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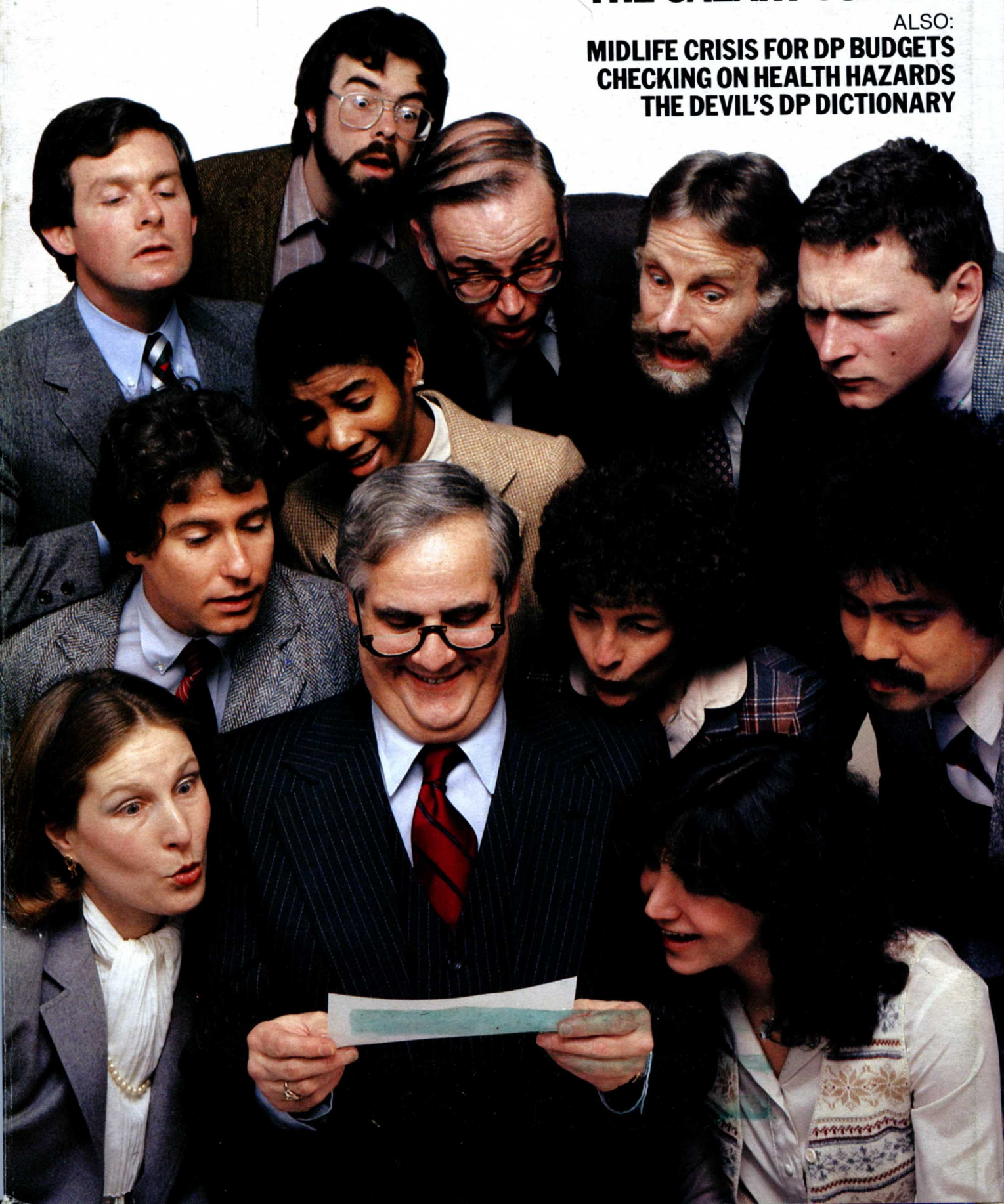

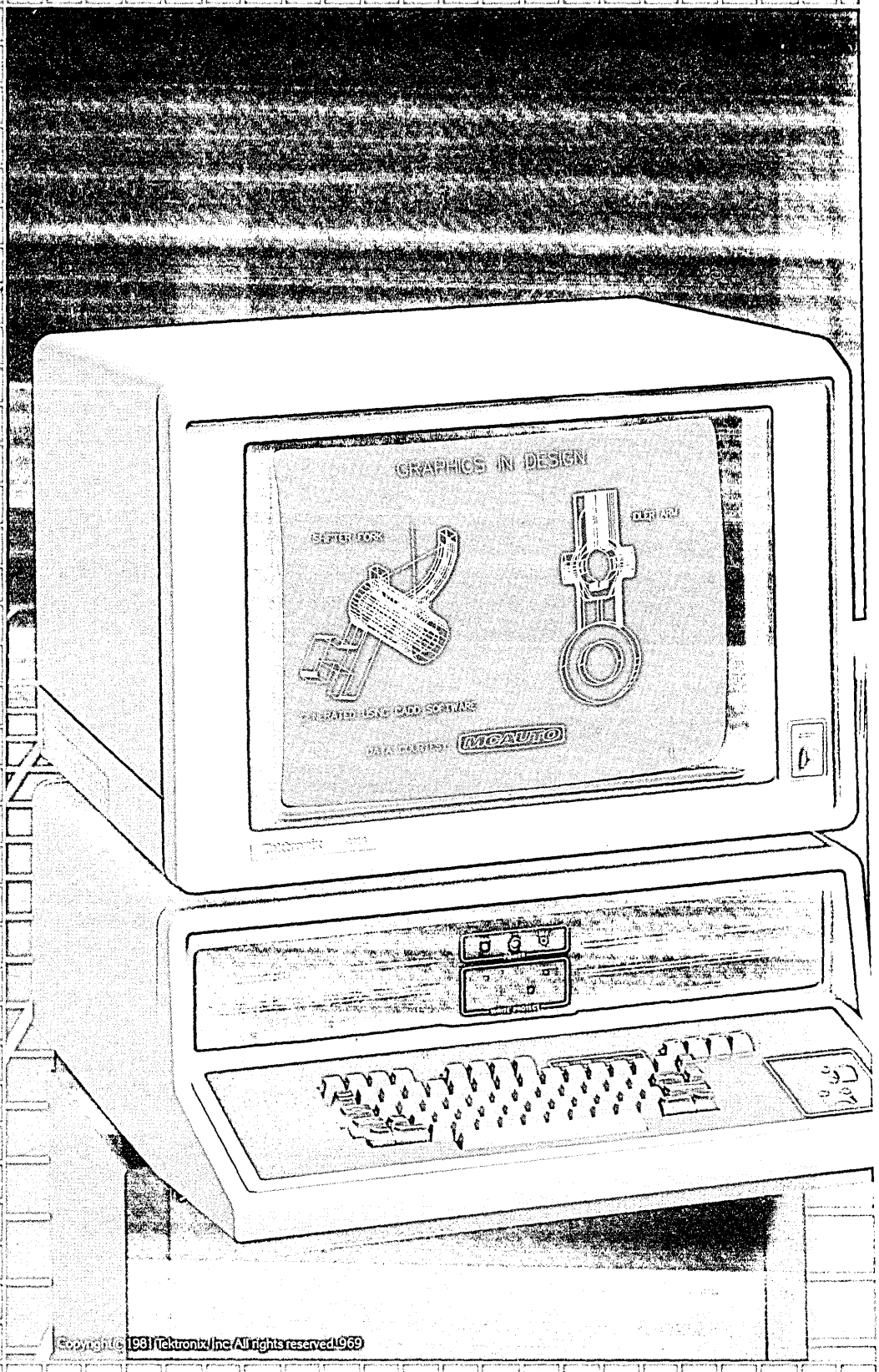

Tektronix 4110 Series Computer Display Terminals

AM Jacquard Systems

The AM Jacquard 121 entry level computer system does two things for your office. Word and data processing.

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

This efficient office automation system can grow with your business, too. Buy it now with only two workstations and add more, for under $5,000 per screen, as you need them. The J121 offers ease of operation, expandable on-line storage, high speed throughput, and comes with a choice of [illegible] printers.

[illegible] designed to boost your office's productivity and profitability. No one, but no other office system has the versatility and flexibility for the money. And we know what we're talking about. Our parent company, AM International, Inc., has been designing products to modernize offices for more than [illegible] years.

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

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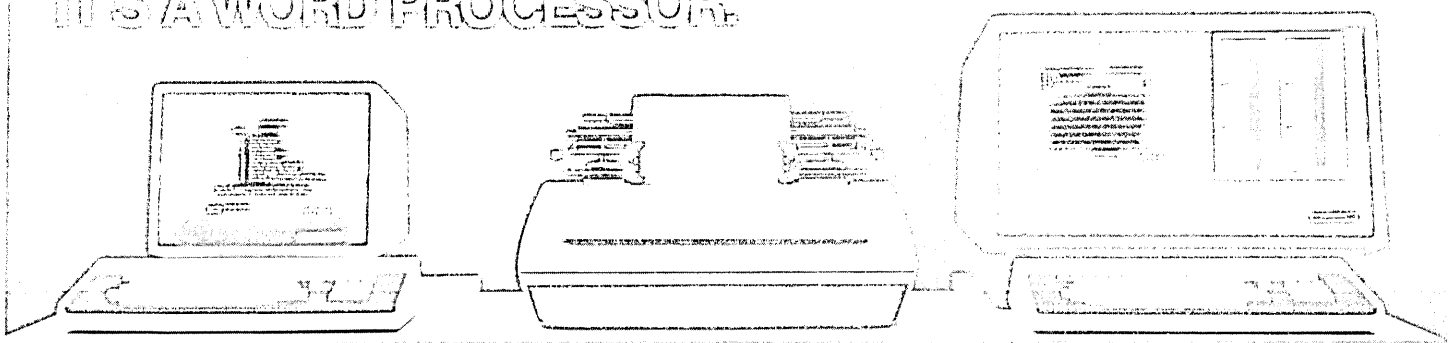
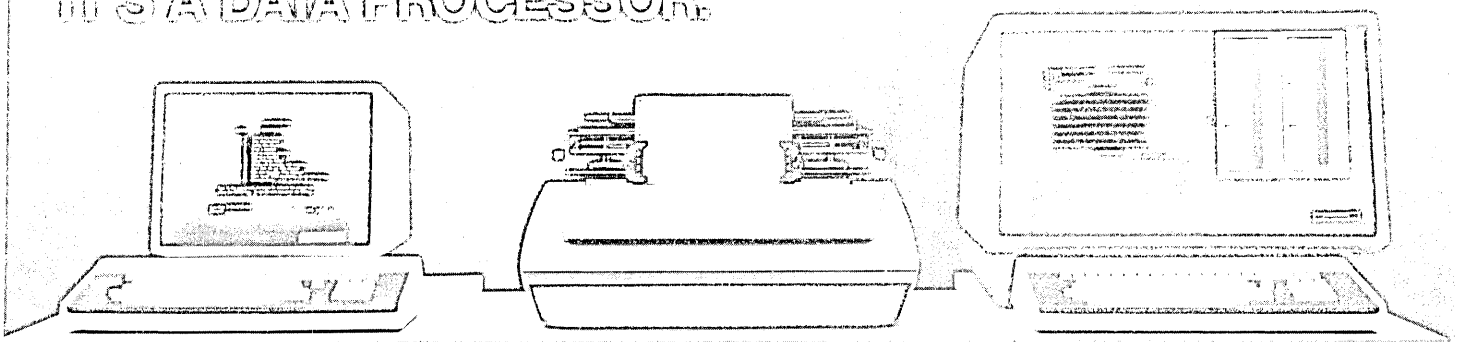


IT'S A DATA PROCESSOR.



