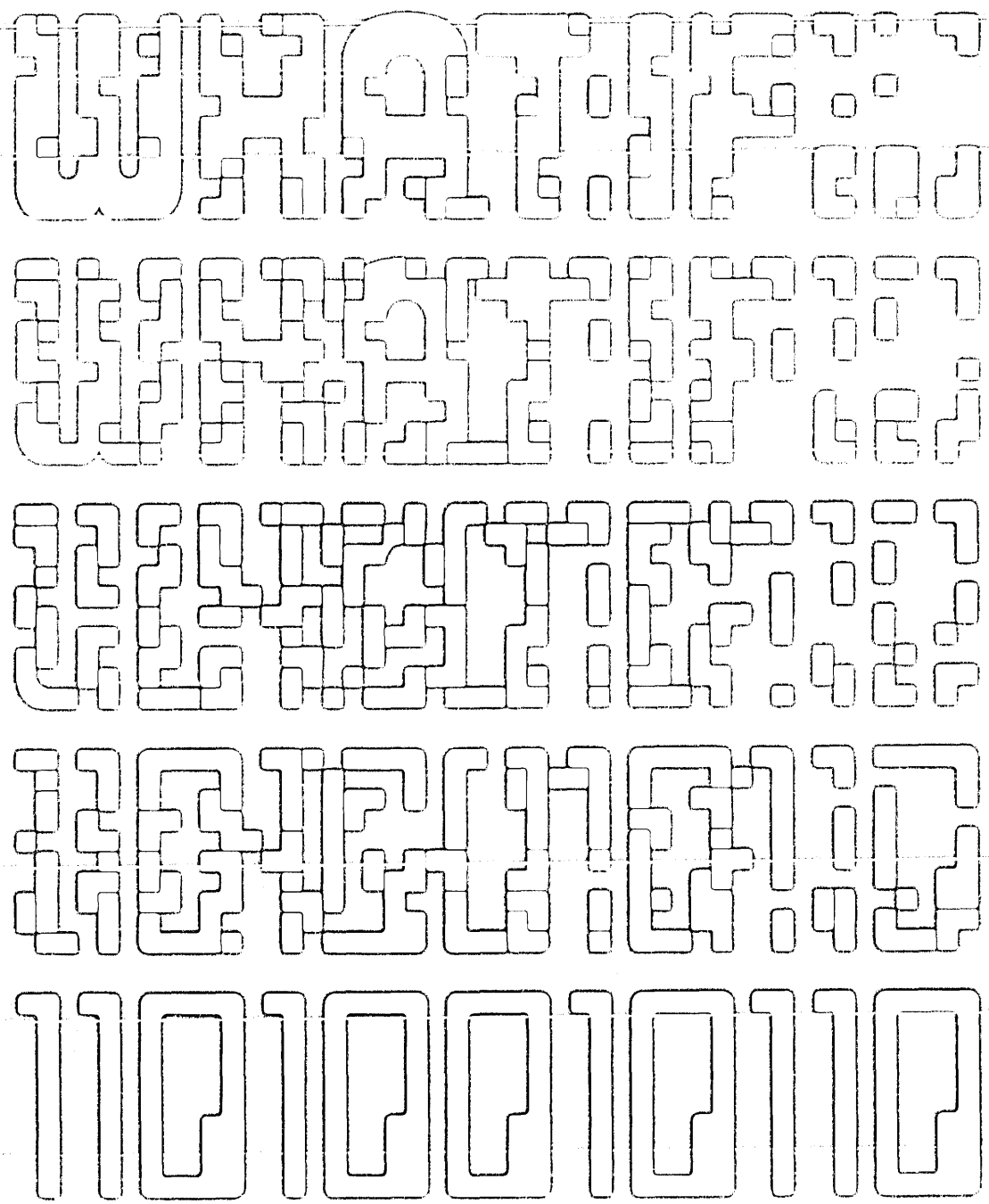
NLSs are considerably more sophisticated than "English-like" systems, which may use English words and phrases and even limited English sentence constructions, but are far less flexible and more demanding of the user. The two types of systems can be distinguished by where the blame is assigned when a reasonable input is misinterpreted. English systems aim to process any acceptable natural language expression, while English-like systems handle only certain terms and forms. The designer of an English system is likely to return to the drawing board when presented with a failure, while the designer of an English-like system is likely to say, "No, you have to phrase it this way."

Clearly, NLSs are very effective for users with occasional ad hoc (arbitrary) questions who may be unwilling or unable to learn the details of the system they are trying to negotiate. The time required to complete the first transaction successfully is usually much less than that for more formal languages, and nontechnical managers are able to access data directly without specialized training or relaying requests through a programmer.

The main drawback to wider use of NLSs is that natural language, entered by keyboard, is simply not an effective communications tool for many existing interactive applications. Natural language can be excessively verbose, requiring an expansive explanation to achieve just a simple result. Instructions or ideas expressed in natural language may be vague or too general to be of use in determining and implementing a user's wishes, or the language may be lacking in the concepts that are required to conveniently

TYPOGRAPHY BY RAY BARBER

WHAT IF...



specify a desired operation.

Many applications of interactive systems involve relatively simple, repetitive transactions of a limited set of types. For example, consider an airline reservation system with only a few commonly used transactions—perhaps to list flights to or from a destination, check the availability of a particular flight, make a reservation, and take billing information. Requesting these transactions in English may be considerably more difficult and time-consuming than they would be in a terse, special purpose query language. "Please list all the flights from San Francisco to Los Angeles that leave after 5:00 p.m. on October 10" is not likely to be more efficient than "L SFO LAX >5P 10/10," nor necessarily easier to understand. A reservationist may require only a short training period to master these basic functions in a specialized language, realizing the savings many times over in the use of a system.

In short, fill-in-the-blanks screen handlers and highly specialized applications languages aren't in any danger of going out of style. Natural language systems face certain other problems as well.

LIMITS OF NATURAL LANGUAGES

Specialized knowledge. While artificial languages are carefully designed to be unambiguous, natural languages do not always exhibit this property, and are hence more difficult to process. Knowledge about the world is necessary to interpret and respond appropriately to natural language questions. As a simple example, consider the following database queries:

1. Which account managers have turned down new customers because they have too much business?

2. Which account managers have turned down new customers because they have too little business?

Although the queries are nearly identical as far as sentence structure is concerned, common sense indicates that in query 1 it is the account managers, not the customers, who have too much business, while in query 2 it is the customers, not the account managers, who have too little business. While a human speaker will have little trouble understanding the intent of these two questions, a program typically requires a wealth of background information about the way business gets done to reach the same conclusions. Most natural language interfaces encode this necessary additional knowledge in special formalisms such as statements in first-order predicate calculus, or a semantic network. Research is continuing on how to represent and apply such knowledge in intelligent computer systems.

Portability. This special encoding of knowledge creates a serious practical impediment to the dissemination of such systems. It is difficult to create and must be recoded every time the system is installed on a new database so that questions will be understood. Further, considerable expertise is required, so the problem of encoding domain-specific knowledge has severely limited the distribution of natural language systems and is likely to continue to do so. One recent approach to this problem, developed at the Artificial Intelligence Center of SRI International, is to engage the system installer in a natural language dialog about the domain in order to automatically elicit the necessary information. Another approach is to use the database content and schema as sources of knowledge about the domain.

Database updates. Another problem with natural language database query systems is that the content of the underlying database may be changing over time, if it is being updated. This can introduce new vocabulary

FIG. 1

BLOCK DIAGRAM OF TYPICAL NATURAL LANGUAGE DATABASE QUERY SYSTEM

(Program modules are in boxes, data structures in ovals.)

Parser: Accepts the actual linguistic text from the user and performs a syntactic analysis. The result is normally an annotated parse tree, indicating the parts of speech (noun, verb, etc.) and the syntactic relationships between constituents of the sentence.

Semantic/pragmatic interpreter: Uses knowledge about the world, the conventions of language use, the previous dialog, and the domain of the particular database to disambiguate and interpret the user's request. May provide advice to the parser to help guide the parsing process. It may also engage the user in a dialog when further information is required. The output may be a program, query, or series of queries in a formal language.

Paraphraser: Often, systems will paraphrase the chosen interpretation of the request back to the user for approval. A component for linguistic generation is a common feature of natural language systems.

Formal query processor: Similar to an English-like query system. A typical interactive query processor or program interpreter. May be part of the DBMS.

DBMS: The database management system.

Database: The underlying database.

Response formulator: Interprets the results of execution against the database and selects an appropriate form for presenting the information to the user. The result may require the generation of a linguistic response such as "There are no items in the database satisfying the request," or it may require special formatting.

Report writer/formatter: Module to compose and label retrieved data in an appropriate form.

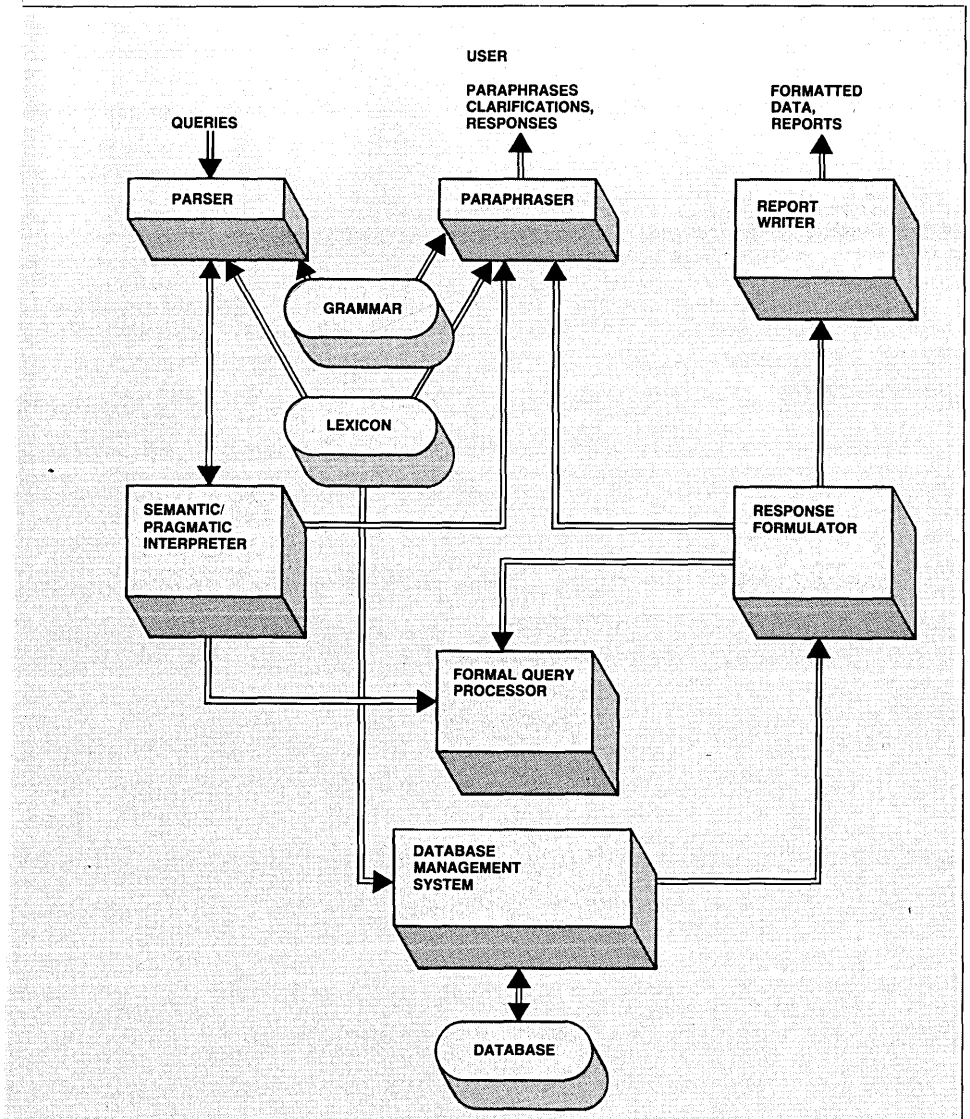
Lexicon: List of words known to the system, their syntactic properties, and meaning in the domain. Content of the database itself may function as an extension of the lexicon and morphological analysis (the recognition of different word forms—great, greater, greatest, etc.) may be performed.

Grammar: A grammar of the natural language. Used to parse (and possibly generate) linguistic strings.

AN ENGLISH-LIKE LANGUAGE EXAMPLE: DEC'S DATATRIEVE

```
QL>FIND BOATS WITH PRICE GT 30000
[17 RECORDS FOUND]
QL>SORT BY ASCENDING LENGTH, PRICE
QL>PRINT ALL ON LP0:
```

Here the 'QL' represents Datatrieve's prompt. In the first line we ask for boats with prices over $30,000. Datatrieve replies that it found 17 of them. We then ask for them to be sorted by length and price, and to be printed on the line printer.



A NATURAL LANGUAGE EXAMPLE: ARTIFICIAL INTELLIGENCE CORP.'S INTELLECT

Intellect can produce reports and replies to queries such as the following:

ARE THERE ANY PEOPLE WORKING AS SECRETARIES AND EARNING A SALARY OF $15,000 OR MORE?

BROKEN DOWN BY STATE AND CITY, PRINT A SALARY REPORT FOR THESE PEOPLE, INCLUDING THEIR NAME AND AGE.

GIVE ME A SORTED LIST OF NAMES OF ALL THE VICE PRESIDENTS IN CHICAGO OR LOS ANGELES.

WHAT IS THE FAMILY STATUS OF THE AREA MANAGERS THAT LIVE IN NEW YORK?

previously unknown to the system. The language front end must be able to deal with queries containing new words or, for that matter, words that may not appear in the database at all. For example, the system should be able to recognize that "John Smith" is the name of a person and respond correctly to the query, "Does John Smith work in the Housewares division?" even if his name does not appear anywhere in the system.

Cooperation. Often a literal answer to a question isn't desirable. For example, an answer of "No" to "Have all departments selling baby food products been inspected by the Health Department?" may be misleading if in fact no departments sell baby food. Another goal is to provide automatic summaries—in the form of descriptions—of responses to queries. For instance, in an interactive setting, a response of "all managers" may be a more appropriate and informative response to "Which employees profit share?" than a list of 1,000 names.

User acceptance. An additional pragmatic problem is that the mass media regularly publish inaccurate stories of talking machines and intelligent robots without proper corroboration. For example, the March 8th issue of *Business Week* announced, "For the first time, so-called expert systems can take the place of human experts in any field." Exaggerated and incorrect statements such as these have created a healthy skepticism on the part of many computer professionals.

Common misconceptions. Surprisingly, cpu time is typically not a problem. Experience with several NLSs indicates that they are comparable in performance to English-like query language processors (though the programs are generally larger). Generally, 10% or less of the total execution time is spent interpreting a query, while 90% or more is spent accessing the database.

It is also often claimed that since natural language systems are susceptible to error and misinterpretation because of the inherent ambiguities of language, they pose a potential danger in critical applications. In reality, such systems are no less reliable than artificial language systems. Misinterpretations occur when the user's intention differs from the system's interpretation. This can happen in artificial languages (where it is usually called programmer error) as well as natural ones. Since natural language systems are specifically geared to detect and resolve ambiguities—often by paraphrasing the alternatives to the user for selection—they tend to catch such occurrences before they become problems. English-like systems are particularly susceptible to misinterpretations because their superficial similarity to true English systems invites the use of natural expressions, which the system may interpret more literally than intended. As a simple example, consider the query, "List the employees that live in New York and Connecticut." A natural language system is likely to list the employees who live in either New York or Connecticut, while less flexible systems may attempt to find employees who have residences in both states simultaneously.

The only practical natural language system currently in wide use outside of research environments is the Intellect system (formerly Robot) of the Artificial Intelligence Corp., Waltham, Mass. This system provides natural language access to data stored in its own retrieval component, a specially tailored database system. In addition, interfaces to various database systems such as ADABAS (of Software AG of North America), and the VSAM file access method are available. A version of this system is available through the Cullinane Database Corp. under the name On-Line English, and through the Honeywell Corp. under the MULTICS operat-

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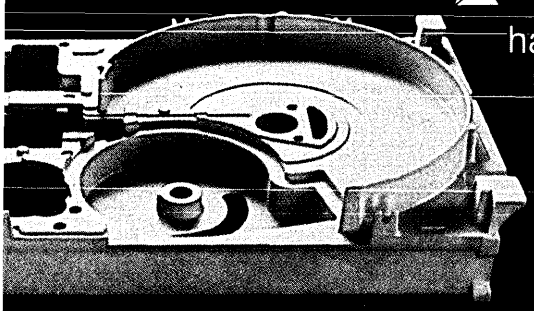

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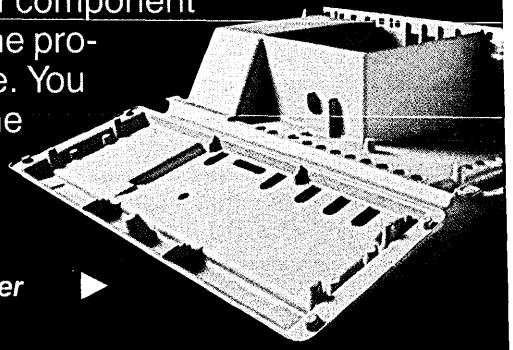
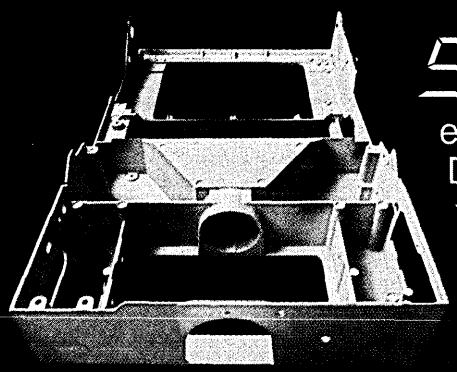


Mini-Computer Chassis ▶



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ing system, with interfaces to their own database systems.

Intellect was developed from a research system at Cornell University by its designer, Larry Harris. It required over six years of careful work to reach the point where untrained users found the system sufficiently fluent and flexible to be of value. To date, there are about 60 installations: the system is clearly a commercial success. Due to Cullinane's recent espousal of the product, it is steadily gaining acceptance. There is room for growth, however; response times, for example, can be unacceptably long in normal usage.

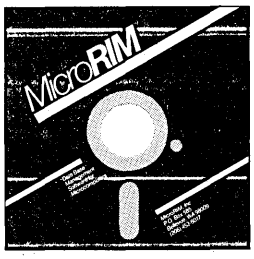
Most potential competitors are at the stage of evaluating natural language systems for viability as a product. Hewlett-Packard, for example, is considering a system for their desktop computers. A program at IBM's research center in Yorktown Heights, N.Y., recently completed a field test in a White Plains, N.Y., government office. The results have now been published, and it seems unlikely that a product announcement is imminent. While it is possible that secret efforts are currently under way at a variety of locations, the lead time and expertise required to develop a practical system suggest that few, if any, new systems are in the offing.

What are the future prospects for practical natural language systems?

In part, the answer hinges on progress in another more difficult area—the automatic recognition of continuous speech. While nearly everyone can speak coherently with minimal effort, relatively few people can type accurately or fast enough to make keyboard entry of natural language practical on a wide scale. Should high-quality continuous speech recognition systems be developed, an explosion in the availability and use of natural language processing systems would certainly follow. Unfortunately, there is no reason to anticipate these developments in the near future.

In the interim, research is likely to slowly increase the robustness, performance, and portability of natural language systems. As dp experience with products such as Intellect spreads, the technology will be recognized for what it is: not a panacea, but a useful way to provide for ad hoc user demands in specific applications. ✱

Jerry Kaplan is a research associate in computer science at Stanford University, specializing in artificial intelligence and database management. He was one of the first to implement a natural language front end for a CODASYL DBMS and is now director of technical marketing at Teknowledge Inc. David Ferris is an entrepreneurial computer industry analyst based in San Francisco and London. In addition to locating new product opportunities for marketing organizations, he advises vendors on software marketing and product planning, and is the author of an internationally syndicated column about the software industry.