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"Before you tell me
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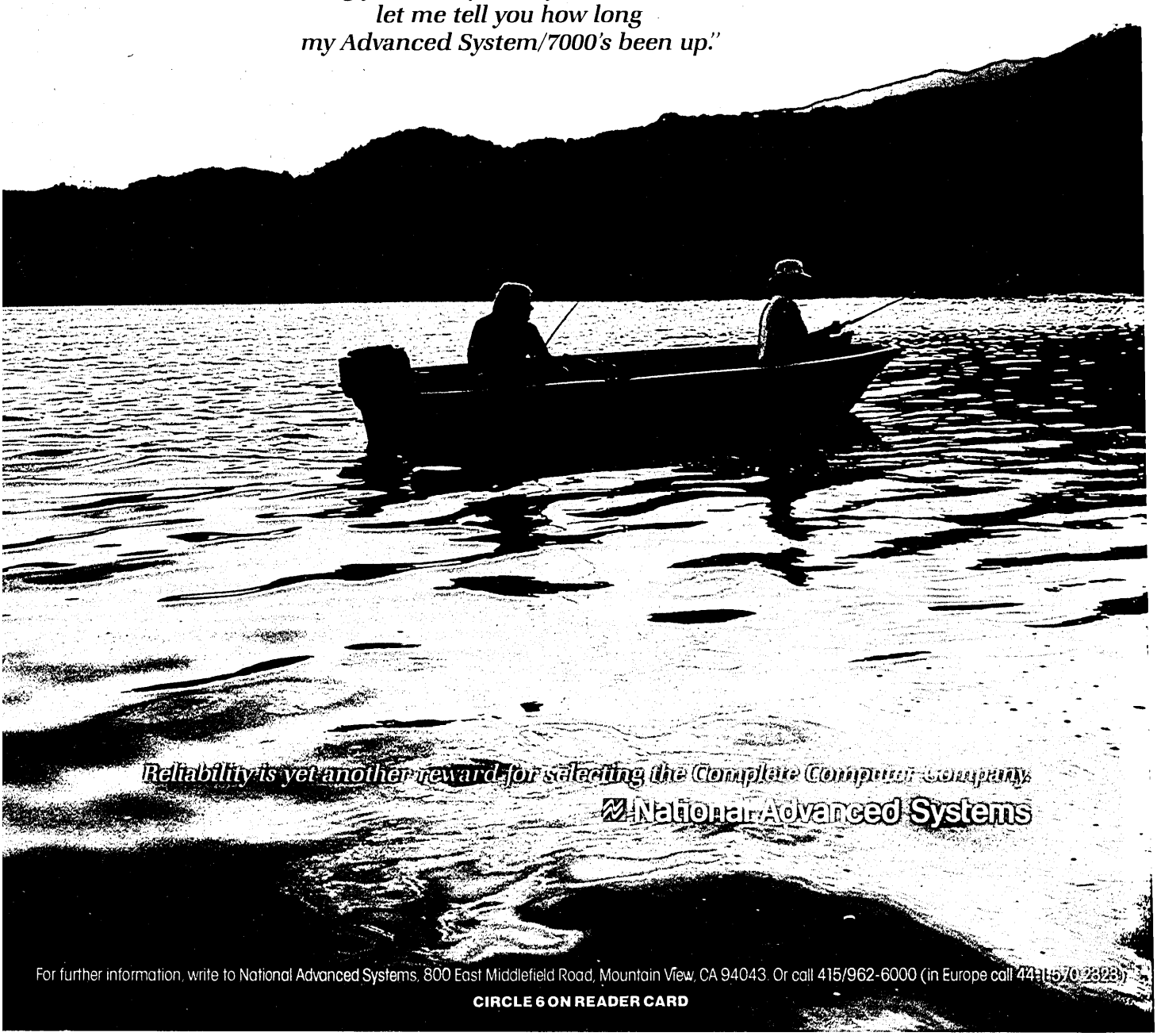
let me tell you how long
my Advanced System/7000's been up."



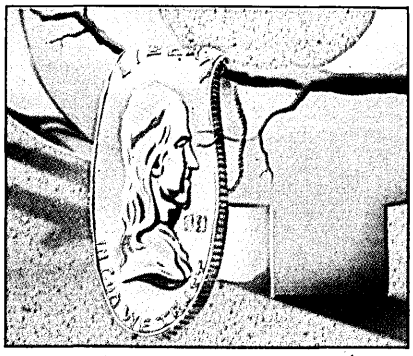
For further information, write to National Advanced Systems, 800 East Middlefield Road, Mountain View, CA 94043. Or call 415/962-6000 (in Europe call 44-1-570 2828).

CIRCLE 6 ON READER CARD

DATAMATION 81®

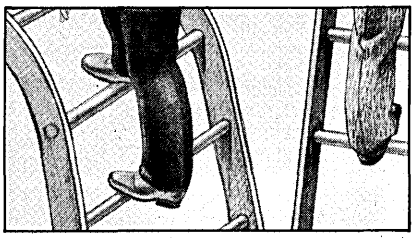
MAY 1981/$4.00 U.S.A.
VOLUME 27 NUMBER 5
This issue, 164,920 copies

FEATURES



NEWS IN PERSPECTIVE

DEPARTMENTS



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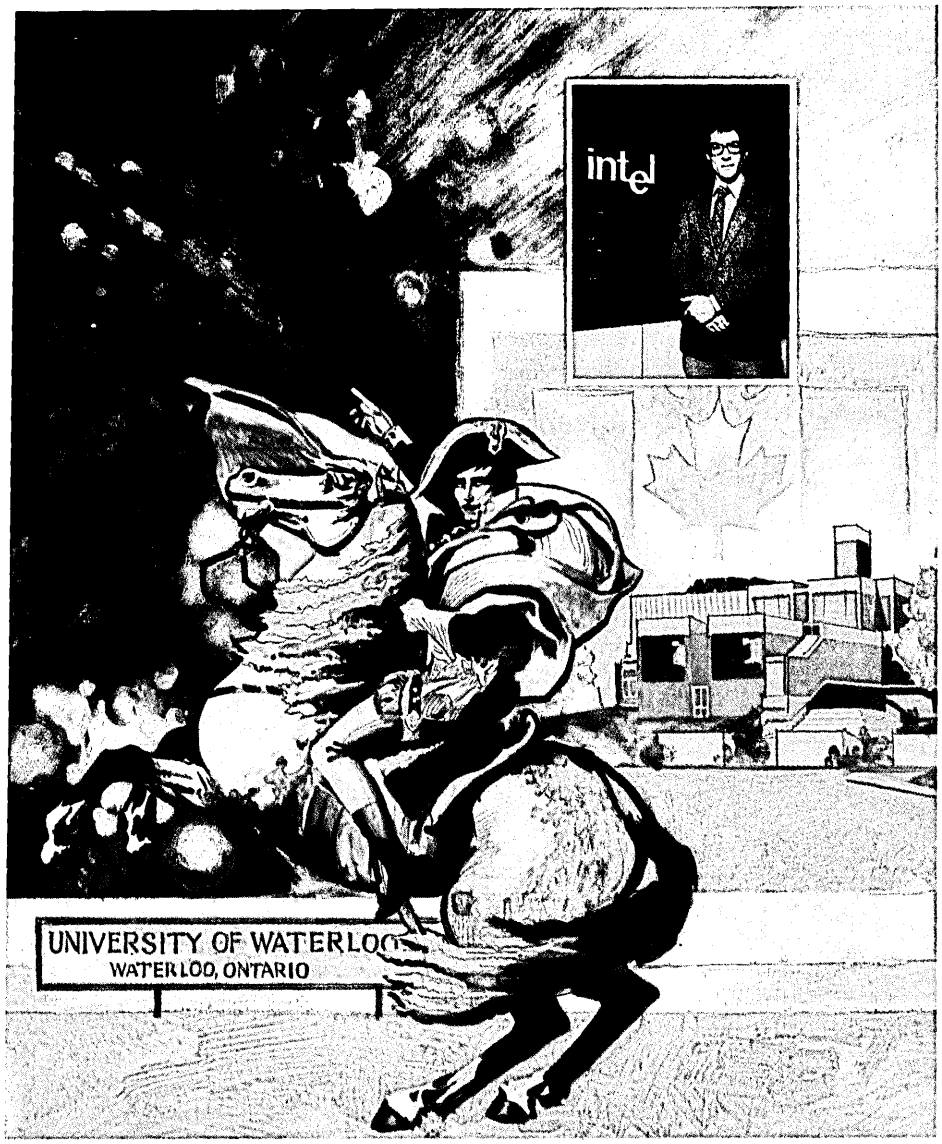

At Waterloo, Intel's FAST-3805 won.

The FAST-3805 saves the University of Waterloo thousands of dollars each month while it increases both user and system productivity. Waterloo's Associate Director-Systems, Romney White, explains how . . .

"Compared to any other DASD, the FAST-3805 in Native Mode* is the fastest thing going. It has a large enough capacity to satisfy the biggest users around, and it's a cost-effective solution. In other words, the FAST-3805 is really an ideal paging device.

"The FAST-3805 reduces paging overhead and increases paging capacity. It's an economical solution for extending current CPU resources."

Increases productivity

"We discovered that our 4341 by itself supported only 25 active users. With the FAST-3805 we were able to double the number of active users at less than half the cost of a new processor. And those users got more consistent and faster response times.

"We found the FAST-3805 eliminated page wait and the page wait that masquerades as I/O wait, as well as reduced device, controller and channel contention. The result was more users who are more satisfied."

Fast paging saves dollars

"On our 3031 we had a page wait of about three percent with two 2305s. However, when we switched to a FAST-3805—which brought in pages about two and a half times faster than the 2305s—the page wait went to zero. In our situation, switching to the FAST-3805 saved us a couple of thousand dollars a month in system and people time. But a user who has a 3033 with a 15 percent page wait could save $15,000 to $20,000 a month.

"Not only did the FAST-3805 take the place of two 2305s and a 2835 controller at Waterloo, but it helped us avoid the purchase of another 2305/2835 system. With the FAST-3805's increased capacity, we were able to stay within our budget . . . and still meet the increased needs of our users.

"Because we wanted to get the most out of our current system, we saw the FAST-3805 as a good investment. We looked at the available paging devices and determined that the FAST-3805, because of its micro-coding, offered the most flexibility.

"The installation was a breeze. Service has been good—and the unit is essentially self-diagnosing. The FAST-3805 is much more reliable than our previous disks.

"In summary, Waterloo got more capacity, better performance and better reliability for less money with Intel's FAST-3805 semiconductor disk."

If you are interested in learning how the FAST-3805 can unleash your system resources and increase your personnel and system productivity, contact Intel's Marketing Information Office at 512/258-5171. Or clip and mail the coupon below.

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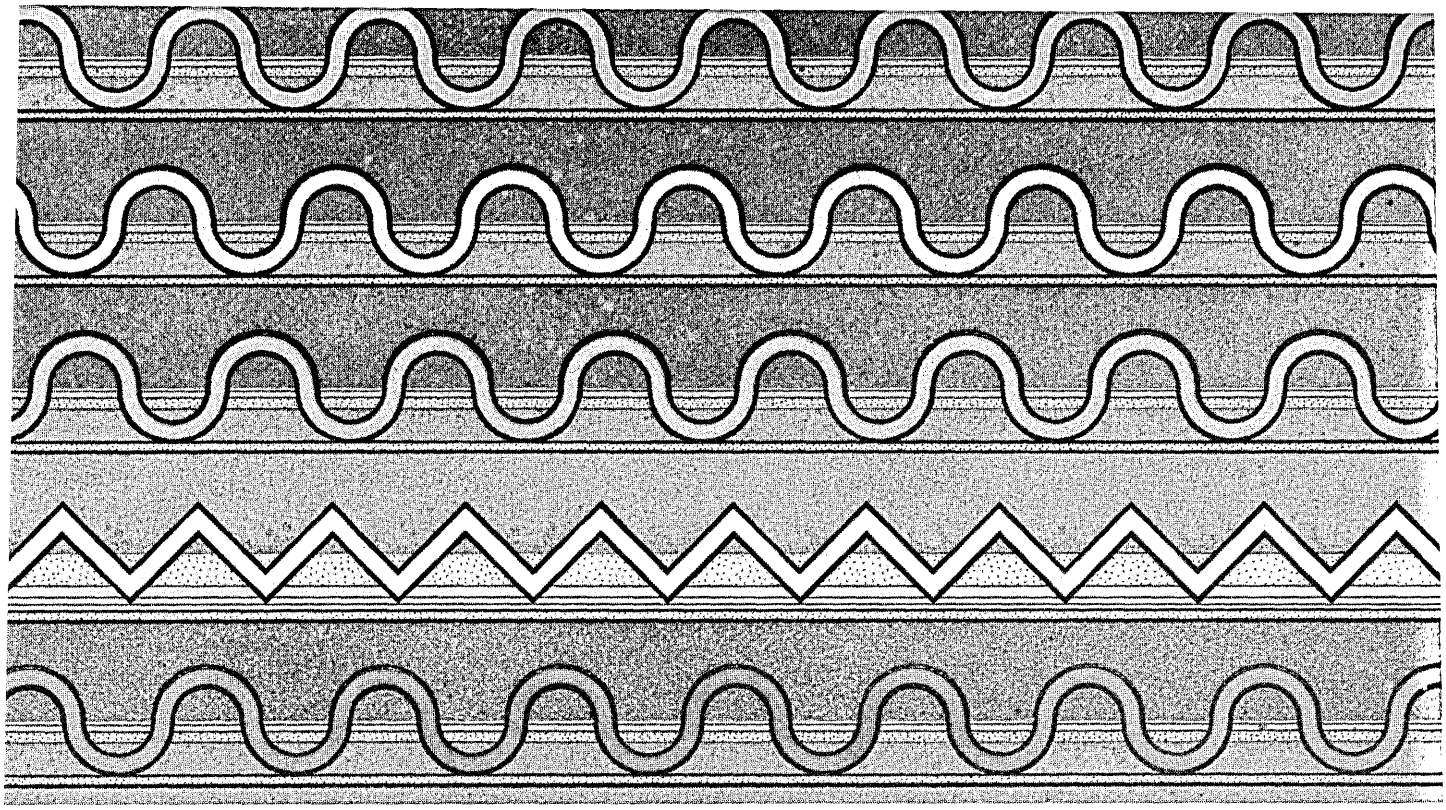
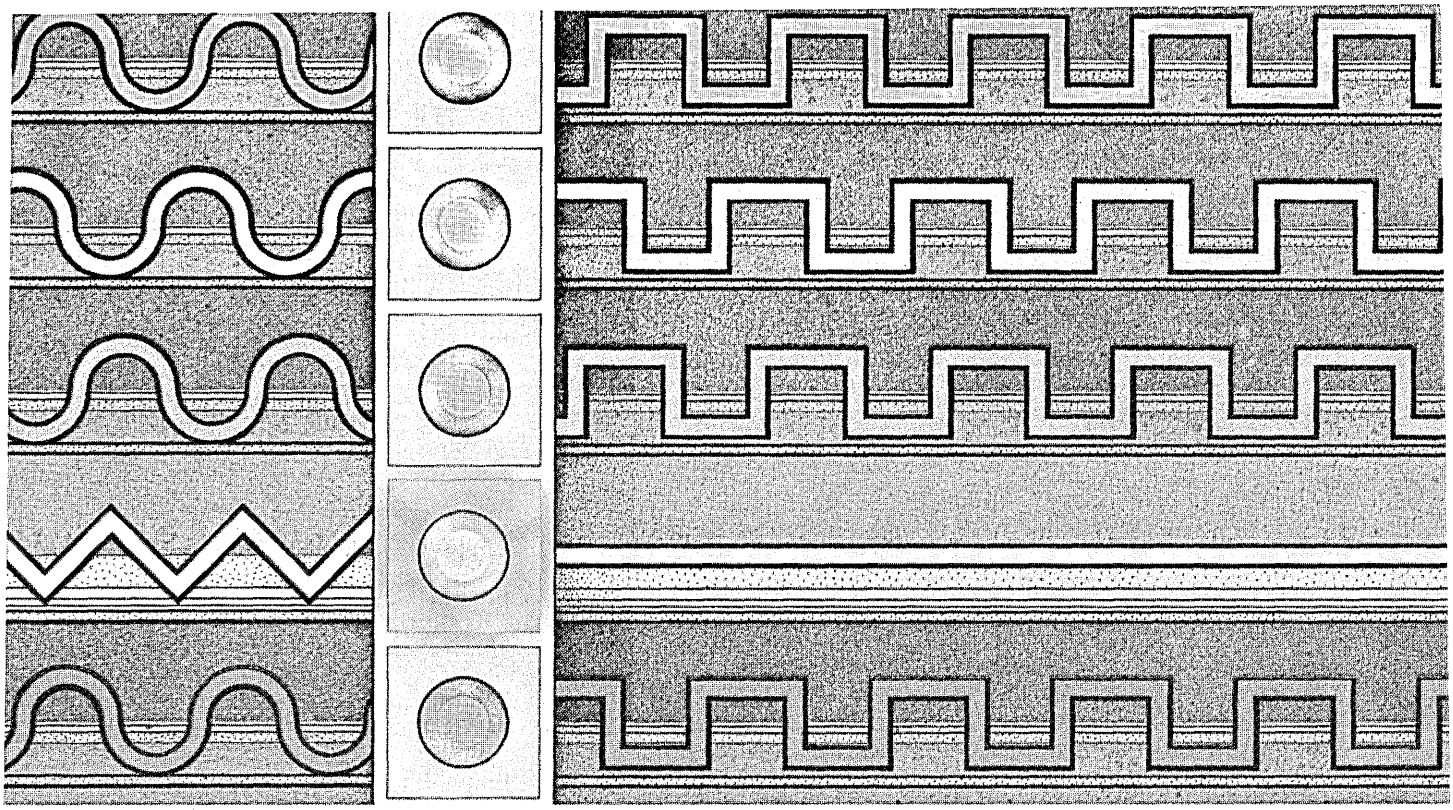
*Native Mode and 2305-emulation are two personalities of the FAST-3805 currently available.



Give every kilobit intensive care.

An ailing data stream can't tell you where it hurts, and that can mean hours of trial-and-error testing, some of it done far away and hard to supervise.



The Bell System's Dataphone® II modular data transmission subsystem gives you central monitoring, diagnosis and control of your whole data communications system, and automatically identifies system faults.

Regardless of your system's host or line protocol, Dataphone II is fully compatible, at transmission rates of 2400, 4800, or 9600 bps. Three levels of service are available, covering every level of system complexity. And because the service is fully modular, it can grow with your needs by simple addition of components.

Dataphone II service is state-of-the-art in sophistication, yet extremely simple in operation, and communicates in plain English.

With its full-time assurance of operational readiness, Dataphone II service is the ideal link to integrate your system. It is a product of the world's most advanced information management system—the nationwide Bell System voice and data network.

◇ Applying our knowledge to your information management needs is a process that begins with one call to your Bell Account Executive. ⬭

The knowledge business

Twenty Years Ago/Ten Years Ago

LOOKING BACK

SHAPE OF THE FUTURE

May 1961: The theme was "Design Trends for Large Computer Systems," and for an overview DATAMATION used a paper delivered by Charles W. Adams at the Western Joint Computer Conference. Adams predicted the key to the design of new systems would be "not hardware but logic." He saw increased attention going to various forms of nonerasable storage systems, and to the potentialities of using "stored logic" in system design.

Small thin film storages operating at 0.6 microseconds were performing satisfactorily in laboratories. NCR had announced a magnetic rod memory storing 1,000 bits per cubic inch, with switching times of 0.05 microseconds. Cryogenics research continued apace.

Adams noted several approaches to the control of large systems of autonomous units. In the IBM 7090, for example, elaborate input-output control units worked out of the same storage as central control, with means usually provided to trap the main program when the I/O control needed a new set of instructions. Scheduling was done by a part of the regularly stored program. The Honeywell 800 used a multiprogramming arrangement in which each of up to eight different programs were performed a step at a time, in sequence. Designers of such large systems, Adams said, had to provide for something called "graceful degradation." He regretted that the term was not widely understood.

The overview was followed by articles on three new computers. There was the Ferranti Atlas with its 0.2 microsecond magnetic slug memory containing a "housekeeping" routine for multiprogramming control; the Burroughs B 5000, which the company said was designed from the start as a total hardware-software system; and the Ramo-Wooldridge AN/UYK 1 stored logic computer, designed for shipboard use. In the AN/UYK 1, logic was put under program control so that the user could read in the logic configuration of his choice and alter it by changing a few words of basic storage.

ROOM AT THE INN

May 1, 1971: It had been obvious for some time that hotels could make good use of computers, but hoteliers had nevertheless proven largely immune to the industry's sales pitch. Hotel automation had gotten off to a bad start in 1963 with the failure of IBM's attempt to computerize the New York Hilton as it was being built. Among other dificulties, the installers had to cope with a sprinkler system that went awry and doused a backup 1405.