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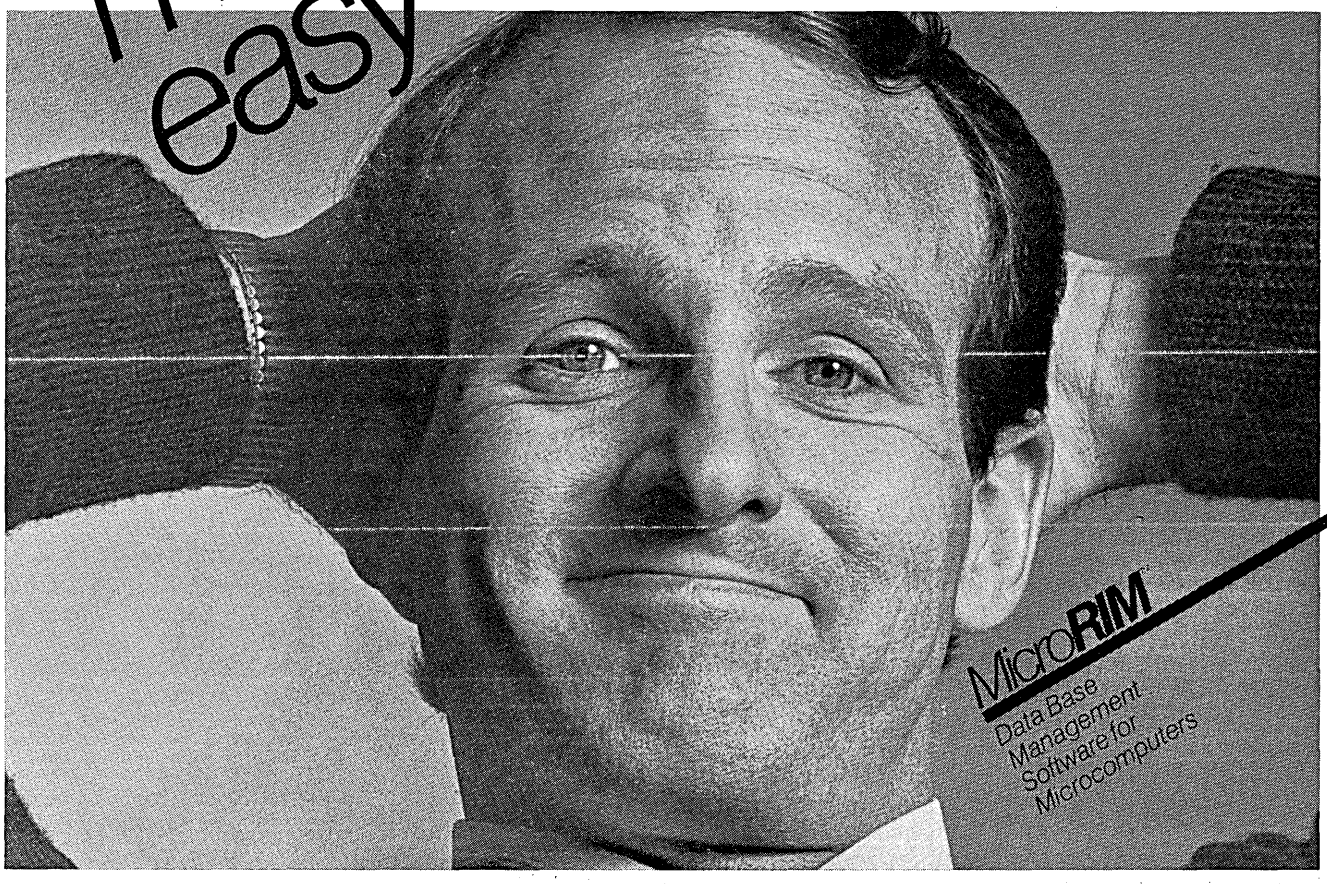

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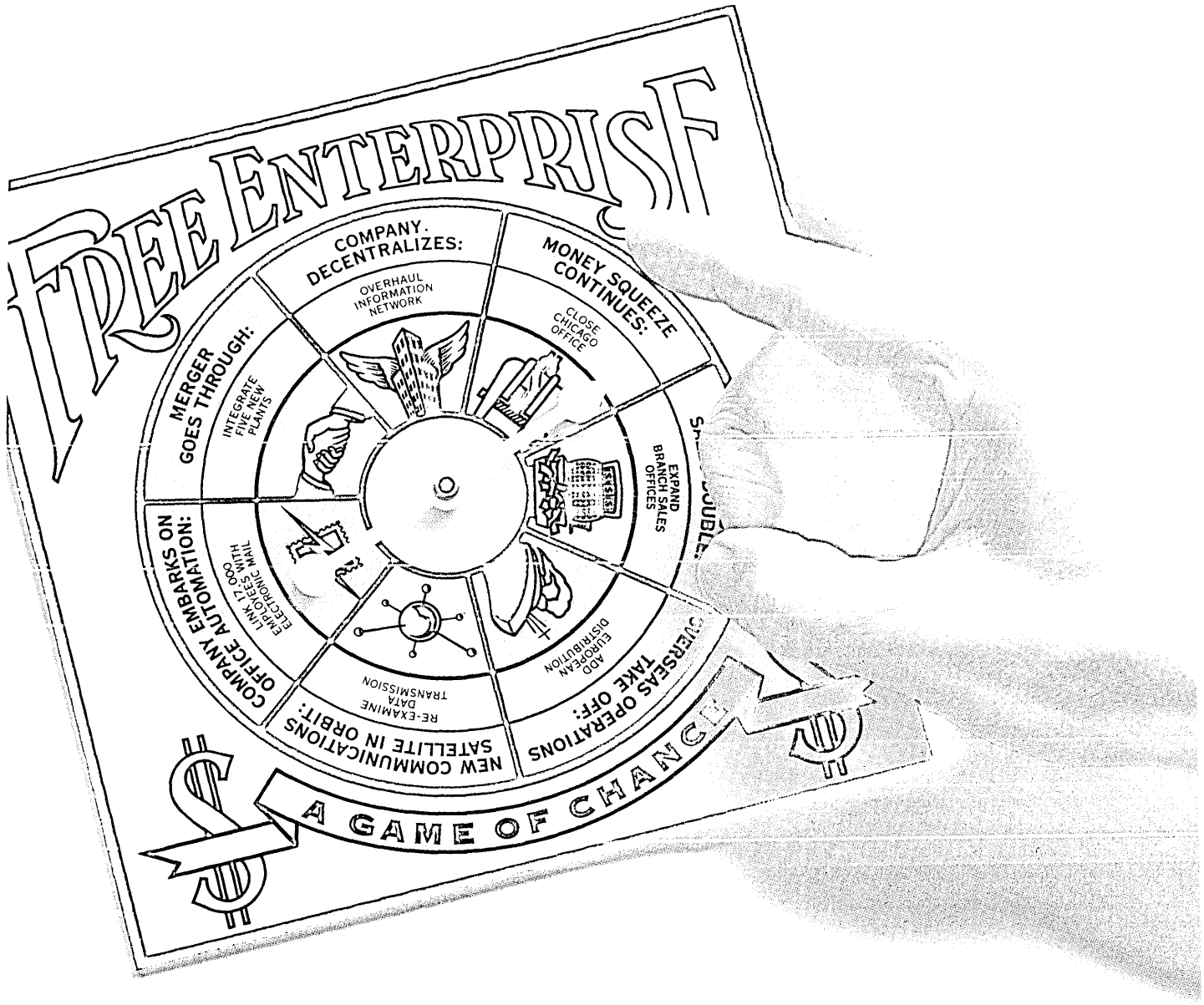

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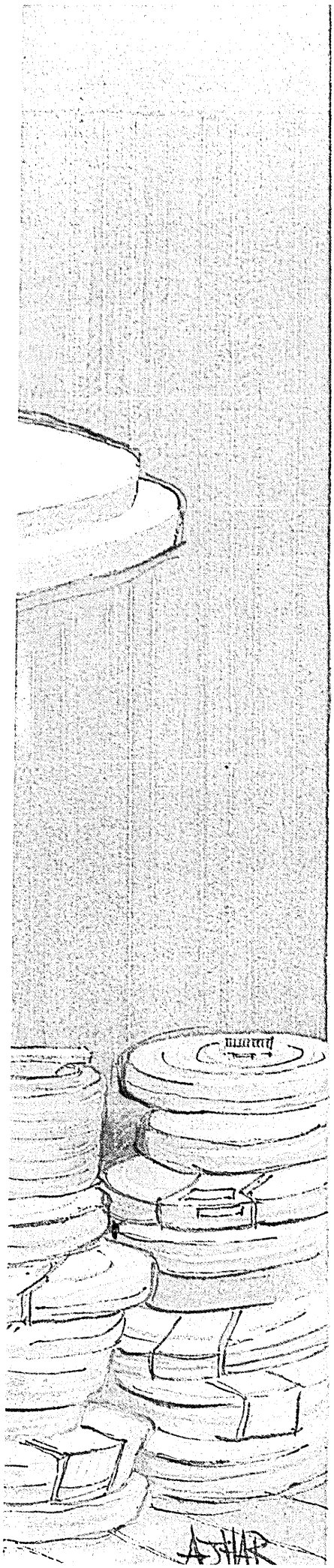


It's time to dispel the myths that overlook the hard day-to-day work of the unsung heroes of the dp department—the maintenance crew.

EIGHT MYTHS ABOUT SOFTWARE MAINTENANCE

by Barbara Schwartz

Rodney Dangerfield may think he gets no respect, but he's a venerated idol compared to the people who perform software maintenance. In-house company magazines rarely include stories with headlines like "Maintenance Team Keeps Vital Program Originally Written in 1958 in Spaghetti-like Assembly Code Running!"

Employment ads take pains to reassure programmers that their next job will involve absolutely no maintenance responsibilities. Programmers who test, repair, adjust, measure, and debug software at their computer consoles don't get much credit for their efforts. Indeed, they seem to be the people everybody needs and nobody wants.

This neglect comes about, to a great extent, because some people think that program development is more important than program maintenance. The focus on coming up with a glamorous, super-whizo, totally integrated, structured database/data communication system that will never need fixes or changes obscures the pressing need to keep current code functional.

"Talk to a president or vice president of a large organization, like an airline. Ask him whether it's more important to keep the present computer system running or to implement some new computer application," says Ned Chapin, a data processing consultant in Menlo Park, Calif. The vp may say implementing, but if the firm's reservation system is down, an airline stands to lose thousands of dollars per minute. "In this instance, implementing a new application would be an irrelevant expense," explains Chapin. "Maintaining the existing system is, by far, more important."

Chapin has found that employees' concern about program maintenance depends on their position in the organizational hierarchy. In general, the higher the management level, the more maintenance is prized; the lower the management level, the less maintenance is valued.

Most companies pay a price when they neglect maintenance. "They invest huge amounts of money in software—at least as much as they spend on their physical plant and equipment—and then don't give it adequate care and attention," states Chapin.

Why this disregard of an important factor in company profitability? One reason is that many lower-level managers have bought some of the prevailing myths of maintenance management—myths that encourage them to overlook the hard day-to-day business of keeping the company going. Looking at some of these myths may reveal their weaknesses.

Myth: Maintenance is all 3 a.m. fixes and frantic hysterics. It's nothing that we could anticipate and it doesn't take up that much time anyway!

Reality: Bennet P. Lientz and E. Burton Swanson, authors of *Software Maintenance Management* (Addison-Wesley), surveyed 485 companies on how they handle various software management problems and found that only 12.4% of maintenance time was devoted to emergency program fixes and 9.3% to routine debugging—what the authors call "corrective maintenance." The greatest part of the maintenance time was devoted to areas that lend themselves to advance planning, including adaptive maintenance (changing the system to fit changes in input data and hardware and systems software), and perfective maintenance (making the system work better through user enhancements and improved documentation). Also significant was the time devoted to generating new user reports and adding data to existing reports.

Myth: Maintenance is the place to dump your trainees, your burnouts, and Joe, the boss's nephew who thinks hexadecimal is a trendy new disco. How can they hurt anything there?

Reality: They can hurt plenty. A mediocre maintenance programmer can take good code and make hamburger out of it by grafting on a series of poorly thought-out fixes.

And Joe may not even be able to figure out how the program that he's trying to fix works. Making sense out of a program that, in the words of John Cris Miller, president of the Catalyst Corp., Brookfield, Ill., may be

ILLUSTRATION BY BRIAN AJHAR

A mediocre maintenance programmer can take good code and make hamburger out of it by grafting on a series of poorly thought-out fixes.

"15 years old, has been maintained by 25 people, and is operating from specifications that came over the telephone in some cases, from sheets of paper in others, or by word of mouth" is no easy task.

Carma McClure, assistant professor of Decision Sciences at Northwestern University believes that "senior, not junior personnel should form the nucleus of the maintenance group. The maintainer should not only be an experienced software engineer but should also have perfected the skills for determining the cause of malfunctions. He should know the consequences of program changes and have an in-depth knowledge of the specific application area and user needs."

Robert L. Glass, president of Computing Trends Inc., a consulting firm based in Seattle, thinks that it's also important to look for certain personality traits. "Look for a person who has some strong opinions on the right way to build and maintain software and has the ability to understand differences. A programmer should be capable of reacting to the style that someone else has placed on a program and not have to rip it up and throw it away just because it was different," says Glass.

"If I ran into a programmer who said, 'Boy, have I run into crappy code! Everything I ever took over, I had to rip out and throw away,' I'd be very suspicious of that person. If I found a programmer who said, 'I've worked on four projects and three of them were pretty good code, but one was really cruddy,' I'd find that credible."

Myth: You just can't find anyone who wants to do maintenance, much less the kind of paragon you're talking about.

Reality: Some people thrive on user pressure, short deadlines, and the intensive detective work required to debug programs with enough spaghetti to qualify for the local trattoria. Eleanor Maurer, supervisor of subscriber and finance, Current Systems Group, Blue Cross of Northern California, is one of these enthusiasts. "You get rewarded very quickly by your users," says Maurer. "You have a specific problem—something is not working—and they can define it for you. You look at the alternatives, find the best one, and apply it. The user usually looks at it and says, 'You did just what I needed.' "

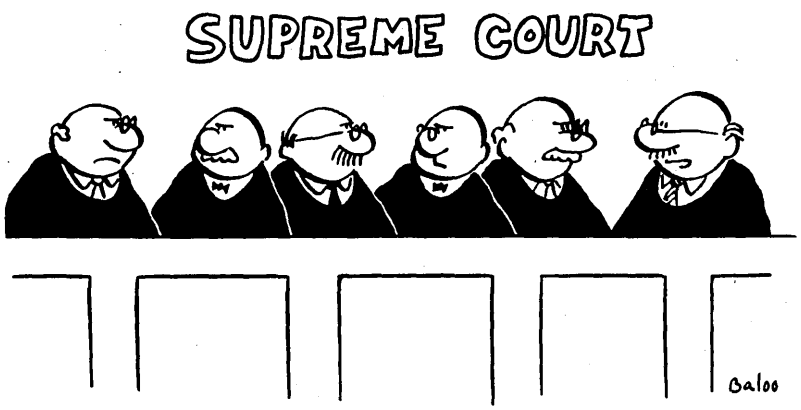
Sometimes you have to offer other rewards to get reluctant programmers to try maintenance. "One company solved its maintenance problems by offering anybody on maintenance an immediate 10% raise and putting people on shifts where they were on call like medical people," says Miller of the Catalyst Corp. "When programmers were called in, they automatically qualified for four-hour clock time. Not very soon after, the company had to force people off the maintenance team."

Myth: You don't get anywhere doing maintenance.

Reality: A savvy programmer or manager can use maintenance work to gain broad knowledge of the programs and the company. For people who want to get somewhere in management, Miller notes a definite advantage in working on maintenance. "Instead of trying to write one 2,000 line program in the course of a year, you deal with 25,000 or 125,000 lines of code and get a chance to find out what the business is really doing," he asserts. "If you're looking for a way up the corporate ladder, knowing the business is the way to move up. Nobody becomes company president as a technician."

Myth: Any of my programmers can maintain any program.

Reality: How well someone does maintaining a specific system obviously depends on how comfortable he or she is with it. Someone trained in a high-level language would be as out of place maintaining a real-time assembly code system as an assembly language programmer would be with a PL/I system.



"Look, we're not going to get any work done if we keep finding each other in contempt."

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CARTOON BY REX MAY

THE MATCHING PROCESS

It's also important to match the complexity of the program with the skills of the programmer. According to Chapin, "If you drop people in over their heads, they'll take a long time to make the necessary changes. On the other hand, if they're underchallenged, they'll add complexity and the added complexity will just make the system harder to maintain."

Myth: Why bother to provide maintenance programmers with new software tools? After all, they're just patching up.

Reality: It should be clear by now that maintenance programming is by no means a trivial effort and people doing it need all the help they can get. And there are good software tools that can be of help: formatters, flowcharters, programs that produce cross-reference and data structure listings, programs that compare files (including programs), and all sorts of advanced debugging tools. Yet, using one of the simpler tools as an example, Miller notes that "formatters have been available since 1965, and I'd be surprised if 10% of the top 500 companies have them. Good formatters cost about $1,000. Usually, you earn your money back in savings the first time a programmer uses one. And once formatters are in place, they're available for anybody."

Myth: A special department for maintenance? Ridiculous. Our development programmers can maintain a system or two each in their spare time.

Reality: Lientz and Swanson found that organizations with a separate maintenance department had a mean of 43.4% of programmer and analyst time spent on maintenance against 49.5% for companies that grouped the two functions together. Chapin thinks a possible reason for this could be "when programmers are assigned to a group to do both maintenance and development, they're serving two masters and usually neither one is pleased."

At the very least, even if maintenance is not separated organizationally, it's better to have programmers work on either maintenance or development at one time. This cuts down on having programmers scurrying hither and yon, alternately plugging holes in existing systems and trying to build new ones.

Myth: We can't really control maintenance or how well the crew is doing. After all, every fix or change is different.

Reality: So is every new development job, and tools are here to control developmental software. Why not maintenance? Jack Hancock, senior vice president and head of the Information Services Group at Chemi-

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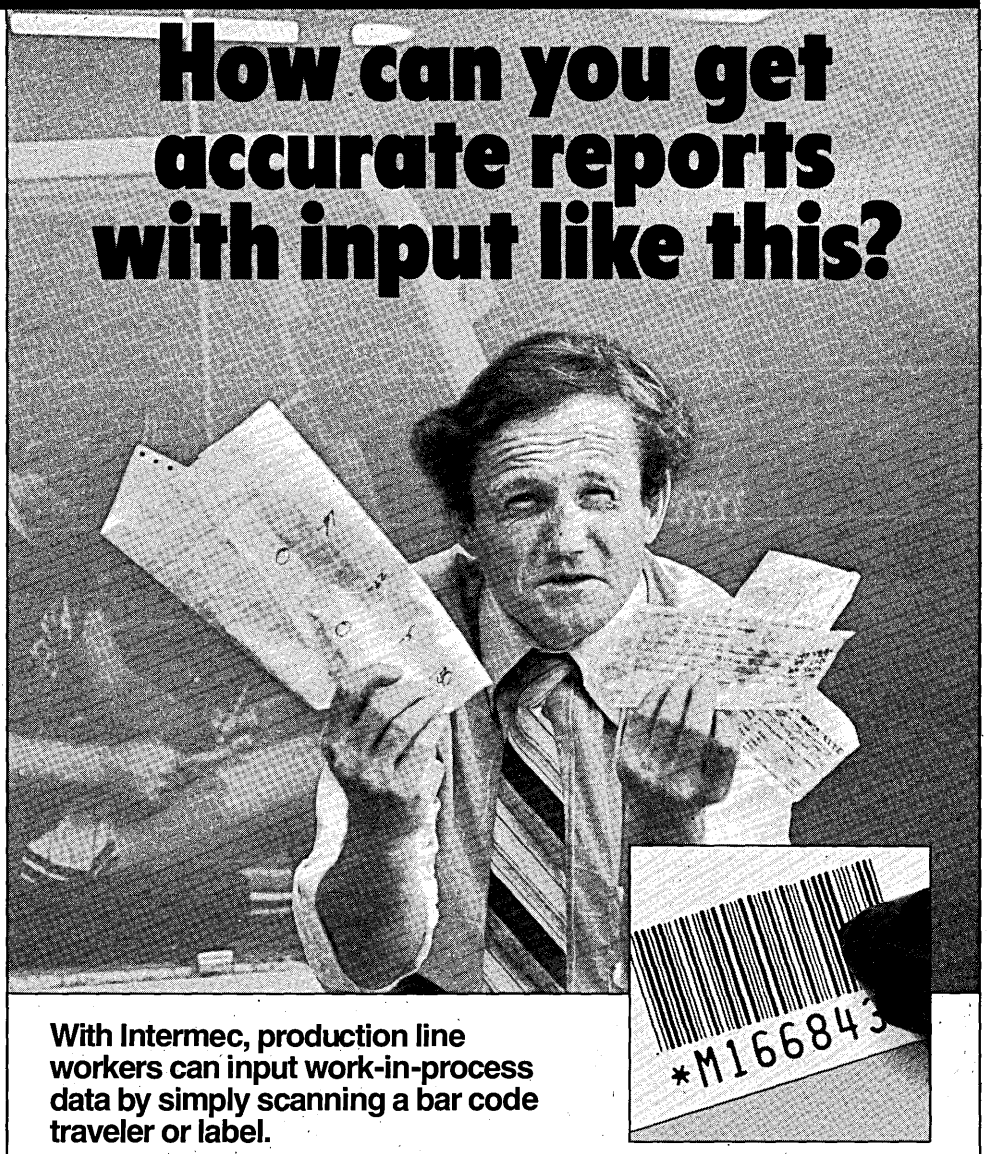

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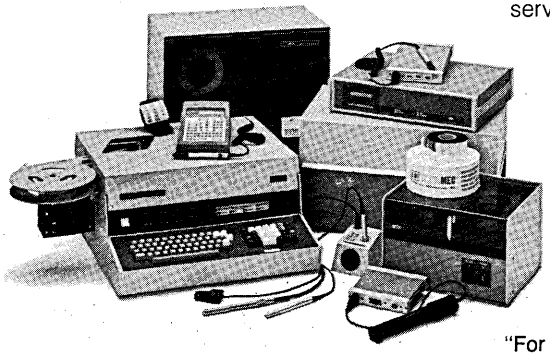

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One company solved its maintenance problems by offering anybody on maintenance an immediate 10% raise.

mental software. Why not maintenance?

Jack Hancock, senior vp and head of the Information Services Group at Chemical Bank in New York, says, "I'm absolutely convinced that quality assurance is the key to minimizing maintenance, to maximizing the value of your people, to vastly improving the way the users look at you, and to avoiding those terrible fiascos." Hancock wants to "put quality assurance in data processing on the same basis as quality assurance in manufacturing. We're not going to release something until the quality assurance group approves it."