Eight years later, a presumably wiser Hilton was announcing that it would once again try to computerize, this time with the help of Compass Computer Services, a TransAmerica subsidiary. The system was to be based on the RCA-2, and would eventually provide on-line internal reservations and back office and guest ledger accounting for all Hilton hotels. A pilot operation was scheduled for startup in Dallas in October. Other companies at work on automating the innkeepers were EECO and Honeywell.

RUSH TO JUDGMENT

May 15, 1971: IBM had announced that its 3330 disk drive, in the works since 1965, would be available in the fall of 1971. Then Memorex announced it would be offering a similar device at about the same time. IBM sued in a California court, complaining that Memorex had been hiring away IBM employees for the sole purpose of obtaining trade secrets. The suit asked that Memorex be forbidden to produce, market, or make use of anything interchangeable with the 3330 or its parts for 30 months.

Memorex denied having gotten any trade secrets, and filed a cross-complaint arguing that because IBM was a monopoly it wasn't entitled to keep trade secrets anyway. That suit asked for over $1 billion in damages. Where it would all lead was not clear, but there was a good chance that Memorex' complaint would be lumped with that of Greyhound Computer and Control Data to form a class action against IBM. Another possibility was an out-of-court settlement at an early date.

One likely effect of the litigation, according to DATAMATION, was that independent manufacturers of peripherals would gain credibility among users as a result of the concern they were obviously causing IBM.

—Ken Klee

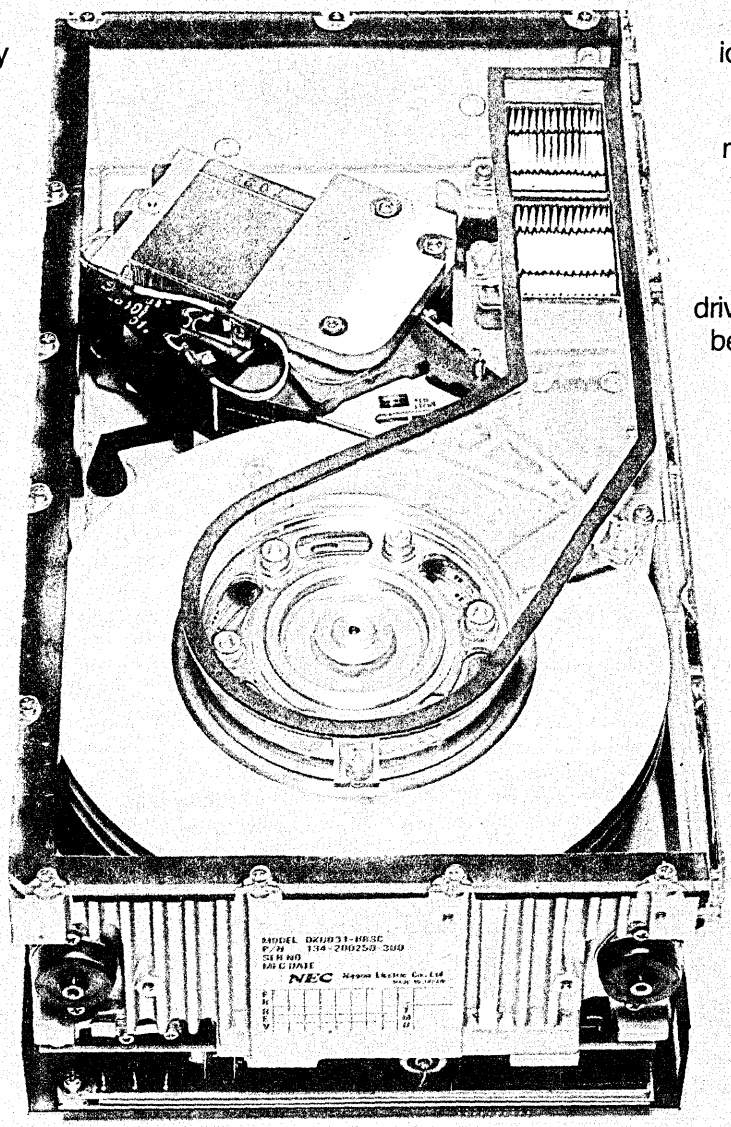
introduces 8-inch Winchesters.

With more capacity. Faster access. And the reliability you'd expect from NEC.

Once again, NEC leapfrogs conventional technology with its new D2200 family of eight-inch Winchester disk drives.

The first models in the series deliver 30-millisecond access time with capacities of 25.5 and 42.5 megabytes, respectively, and use conventional storage module device (SMD-type) controllers for convenient interfacing and formatting.

Sealed-disk Winchester technology is enhanced with voice-coil actuators, direct-coupled DC spindle motors and closed-loop air circulation which reduces parts count, eliminates periodic maintenance and gives the D2200 Series an MTBF in excess of 10,000 hours. When service is required, it's fast: the D2200s have a 30-minute MTTR.



The D2200 family is ideally suited to medium and heavy volume interactive business applications that require frequent disk access, as in virtual memory, database access and data communications operations.

Eight-inch Winchester drives are increasingly popular because they offer significant savings in installation, packaging, maintenance and cost-of-ownership.

And once again, NEC technology adds an extra dimension. Call your NEC Information Systems representative for more information.

NEC Information Systems, Inc.

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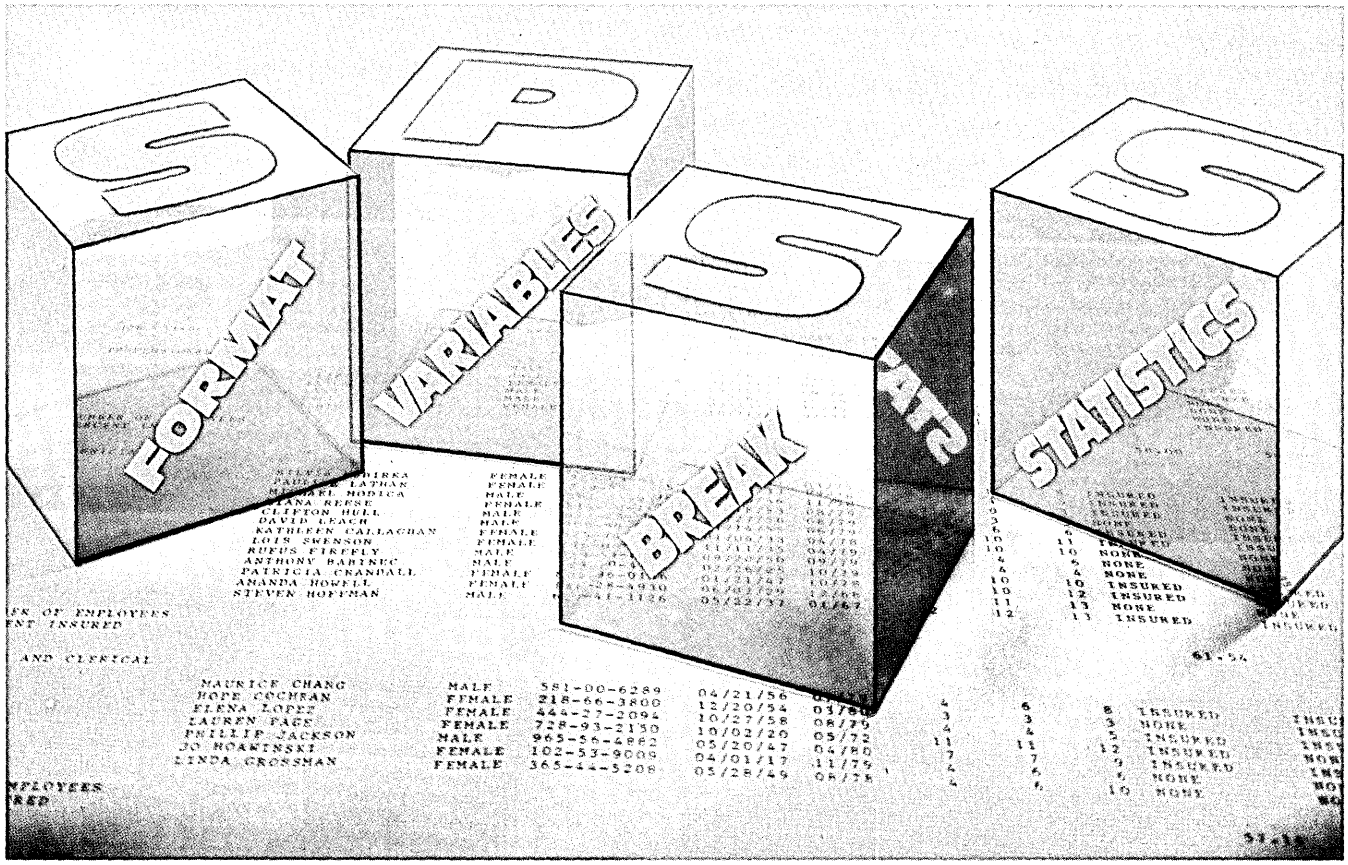
REPORT WRITING
MADE SIMPLE



With the power of the SPSS® Batch System behind you, you don't have to be a data processing specialist to generate highly specialized, easy to read reports. The SPSS report writer is designed to make it easy.

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Like all of the other capabilities of the SPSS Data Analysis System, the SPSS report writer is a research and management tool that is thoroughly and clearly documented, assuming no previous computer knowledge or experience on the part of the user. In fact, you'll need no help from data processing people—even when you need to reduce or summarize huge amounts of data before producing reports. It's all done automatically—in one easy step!

SPSS is highly portable and low in cost. With its powerful report writer *and* its highly flexible, sophisticated, and elegant Graphics capabilities, (as well as its full range of statistical and data management features) SPSS costs less than many systems that offer report writers alone!

For full information on the SPSS report writer, call or write SPSS today:

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See for yourself why our report writer is another reason to choose SPSS—the largest selling data analysis system in the world.

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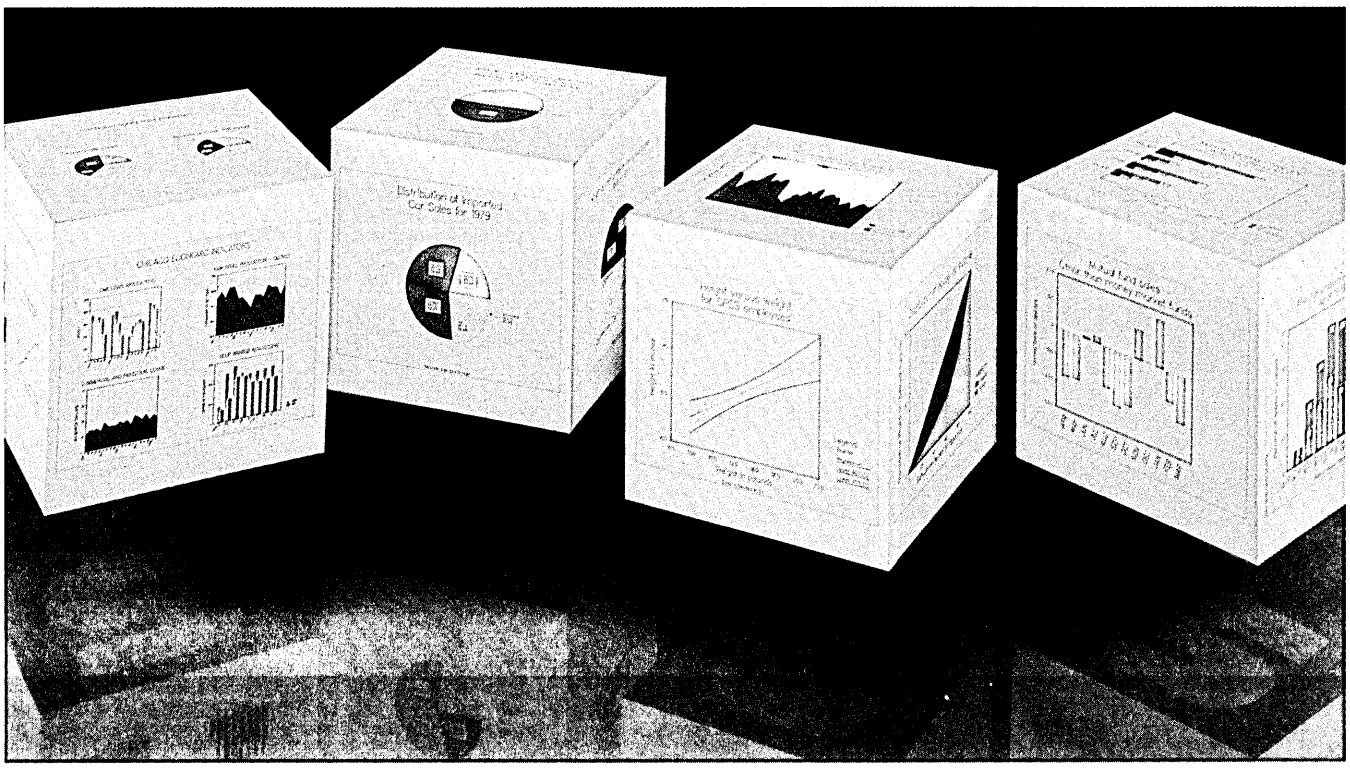

Now the world's leading producer of computer software for data analysis—SPSS® Inc. —and the world's leading producer of graphics software —ISSCO®—have developed the most useful graphics package you can find—at any price. It's SPSS Graphics: the state of the art in versatility, range of options, simplicity, and "artistry".

Management graphics in one easy step.
Backed by the power and simplicity of the SPSS Data Analysis System, SPSS Graphics allows you to operate directly from large amounts of data to produce elegant graphs and charts. There's no need to involve data processing people. *You* do it yourself: data in/graphics out!

Take control over form and content.
You choose the colors and/or shaded patterns as you wish. Use or modify a wide range of automatic "artistic" decisions too: label placement, margins, legends and scaling, for example.

Exclusive interactive preview capability.
Produce hundreds of graphs—preview them on a graphics terminal—decide which to use —and have graphs drawn on a hard copy device—*all in one step!* You may combine independent graphs (pie charts, bar charts and/or line graphs) on a single page, in any order.

Other SPSS Graphics features: simple or fancy displays; pie charts with "exploded" segments; bar charts with bars that extend above and *below* a given point; line graphs with color and/or pattern shading between the lines; automatically generated summary statistics; directly generated graphs of statistical functions; and complete use of SPSS data management facilities.

And, as you'd expect, SPSS Graphics was developed with the user in mind. It's a research and management tool that's easy to use, easy to learn, highly sophisticated, flexible, portable, and economical. With SPSS Graphics, you can have complete data summary and display facilities for less than you'd pay for a report writer alone!

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Chicago, IL 60611
312/329-2400

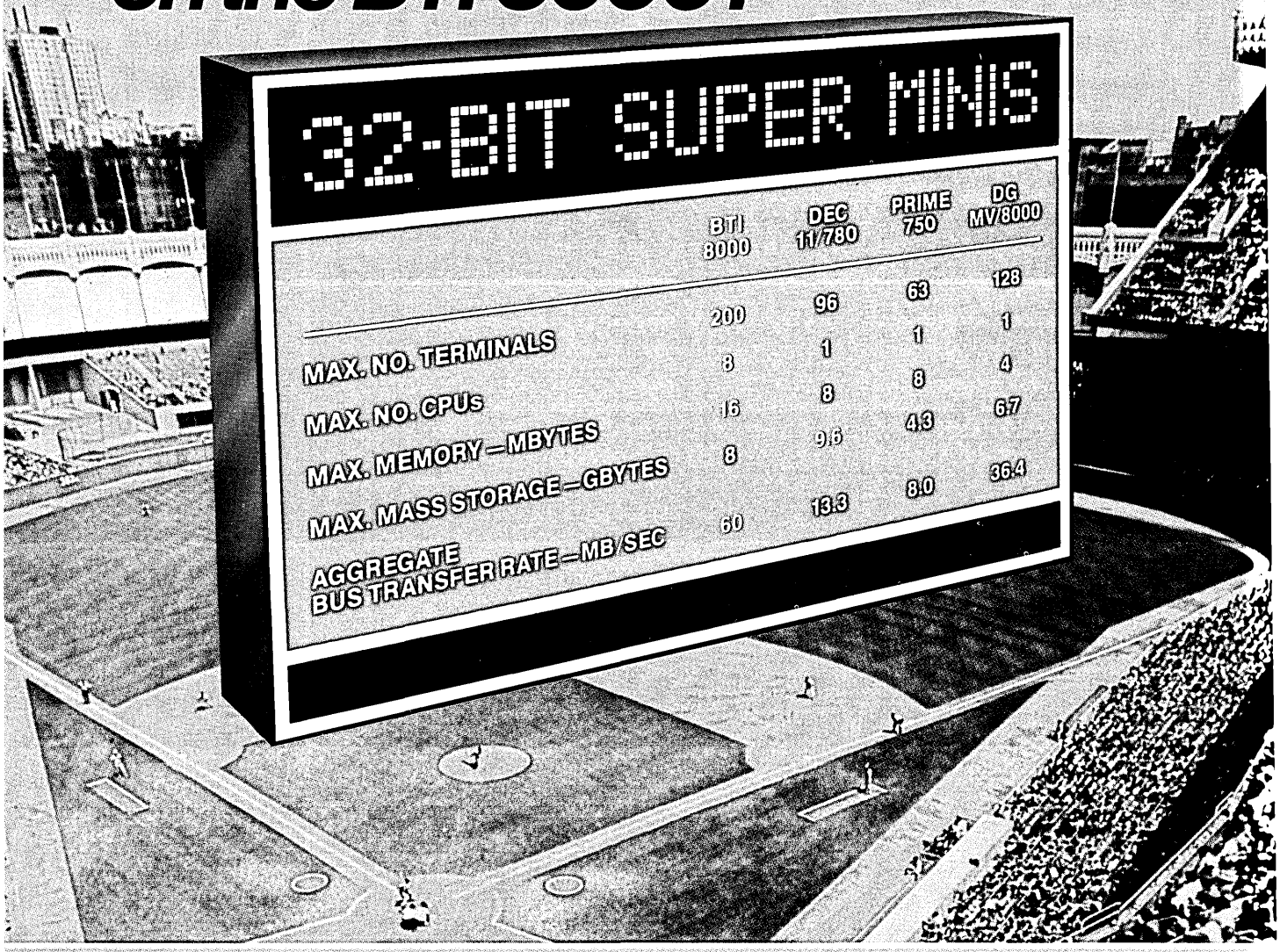
See for yourself why SPSS Graphics is another reason to choose SPSS—the largest selling data analysis system in the world!

SPSS inc.

Currently operational or soon to be operational on: IBM 360, 370, 4300, OS, CMS/DEC Systems 10, 20, VAX/Prime 400-750/Univac 1100/Other SPSS conversions will be available. Contact SPSS, Inc. for more information.

CIRCLE 13 ON READER CARD

What's the score on the BTI 8000?



In this game, it's clearly no contest. The BTI 8000 32-bit multiprocessor system gives you the lead in the first inning, and keeps you there all the way. And, you can sign it up for 30 percent less than competitive systems.

Furthermore, the BTI 8000's hardware and software architecture will continue to make it a top performer, long after other systems have been traded away.

For example, starting with a basic system, BTI's exclusive Variable Resource Architecture lets you increase processing power by ten times, just by plugging in resource modules. You don't have to rewrite systems or applications software either.

Despite its "superstar" status, the BTI 8000 is friendly to users and a real team player. A virtual machine environment, hierarchial account structure and fail-soft architecture eliminate any worries about security, control or downtime.

As for reliability, BTI bats near 1000, thanks to service via remote diagnostics. BTI has been using this method for over 10 years, and currently supports over 3000 systems.

These are just a few reasons why you should put the BTI 8000 in your starting lineup. For a complete scouting report, contact your nearest BTI office.

BTI COMPUTER SYSTEMS

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

CIRCLE 14 ON READER CARD

LOOK AHEAD

IN TANDEM WITH TANDEM

Sources say that a non-stop multiprocessor system similar to that offered by Tandem Computers is in development at Magnuson Computer Systems, maker of IBM-compatible machines. No firm introduction date for the networking arrangement has been set, but a trial system is running at the firm's labs, we hear. It seems the company has managed to get several cpus, including an IBM 4341, to operate under a single IBM operating system. Meanwhile, the company is investigating further microcode assists for the popular software packages similar to the one it offers to help Cullinane's IDMA database manager run on the M series of computers. Some 20 Magnuson machines are to be shipped next month now that production is approaching full steam.

BIG TALK ON SMALLTALK

Sources say that sometime this summer Xerox will release specifications for the language Smalltalk, developed over the past 10 years at the company's Palo Alto Research Center. We hear that five companies are working on implementations, among them Xerox, Apple Computer, and Texas Instruments.

KEY WORD AT FUJITSU IS FAST

Fujitsu is working on two supercomputers. One, designed to be 10 to 20 times faster than the Cray-1, is expected to be on the market by about 1985. A still bigger machine, rumored to be about 100 times faster than the Cray, is planned for very late in the decade. The Japanese firm is investigating gallium arsenide (GaAs) technology for possible use in the supercomputers' logic. GaAs run very fast when cooled to minus 200 degrees C, but not quite as fast as IBM's Josephson junction devices.

Meanwhile, as it intensifies its competition with IBM in the mainframe area, Fujitsu is planning to iron out the few incompatibilities that remain between it and the industry leader's machines. "When we say compatibility, it does not mean we will make an exact copy of the IBM hardware," explains Fujitsu development and manufacturing group general manager Shoichi Ninomiya. "We mean complete compatibility from the user's point of view; we may use different hardware and microcode."