The Quality Assurance Group at Chemical Bank, a group of 26 overseeing the work of about 900 employees, reports directly to Hancock. "If I had infinite knowledge, infinite time, and infinite technical expertise, I wouldn't need Quality Assurance," says Hancock. "Quality Assurance is the eyes and ears of the director, and its job is not to let shoddy performance occur." Here's how Quality Assurance functions:

1. *Regular program enhancements.* The users of each system have to get their proposed changes in to Quality Assurance by a certain date so these changes can be considered for incorporation into the system on a regularly scheduled basis. Proposed changes go to Change Control—a group within Quality Assurance—where they're logged and sent on to the maintenance people, who decide which changes to make based on user priorities and funds. In this way the programmers have to open each module only once in the cycle. Hancock thinks that this kind of careful planning avoids new errors made by ad hoc changes that "generate the need to make another change simply because you made mistakes or because you did something without thinking it through." Once the changes are made, Change Control publishes a calendar for the users that tells them the purpose and date of the change and any impact it will have on associated systems.

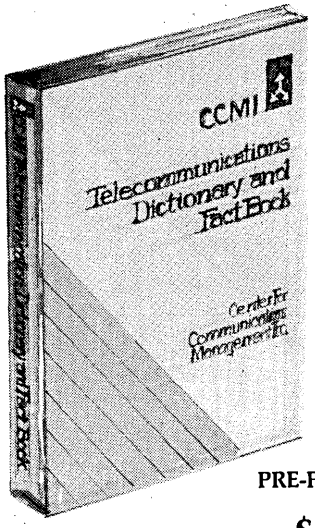
2. *Test Management.* Every change made in an existing system is regression tested against a library of test data developed when the program was written and expanded when significant enhancements were made. Hancock feels that this method is superior to live data. Quality Assurance also serves as the gatekeeper in testing. Hancock notes that "every version of a change to be implemented either goes through a specified, certified test conducted by the maintenance people and certified by Quality Assurance or, if it is a larger change, Quality Assurance will test it independently.

3. *Problem Management System.* ISG has an on-line problem management system that has a record of every failure with a description of the problem. Hancock notes, "The problem is tracked until it is solved. One of the tendencies if you don't have such a system is that an error occurs, somebody makes a quick fix, and you forget about it. Consequently, the problem's never really solved." Hancock can also retrieve data on past failure from this system by date, name of the system, the hardware, programmer, and person who solved the problem.

With all of this careful quality control, Chemical Bank has seen a steady drop in the number of failures even though the number of systems and jobs processed has risen steadily. The number of incidents for the number of jobs processed has dropped from 9,660 failures in 417,000 jobs in 1979 to 7,680 failures in 489,000 jobs in 1980 to 7,366 failures in 783,000 jobs in 1981. ❋

Barbara Schwartz is a New York-based consultant, teacher, and writer.

Telecommunications Dictionary and Fact Book



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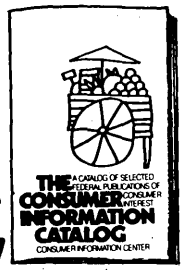

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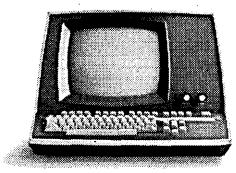
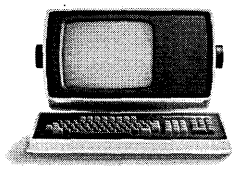


WORD PROCESSING SYSTEM



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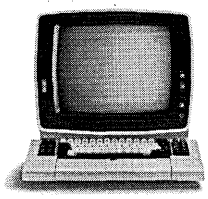

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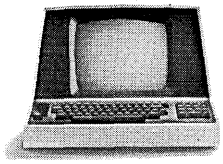

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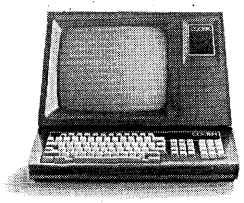

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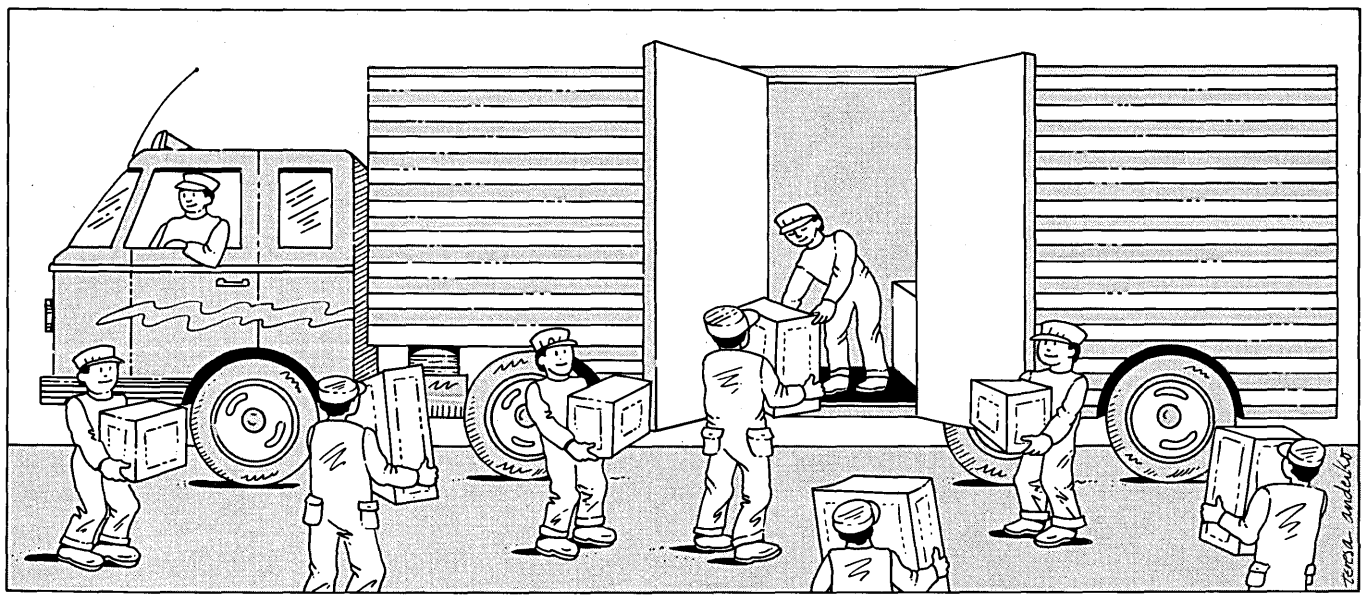


ILLUSTRATION BY TERESA ANDERKO

by Doug DeVries

In the summer of 1981, Hewlett-Packard relocated its corporate data center. Over a weekend the company moved two Amdahl V/8 systems, a worldwide data communications center, and a 50,000-reel tape library. In the weeks preceding and following, 30 minicomputers were transported and 500 terminals were installed.

A move of this kind is not an everyday experience. In fact, it occurs so rarely that it may happen only once in your entire career. There's little chance of benefiting from past experience with this kind of event. But if you ever do need to attempt a move, be forewarned: the magnitude and complexity of the project can rival the launching of the Space Shuttle. So can the tension; you and your user community will have a lot on the line. Based on our experience at HP, here are some of the difficulties you'll face:

- It has probably taken years to create the current facilities and hardware configuration you want to move. To tear it down, rebuild it, and get it all working within a few days requires a minor miracle of coordination.
- There are high risks to your whole organization if it doesn't work. Depending on the importance of the data center, the whole company could be brought to its knees in a matter of days.
- To carry off the project, you will need to mobilize dozens of people to do hundreds of separate tasks. Coordinating all the people and ensuring that all the work gets done takes strong organizational skills.
- To avoid last-minute panic, anxiety, and disruption, the planning process must be started many months before the move itself. It can be difficult for workers to visualize the importance of starting so early on a project that seems so distant.

Moving a data center can provide you with some unique opportunities. In most cases, you can finally get enough space for future hardware growth. Getting out of a crowded and "make-do" physical environment can be a major incentive for the entire operations staff. In addition, you have your best chance to create an ideal computer environment, incorporating many "wish list" items. The increased cost of doing it right at this point is small compared with the total expense of moving and building a new computer room. Also, you have the opportunity to make procedural changes that might otherwise be difficult; the new location can justify new rules.

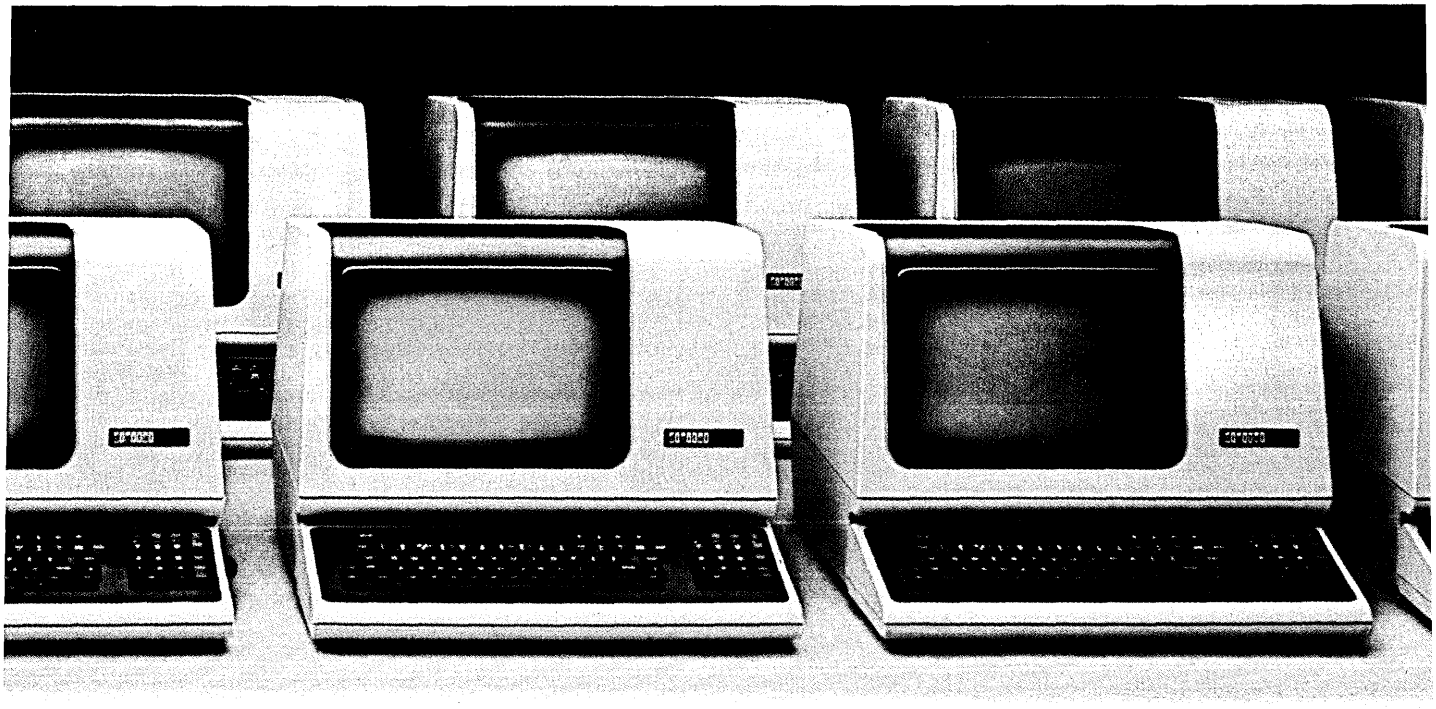
THE PLANNING PROCESS

When you consider the broad picture of managing a data center move, what is it that you want to accomplish? At the most basic level, managers want to change operations in an orderly, phased sequence, thereby minimizing confusion and maximizing system uptime.

To accomplish the overall goals, you'll probably want to distribute responsibility, so that the workload is shared and there is widespread commitment to the success of the move. You'll also need a control mechanism that provides an early warning system for problems and ensures that necessary tasks are completed on time. And you'll have to communicate widely inside and outside the department to keep people aware of how the move will affect them.

Here is a step-by-step method for effectively managing the planning process and

Now you can get a terminal as easy to use as a VT100 no matter what kind of terminal you need.



Up until now if you wanted VT100 quality in anything other than a VT100, you had two choices: Do without, or settle for something less.

Now Digital's created a family of VT100 terminals. All of them as easy to use as a VT100 because they're all made with the same high regard for people and the way they work.

The new VT125 business graphics terminal, for instance.

Affordable graphics for business and engineering.

It gives you what you'd expect in terms of durability and ease of use from a VT100. But what makes it an ideal graphics terminal is our new graphics instruction set called ReGIS (Remote Graphics Instruction Set).

With just a few simple lines of programming language, even an average programmer can run VT125 graphics off of your present minicomputer.

Then, with simple but powerful ReGIS commands, any operator can call up data and put it into graphic form with very little demand on the CPU.

The VT125 also writes text as well as it draws pictures, so what graphics fail to express, words can.

You can buy the VT125 as a complete terminal package. Or you can buy it as an option for the VT100 you already own.

Either way, it'll work like a charm on most systems supporting ASCII terminals. As will any other terminal in the VT100 family.

This next one, for instance.

The economical VT101.

It can display 80 or 132 columns of data with smooth scroll. You can select double-height and double-width characters. And you can personalize it right from the keyboard . . . so you'll feel comfortable working with it.

But because the VT101 was designed with less option space than the VT100, it costs less.

Thus it's perfect for people who want a terminal as easy to use as a VT100 but not as expensive.

The VT101, we think, fills a very practical niche between too much terminal and not enough.

But suppose you need even more features to start out with?

The VT131. A new, fully optioned terminal.

You get advanced video features to make an operator's life easier and more productive. The VT131 also comes with a printer port, five full and half duplex protocols and full modem control.

With the VT131 you can select block mode or character operation from the keyboard.

All of these features are designed in a terminal package that, like the VT101, has less option space than the VT100.

Thus the VT131 also represents an affordable choice in terminals.

Then, of course, there's the VT100 itself.

Some have called it the "perfect" terminal.

Perfect for OEMs developing demanding applications. Perfect for people who'll want its extra capacity power supply and card space for additional options later on.

There are options now that'll turn a VT100 into a personal computer for the office, or into a business graphics terminal. Easily and affordably.

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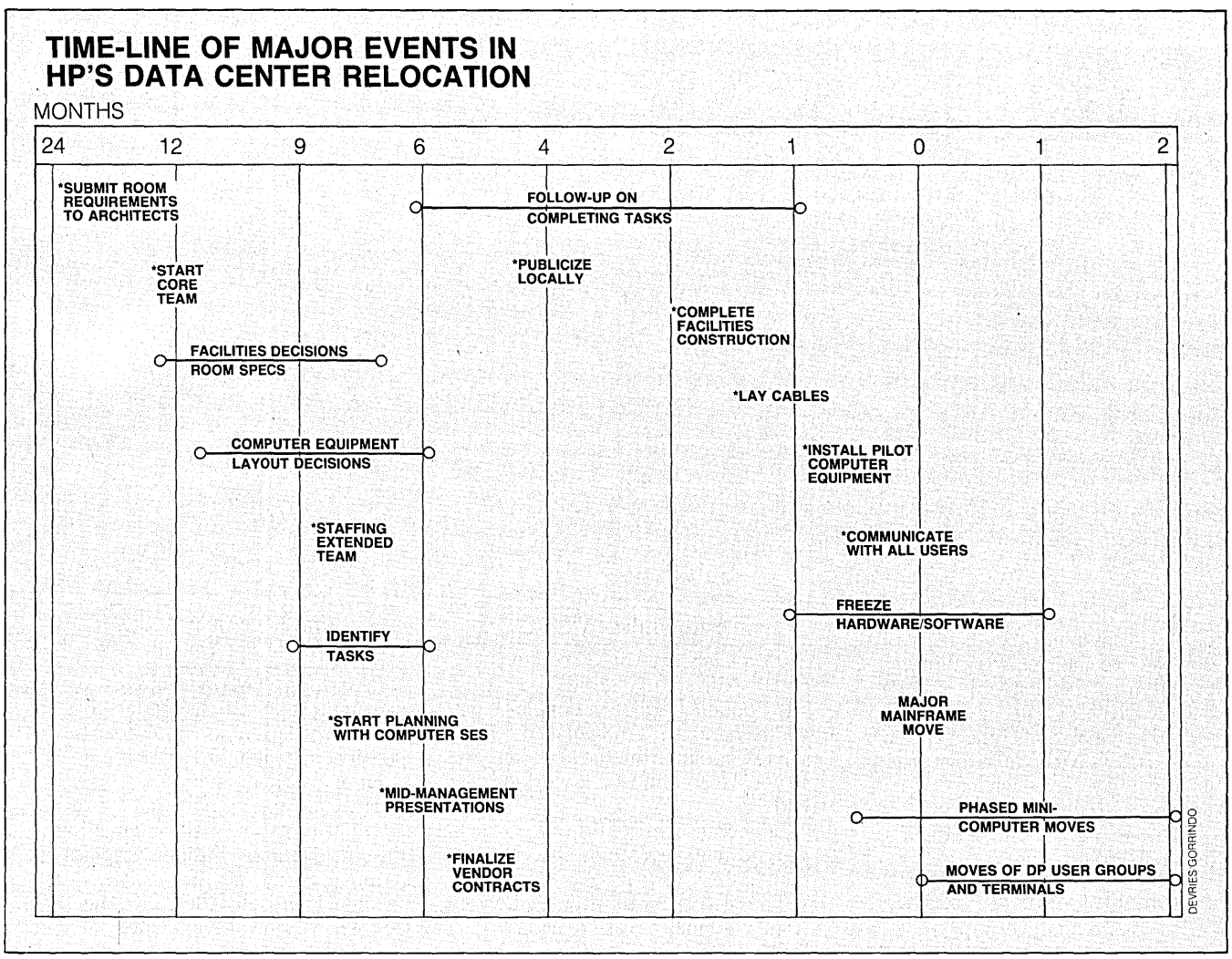


implementing a smooth relocation.

1. *Staffing and team organization.* A common approach is to assign one person to manage the entire project, which will probably put tremendous pressure on that individual. Nine months of 12-hours days are bound to leave him stressed and fatigued.

A better idea is to give the overall project direction to a small "core" team. The team can consist of two to four individuals with complementary technical and administrative skills. This approach has the advantages of providing built-in staff backups, a synergy of different perspectives, and a reduction in long hours by sharing the work.

In addition to the main project leadership, you'll probably want to get other people involved as part of an "extended team." The moving job is so big that it needs to be broken down into manageable areas of responsibility (see Table I).

There is one unique, nontechnical area of responsibility—people. When moving computers, there's a natural tendency to focus only on transferring the hardware. But the human interface is important, because the real payoff of moving is the solution of the human problems of users and the computer operations staff.

At HP, the core group consisted of four people and started its work 12 months before the move. The extended group consisted of 15 people and started nine months beforehand.

2. *Identifying tasks.* After you decide on the broad categories of work, you'll want to identify the multitude of tasks to be done. This phase lays the groundwork for the entire project's success.

One effective way of identifying specific items is to require team members to prepare written plans on how they will move their specialized areas. Once the plan is written, it's valuable to verbally review it with the people it affects. You can set up a schedule of review meetings, and invite people from inside and outside the department as well as key vendors. These meetings provide important feedback and ensure that the written plans actually get finished.

At HP, this phase took two months and the plans averaged 10 pages. About 1,000 main tasks were identified, and many required several months of lead time.

3. *Follow up on completing tasks.* Once you know what needs to be done and who's going to do it, you'll want to be certain that tasks are completed as the move date approaches.

One way to do this is to hold short, periodic status meetings. Each team member reports on his or her area, emphasizing the status of individual tasks that are due. There is an implicit incentive for the team members to finish their tasks on time, since they'll be reporting success or failure to their peers and managers. These meetings also act as an early warning system so that problems can be resolved before they become severe. At HP, these meetings were held every three weeks for five months.

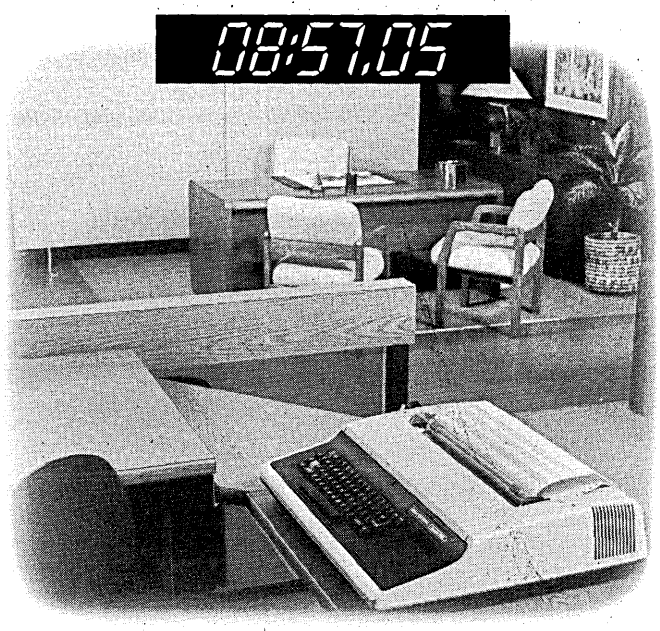
4. *Communications.* The success of the move depends upon users' perceptions, as well as on the actual transfer of computer equipment. Thus, you'll probably want to make sure users are kept informed throughout the planning process.

CUSTOMIZE YOUR MESSAGES

It's best to customize your communications to differing target audiences, since each group has unique information needs. For example, key groups might be:

- Programmers/Analysts
- Computer Operations Staff
- Middle Management
- Vendors
- Remote sites that might be affected
- Other functional groups for coordination (such as facilities, construction, security, traffic, and administrative services)

You can use multiple reinforcing routes to convey the information. For example, you might consider presentations, meetings, newsletters, company publications,



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Of Course, We Have More Than One Model of Excellence.