COLOR ME BLUE

Now that color graphics displays are catching the attention of business users for MIS reports, the next step is full color printouts. Integral Data Systems Inc., a Milford, N.H., oem dot matrix printer vendor, is readying a seven-color RS-232 unit that reportedly will be priced to appeal to

LOOK AHEAD

users of small business systems which have color displays.

A GEM OF A PRODUCT

Tecstor, Huntington Beach, Calif., has a gem of an offering coming up. The new firm, financed primarily by Citicorp Venture Capital, introduced the first of its "jewels," Sapphire, at this month's NCC. Sapphire is a 160 megabyte, 14-inch Winchester disk drive. Next will come a 320 meg version, due out 12 to 18 months later. The crowning jewel will be a 640 meg version.

HIGH FLYING COMPUTERS

If present plans fly, Osborne Computer expects airline passengers to be offered not only a magazine, a drink, and a pillow, but a computer as well. The Hayward, Calif., company is negotiating with a major airline, whose name it won't disclose, to offer its air patrons the Osborne I, a business micro system in a briefcase-sized package. "It requires FAA approval," said an Osborne spokesperson, "but it's a natural when you think of the time busy executives spend on airplanes."

SECOND TIME AROUND

Computer Communications Inc., Torrance, Calif., has reached, for a second time, an agreement with its creditors and has, again for the second time, a plan that pleases the court. The company has once again come out of Chapter XI, and now it's planning another coming out -- a new product line. CCI is not yet ready to dicuss its plans, but perhaps that's understandable; president and chairman Raymond High has been in on the first two go-unders, and he's hoping a third doesn't happen.

AMDAHL'S TOP PRIORITY

We hear that Amdahl has deemed the development of its own operating system a major priority in order to give users an alternative to IBM's MVS system. MVS would still remain the main OS for Amdahl users, but the firm could add more value with its software. Despite having shown the Fujitsu OS/4 MVS look-alike OS to users several years ago, Amdahl has no plans to pick that up as its own product.

RUMORS AND RAW RANDOM DATA

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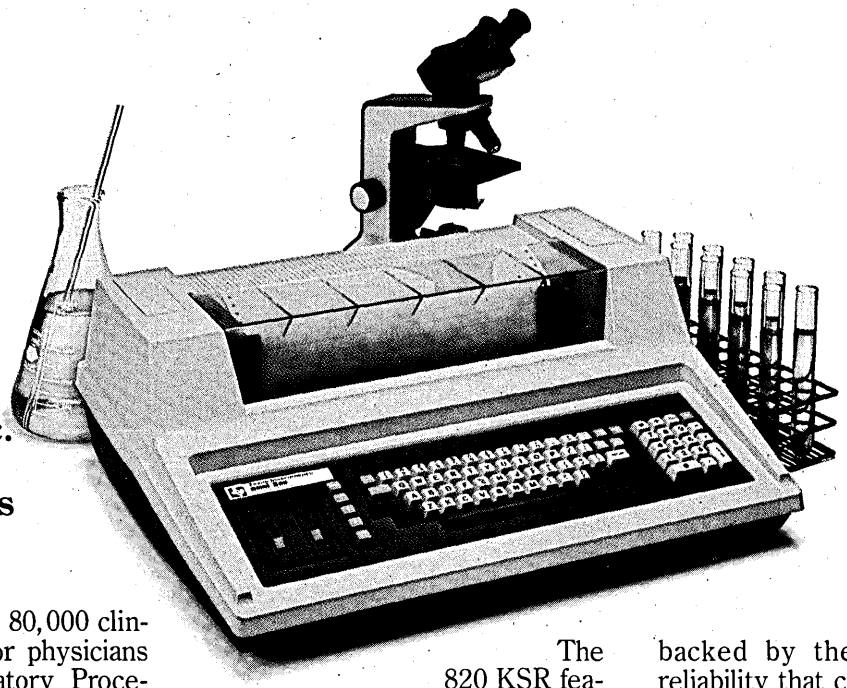
Lab Technologist.



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CALENDAR

MAY

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

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

Automan '81, May 19-21, England.

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

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

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

Office Korea '81, May 26-29, Seoul, Korea.

The second in an annual series. Last year's participants included the U.S. the U.K., Japan, and Korea. Contact Clapp & Poliak, International, 7315 Wisconsin Ave., Washington, D.C. 20014, (301) 657-3090.

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

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

JUNE

AUTOMATED OFFICE EXPO, June 2-4, Los Angeles

Seminars and exhibits on technology plus employers interviewing for automated office jobs. Contact New Horizons, 6521 West Sixth St., Los Angeles, CA 90048, (213) 651-2096.

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

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

ICC '81, June 14-17, Denver, Colorado.

The '81 International Conference on Communications is sponsored by the IEEE. Contact ICC '81, P.O. Box 21291, Denver, CO 80221, (303) 779-0600.

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

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

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

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

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

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

Syntopican IX, June 29-July 2, Atlanta.

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

JULY

ICALP '81, July 13-17, Haifa, Israel.

This is the 8th International Colloquium on Automata, Languages, and Programming. Contact Dr. Oded Kariv, ICALP '81, Computer Science Dept., Technion - Israel Institute of Technology, Technion City, Haifa, Israel.

Eighth Cranfield International Conference on Mechanised Information Transfer, July 21-24, England.

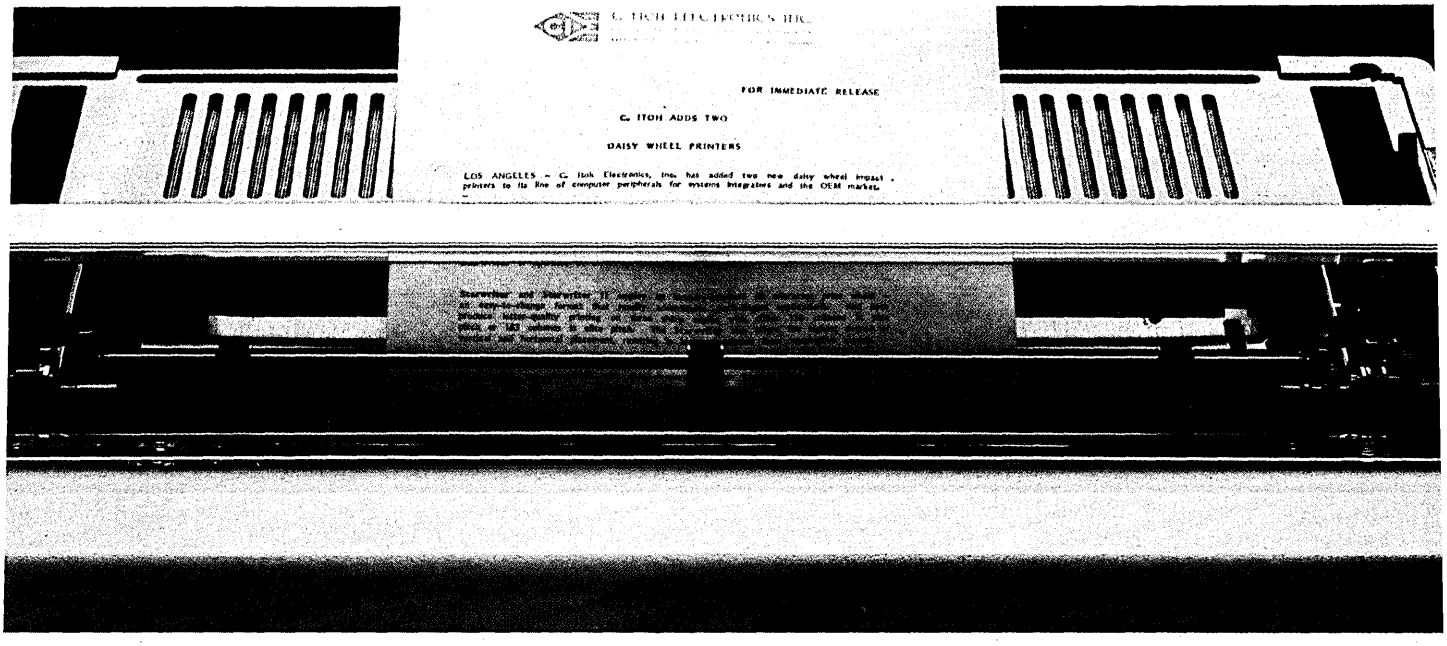
The conference is organized by the Information Div. of the Institution of Electrical Engineers. Contact The Marketing Dept., INSPEC, Station House, Nightingale Rd., Hitchin, Herts., SG5 1RJ, England.

Symposium on Reliability in Distributed Software and Database Systems, July 21-22, Pittsburgh.

The IEEE Computer Society presents this symposium. Contact Marie S. Hreha, LRDC Bldg., University of Pittsburgh, Pittsburgh, PA 15260, (412) 624-4908.

OCR Users Association's Summer Conference, July 26-29, Minneapolis.

The conference theme is "Managing Data Entry Productivity in Turbulent Times," held in conjunction with EXPO '81. Contact OCR Users Assn., 10 Banta Pl., Hackensack, NJ 07601, (201) 343-4935.



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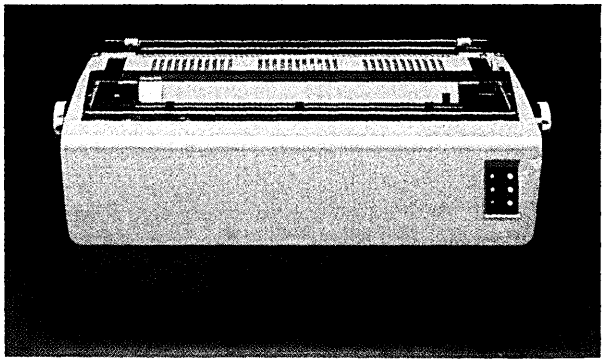

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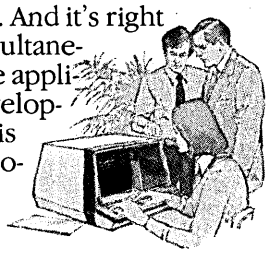

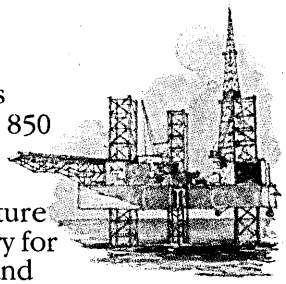

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LETTERS

TALKING WRITERS

Re: "Death, Taxes, and Dp Documentation," "Tech Writers Talk," and "Adjusting After Automation," (Feb., pp. 73, 81, 188), Mr. Zimmer went to the heart of the issue of technical writing.

As technical writers we are a menace to the societal structure of every profession. We want to deprive professional groups of their dearest possession—membership by virtue of jargon in a tribal grouping.