General Electric also offers the GE 2030 printer. Identical to the GE 2120 in standard features and available options, the GE 2030 prints at sustained speeds up to 60 cps. And there is one other difference...it also costs less. So if you don't need the speed, selecting the GE 2030 may be your best choice.

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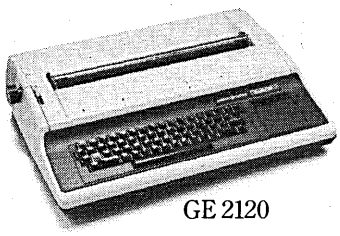

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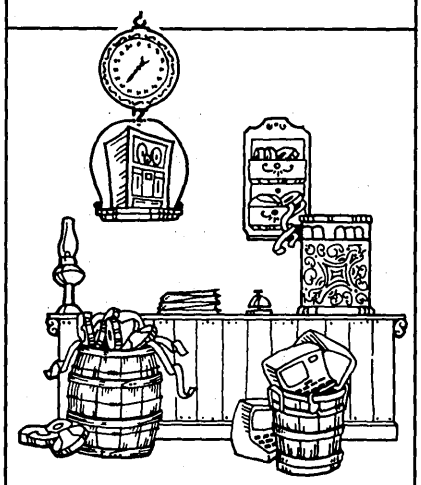

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TABLE I

BREAKING THE PLANNING EFFORT INTO MANAGEABLE TASKS

AREAS OF RESPONSIBILITY	TYPES OF ITEMS COVERED
Facilities	Electrical power, air conditioning, raised floors, fire suppression, monitoring panel
Mainframe	Floor layout, cables ordered and installed, multivendor coordination, test plan development, staffing schedules, minimum I/O configuration
Minicomputers	Floor layout, cable ordering, labeling equipment, phased move plan, moving company choice
Datacommunications	Network design, ordering and installing cables and equipment, cutover coordination with telephone companies, staffing for terminal installations
Tape Library	Floor layout, extra racks, logistics, backup vault
Associated	Microfiche, data entry, off-line equipment, dispatching
Forms/Storage	Shelving, floor plan, transfer existing stock
Office Space	Seating arrangement, voice phones, furniture moves, training/conference rooms
USER MOVE	
Coordination	Terminal installation needs, timing coordination
Human Interface	Suggestions for environment and work flow, communications (newsletters, tours, orientation booklets), feedback via formal/informal surveys

messages on terminal screens, or dial-up phone recordings.

5. *Detailed facilities/hardware preparation.* Although a good conceptual idea of the computer room design has been developed, you'll need a mechanism for nailing down the details. To do this, you can get a large magnetic board and make templates for the relative sizes of the computer units. This allows you to experiment with different arrangements and come up with a wide consensus on how the floor should be laid out. Also, before any machines are moved, it's ideal to lay the majority of cables under the raised floor. At HP, this cable prelaying approximately doubled the speed of relocating the equipment.

6. *Special actions during the final weeks.* It's predictable that the last four to six weeks before the main move date will be a hectic time. Your extended moving team will concurrently be taking care of final details in many different areas, such as laying and labeling cables, checking with vendors to make sure that equipment will arrive when expected, and installing some pilot equipment to make sure the new facilities are functioning properly. A freeze on hardware and software changes during the last four weeks is a must.

7. *During the move.* You'll want to pay special attention to your people during the move. Schedule your technical people so that they don't become overly fatigued during the early stages. You want them to have an energy reserve and a clear mind to resolve the remaining problems.

Hewlett-Packard hired a caterer to provide food for those who worked during the major move weekend. This reinforced the group's esprit de corps and also meant that they were on-site when they were needed.

Another key activity during the move is to continue to hold regular status meetings. By using a checklist of milestones that should be accomplished by a certain hour, you'll know exactly where you stand throughout the move process. You don't want to arrive at the end of your allotted time, only to wish you'd called for extra resources earlier.

Relocating a data center is a large project that calls for mobilizing and coordinating many individuals. The most important things are to start early, to communicate widely, and to identify (and resolve) problems before they become severe. With effective project management, you can provide the structure for a large team of people to make a significant contribution to the organization your data center serves. ✲

Doug DeVries, information systems function manager with HP, was move coordinator during the 1981 data center move. Under normal circumstances, his responsibilities include computer security, long-range planning, and several other dp-related procedures. He speaks regularly on computer security and is the founder of BACSIG (Bay Area Computer Security Interest Group). Before joining HP, he spent seven years with AT&T.

HARDWARE

OFF-LINE

Competitors may have to come up with a new benchmark if they want to challenge Gould S.E.L.'s new top-of-the-line 32-bit supermini, which performs 6.66 million Whetstones a second with unoptimized code and 17.48 million Whets per second with optimized code. The Concept 32/8780, said to be five times faster than its closest competitor, uses parallel processors and very large cache memories, and starts at $330,000. Also announced were two companion single-processor systems: the 32/8750 for $235,000, field-upgradable to a 32/8780; and the 32/8705 for $199,900, not upgradable.

Kennedy Co., of Monrovia, Calif., has bought the 8-inch Winchester disk-product line from BASF Systems Corp. Kennedy will continue to supply drives to existing customers, and has also acquired U.S. manufacturing and marketing rights to the BASF 5¼-inch disk drive.

Emulex Corp., of Santa Ana, Calif., has started what it claims to be the industry's first exchange program for users of DEC PDP-11/70 and VAX computer systems who wish to swap other non-DEC disk controllers for Emulex units "without obsoleting their investment in the disk drives."

Latest member of the nationally franchised Barter Systems is Information Management Systems, a Data General oem and turnkey system vendor based in Canoga Park, Calif., which joined with Barter Systems of Los Angeles/Orange County, a member of the national organization. Computer hardware and software will be supplied nationally on a barter basis, for cash and/or "trade units" equal to a dollar each.

PROFESSIONAL COMPUTER

With the Wang Professional Computer, Wang Laboratories claims to have "redefined the 'personal computing' marketplace" with a machine "uniquely designed for the new generation of personal computer users." Its three main features are a 16-bit architecture; ability to function as a

workstation on any Wang 2200, Virtual Storage (VS), Office Information System (OIS), or Alliance system; and "more communications options than any other personal computer on the market today," including both industry standard and WangNet communications capabilities.

Physically, the Wang Professional Computer is different, with a low-profile keyboard completely detached from the "electronics enclosure," 6.5 by 14.6 by 22.6 in., that can stand on its end, lie on its side, or attach to a desktop or tabletop with an optional clamp. The enclosure houses the 8086-based processor, 128K bytes of memory (expandable to 640K bytes), disk drives, and option boards. Both internal and external data paths are 16 bit.

Also included is a three-channel direct memory access capability, programmable internal clock, RS232C interface, parallel printer interface, a 320K byte 5¼-in. floppy disk drive, MS-DOS, and Microsoft's Basic-86. Options include a second floppy disk drive or a 5¼-in. 5-megabyte Winchester drive. Basic prices range from $2,695 to $8,945, depending upon configuration. WANG LABORATORIES, INC., Lowell, Mass.

FOR DATA CIRCLE 301 ON READER CARD

HALF-INCH TAPE DRIVE FOR APPLE

A magnetic tape subsystem has been configured for the Apple II and III personal computers by Innovative Data Technology, using half-inch format and compatible with IBM, ANSI, and ECMA hardware and software. The SCDR-1050, according to IDT, "effectively removes data exchange problems" between the Apple and larger systems by standardizing data storage and transfer routines.

With IDT's tape subsystem, Apple users can communicate with most IBM-compatible large mainframes that use 9-track (NRZI 800 cpi and/or 1600 cpi PE) magnetic tape. A typical 2,400-ft., 10½-in. reel accommodates over 40 megabytes of formatted data. The drive is connected to the Apple via the RS232C/CTTV-24 port.

The SCDR-1050 system includes an input/output controller with up to 32K bytes of RAM, a TDF-4050 formatter, and IDT's TDI-1050 tape transport. A single 1600-cpi (PE) system is $8,500; additional daisy-chained drives are $4,250 each. Options include a cabinet, code converters, and large front-end buffers. INNOVATIVE DATA TECHNOLOGY, San Diego, Calif.

FOR DATA CIRCLE 300 ON READER CARD

NETWORKING

A 10-megabit coaxial cable-based networking facility that extends high-performance digital networking to the users of RS232C terminals, 3270 terminals, CAD/CAM systems, mini/micro systems, and process control equipment, is available from Network Systems Corp. Hyperbus is designed for multivendor equipment using various protocols and permits differing applications to simultaneously use a common network on a peer-to-peer basis. It also permits equipment connected to the network to share resources via the Network Systems ultrahigh-speed computer-to-computer networking product, Hyperchannel.

Prices for Hyperbus interface units range from $2,150 to $6,950, depending on the equipment interfaced and the number of

ports provided. Hyperbus will interconnect existing computer and terminal within a laboratory, factory, or office, and requires no hardware or software modifications by the user. Hyperbus uses a hierarchical addressing scheme similar to that of the phone system; dialing across the network is transparent to data protocols. NETWORK SYSTEMS CORP., Minneapolis, Minn.

FOR DATA CIRCLE 302 ON READER CARD

TURNKEY CAD/CAM

Four turnkey systems for computer-aided design and manufacturing, based on Perkin-Elmer's family of 32-bit superminis and CADAM (Computer-graphics Augmented Design And Manufacturing) software licensed by the CADAM subsidiary of Lockheed, have been introduced by P-E. The firm thus claims to be the first supermini manufacturer to offer distributed workstations that combine high-performance, low-cost computer hardware with "proven sophisticated" CAD/CAM software.

The CADAM system is an interactive, general-purpose 3D design and drafting system containing analytical design aids for design drafting, numerical control processing, and other applications.

A single-terminal workstation includes a 3200-series supermini with two megabytes of memory, floating point processor, console terminal, 80-megabyte disk, graphics terminal with keyboard, light pen and function keys, and a user-oriented worktable. It lists for $160,000.

A two-terminal workstation with 4 megabytes of memory is $220,000; with three terminals, $260,000; and with four, $300,000. The CADAM software is licensed and offered for a one-time charge or a monthly fee. The single-terminal CADAM first-time fee for the CAD-only module with data management capability is $80,879, or $2,313 monthly. PERKIN-ELMER DATA SYSTEMS GROUP, Oceanport, N.J.

FOR DATA CIRCLE 303 ON READER CARD

PORTABLE COMMUNICATIONS COMPUTER

The LEX-31 is "the world's first handheld personal communications computer," by the originator of "the world's first handheld language translator," according to Lexican Corp., which got its start in 1976.

The LEX-31 is 10½ in. long, with a full QWERTY keyboard, 40-character liquid-crystal display, and built-in modem with handset jacks for accessing databanks. A special DJ key permits single-stroke access to the Dow Jones News/Retrieval Service. A 16K byte memory stores several pages of text that can be sent over a telephone line,

for transmitting sales orders, electronic mail, etc.

Battery-operated, LEX-31 is designed to verify inventories, perform credit checks, place new orders, establish shipping dates during sales calls, and engage in other related activities. The $995 device has a word-processing capability, optional acoustic cups for telephone use, a power-line adapter, a perpetual calendar, and clock with alarm. LEXICON CORP., Fort Lauderdale, Fla.

FOR DATA CIRCLE 304 ON READER CARD

DESKTOP MICROCOMPUTER

The SMC-70, intended by Sony for business applications rather than personal use at home, is based on the Z80A microprocessor, but can be upgraded to a 16-bit system with an optional 8086 adapter.

Priced at $1,475, the basic unit includes 64K of program/data memory, an additional 38K of graphics memory, and a separate 32K of system memory. The system memory includes a resident Sony interpretive BASIC extended for graphics, plus the system monitor.

Thirteen resident I/O interfaces are standard, including a Centronics-type parallel port, RS232C serial interface, RGB video, B/W composite video, a light pen, a numeric keypad, and tape-cassette interface. A slide-out tray accepts snap-in expansion modules for interfacing accessories or for extending system capabilities. User memory can be expanded by adding 192K bytes of bank-select memory. The 16-bit adapter comes with either 128K or 256K bytes of on-board memory. Four resolution modes are available, up to 640 by 400 dots, on a $375 video monitor or an $895 Trinitron monitor.

Options also include one or two 3.5-in. "micro floppydisk" drives, which provide 280K bytes of formatted capacity per drive—$650 for one drive, $1,100 for two—which can be mounted onto the main console. Coming attractions include an 8-in. disk drive, 6-megabyte hard disk system, and a 256K cache memory system. SONY CORP. OF AMERICA, New York, N.Y.

FOR DATA CIRCLE 305 ON READER CARD

64-BIT COMPUTER

MDS Quantel's new System 64 is "the first computer system designed specifically for business applications which uses a fast-access 64-bit-wide aligned memory path," rated between 0.7 and 1.0 MIPS. The basic configuration, with 512K bytes of main memory, terminal controller, and a communications interface for on-line remote technical support is $105,000, with deliveries scheduled for the first quarter of 1983.

System 64 is intended for business requiring multiple users to have immediate access to large amounts of on-line data, and can support up to 100 intelligent workstations, 2.5 billion bytes of disk memory, 30 printers, eight data-communications ports, and BEST/NET, Qantel's local area network. An average configuration of System 64, with a megabyte of memory, a 300-megabyte disk system, 12 crts, a 600-line-a-minute printer, and two dot matrix printers, is $220,000.

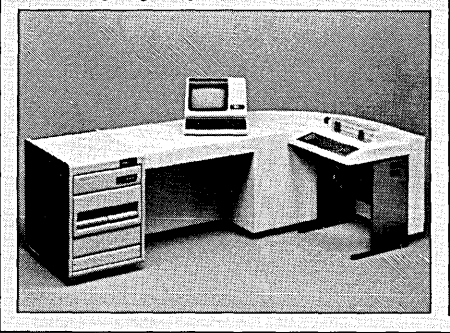
The system features an independent preprocessing unit said to speed up the execution of most commonly used machine-level instructions, a 400-nanosecond memory cycle time, a 64-bit writable control store that permits emulation and efficient execution of multiple instruction sets, a high-performance 16-bit processing unit using bit-slice architecture, and a 16-bit I/O interface that can transfer data at up to 5 megabytes per second. MDS QANTEL, INC., Hayward, Calif.

FOR DATA CIRCLE 306 ON READER CARD

HARDWARE SPOTLIGHT

PERIPHERAL SWITCH

Billed as "a revolutionary step beyond network management," the XY-MAX Interactive Communication Director System can switch more than 1 million RS-232C cross-points to provide "the greatest line/port switching capacity available."



Driven by a Digital Equipment Corp. PDP-11/23 mini with printer, display console, and dual disks, XY-MAX provides up to 16 large-scale switching matrices with 131,072 cross-points each. The computer-based system can menu-drive the cross-points to "dynamically rotate" spare front-end processors. New line/port configurations can be created in a fraction of a second. Data paths are fully transparent, at up to 19,200 bits per second.

Prices range from $109,200 for a system that switches 1,024 cross-points, to $320,400 for 131,072 cross-points. Prices include a PDP-11/23, color console, printer, and software. Systems are expandable on-site and video training aids are available. DATA SWITCH CORP., Norwalk, Conn.

FOR DATA CIRCLE 320 ON READER CARD

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CIRCLE 100 ON READER CARD

HARDWARE

INTELLIGENT TERMINAL

Two mainframe protocols are supported by the 4100 intelligent terminal from ECS, Microsystems. Keyboard-selected protocols chosen by the customer are incorporated in the 4100 for direct sequential communications between the terminal and any two host mainframes, from the same or different manufacturers. The dual protocol options include IBM, Burroughs, Honeywell, NCR, Univac, ICL, HP, DEC, and others.

The $3,195 terminal includes a nonreflective faceplate, green phosphor screen, and a display of 25 lines of 80 characters each. Fully compatible with a variety of printers, the 4100 uses a RS232C interface for synchronous or asynchronous communications at user-selected rates from 300 to 19,200 baud. Full modern controls are standard; a parallel interface is optional. ECS MICROSYSTEMS, San Jose, Calif.

FOR DATA CIRCLE 309 ON READER CARD

TURNKEY CAD/CAM

The Autograph marks the entry into the low-cost CAD/CAM field of Gerber Systems Technology (GST) with a turnkey system starting at $87,000. The hardware includes a Hewlett-Packard 2111 minicomputer, high-resolution black-and-white or color raster display. Winchester disk drive, and data streamer cartridge.

The system is designed for users in the areas of mechanical design and drafting, manufacture of machined parts and form tools such as molds and dies for the metalworking and plastics industries, and electrical and electronic design and component production. Software application modules are available in three categories: mechanical design and drafting, manufacturing, and electrical and electronic design.

A high-speed interface bus incorporates peripherals such as plotters, graphics printers, paper-tape punch and reader, and magnetic tape. Autograph can operate as a standalone system or in a communications network. Using the Gerber Network Module (GNM), Autograph can be an intelligent remote graphics workstation to GST's large IDS-80 CAD/CAM system, or can communicate with other Autograph systems, a mainframe computer, or a machine tool. GNM supports both synchronous and asynchronous communications with various protocols. GERBER SYSTEMS TECHNOLOGY, INC., South Windsor, Conn.

FOR DATA CIRCLE 307 ON READER CARD

FAIL-SAFE COMPUTER

DOSC Inc. expects to carve out a new market for redundant systems with its fail-safe computer, which the company says is priced equal to, or less than, systems that don't offer a nonstop capability. DOSC thus hopes to outmode the use of systems with no backup capability.

The new FailSafe system, a reconfiguration of a new system announced last November, has a redundant architecture said to virtually eliminate downtime caused by hardware failure, prevent loss of the database, and eliminate long response time for on-line applications.

Added flexibility is offered by each station having its own dedicated microcomputer. Thus different stations may run entirely different programs, yet each has simultaneous access to the control database and automatic mirror imaging.

DOSC claims its price for the FailSafe system to be a quarter of that of any manufacturer of fault-tolerant systems—$29,000 for large end users and systems houses that order two or more systems. The base price for an individual system is $35,000. The base price includes 256K bytes of RAM main memory, two 24 megabyte Winchester disks, two 24 megabyte removable disk cartridges for backup, dual power supplies, dual bus interface comparators, a database manager, CP/M overlay operating system, and FailSafe spooler software. The system accommodates up to 16 users on individual microcomputers arranged in parallel. DOSC INC., Albertson, N.Y.

FOR DATA CIRCLE 310 ON READER CARD

8/16-BIT MICRO, NETWORK

The Advantage 8/18 microcomputer from North Star Computers includes an Intel 8088 16-bit microprocessor and an 8-bit Z80 microprocessor, priced at $4,099 with two integrated disk drives. The same system can be created from the 8-bit North Star Advantage by adding an 8/16 upgrade kit for $499.

The Advantage 8/16 supports the operating systems of the standard Advantage, which are Graphics CP/M, GDOS/BASIC, and North Star's own ASP, plus the 16-bit MDSOS operating system and future options such as CP/M-86. This provides a migration path from the extensive 8-bit applications software to 16-bit applications software as it becomes available, and as larger cpu memory capacities are needed.

The Advantage 8/16 with an integrated 5-megabyte hard disk and one diskette is $5,499. The 8-bit Advantage has been reduced from $3,999 to $3,599, along with other price reductions for major North Star systems, in both the Advantage and Horizon lines.

North Star also announced its NorthNet local area network, designed to link both 8-bit and 16-bit Advantage systems on a branching network system using unshielded twisted pair cabling. Gateways will be provided to give Horizon systems access to the network.

Network users will be able to communicate with each other, access large central files, and expand their output resources by sharing expensive peripherals such as printers and plotters. NorthNet is controlled by a proprietary CP/M operating system. NORTH STAR COMPUTERS, INC., San Leandro, Calif.

FOR DATA CIRCLE 311 ON READER CARD

NCR-EMULATING TERMINAL

Responding to an apparent demand for low-cost MCR-emulating video terminals, Socor Technology has introduced the IQ 135N intelligent terminal. The Z80-based terminal can replace either an NCR 7900 or a Regent 25 vdt, and lists for $1,095.

The terminal includes 14 user-programmable function keys, with 128 bytes of memory to provide separate functions with a single keystroke. Preprogrammed edit commands include character and line insertion and deletion, and a graphics option can draw lines and has 11 special graphics characters. Seven video attributes are available in varying combinations of blink, underline, and reverse video.

Other features include keyboard lock, 25th status line with a 36-character user message, block and conventional modes, printer and auxiliary RS232C ports, and selectable transmission rates from 110 to 19,000 baud. Amber or green screens are optional. SOROC TECHNOLOGY INC., Anaheim, Calif.

FOR DATA CIRCLE 312 ON READER CARD

DUAL PROCESSORS

Cromemco's new Dual Processor Unit has 68000 and Z80A processors on one S-100 board. The 68000 was chosen for its 32-bit architecture and 16-megabyte addressing range. Dual processing permits the use of existing software that runs on Z80A-based machines, plus 68000-based software such as FORTRAN 77, COBOL 74, Pascal, Structured BASIC, C, and Cromemco's own multi-user, multitasking Cromix operating system.

The Dual Processor Unit is modular, and has been incorporated into several Cromemco configurations of its System One, System Two, and System Three. A 68000-based System One, with dual 5¼-in. floppy disk drives and 256K bytes of memory, is $5,495; with 512K, $6,495. Cromemco's System Three with dual 8-in. floppy disk drives is also available with the 78000; with 512K bytes of memory it is $9,995. System One can be expanded to 2 megabytes of memory, and the System Three to 4 megabytes; the latter is under

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Advanced graphics features include: Resident vector draw, point plot, rectangle draw, multiple linestyles and patterns with rectangle pattern fill. Raster scan technology provides fast data update and develops a bright display image.