Why else does DATAMATION use the abbreviation dp instead of spelling out "data processing?" Surely not to save space. It is done to induce in your readers a feeling of belonging. Anyone who knows and uses the buzzwords of any profession or trade is perceived to be a member of the tribe.

Technical writers want to explain such symbols as the fourth moment of inertia, the etiology of a cell, a polygonaceous plant, or a reeentrant routine. To those who have worked to achieve a familiarity with such terms, the outsider who wants to use other words is seen as an enemy.

However, don't jump to the extreme feeling that all special terms are only just for show and tell. Every jargon develops out of a felt need for compressed communication. "Analyzer is a dual purpose syntax designed to assist in debugging BNF grammars so as to be MSP of degree, parsable . . ." is a meaningful statement to those who have the background to understand it.

BOB LUNCH
Oxnard, California

Both articles mention that writers earn less than systems analysts and programmers. Statistically, this may be true, but, as often happens, the statistics are misleading.

Writer salaries vary enormously. Editors who scan manuscripts for misuse of words like "hopefully" are at one end of the scale. At the other end, there are senior writers who understand operating systems as well as a systems programmer. They live well.

The general guideline is that writers who can read a program listing can also learn to code one. They must be paid comparably with the technical staff, or most will switch jobs.

The mainframe manufacturers, such as IBM, can't sell their operating systems without manuals. They are highly motivated to pay their writers well enough to keep them working as writers.

Pressures are different in the user shops. They want documentation and user manuals, but they are even more eager to get their systems up and running. They want programmers now, and maybe they will bring in consultants later to take care of the paperwork.

Writers who learn the technical facts of life in a user shop are under constant daily pressure to switch into programming or analysis. Relatively few survive long enough as writers to move into the higher salary brackets, so averages are based on an unusually high percentage of people in entry-level jobs.

These days, some users can't even wait for a new writer to get oriented. I recently heard from a woman who had been teaching technical writing in college. She was looking for work in the real world, and she found it quickly. A large insurance company hired her almost immediately—as a systems analyst.

JOE RIGO
New York, New York

The lead-in to Petersen's article quoted me as saying, "It's not the writer's job to prepare the best manual in the world—just what he can when it's needed." What I said when Mr. Petersen interviewed me was, "It's not the writer's job to prepare the best manual in the world, but the best that can be done—always when it's needed." The difference may seem subtle, but is not trivial. The first statement implies that any manual, no mater how poor, is acceptable if it is completed on schedule. The actual quote says that the writer's job is to prepare the best possible manual *within the time that is allocated to prepare it.*

Technical writing is a deadline-conscious profession. Manuals must be available when products are shipped to customers; there are no exceptions to this requirement. It is not the case, however, that a poor manual is always better than no manual at all. If the manual is poor because it is not technically accurate, for example, then the results can invite disaster—loss of property, revenue, or even life can result. For this reason manuals must be subjected to a thorough technical review before publication.

A poor but technically accurate manual *is* better than no manual at all because users have at least some of the information they need. Professional tech writers in the data processing industry today earn their money by producing both good and technically accurate manuals that are available to users when they are needed. The tech writers' ability to do this makes them a valuable part of the development team.

It is management's responsibility, of course, to establish schedules that provide sufficient time to write good manuals, just as they must provide time for engineers and programmers to make their best efforts. Unless the time is there, good manuals won't be there. Without good manuals, users will not be able to install even the best products, or run them efficiently, or use them creatively, or repair them when they break.

BERNARD GOLDSTEIN
Amdahl Corp.
Sunnyvale, California

There are technical writing programs at colleges and universities around the country. Among the many courses offered in our program here at the University of Minnesota (not the only program in the country, but we feel it is the best): scientific and technical writing, scientific and technical presentations, technical graphics, and professional writing. Classes like these, with a concentrated emphasis in various fields of science (including computer science), result in a

LETTERS

communications specialist who understands the concepts of a particular science. For example, FORTRAN programming is now a required class for the technical communication major.

JEFF PAULSON
University of Minnesota
St. Paul, Minnesota

I was pleased to find the articles on technical writing. It was enlightening to read about the experiences of other technical writers and the recognition they are beginning to receive.

JASON MONAS
Dataline Systems Ltd.
Toronto, Ontario

Congratulations on publishing not one but two articles on documentation.

We are part of the overall software effort; we find useful documentation is possible when writers are involved directly in the project working with programmers/engineers.

LYNN SCHOCKNER
Technical Writing Instructor
California State Univ. at Northridge
Northridge, California

CORRECTION

Re: Look Ahead (March, p. 45), the item on Century Data Systems was inaccurate. I cannot comment on your financial speculation, but the following points are pertinent:

- We have not had a layoff.
- The Marksman series of disk drives is selling well.
- We have just announced an addition to the product line.

DAVE DAVIDSON
Director, Advertising & PR
Century Data Systems
Anaheim, California

SNARLED

Re: "Winds of Change at IBM" (News in Perspective, Feb., p. 40), Mr. Emmett displays the kinds of garbled understanding of technology all too common among journalists. The notion that IBM needs or wants to "break with SNA" is clearly based upon fundamental misconceptions of what SNA is all about. Also, the article rests on the common but false misconception that SNA and X.25 are somehow competing alternatives for similar applications.

Were Emmett to survey IBM users, he would find that SNA is receiving growing and generally quite enthusiastic acceptance. Were he to study the differences seriously, he would realize that SNA and X.25 were designed for different purposes and have different areas of application. Were he to seriously examine IBM strategy, he would see that SNA is and will be a fundamental component of future products from IBM for some time.

Both SNA and X.25 have basic limitations for newer technologies such as the growing number of carrier sense multiple access bus network architectures. These will ultimately lead to different and much simpler protocols and communications systems designs.

WILLIAM F. ZACHMANN
Information Systems Planning Service
International Data Corp.
Waltham, Massachusetts

Not only does the article predict the demise of SNA prematurely, it is inappropriate and contains many inaccuracies.

First the inaccuracies. Mr. Emmett's basic premise is that since X.25 has "triumphed over" SDLC, SNA will go away. Using the seven-level OSI model as a reference, it is easy to point out the fallacies in this argument. X.25 did not triumph over SDLC because they do not compete. X.25 defines the boundary functions between levels three and four while SDLC is equivalent to level two.

What about X.25 replacing SNA? No, SNA's six levels cover all seven levels of the OSI model not just the bottom three. IBM will undoubtably provide X.25 compatibility within SNA, which may require new hardware and software changes, but rather than a "killer blow" this will provide a welcomed additional option to the network planner, *not necessarily* a replacement for either dedicated private links or switched links.

Why is the article inappropriate? SNA is either under active consideration or implementation in very many dp organizations. Since SNA is not easily understood by the uninitiated, an article, like yours, which uses such colorful phrases as "killer blow," "dead end," and "X.25 has triumphed over SDLC" is bound to stick in the minds of people who have neither the time or need to understand SNA (but who often make the 390 decisions). One of the reasons for choosing SNA is the expectation that it is now and will remain in the mainstream of communications development. It would be a shame if people with a lot of influence and little understanding turn SNA into another PL/I.

KURT DAHL
Nordstroms, Inc.
Seattle, Washington

I was very disappointed with the article. The reporter clearly missed the mark and did a disservice to readers in questioning IBM's commitment to System Network Architecture.

Let me make our position clear.

We will continue to enhance SNA

"Mr. Brissley, I'd like a raise."

"After due consideration, Michaels, the answer is no."

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CIRCLE 19 ON READER CARD

ers' current and anticipated data processing needs. Our announced intention to provide the capability to attach selected products to X.25 networks is an example of this.

I'd like to assure DATAMATION's readers that IBM remains firmly committed to SNA as a framework for future systems growth.

N. D'ARCY ROCHE
Director, Communications Systems
IBM Data Processing Div.
White Plains, New York

We agree with our readers' implications that the future of SNA is a subject to be explored, amplified, and clarified—and we will continue to do so. The next feature to analyze and discuss X.25 and SNA will be published in the July DATAMATION.—Ed.

MEA CULPA

Re: Crossword (Feb., p. 184), if you can't find a more skilled puzzlemaker, I suggest you drop your crossword. This one had three mistakes:

1. No clue for 14 Across (ACRID).
2. Extraneous clue for 32 Down (What does Kissinger have, anyway?).
3. The German word for THREE (62 Down) is DREI, not DRIE.

A couple of the other words are pretty dubious, too: LAIN (67 Across) is the past participle of LIE (intransitive), not of LAY (transitive), and as such can scarcely take the meaning PLACED. Is TORA (55 Down) a newly minted variant form of TORO?.

E.W.B. DAVIDSON
Toronto, Ontario, Canada

GENEOLOGIST RESPONDS

Re: Letters (April, p. 21), I appreciate Mr. Metz's reading my article so thoroughly as to be able to pick out so many areas of disagreement. Taking the major points, in turn:

1. I agree (as does the family tree) that many of the major product lines of the other mainframe manufacturers were introduced before the IBM 360. The 360 introduction increased emphasis of some of these manufacturers, such as Honeywell (with the Liberator software) and Univac, to capture parts of the then orphaned customer bases.

2. IBM software implementors who participated in the OS/MFT and OS/MVT development have told me that there was a separate development team working on each system.

Although coordinated, most of the kernels of these systems and a great deal of the supporting code were separately developed for each system. On this basis, I have chosen to identify the two systems as separate operating systems independent of how they were externally packaged (as different SYSGEN options on the same tape).

3. TSS is not listed in a recent version of the IBM Consultant's Manual as being supported on the 303X or 4300 systems. For this reason and many others, I have called it history.

4. I apologize for not showing the high degree of user level compatibility between the OS systems. It certainly exists as Mr. Metz points out.