Powerful alphanumeric operation is also provided, displaying 80 characters by 33 lines with separate display memories for alpha and graphics modes. The VISUAL 500 provides switchable emulations of the DEC VT52,® Data General D200, Lear Siegler ADM-3A, and Hazeltine 1500 terminals. The VISUAL 550 is a block mode terminal which complies to the ANSI X3.64 standard.

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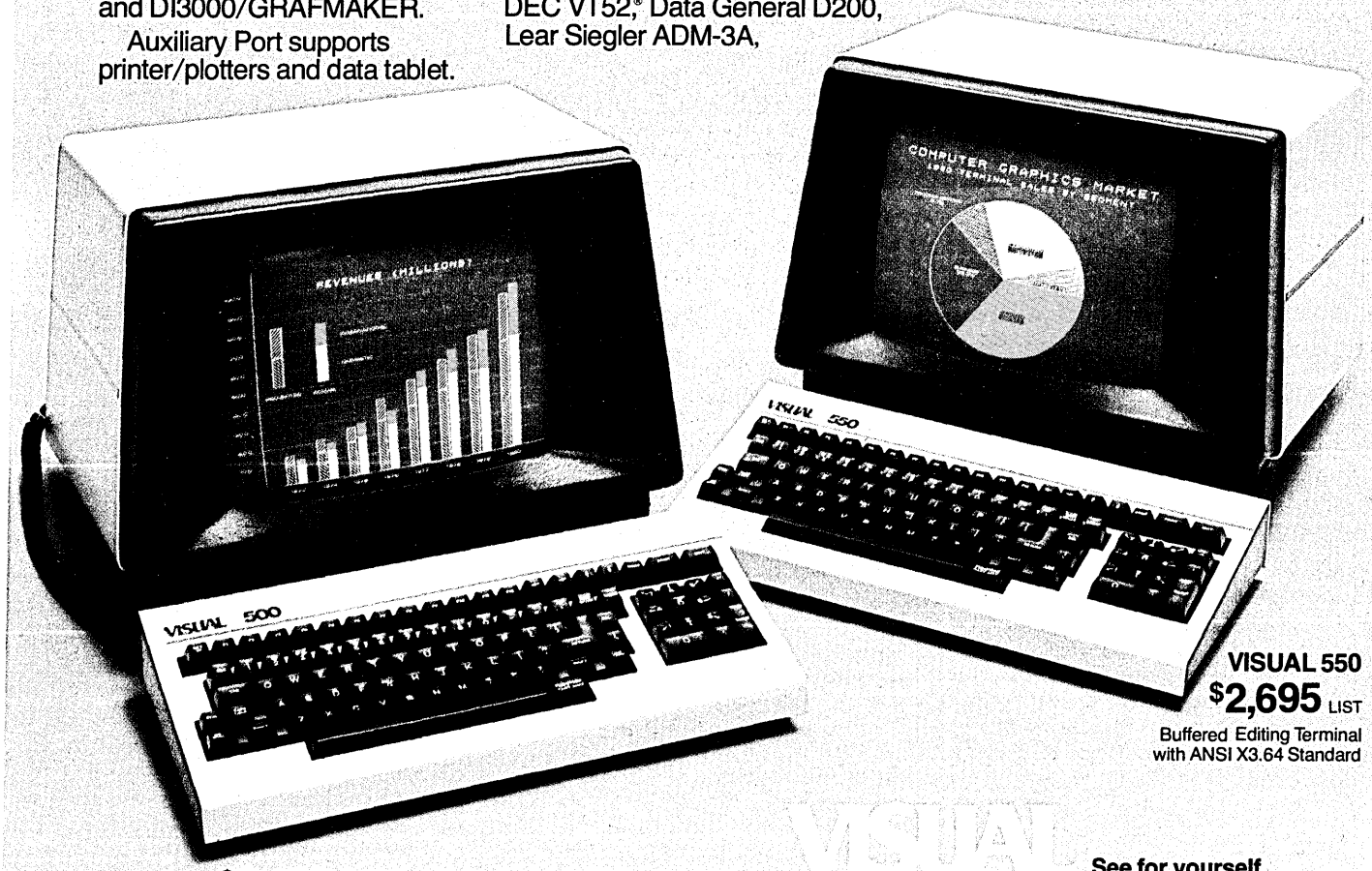

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CIRCLE 101 ON READER CARD

$30,000. CROMEMCO, INC., Mountain View, Calif.

FOR DATA CIRCLE 308 ON READER CARD

8/16-BIT MICRO

Vector Graphic's new Vector 4 business and professional microcomputer contains both 8-bit and 16-bit microprocessors and offers a choice of several operating systems. Using both Z80 and 8088 chips, Vector 4 offers a choice between CP/M, MS-DOS, and Oasis. Two models are offered. The 4/20, with dual floppy disk drives that provide 630 kilobytes on each 5¼-in. disk, is $4,495. The 4/30, with one floppy disk drive and a Winchester hard disk drive storing 5 megabytes, is $5,995. Both come with 128K bits of main memory using 64K RAM chips, and are expandable to 256K. Memory mapping allows the Z80 to access the entire memory in 2K increments.

Vector 4's main memory is time-shared between the cpu and the video display controller. Software control of the display controller allows fast access to screen memory for high-resolution graphics and allows the screen memory to be moved anywhere in main memory. Other Vector 4 features include detached keyboard, green phosphor display screen, three S-100 card slots for adding communications interfaces or peripheral controllers, and a pixel display of 640 by 312 elements. For displaying charts, graphs, and drawings, four levels of gray scale are available with 320-by-132 resolution or 16 levels with 160-by-312 resolution. The Vector 4 also generates color signals to drive a color monitor. VECTOR GRAPHIC, INC., Thousand Oaks, Calif.

FOR DATA CIRCLE 314 ON READER CARD

ERROR CONTROL AND PRIVACY

In addition to its main function of providing error-free communications, the Micro500 Error Controller 512 from Micom assures the confidentiality of users' data. Remote timesharing users and others can stop worrying that outsiders may peek at their accounts, applications, or proprietary data because of a telecom malfunction.

A 512 with the privacy option, when installed on all incoming lines operating at up to 24,000 bits per second, automatically recognizes a remote 512, and whether or not it has the privacy option. If it does, the central site 512 switches to private communications mode.

Users of the privacy option will not be open to a security breach if they are accidentally disconnected from the computer before logging off. The 512 works with full-duplex dial-up or dedicated modems at asynchronous speeds up to 2400 bps; its main use is with dial-up 1200-bps modems such as the Bell 212 and Racal-Vadic 3400. The privacy option is $50 per unit; a 512 with the option installed is $845. MICOM SYSTEMS, INC., Chatsworth, Calif.

FOR DATA CIRCLE 315 ON READER CARD

TABLETOP COMPUTER WITH LSI-11/23 PROCESSOR

The Compat/123 tabletop computer from General Digital Industries consists of a DEC LSI-11/23 processor, 256 kilobytes of memory, a 10- or 20-megabyte 5¼-in. Winchester disk, one or two 8-in. double-sided double-density floppy drives, a 17-megabyte cassette-tape drive, and four asynchronous ports for crt displays, printer or modem.

Among the software offered by GDI for the Compat/123 are the RT-11, RSX-11, and Xenix operating systems, a CORE graphics package, and a relational database manager. Hardware options include memory above 256K bytes, parity or error-correcting memory, additional communications interfaces, and analog and digital signal-conditioning interfaces.

Packaged in an aluminum tabletop cabinet, the Compat/123 with processor, 256K bytes, a 10-megabyte hard disk, 1-megabyte floppy disk, and four asynchronous ports is $12,175. GENERAL DIGITAL INDUSTRIES, INC. Huntsville, Ala.

FOR DATA CIRCLE 313 ON READER CARD

INSURANCE COMPUTER

The IBM Personal Computer is now being offered by Informatics General as a point-of-sale system for life insurance agents. Intended for use in an agent's office, rather than as a portable product, it has been named "The Top Producer," and is furnished with software to analyze client financial needs and illustrate insurance programs. It can also communicate with a home-office computer through a message-switching capability available in LifeComm, an IBM mainframe software product offered by Informatics.

The Top Producer's basic configuration consists of a 128K byte IBM computer, two floppy disk drives, and an 80-cps printer, with software for client/prospect retrieval, financial needs analysis, and sales illustration of traditional life insurance programs. It lists for $8,490. The software is available separately for $4,425. Optional software includes a "universal-life (nontraditional)" illustration, an enhanced capability for client/prospect retrieval, and estate planning. The operating system is UCSD-P; the language is Pascal.

A tutorial program with prompts or questions helps an agent learn the system. Also, a one-day training class is offered as part of the system purchase price. INFORMATICS GENERAL CORP., Dallas, Texas.

FOR DATA CIRCLE 316 ON READER CARD

PORTABLE TERMINAL

A portable terminal with integral printer, the Computone SST is designed for use by life insurance agents in point-of-sale financial planning and analysis. The SST, built into an attaché case, is Computone's first standalone terminal.

Data are entered via two rows of thumbwheel switches that are set to the numbers 0 through 9. Removable plastic templates, one for each policy program, define each switch. Plug-in ROM cartridges provide selected programs for the SST'S Z80-based computer, with results printed out on a 9-by-9 dot matrix printer that uses either single or multiple-copy pin-fed fanfold sheets. Using a built-in telephone coupler, the SST can communicate on-line with Computone's data center in Atlanta for access to a database that includes 660 financial planning programs and data on more than 3,100 insurance policies offered by over 240 companies. An optional ASCII keyboard plugs into the SST to turn it into a general purpose communications terminal.

The SST terminal is $3,295, ROM cartridges are $200 each, and the optional keyboard, which will fit into the attaché case, is $300. Named after the supersonic transport plane, the 18-pound SST is informally called the "Super Sales Tool" and the "Super Salesman's Terminal." Computone figures there are some 125,000 prospects for the SST, defined as full-time agents in the business for over five years. COMPUTONE SYSTEMS, INC., Atlanta, Ga.

FOR DATA CIRCLE 319 ON READER CARD

P.C. PROGRAMS ON APPLE

Using the 88Card form Coprocessors Inc., owners of an Apple II can run programs written for the IBM Personal Computer. The accessory card, which plugs into the Apple computer, contains in Intel 8088 16-bit microprocessor along with 64 kilobytes of RAM and control functions. Plugged into the Apple, it turns the machine into a 16-bit computer with 128 kilobytes of memory.

Available from selected dealers at $899, including the operating system designed for the IBM P.C., 88Card is fully compatible with Apple peripherals such as disk drives and printers, and permits immediate use of either conventional Apple operation or IBM P.C. programs. No external power supply or connection is required. COPROCESSORS INC., San Jose, Calif.

FOR DATA CIRCLE 317 ON READER CARD

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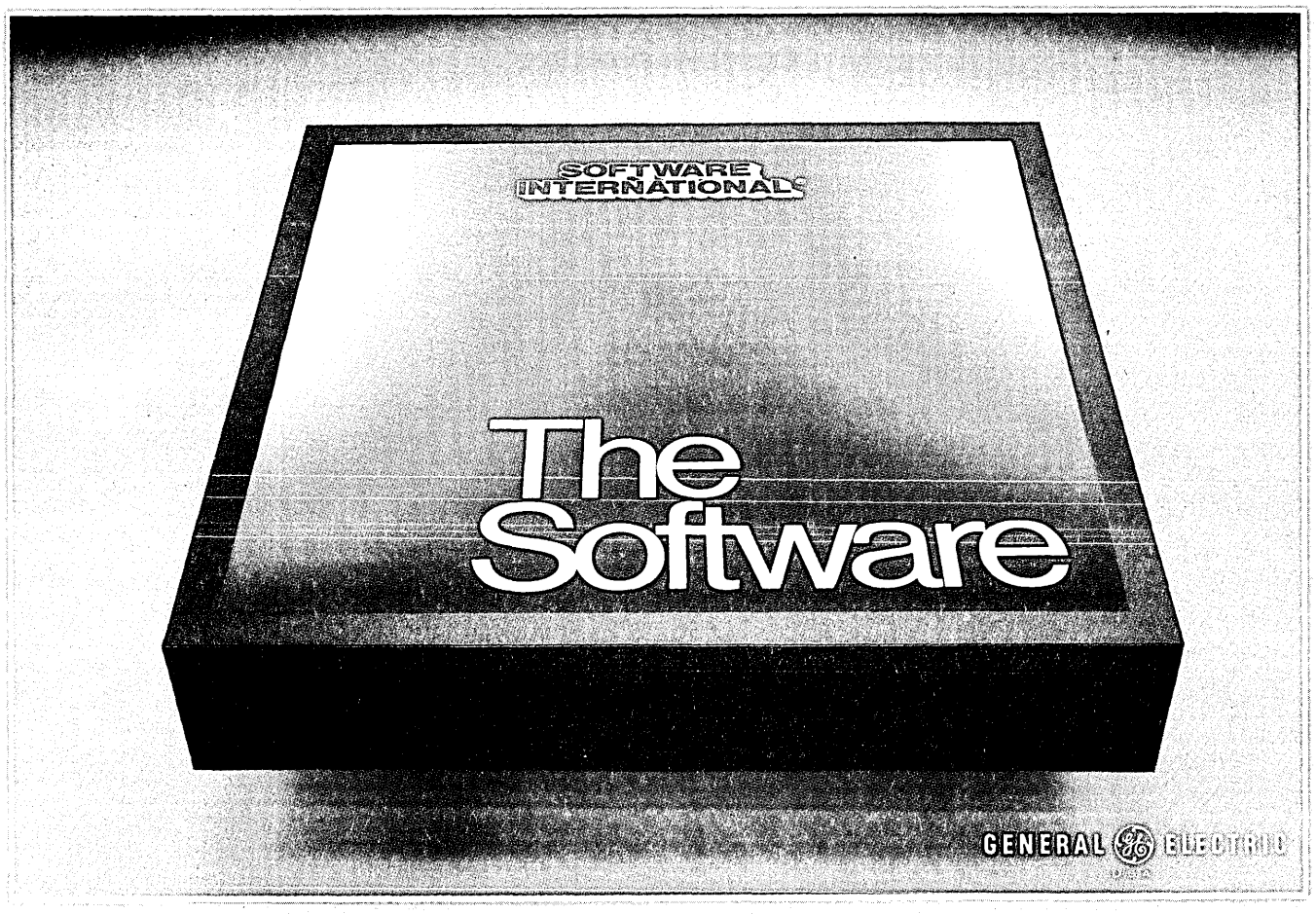

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SOFTWARE AND SERVICES

UPDATES

Computer Associates International of Jericho, N.Y., will acquire the stock of Phoenix-based Capex Corp. for about $22.5 million. Both firms develop and market standardized software, mostly for IBM and IBM-compatible mainframe computers. Capex has been strong in OS packages, while Computer Associates is said to be the leader in the DOS market. The two supply over 30 packages, with "no significant duplication." Where overlap exists, the best features of each will be combined.

Wiley Professional Software, a new line for publisher John Wiley & Sons, will announce its first product this fall. Floppy disks will be offered for the Apple, TRS-80, IBM P.C., and possibly the HP-87 and Atari, in areas such as business (spreadsheet, integrated accounting packages), science and engineering (differential equations, chemical engineering, construction), and non-game consumer programs (personal finance, education).

Matra Datavision, an affiliate of the French company, has opened its HQ in Burlington, Mass., and will enter the U.S. CAD/CAM market with its Euclid 3D solids-modeling system, already installed in more than 50 customer sites worldwide. Also in the product line will be turnkey systems based on Euclid and Digital Equipment Corp. VAX computers.

Solid Software, a national supplier of software packages for small business computer users, combines four Atlanta software houses including Georgia Software Consultants, Systems Sciences of America, Jim Reeves & Associates, and Pro Soft. All programs run on the TRS-80 Model II and will be converted to also run under CP/M.

FINANCIAL MODELING

Insight, a financial modeling and reporting system from Interactive Program Products (IPP), is now compatible with the IBM System/38 minicomputer. A menu-driven, user-friendly system, Insight/38 features budget planning, forecasting, and graphics capabilities, plus an optional general ledger module.

Purchase price of Insight/38 is $17,000; with general ledger, $21,000. IPP also markets Insight/34, with the same capabilities, for IBM's System/34 computer, at $12,000 or $15,000 with general ledger.

Designed mainly for financial executives and accountants, Insight/38 requires no programming or computer experts. Business models can be created with up-to-date actual figures because Insight/38 automatically retrieves stored data from any file on the computer.

After a model is created and stored, it can be accessed at any time from any System/38 workstation. Menus and prompts guide the user, who can easily compare actual versus budget figures, this year to last, and answer "what if" questions without permanently changing data.

The user can customize report formats and define required accumulations, totals, and summaries. A Report Writer facility eliminates manual preparation of reports and program special commands, and also allows standard reports to be defined in advance, report structures to be applied to other financial models, and a range of reports to be combined and produced at one time. INTERACTIVE PROGRAM PRODUCTS INC, New York, N.Y.

FOR DATA CIRCLE 326 ON READER CARD

DBMS FOR IBM P.C.

ISE-USA has released its MDBS III database management system for the IBM Personal Computer, describing it as "the world's most advanced DBMS" and as providing for "serious application developers" DBMS "facilities that are not yet available with any DBMS currently offered" on IBM mini and mainframe computers "including SQL, DL/1, Adabas, Total, and IDMS."

MDBS III, at $3,120, provides a free-

SOFTWARE SPOTLIGHT

SOFTWARE SECURITY

Modestly described by Chapman & Associates as "the most important software package ever developed for business data processing," Signed Data assigns and verifies ownership of all computer-processed data transferred between companies. As a software implementation of a secure communications channel, Signed Data can be executed as a utility or integrated into existing software on all IBM OS/370 systems and up. In consists of over 50 BAL routines.

The package is said to guarantee data security by providing proof of authorship (as well as proof of ownership) of data, proof of receipt of unaltered data, and secrecy and integrity of data. Even if a data-transmission line is compromised, Chapman & Associates say the message is "impregnable to all methods of analysis now available; furthermore, data cannot be acted upon or altered in any way without effectively destroying the data content."

Signed Data depends on a combination of a public cipher, or key, and a private, individually held key. Each party in the communicating network is assigned both private and public keys. A message is first encoded with the sending company's private key, creating a "digital signature" and proof of authorship. The message is encoded again with the receiving company's public key, creating a "digital seal" that "no one but the intended receiver may break." Signed Data, which is $50,000 per physical location, is said to go far beyond the Data Encryption Standard established by the National Bureau of Standards. CHAPMAN & ASSOCIATES, Laguna Niguel, Calif.

FOR DATA CIRCLE 325 ON READER CARD

form data-description language (DDL) for generating data dictionaries. The DDL supports nine types of data items, data compression, data encryption, an access-code approach to data security (down to the field level), feasibility range checking, multiple relationships between record-type pairs (with any of six ordering conventions), and various performance control features. ISE-USA, West Lafayette, Ind.

FOR DATA CIRCLE 327 ON READER CARD

FOUR MICS COMPONENTS

Four new components for use with the Morino Associates MVS Intergrated Control System (MICS) will be available this fall for use in IBM MVS installations: System Reliability, Installation Accounting, Basic Performance Management, and Basic Capacity Planning.

System Reliability, which has a $4,400 first-year license fee, uses the standard error records collected on the MVS system error recording data set, SYS1•LOGREC, to build system reliability information in the MVS database, generate exception reports, and integrate the reliability data with other information areas.

Installation Accounting ($6,800) supports charges for batch jobs, TSO, IMS, and CICS usage based on any combination of data elements contained in the MICS database. It also supports an unlimited number of user-defined surcharges, discounts, and differentials.

Basic Performance Management ($3,000) provides the analyst with a systematic approach for using MICS in performance management and problem solving, focusing on four basic MVS areas: installation performance specification, I/O subsystem, auxiliary storage management, batch workload, and real storage management.

Basic Capacity Planning permits using workload profiles, simple trends, univariate forecasts, and business element forecasts. It augments the present MICS capacity-planning capability, which includes the Single Workload Model and Best/1 Model Generator. MORINO ASSOCIATES, INC., Vienna, Va.

FOR DATA CIRCLE 328 ON READER CARD

DATA ENCRYPTION

Data Encryption Facility, a software product designed to protect computer data from unauthorized access and piracy, is available from Applied Software. Based on the National Bureau of Standards DES algorithm, DEF is said to provide a totally software-driven encryption capability for medium- to large-scale computers using the MVS, SVS, or MVT operating systems. With DEF, each user can protect his data and programs from unauthorized use or modifications without the need for specialized equipment or changes to the operating system.

The encryption key is not stored in the computer system or within the encrypted data. DEF supports binary and hexadecimal encryption keys, and also permits using words and phrases up to 25 characters long as keys, so users can more easily invent and remember their keys.

For the first year's lease, the charge per site for DEF is $16,000 for the first cpu, $8,000 for the second cpu, and $4,000 for any additional cpus. Sample COBOL, FORTRAN and PL/1 programs using DEF assembler-language subroutines are supplied with DEF. APPLIED SOFTWARE, INC. Palm Beach Gardens, Fla.

FOR DATA CIRCLE 329 ON READER CARD

BUDGETING AND FINANCIAL MODELING

A budgeting and financial modeling tool designed for end users as well as for data processing professionals has been introduced by General Electric Information Services. CPL/Tactix was developed for operational and corporate managers "who appreciate the control and ease of a desktop computer, but now need mainframe power as well." CPL/Tactix is available via GE Information Service' IBM-compatible Mark 3000 computing service.

The product is also available for licensing on in-house mainframes equipped with IBM MVS/TSO or VM/CMS operating systems for $22,000 annually, including maintenance.

CPL/Tactix provides an electronic spreadsheet, a method for delivering data around the world quickly and securely, and flexible financial modeling for ad hoc analysis. It also provides application programmers with a "powerful and efficent" language for building large, complex systems. It provides an interactive interface to a full-screen terminal such as the IBM 3270, communication lines, color graphics hardware, and to mainframe computers. CPL/Tactix provides built-in financial functions for cash-flow analysis, short- and long-range budgeting and planning, revenue consolidations, pricing, and profitability analysis. GENERAL ELECTRIC INFORMATION SERVICES CO., Rockville, Md.

FOR DATA CIRCLE 330 ON READER CARD

PAYROLL SERVICE

A phone-in service for businesses that process payrolls is now offered through Control Data Business Centers. Because of its phone-in aspect, the Phone 4 Payroll system "provides greater customer convenience and faster turnaround than ordinary batch services." Control Data sees the system as a boon to many companies that were previously too far from a processing center and who can now "enjoy the benefits of our payroll service," and says it will suit the needs of many small- and medium-sized business that do not require in-house computer systems "or complicated data processing services."

The system produces payroll checks and registers, plus quarterly reports and annual W-2 forms automatically. Optional reports provide in-depth and expanded payroll, accounting, and management informa-

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Computer Systems News Report

Ron Audet, OEM Division manager at NCR Corp., agreed that the show was worthwhile. "We have had literally hundreds of inquiries...from some very qualified people.

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Computer Systems News Editorial

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The system produces payroll checks and registers, plus quarterly reports and annual W-2 forms automatically. Optional reports provide in-depth and expanded payroll, accounting, and management information. Monthly processing charges vary with the frequency and number of checks and the number and frequency of optional reports. CONTROL DATA CORP, Greenwich, Conn.

FOR DATA CIRCLE 331 ON READER CARD

ELIMINATING CPU SEIZURE

A multiterminal, multitasking executive, named GO by Exact Systems and Programming Corp., is said to eliminate the seizure of the cpu caused by different terminals making simultaneous updates at the record level.

GO, designed for Data General computers (microNova, Nova, and Eclipse) or the Rolm 1666, provides the environment in which multiple terminals may perform different tasks, controls communications with the outside world, provides access to Exact's DNA database manager, and performs various functions while operating within the manufacturer-supplied operating system.

GO, which carries a license fee of $1,800 to $10,000 depending upon system configuration, consists of two sets of program modules. The first set handles I/O crt control, the multiterminal environment, memory mapping, task and communications control, system startup, and environment management. The second set represents elementary functions (reusable code) that comprise any program.

Prime features of GO include fast context switching, integral communications control, fast response time, memory-map control, automatic database logging, roll forward reconstruction facility, and networking capability; it is reentrant and multithreaded, written in macro-assembler, and requires no system generation. EXACT SYSTEMS AND PROGRAMMING CORP., Armonk, N.Y.

FOR DATA CIRCLE 333 ON READER CARD

GENIUS FOR CDC, UNIVAC

The Genius conversational report generator designed by Intel for the System 2000 DBMS, is now available for Control Data and Univac hardware. It has been available for IBM/OS machines since October 1981.

An adjunct to the System 2000 Report Writer, Genius automatically generates reports based on user responses during interactive prompting sessions. Genius is said to provide the capabilities required by the experienced programmer, with the prompting and error detection and correction capability needed to support novices.

Genius for CDC and Univac is priced the same as the IBM version: $10,000. It reportedly aids in application development by freeing up programmer time and removing coding steps, eliminating reporting errors, providing end users with "a powerful report-generating tool and rapidly producing distribution-quality reports." Genius provides summations, simple and complex calculations, intermediate values, data selection, and detailed item display. INTEL CORP. SYSTEMS GROUP, Austin, Texas.

FOR DATA CIRCLE 332 ON READER CARD

ADA SYNTAX CHECKER

An educational tool from Intermetrics, the new Ada syntax checker is a Pascal program which checks the grammar of an Ada source program, to help programmers create software written in Ada, the language defined by the U.S. Dept. of Defense.

Called AdaSynCh (pronounced Ada-cinch), the checker runs on most computers that support Pascal and is $900 in source form on magnetic tape. AdaSynCh determines whether a program is written with proper Ada grammar and format and also indicates where errors exist. It is said to be particularly useful in commercial and educational settings where programmers will be working with Ada in the future and wish to gain experience now.

AdaSynCh allows programmers "to master the grammar and syntax of Ada" before actual Ada compilers are available. Intermetrics' own full Ada compiler for the DEC System 20 is undergoing validation testing.

A cross-referencing program summarizes programmer-defined names, showing where they appear in the Ada source program. AdaSynCh consists of some 2,000 lines of Pascal source code; the cross-referencing program contains 50 lines of source code. INTERMETRICS, INC. Cambridge, Mass.

FOR DATA CIRCLE 334 ON READER CARD

DEBUGGING PDP-11 FORTRAN-77

Computer Interface Systems, developers of the XBug FORTRAN-IV debugger, has released XBug77, for PDP-11 FORTRAN-77 and FORTRAN-IV-Plus systems. XBUG77 is said to bring all the XBug features to users of DEC FORTRAN-77, including the ability to place breakpoints at any statement within a program, step through a program statement by statement, examine and change variables of any data type, and cause breakpoints to occur whenever selected variables change value. XBug77 runs on any PDP-11 using RSX-11M and FORTRAN-IV-Plus or FORTRAN-77.

License fees are $495 for XBug, $695 for XBug77, and $995 for both when ordered together. COMPUTER INTERFACE SYSTEMS, INC., South Plainfield, N.J.

FOR DATA CIRCLE 338 ON READER CARD

SNA FOR MICROS

Personal computers can function as 3270-type terminals in an SNA environment with Miro-SNA/3270, developed by Micro-Integration Inc. and marketed by IE Systems. Micro-SNA has "all the layers" required to give microprocessors true SNA/3270 capability, including SDLC protocol and session command support.

The initial release, scheduled for third-quarter 1982 and priced under $1,500, is designed for CP/M-80 and CP/M-86 operating systems, using top-down structured programming "to meet portability and maintainability design goals."

All modules are written in Pascal or relocatable assembler. The package, developed because of "the growing importance" of IBM's Systems Network Architecture, emulates either an IBM 3274 terminal with one 3277 or 3278 display and one 3284, 3286, or 3287 printer, or it emulates a 3276 control-unit display station with one 3287 printer.

Using Micro-SNA, a personal computer could replace both a dedicated word processor and a 3270-type terminal, saving cost and space. IE SYSTEMS INC., Newmarket, N.H.

FOR DATA CIRCLE 335 ON READER CARD

SCREEN FORMATTING

An on-line, interactive screen formatter that "speeds up and simplifies" the design and use of screens for IMS/DC and TSO applications is new from Boole & Babbage. Called Screenform, it is said to provide an accurate and fast way to design, create, and maintain complex screen formats using the full capabilities of a 3270 terminal. Formats entered or changed at the terminal are stored and maintained as screen masks in a format database (ISAM or VSAM dataset). For IMS/DC, Screenform uses these definitions to automatically generate all the MFS macros required to produce a complete IMS/DC screen format.

Screenform, written in assembler, is $12,500, including a year of product maintenance. It is said to be currently in use at more than 40 computer installations in Europe, where it was originally introduced by The European Software Co. It features screen formatting for applications written in assembler, COBOL, PL/1, and FORTRAN; on-line simulation for format testing; and functions to create, delete, display, and modify individual screen formats, create format layouts, and display the field survey format. BOOLE & BABBAGE, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 336 ON READER CARD

INFORMATION SERVICES

Two new information sources are available on the CompuServe Information Service. Money Market Services, a multinational corporation, uses weekly Federal Reserve data to forecast interest-rate trends and their effect on the stocks, bonds, and commodities markets. A library of the firm's weekly financial newsletters is also available

through CompuServe.

Small Business Reports provides information on capital investment and savings plans, tax laws, insurance tips, and services available to help operators of small business. These new sources can be accessed for the standard fee of $5 an hour. A personal computer or terminal, a telephone, and a modem are required. COMPUSERVE, Columbus, Ohio.

FOR DATA CIRCLE 339 ON READER CARD

MAILGRAMS VIA PERSONAL COMPUTERS

Over 18,000 subscribers to The Source can now compose and send Mailgram messages from their personal computers. Messages may be sent anywhere in the United States, including Alaska and Hawaii. If entered in The Source by 4 p.m., they are "virtually guaranteed" delivery on the next business day.

The Mailgram messages are electronically forwarded by The Source to Western Union's largest Mailgram processing center, then routed by zip code to the serving post office nearest the addressee, where they are printed, placed in envelopes, and given preferential delivery treatment.

Sending a single Mailgram on The Source is $5.15 for up to 100 words, plus $1 for each additional 100 words.

Multiple Mailgram messages with identical texts are $4.25 each for 2 to 25, $3.50 each for 26 to 100, and $3 each for 101 to 200. Another $1 is charged for each 100 additional words. Confirmation copies, delivered at the same time as the Mailgrams, are $2 each, with another $1 for each additional 100 words.

Messages can be saved in a user's personal file on The Source, text files can be created for frequently used messages, the Mailgram Message Processing Service can enter names and addresses of large lists at 35¢ each, and lengthy address files can be stored with the Message Processing Service at a nominal charge. SOURCE TELECOMPUTING CORP., McLean, Va.

FOR DATA CIRCLE 337 ON READER CARD

SCREEN DESIGN

A CP/M-based program that provides "an efficient way" to manage fixed-field screen forms, maps, and menus, Dynamic Screenforms functions as a dual-purpose system, with a Screenforms Design subsystem, and a Dynamic Input routine.

The Screenforms subsystem allows the programmer to type the desired screen form, map, or menu just as the user would see it on the crt screen. The BASIC statements needed to display the screen form are generated automatically.

The Dynamic Input routine frees the programmer from having to statically code BASIC statements to accept and display data. The routine, using a single command, allows the keyboard operator to complete and/or update Screenforms-defined data fields, which are automatically defined each time a screen form, map, or menu is displayed.

The Screenforms Design subsystem features menu-driven control, up to 99 I/O fields per screen form, default values, and a 24-by-80 full-screen support. The Dynamic Input routine supports a wide range of field attributes, for controlling the access, content, and/or video characteristics of each field, field range limit parameter, sequential or random cursor placement, etc. Dynamic Screenforms is $395 from RIVER JORDAN MISSION, Lake Jordan, Ala.

FOR DATA CIRCLE 340 ON READER CARD

APPLE III COBOL

Apple Computer says its Apple III COBOL is "the first personal computer-based COBOL language capable of executing significant mainframe applications." Apple III COBOL has been certified by the GSA's Federal Compiler Testing Center at the High-Intermediate Level, "a higher level than many of the COBOL systems available for minicomputers."

Apple III COBOL features Animator, a screen-oriented, source-level debugger;

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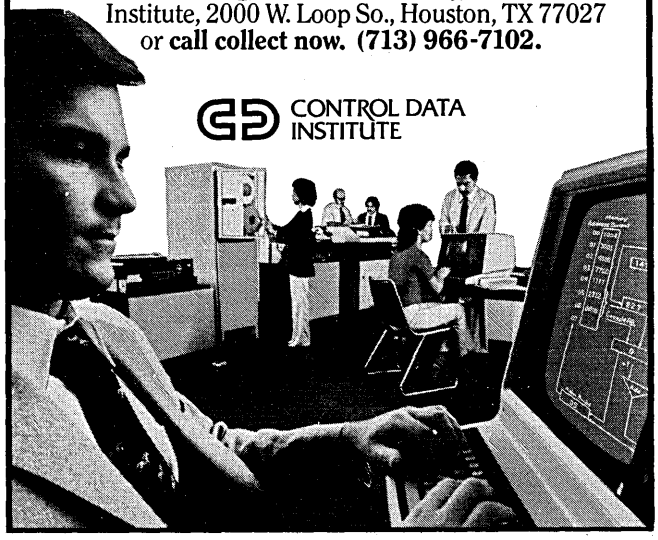

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and Forms-2, a COBOL source-code generator; and requires a 128K Apple III system, a video display such as the Monitor III, and at least one external floppy or hard-disk drive. Full use of Animator requires 256K of memory. The program will retail under $500 this fall. APPLE COMPUTER, INC., Cupertino, Calif.

FOR DATA CIRCLE 341 ON READER CARD

PROBLEM-SOLVER

TK!Solver, introduced by Software Arts, creator of VisiCalc, solves engineering and business problems without programming. The user enters equations that define the problem, types in the known values, and the program calculates the unknown value.

The program has a variety of built-in functions, from sine and cosine to net present value and internal rate of return, and can provide answers as numbers, tables, or graphs. TK!Solver (TK is for tool kit) will retail this fall for $299 with applications packages for specific industries priced at $50 to $100. Each package will contain several predefined models to solve particular problems in a given field. Initial application packages will be available for mechanical engineering, financial analysis, high school science, and architectural design and construction.

The program and application packages will first be offered for the IBM Personal Computer and the Apple II, with versions for "other major brands" of personal computers to follow. Software Arts will market the TK!Solver program itself, rather than through VisiCorp (formerly Personal Software Inc.), which has sold over a quarter of a million copies of VisiCalc.

TK!Solver supports the DIF file format developed by Software Arts, so data can be interchanged with other programs, including VisiCalc. A support publication will be published with tips and tutorials. SOFTWARE ARTS, INC., Cambridge, Mass.

FOR DATA CIRCLE 342 ON READER CARD

CRT EMULATOR FOR APPLE

New software from Softronics allows a low-cost Apple system to emulate many of the popular crt terminals, for accessing applications on large host computers and timesharing systems. The $150 Softerm package supports 9,600-baud transmission, and permits emulating terminals such as the IBM 3101 series, DEC VT-100, Data General D-200, Lear Siegler ADM-3A and ADM-5, Hazeltine 1400 and 1500 series, ADDS Regent series, and TeleVideo 900 series.

Features include 40/40 or 80-column display and file-transfer capability in a choice of modes including Softrans, which provides data compression. Support is included for most asynchronous serial interface boards and 80-column video boards available for the Apple. Softerm operates on any Apple II Plus with 48K memory, disk drive, and a standard tv set or video monitor. SOFTRONICS, Memphis, Tenn.

FOR DATA CIRCLE 343 ON READER CARD

PURCHASE-ORDER PRINTING FOR MAPICS

A purchase-order printing and history package for IBM System/34 MAPICS users has been released by Para Research. The current IBM MAPICS (Manufacturing Accounting and Production Information Control System) does not provide this feature. The new package helps users track and control all their purchases from the printing of suggested orders to the inputing of invoices. It also interfaces with any installed Materials Requirements Planning and Accounts Payable modules.

Priced at $1,500, with a $200 annual maintenance fee, the system allows manufacturers to print purchase orders based on information from the Inventory Management or Materials Requirements Planning modules of MAPICS. This is said to be the first system of its kind that uses item information directly from MAPICS, yet can remain external to the MAPICS code. PARA RESEARCH, INC., Rockport, Mass.

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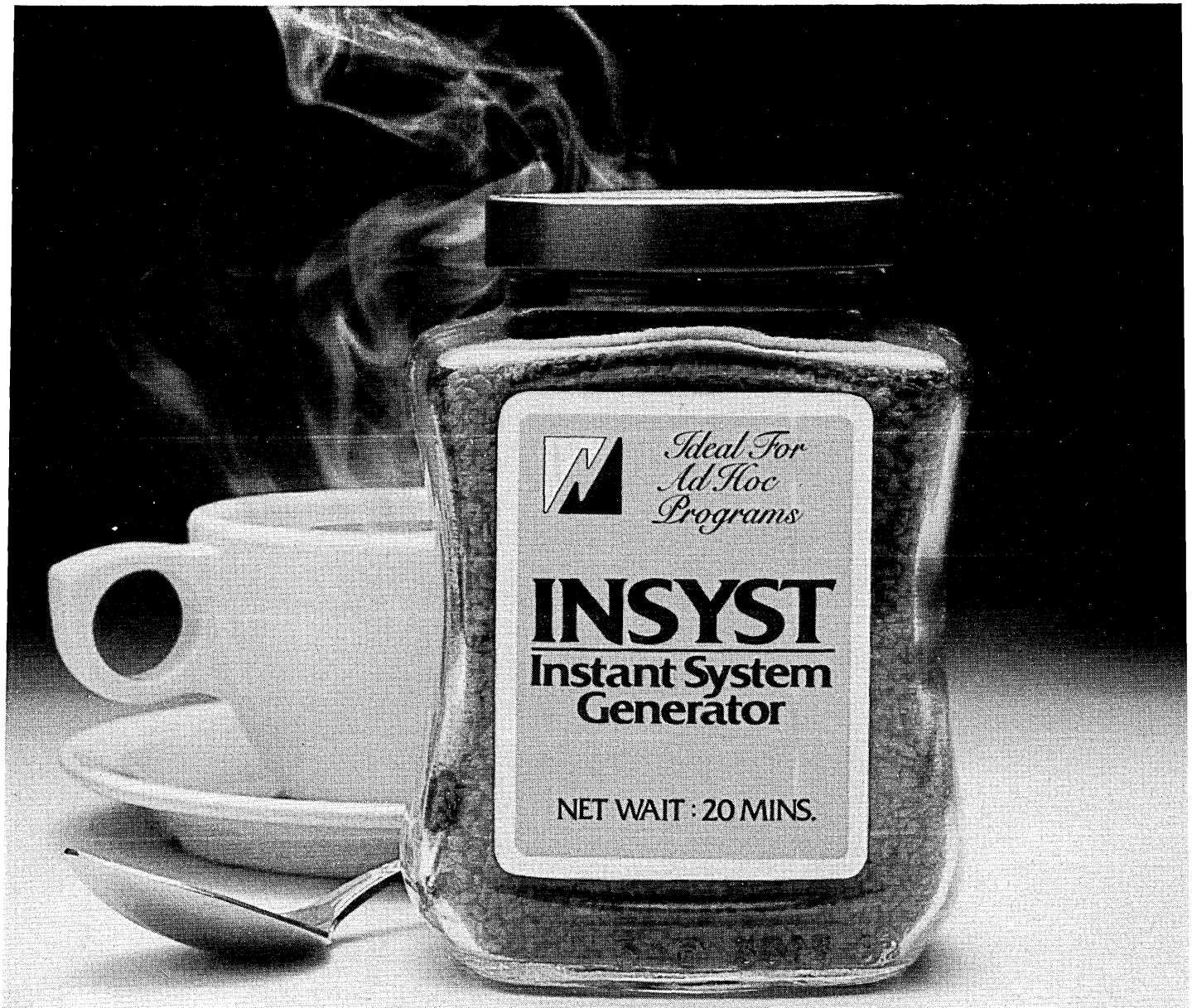

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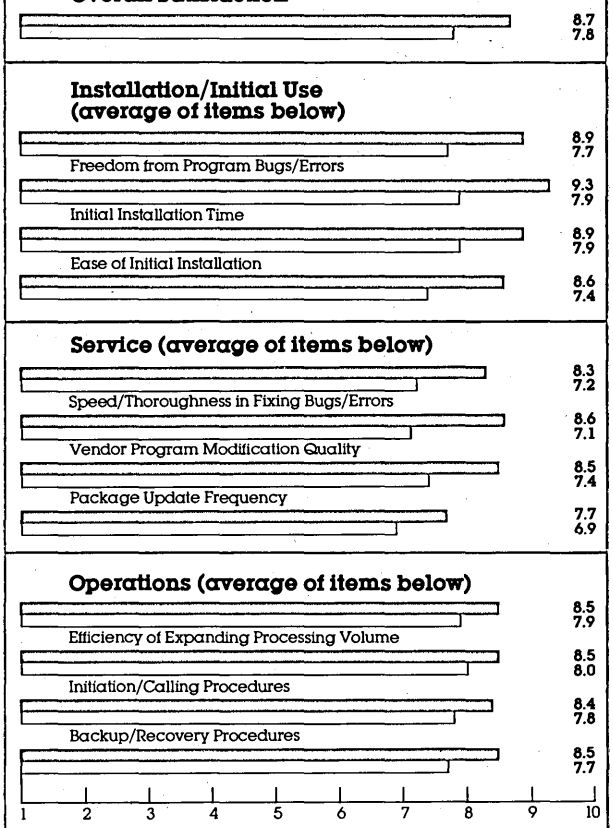

Above values based on a scale of 10 to 9 Superior, 8 to 6 Very Good, 5 to 3 Acceptable, and 2 to 1 Inadequate. Solid bars ▭ denote specific package, open bars ▭ denote group average.

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	Excel.	Good	Fair	Poor	MAUR*	CA**
Reliability	42	7	0	0	3.86	1
Efficiency	40	8	1	0	3.80	1
Ease of installation	34	12	1	1	3.63	1
Ease of use	35	12	2	0	3.67	1
Trouble-shooting	23	18	4	0	3.42	2
Documentation	17	31	1	0	3.33	2
User Education	7	21	11	0	2.90	2
Vendor's Maintenance	19	24	1	0	3.41	2
Overall satisfaction	36	13	0	0	3.73	1

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AC Manufacturing.....54, 55
Ampex.....65
Ann Arbor Terminals.....130
AT&T.....20,21
AT&T Long Lines.....46

BBN Computer Corporation.....62

Calcomp.....36, 37
Center for Communication Management.....128
Clapp & Poliak.....105
Codex.....129
Computer Corporation of America.....25
*Columbia Data Products.....136-13
Control Data Institute.....149

DASD.....172
Data General.....122, 123
Datapoint.....107
Data Set Cable.....52
Dataswitch.....12
Decision Data.....9
Digital Equipment Corp.....58, 59, 132, 133
Digital Microsystems.....73
Doehler Jarvis.....118

Electrodata.....106
Emulex.....17
L.M. Ericsson.....136-22, 136-23
Execucom.....139

Floating Point Systems.....2
*Fujitsu.....136-8, 136-9

General DataComm.....60
General Electric.....135
Glasgal Communications.....149
Graham Magnetics.....81

*Hazeltine.....136-5
Hewlett Packard.....27, 100, 101
Honeywell Info Systems.....167
Hughes Aircraft.....91

IBM.....56, 57, 71, 78, 79
IMSL.....38
Infodata.....89
Informatics.....15
Information Builders.....170
Innovation Data Processing.....152
Intel.....5
Intermec, Inc.....127
ISOREG.....111
C. Itoh.....19

Kennedy Co.....Cover 2

Lanier.....66, 67
Lee Data.....16
Liebert.....143

Martin Marietta.....150
*Maxell.....136-18
McCormack & Dodge.....48,49
Megatek.....77
Micom.....1
Microcom.....113
Microrim.....121
MSA.....69
Multitech Systems.....39

National Advanced Systems.....6, 7
National Electric Cable.....52
National Information Systems.....70
NCR.....74, 75, 108
NEC.....53
*Norsk Data.....136-21
Northern Telecom.....82, 83

*Olivetti.....136-25
On Line Software.....151

*Philips.....136-17
Prime Computers.....22

SAS Institute.....43
Selecterm.....164
Siemans.....94-95
*Siemans.....136-14, 136-15
Software International.....144
Software Results.....8
Source EDP.....50, 51

Technology Transfer Institute.....26, 61, 63
Teletype.....Cover 4
Televideo.....44, 45, 84, 85
Texas Instruments.....99
Three M.....4
Three Rivers.....30
Trans Net.....70
TRT.....168

*UCSL Microsystems, Ltd.....136-26, 136-27
Ungerman Bass.....28, 29
United Airlines.....162, 163
United Technical Products.....171
University Computing Co.....10, 11

Verbatim.....35
Victor Business Systems.....93
Visual Technology.....141

Xerox Computer Services.....Cover 3

*International edition

The Marketplace...

ADVERTISERS' INDEX

SOFTWARE & SERVICES

Amcor Computer Corp.....158
Dataware, Inc.....158
Dataware, Inc.....158
Dataware, Inc.....158
IOTC, Inc.....159
Mitchell & Gauthier Associates, Inc..158
NDD.....158
On-Line Software International.....159
Pioneer Software, Inc.....159
Plycom Services, Inc.....159
Pycco Computer, Systems, Inc.....159
RSTS Professional.....158

BUY, SELL, LEASE

Advanced Systems Concepts, Inc..160
Genstar Rental Electronics, Inc.....160
Raymond G. Lorber, Incorporated...160
Northern Telecom Canada Ltd.....160
C.D. Smith & Associates, Inc.....160
Thomas Business Systems, Inc. 159

PERSONAL COMPUTING

Computer Plus.....160

JOB MARKET PLACE

RSVP Services.....161
University of Petroleum & Minerals.....161
University of Petroleum & Minerals.....161
Wallach Associates, Inc.....161

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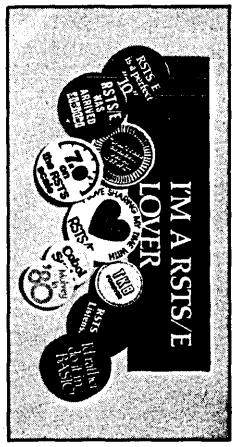

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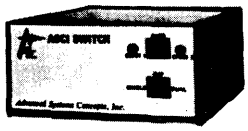

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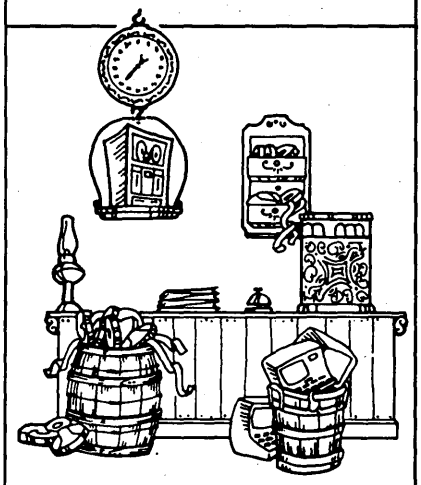

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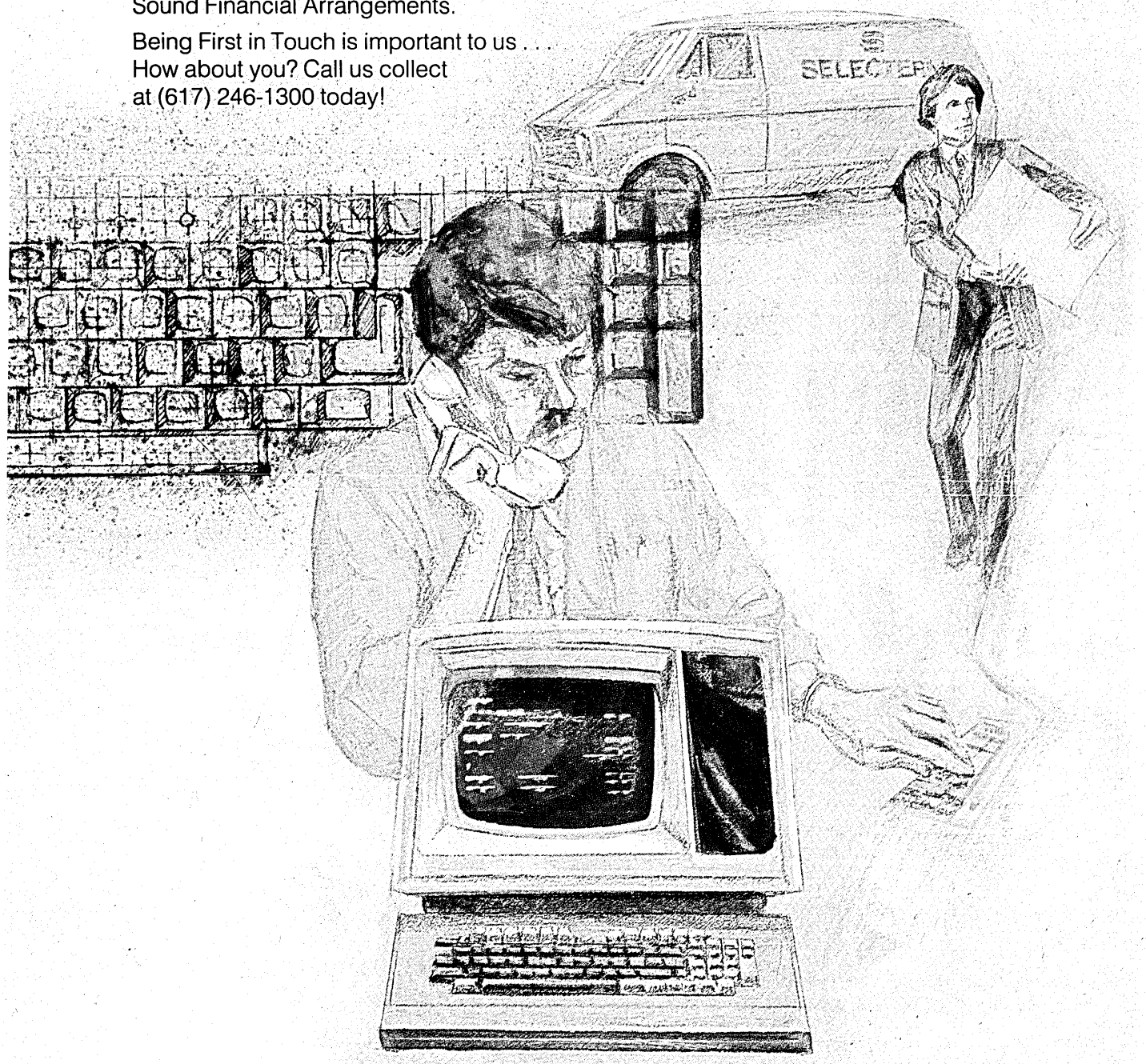

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BOOKS

THE SYSTEM BUILDERS: THE STORY OF SDC
by Claude Baum

Industry pundits have been saying for years that this business is maturing. Now we have the proof. SDC has celebrated its 25th anniversary.

To celebrate its silver anniversary, SDC issues a corporate history. That's not unusual. Traditionally, large corporations hire professional writers to grind out bland histories celebrating the triumphs of the management currently in power and glossing over any unsavory details of the past. The books, usually handsomely printed and profusely illustrated, become suitable coffee table decorations and giveaways to favorite customers. Histories they are not. All the warts have been removed.

SDC, System Development Corp., now a part of Burroughs, went about the task a little differently. That's not at all surprising to those who know SDC. It has always been just a little different.

Claude Baum, a veteran SDCer, took on the task of writing the story. Complicating the assignment was the changeover period as Burroughs took control. This is handled in the brief epilogue.

As a literary work, the book suffers somewhat from not having been written by a professional. There is a certain amount of moving back and forth through history. Acronyms appear far from their explanations. The years get a bit tangled. Inevitably, the impact of SDC's expensive commercial failures is downplayed. If the book is believed, all presidents have been great and top management was just super. Almost everything that SDC ever did was a technical success.

Well, of course, that's not quite the way it was. SDC has had its share of failures. Some of its management has been less than farseeing and effective. Proposals have been mishandled. Too many good people have gotten away.

When a corporate history is written by a staff person, inevitably there is a bias toward the company's successes. That's a fact. One cannot quibble too much.

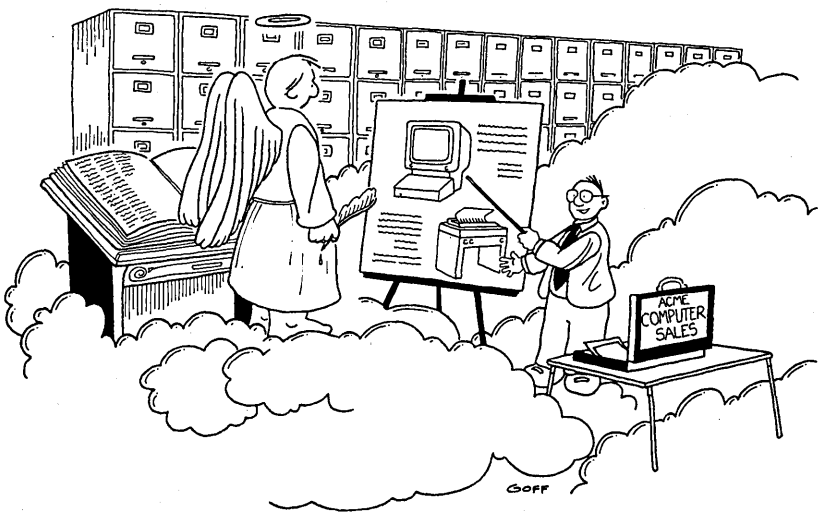
On the positive side, however, there is a great deal of very important material, particularly that dealing with the early years of the SAGE (Semi-Automatic Ground Environment) system and the AN/FSQ-7 computer. Without SAGE, there would have been no SDC and no story to tell.

Younger members of this profession will not believe the Q-7's size and performance characteristics. Even the pictures won't help. There's no way to get a feel for the scale of the beast. Suffice to say, even in the face of disbelief, that its speed was better than that of general purpose computers on the market 10 or 15 years later. How many duplex systems existed in the 20 years after SAGE went live? What other machine had over 90 on-line consoles? Were there any serious communications-based systems besides SAGE in the '50s or '60s? The SAGE breakthroughs were so far ahead of the commercial state of the art that some don't exist to this day. How many computer systems allow a programmer to correct a failing parity bit? How many software systems allow a programmer to test one module of a system while simulating all the others in the surrounding environment?

SDC in most senses was the creation of the U.S. Air Force and a small group of Rand Corp. managers. Led by M. O. (Kap) Kappler, SDC was created as a captive software house to take care of air defense-related design and programming needs. Nonprofit from its birth, the conversion to a commercial software house was painful. Kap always knew that it would have to be accomplished someday. His major try in 1963 led to a sellout by the SDC board, and Kap resigned. He was correct. It took a long time before his successors realized just how right he had been.

Kap got it off the ground. His only error, aside from misjudging the mental toughness of his board, was perpetrated on July 1, 1960, the day the free coffee ended! It only cost the USAF $75,000 a year to keep hundreds of programmers happy.

The history of SDC would not be complete without some mention of the organization today known as ADAPSO. From its inception, ADAPSO was an enemy of SDC. SDC as a nonprofit company could, and often did, underbid ADAPSO's profit-oriented membership. With loud cries of "foul," the ADAPSO membership banged away at the nonprofit concept, harassed SDC at every opportunity, and did a first-rate Washing-



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ton lobbying job.

The soundness of the nonprofit concept, however, endured for many years until SDC itself had to break out of its USAF relationship to survive. One thing that the ADAPSO people never really understood was SDC's self-imposed mission as the first, indeed the only, "university of programming." SDC trained literally thousands of programmers. Salary scales were kept low and aligned with those of the Air Force rather than industry. SDC programmers got restless and went off to industry and high paying jobs. Within four years, 50% of the trainee programmers departed. That's the way it was supposed to be. Kap understood. The ADAPSO people never did.

Today, and even before the Burroughs acquisition, SDC has no uniqueness. The special SDC-USAF relationship has long since deteriorated. The USAF is just another customer. From purely a design/programming/system simulation house, SDC has moved into such areas as data centers, remote database searches, and even hardware implementation.

But it is the early days that can never be forgotten. Alone among today's software houses, SDC has a background of very large, real-time, communications-oriented systems. The overriding influence of its past can never be totally suppressed. One wonders how Burroughs will come to terms with veteran SDCers who grew up in the balmy USAF days.

Finally, the book, as detailed as it is, never really comes to grips with one abiding mystery. Why did George Mueller, SDC president from 1971 to 1981, when he kicked himself upstairs, pull down the famous "flying diaper," the hyperbolic paraboloid so long SDC's logo and symbol? Things have never been the same.

The System Builders is fun for a while, particularly during its descriptions of the '50s and early '60s. The later sections of the book, mostly a recital of projects won and lost as well as a description of SDC's many attempts to operate in the commercial world on a profitable basis, drag. This isn't "the big book on SAGE" for which many have hoped. But it is a start and does contribute a bit to our knowledge of the early years of one of the more unusual ventures in American business. System Development Corp., Santa Monica, Calif. (1981, 283 pp., $20).

—Philip H. Dorn

Reviewer Dorn, longtime DATAMATION contributor and self-styled computing history buff, is an SDC alumnus, a graduate of its programming school, and owner (he wrote them) of a set of training manuals for SAGE releases 5 and 8. If anybody wants to know how Bud Drutz's PEC worked or how to FIX a parity error, Dorn can be contacted through DATAMATION. However, he doesn't promise to be able to find the documents.

REPORTS & REFERENCES

FOCUS ON CAD/CAM

The CAD/CAM Technical Survey 1982 is billed as a "comprehensive study of the computer graphics industry." Its five sections include the history and background of computer graphics, the current state of the market, the results of an end-user survey, the results of the Delphi survey, and a section of recommendations to users, potential users, and vendors. Various types of hardware are examined for usefulness and effectiveness, and technical weaknesses in existing hardware are also discussed. Users are provided with recommendations regarding the hardware characteristics they should look for and those to steer away from when making purchase decisions. The survey contains equally valuable information for vendors and potential vendors, such as the markets currently unserved, market trends and financial forecasts, and a long-range market outlook. As is to be expected, the report bears a hefty price tag—Technical Management Resources, Ltd. is asking $695 a copy. TMR can be reached at 620 Howard Building, Providence, RI 02903, (401) 274-2843.

DATABASE DIRECTORY

In September, CSG Press will offer its revised ninth edition of the Directory of Online Information Resources. The directory contains information on over 400 databases commercially available in the U.S. and Canada. The databases are listed in alphabetical order and range in subject matter from the accountants' index to the Yukon bibliography. Each listing includes a description of the database, who produces and sells it, and where those companies or persons are located. The directory costs $18.50 per copy, and is revised in March and September of each year. A two-year subscription price of $48 buys four issues. For more information, contact CSG Press, 11301 Rockville Pike, Kensington, MD 20895. Please note that single orders must be accompanied by payment.

A GUIDE TO ALL GUIDES

Over 7,000 directories are described in the Guide to American Directories, published by B. Klein Publications. This 11th edition of the guide is the first one released in three years and has been selected by the Library of Congress as "one of the 500 works to be used in the White House Conference Information Center Library." It sells for $55 and can be obtained from the publisher at P.O. Box 8503, Coral Springs, FL 33065.

VENDOR LITERATURE

SYBERCACHE

"Sybercache: STC 8890 Intelligent Disk Controller" is both the name and topic of this four-color brochure. Operational specs, director and DASD functions, and Sybercache's memory are detailed by the vendor. STORAGE TECHNOLOGY CORP., Louisville, Colo.

FOR DATA CIRCLE 350 ON READER CARD

DON'T FORGET

The vendor has published a six-page, four-color brochure describing its Model 6000A Memory Tester. Listed inside are features and specs, applications, options, information on user training, and the company warranty. TESTMASTER, Costa Mesa, Calif.

FOR DATA CIRCLE 351 ON READER CARD

SOFTWARE DIRECTORY

The Harris Corp.'s 108-page directory lists software tools and application software packages available for use on Harris computers. It includes software distributed by Harris, by the Harris Users' Exchange Library, and by outside companies and organizations. There are two sections: software tools and applications software. Both are organized by function or discipline, and each entry includes the program name, a brief description, and availability information. HARRIS CORP., Computer Systems Div., Fort Lauderdale, Fla.

FOR DATA CIRCLE 352 ON READER CARD

LIGHT READING

Thanks to the kind consideration of DC Comics, a division of Warner Communications, Radio Shack's third Superman comic

features guest appearances by the dynamic Wonder Woman and—boo, hiss—Lex Luthor. The 36-page comic, "The Computer Masters of Metropolis," is a follow-up to "Victory by Computer," and is available free of charge from TANDY CORP./RADIO SHACK, Fort Worth, Texas.

FOR DATA CIRCLE 353 ON READER CARD

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SUPPORTING PROTOCOLS THAT ALLOW YOU TO ACCESS AND EXCHANGE INFORMATION EASILY IS HONEYWELL'S APPROACH TO OFFICE AUTOMATION.

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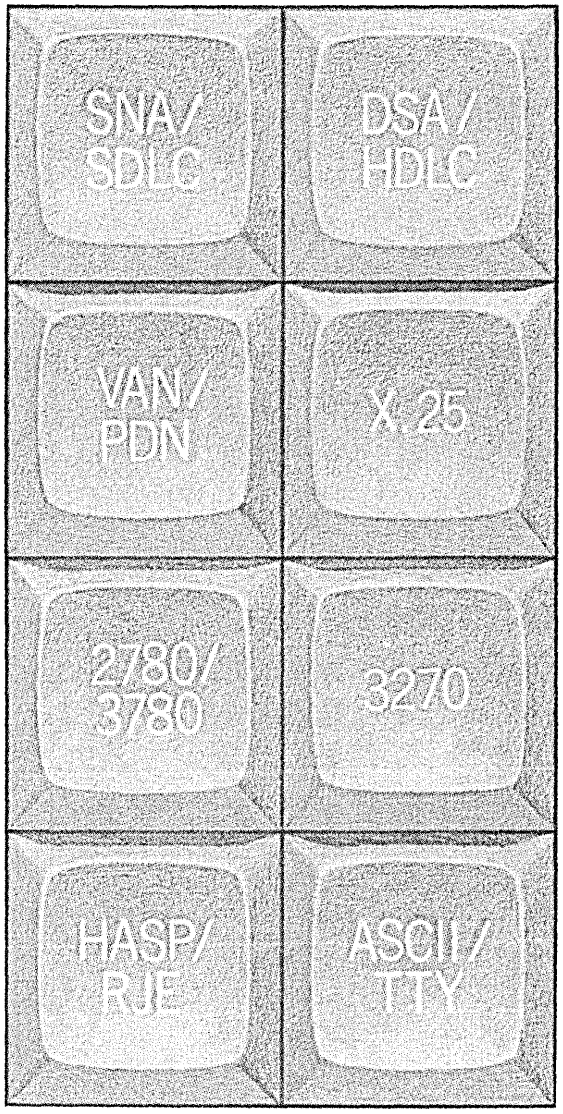

Naturally, this means supporting many protocols: 2780/3780, SNA/SDLC, HASP/RJE, ASCII-TTY, 3270, X.25, DSA/HDLC, and others. Our office information systems can communicate with data bases maintained by multiple vendor host systems whether in-house or at remote locations.

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- ☐ Have a salesperson call me.
- ☐ Call me to arrange a demonstration.

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Company

Title Tel. No.

Address

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Mail to: Ms. Carol Vallone, Dept. DT 8
Honeywell Office Automation Systems
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Newton Lower Falls, MA 02162

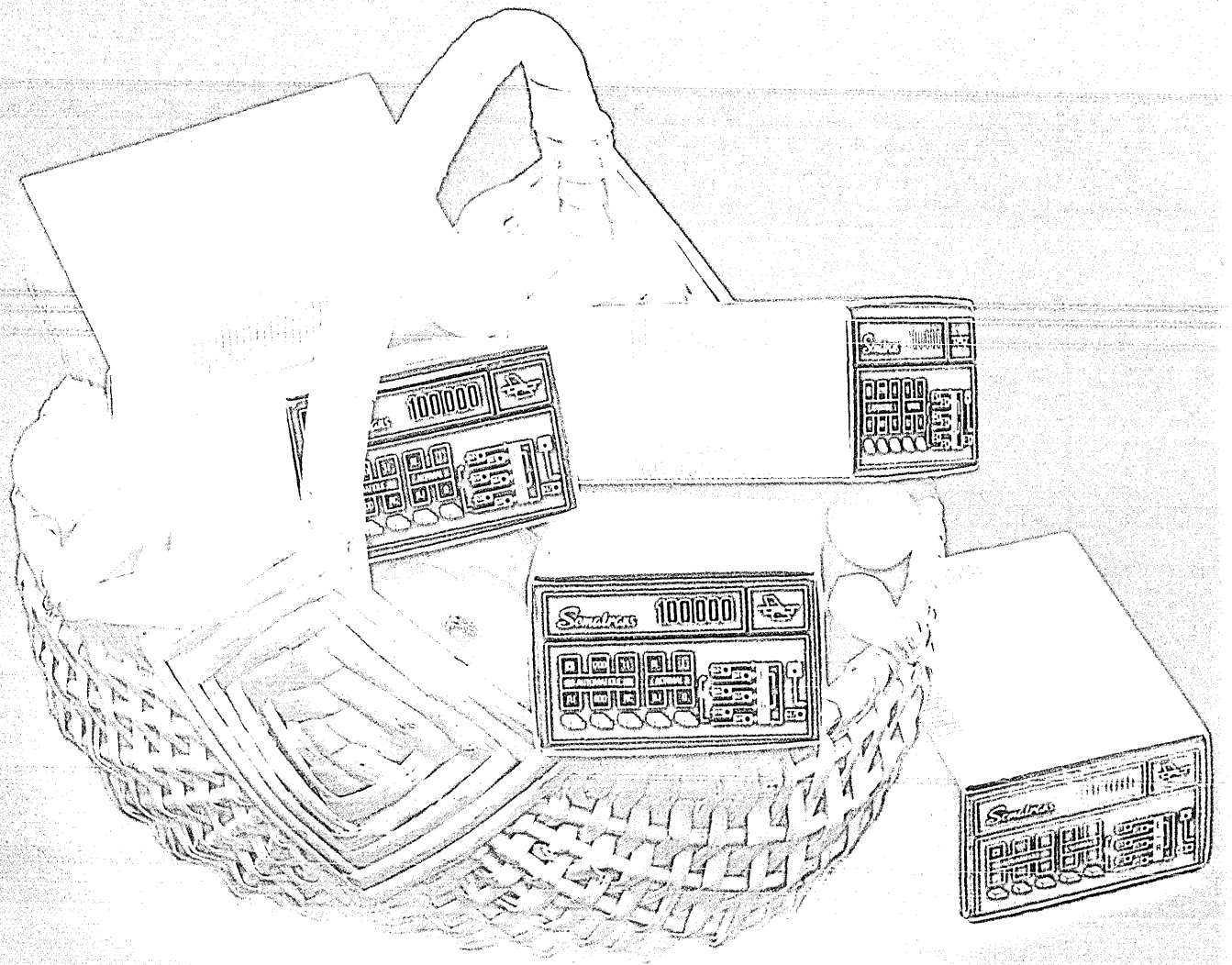
Honeywell

CIRCLE 117 ON READER CARD

The cream of the crop

Packed with a basketful of features, the TRT range of Sematrans modems are outselling and outperforming all the others on the market.
Over 130,000 Sematrans modems are now in service in more than 50 countries.

Shoppers the world over have chosen them for their conformity with international specifications and their configurability - with standard operating features and options designed to meet the specific needs of networks of all sizes and shapes.



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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

TRANSLATION TEST

The legislative draftsman has the makings of a fine software designer. Out of the vaguely expressed ideas of politicians he has to frame laws that will be judged constitutional, and allow law-abiding citizens to do their business with dispatch while closing all loopholes to would-be evaders. The law has to be interpreted in the same way by citizens, bureaucrats, and judges, and it must withstand the changing circumstances and values of society. Of course no draftsman can frame such a perfect law but he strives to approach this ideal. The framers of the United States constitution were perhaps the finest software designers in history. How many of us dare to hope that our products will still be in use in 20 years, let alone 200? The drafter of important legislation often works behind the scenes, getting none of the acclaim accorded to members of Congress. These devoted men and women work long hours at tasks requiring knowledge, intelligence, painstaking attention to detail, and logical ability of the highest orders, while their masters bask in the glow of publicity and receive all the credit for their labors. Sound familiar?

The business executive, like the politician, needs a lawyer to draft ironclad contracts once negotiations have been concluded. Generally speaking, the company legal counsel takes part in important negotiations to help him capture all the nuances that need to be built into the final "boiler plate." How often are the company's information systems designers invited to take part in such negotiations? Remember that these people design systems to help forecast the financial consequences of decisions or to calculate the effects of union contracts. If they were invited more often perhaps they would develop the same skills as lawyers.

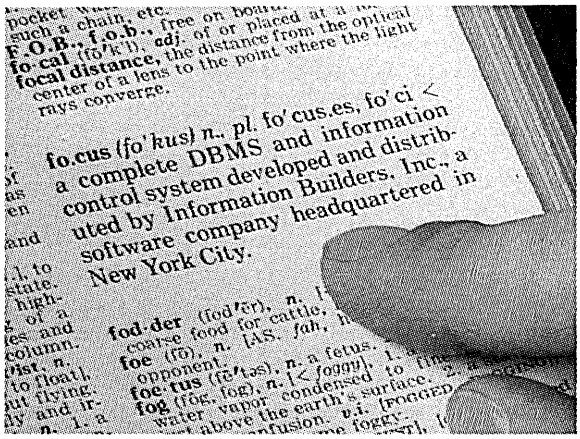
Many of us have a tendency to think that in a computerized information system the programs are the "real thing," all other documentation (the word is significant) being a sort of adornment like tinsel on a Christmas tree. It is useful, even indispensable, we think, but the essence of the system lies embedded in the code, the rest being merely outward form. I suggest that the reverse is a more fruitful way of thinking about an information system. More specifically, the essence of the design is embodied in a natural language text that can be understood by layman (perhaps with some difficulty) and expert alike, and the code is merely a high-fidelity device to convey the author's work. A good businessman will usually make the effort to read and understand important contracts even though he has a lawyer to help him. Few businessman can understand computer programs written by other people and quite often even their authors are unable to explain them articulately. The businessman in effect becomes party to a contract he doesn't understand. I am not talking about the contract between the businessman and the supplier of the software; I am talking about the contract between the businessman and the system he has bought. The system is supposed to do certain things for the businessman, but he usually has no clear statement of what those things are. The glossy booklets, even the users' manuals, are usually either too superficial or too procedural. What the buyer needs is a carefully written specification that will exactly describe the system's performance capabilities so that he can use it to test the results of what he has bought. Such a document is like the text of a bill submitted to Congress or of a treaty to be negotiated with a foreign power. Flowcharts, decision tables, and the like may be used as aids to understanding, but the natural language text should be the final recourse in case of any disagreement or misunderstanding. The specification is, of course, implemented in detailed administrative procedures and computer programs. These should be regarded as fleshing out the specification, which is fundamental, instead of the specification being thought of as mere documentation. The specification tells everybody what the system is supposed to do. Its drafting and amendment require the skills generally possessed by legal draftsmen but rarely by software designers.

If we were to follow strictly the canons of top-down development, we would first make a general statement of objectives, maybe with a scenario or two to get the feel of the proposed system in its environment, then write the specification, and finally develop the detailed flowcharts, algorithms, programs, and procedures. As pointed out in a recent DATAMATION article (Gideon Samid, "Modified Top-Down Design," Nov. 1981), strict adherence to sequence has several drawbacks. In practice, therefore, the components of a system are developed in interactive fashion and the last comma will not be added to the specification until the rest of the work is complete or nearing completion.

Such a specification is, in effect, an embodiment of the system in high-level language. The natural languages, developed over millennia, are the highest-level languages known to man. All such languages are culture-bound but not esoteric like artificial programming languages. What is natural to an actuary may be jargon to a literary critic and vice versa, but with a little effort each can understand the other's jargon. When we write a contract or system specification in English, to be understood, interpreted, and used by actuaries in the United States, we expect it to be comprehensible to 100% of the American actuaries, at least 90% of the actuaries in other English-speaking countries, and perhaps 70% of the educated English-speaking laymen. This means that when we use technical or local terms we try to define them in a common, nontechnical language.

One way of finding out whether we have done a good job is

PLAIN ENGLISH



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CIRCLE 119 ON READER CARD

READERS' FORUM

to ask a number of people—experts and laymen—to review and criticize the text. Another way is to have it translated into a foreign language and then back into English by two different translators. While the final result will hardly ever be identical to the original, its meaning should be invariant, in the opinion of a qualified independent judge. Even when the meaning is judged to have remained unchanged, differences in wording can often help us to pinpoint defects in the original text. This is familiar to anyone who has converted a system from one programming language or version to another. In natural language texts there is even more scope for ambiguity and looseness. If a system specification passes this test, there is some hope that the programs and procedures it implements will pass muster as reasonably accurate interpretations of it. More important, if it doesn't pass the double translation test, then, in accordance with Murphy's law, we can be quite sure that its implementation will contain serious defects.

I do not suggest that double translation is an infallible way to detect errors; Murphy's law operates on texts that pass this test with flying colors. I do suggest that it is somewhat better than structured walk-throughs by systems analysts bound by the same culture. And the more exotic the foreign language used, the more rigorous the test. Translating through two or more foreign languages would be still more testing, particularly if the translators knew nothing about the subject matter.

After the specification passes the double translation test, but before the code and procedures are written, we draw a logic diagram to help readers understand the text. Note that this diagram takes up more space than a written specification might. To modify it efficiently requires graphics capabilities and a skilled operator, whereas modification of the written specification requires only a good typist and, preferably, a word processing facility. More importantly, business people, lawyers, and bankers will feel more comfortable with the text than with the diagram, even though the reverse may be true for systems analysts. Finally, a lawyer can take a tightly written specification and turn it into a contract between supplier and user. For all these reasons I submit that a properly

"You get there by butterfly,
and then we give you a centipede."

© DATAMATION

CARTOON BY SIDNEY HARRIS

NECOM '82 Boston

Date: October 12, 1982
Time: 1:00–7:00 P.M.
Place: Boston Marriott, Commonwealth Ave. and Route 128 at Mass. Turnpike, Newton, MA.

TAKE A LOOK AT TOMORROW — meet the industry giants as well as the innovators who'll be tomorrow's leaders.

A single source computer show for OEM's, sophisticated end users, dealers and distributors, Necom '82 features the industry's newest developments in a one-day regional format.

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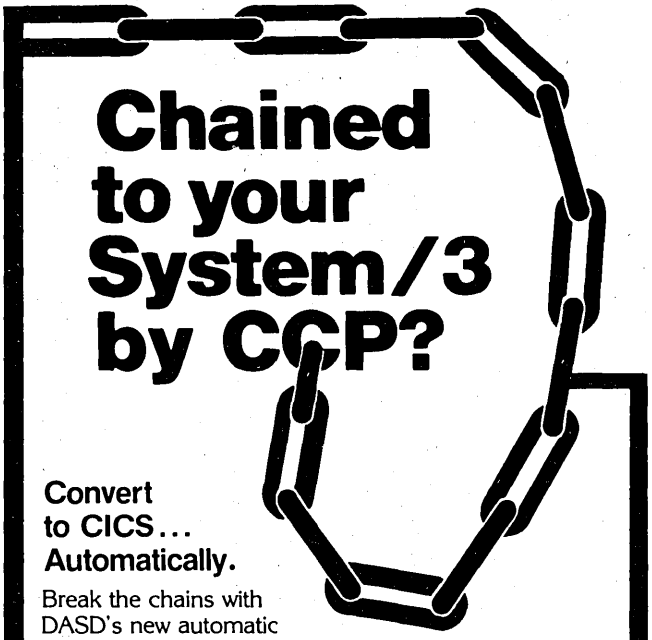

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MAP to COBOL
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READERS' FORUM

written specification is the basic document of an information system. It ought to survive many implementations just as the U.S. constitution has survived numerous judicial interpretations.

I hope the preceding discussion has demonstrated the following points:

1. A good specification describes everything that the system is supposed to do, in natural but rigorous language.
2. Natural means that any intelligent layman can understand the specification (if he is prepared to make the effort.)
3. Rigorous means that it should be written as though it were a legally enforceable contract between the client and the system.
4. Don't ask another systems expert to check your specificiation. Give it to a layman with no background in systems analysis and no knowledge of the subject matter. Better still, give it to several such laymen with widely differing backgrounds.
5. A good specification is more useful to more people than flowcharts (without denying the utility of flowcharts).
6. A good specification will still be good when several generations of code are dead and buried.

—Edward R. Lawrence
Monterrey, Mexico

THE COMPUTER MUSE

DOLOR*

I have known the inexorable madness of pencils,
Neat in their boxes, dolor of pad and paper-weight,
All the misery of manila folders and mucilage,
Desolation in immaculate public places,
Lonely reception room, lavatory, switchboard,
The unalterable pathos of basin and pitcher,
Ritual of multigraph, paper-clip, comma,
Endless duplication of lives and objects.
And I have seen dust from the walls of institutions,
Finer than flour, alive, more dangerous than silica,
Sift, almost invisible through long afternoons of tedium,
Dropping a fine film on nails and delicate eyebrows,
Glazing the pale hair, the duplicate gray standard faces.

—Theodore Roethke

COMPUTER CURES ROETHKE'S "DOLOR"

I've known the boundless bliss of the crt
Beam from its metal box, weightless and wild,
All the magic and music of memory,
Triumphant at a public terminal,
Clarity of classroom, meeting room, machine room,
The self-altering pattern of the program,
Originality of alphanumerics,
Endless innovation of lives and symbols.
And I have seen rainbow flicker on corporate walls,
Stranger than sunlight, alive, stronger than solitude,
Dance, silent and subtle, through timeless nights of invention,
Shining on fingernails, shaping a studious eyebrow,
Streaking the fair hair, the unique individual faces.

*"Dolor" appears in *The Lost Son and Other Poems*, by Theodore Roethke. Copyright © 1947 by Beatrice Lishington. Published by Doubleday and Co., Inc.

—Jonathan V. Post
Seattle, Washington

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

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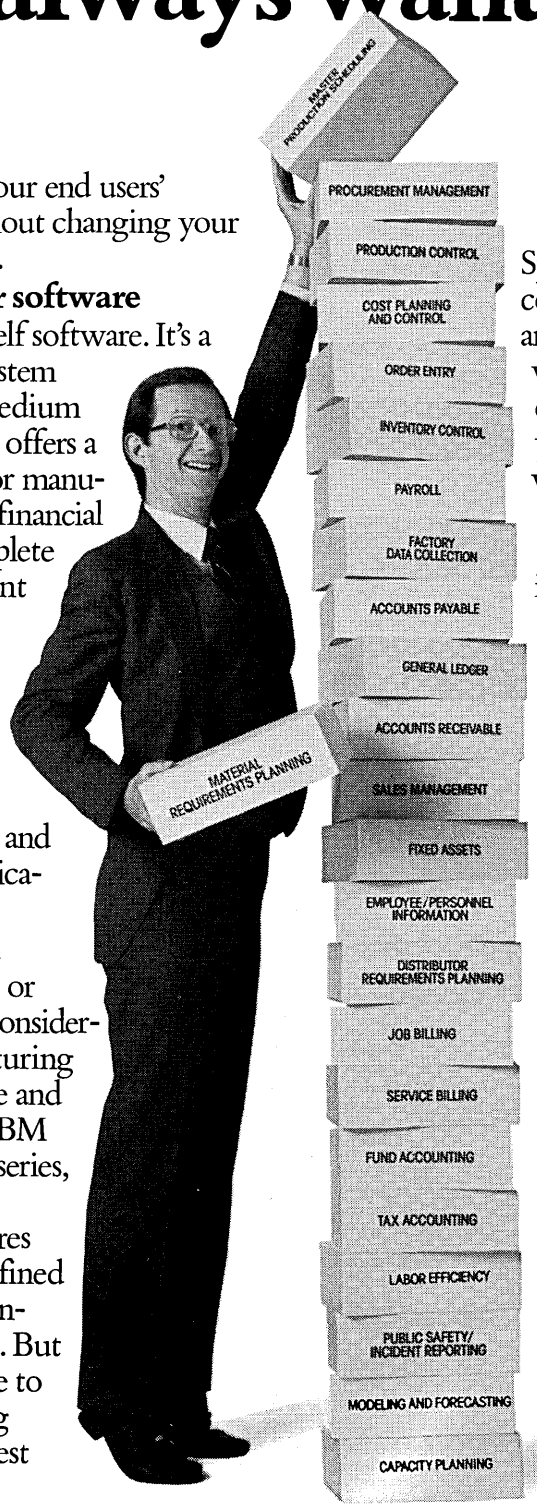

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D8/82

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CIRCLE 2 ON READER CARD

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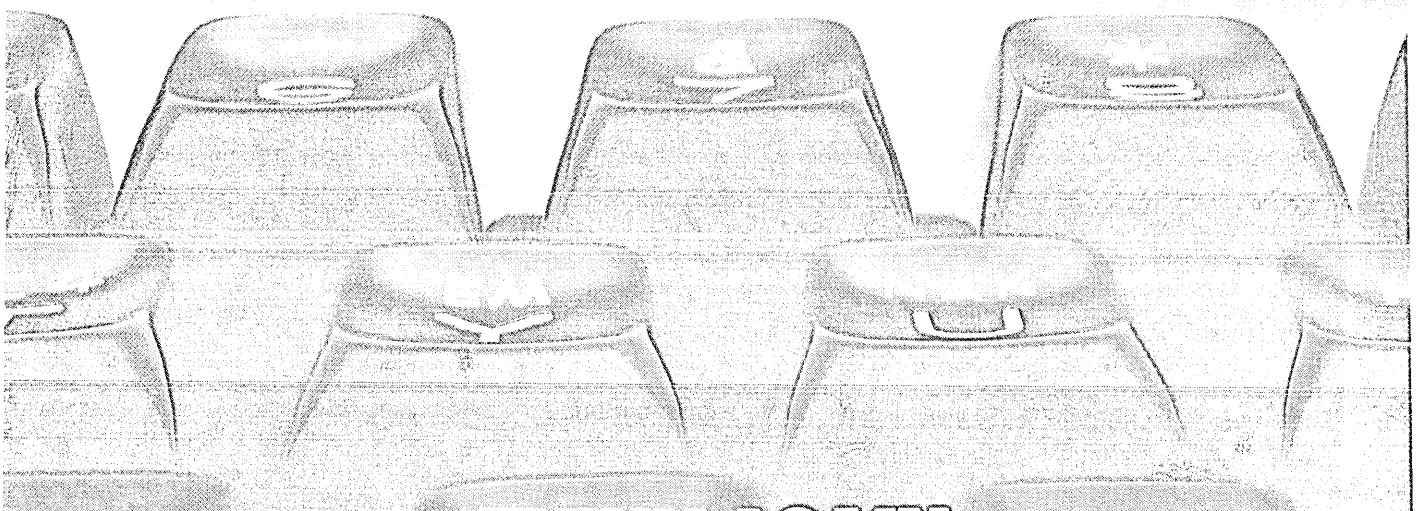
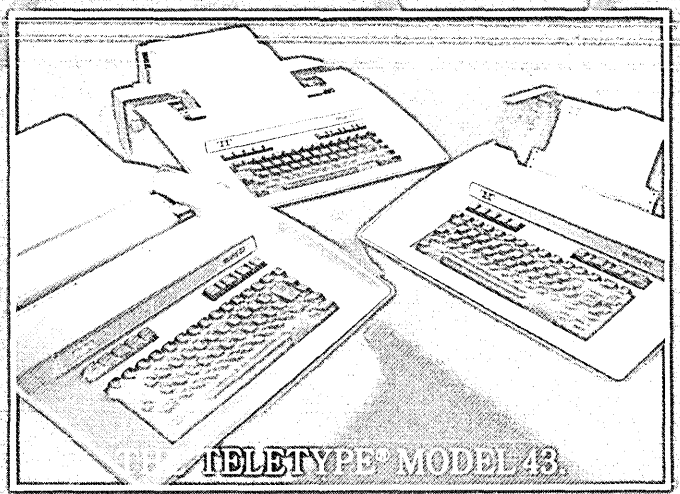


THINK AGAIN.



Imagine an MTBF of over 4½ years. That's the kind of reliability you can expect from the Teletype® model 43KSR, based on current field experience.

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Reliability begins with features like LSI circuitry which requires fewer moving parts and greatly reduces wear; gold plating over nickel plating on all electrical connections and sockets handling low voltage; injection molding of many components for a precision fit; and custom designed MOS chips.

The 43's value is also highlighted by high quality features like our dot matrix printhead that is capable of delivering more than 200 million characters. You can choose among tractor, pin or friction feeds to suit your needs. And ergonomic features like tactile feedback keyboards improve value by enhancing operator performance.

When you size up reliability, the value of our 43 really shows up.

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CIRCLE 3 ON READER CARD