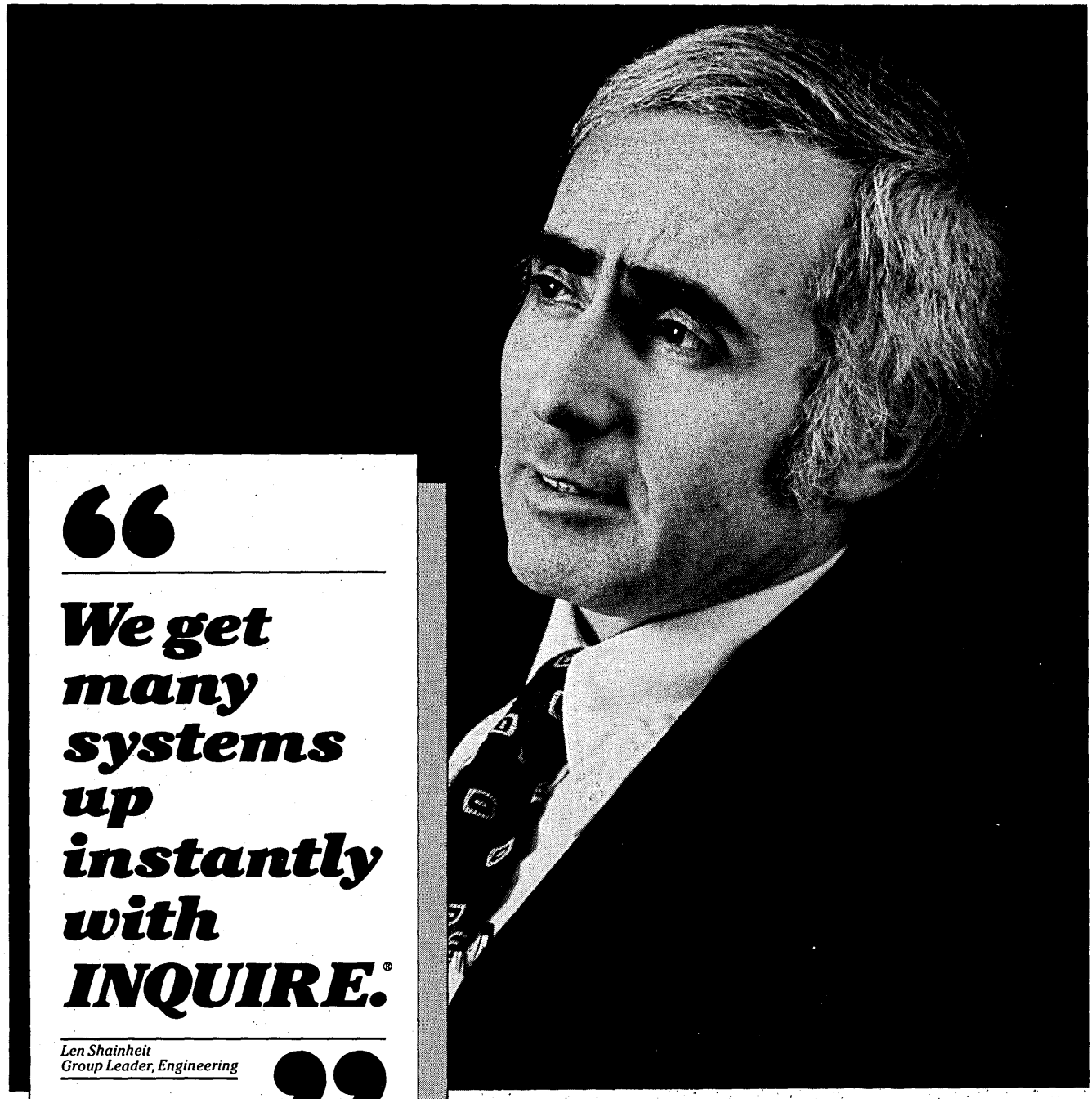
5. Burroughs software implementors have told me that they consider the B6000 and B7000 MCP as an unbroken evolution of the B5000 MCP. Since I was attempting to describe operating systems and not hardware generations, I did not show, as Mr. Metz so clearly points out, the introduction of these systems.

6. Mr. Metz and I clearly have differing views of the current state of operating system development. Only time will tell who is correct.

NORM WEIZER
Arthur D. Little, Inc.
Cambridge, Massachusetts

LOOK BEFORE

Re: "Making Friends With User-Friendly" (Jan., p. 108), the article makes a passing aside about the ease with which one can calculate the occurrence of leap years, and then remarks" . . . so calculating a leap year can't be a very big deal."



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CIRCLE 21 ON READER CARD

LETTERS

Agreed. But for those who are programming the occurrence of leap years, it is worth while noting that all years divisible by four are leap years *except* those centennial years which are divisible by 400. For example, 1900 was a leap year; the year 2000 will not be a leap year.

I am bringing this to your attention a little bit early—about 20 years early—because I figure that I might not be around when 2000 rolls around, and someone might foul up the leap year count.

EUGENE D. GODDESS
Seattle, Washington

NO OTHER MAGIC

Re: Readout (Jan., p. 33), you correctly pointed out IBM's OS and DOS operating systems are old, and badly in need of updating. Unfortunately, you said that very soon we will see operating systems moved into microcode, and that will be our salvation.

When I read the part about the microcode, I duly rose, turned to the East and bowed respectfully. Like other supernatural forces, microcode works in its own mysterious ways. We need not understand them. We need only have faith that they are benevolent, and they will somehow come to our rescue. Indeed.

Folks, I have a revelation for you. Microcode is a great technology if you are a vendor. It's not too bad if you are a systems programmer. There is even a bright side if you are an operations manager. However, if you are a user, microcode is not so hot. In fact, if you are a user, microcode is invisible, intangible, and largely irrelevant.

The problem with being a user is that I have a lot of trouble making a computer do what I need done. I have to learn JCL and other foreign languages. I have to learn to cope with the strange mechanics of input and output devices. I have to understand why the machine won't respond to what looks to me to be a simple and straightforward request. And I have to learn about programmers and other application developers.

Application developers seem always to be fighting the computer. They are fighting their way through JCL and TSO and hexadecimal dumps and link editors and a host of other things that don't have much meaning to me. There is always a good reason why they don't run into trouble, but by now I've heard so many "good reasons" that I'm beginning to wonder. And what I'm wondering a this: could it be that the operating systems are hindering them instead of helping?

And that brings us back to OS and DOS. They were designed for a time when computers were expensive and people weren't. It made a lot of sense in those days to have programmers tweak every bit and twiddle every byte, all in the name of making the best use of the hardware. But today, computers are cheap, and people are scarce and expensive.

Today, it makes sense to make computers easy to use. It makes sense to move the programming away from the intricate details of the hardware and the operating system. It even makes sense to make computing directly available to nonprogrammers.

But OS and DOS weren't designed that way. No matter how many "user friendly" layers of software are laid on top of them, the JCL and blocksize and space perameters and hexadecimal return codes still seem to show through.

So your point is well taken that OS and DOS are overdue for an overhaul. But the overhaul is to their design and architecture, not to their internals. No amount of microcode will help with the job that needs to be done.

There is a reason why OS and DOS haven't changed much. They have been consciously stabilized to protect the hundreds of billions of dollars already invested in applications that depend on them. With that kind of investment involved, wholesale change is unthinkable; yet stagnation isn't an alternative either.

I applaud your project to assemble a

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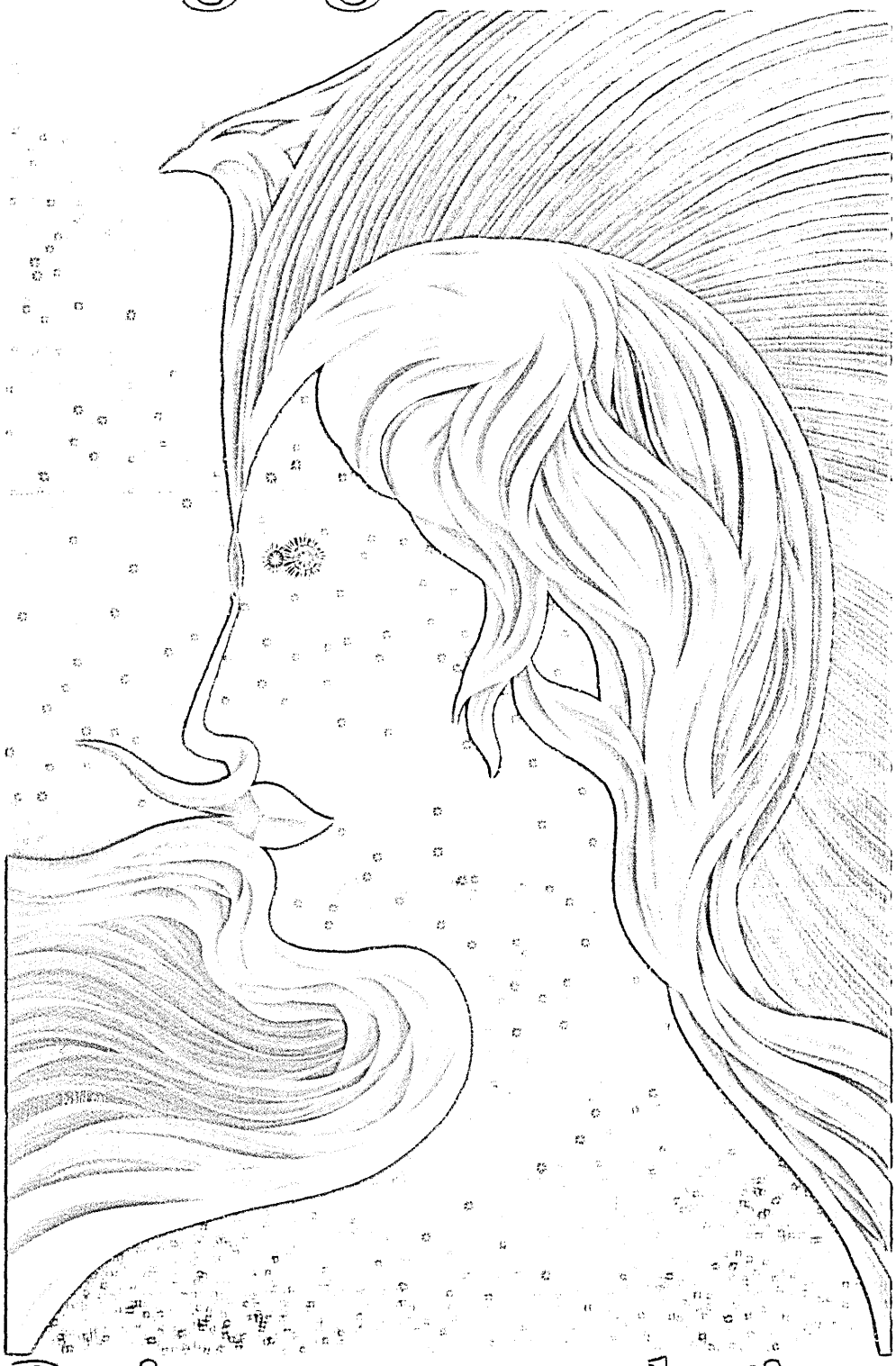

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LETTERS

panel to discuss how OS and DOS might be updated. But let us not be lulled into believing that microcode or any other magic will offer a quick technical fix for our dilemma. The only things that will help are the old traditional ones: hard work, careful planning, purposeful management and an open dialog.

JAY MICHLIN
Exxon Research and Engineering Co.
Florham Park, New Jersey

I just finished reading "The Long Goodbye." It leads into an outstanding article on the history of operating systems that provides depth and understanding to a process that seems quite amorphous at times. Mr. Weizer is to be complimented for bringing so many variables together and grouping them into logical families for all of us to reference.

TOM C. MARTIN
Computer Financial, Inc.
Hackensack, New Jersey

QUESTIONS OF COPYRIGHT

Re: "For Better of Worse" (News in Perspective, Feb., p. 49), much has been written concerning the Computer Software Copyright Act of 1980, with particular emphasis on the protection (or lack thereof) it affords the owner of the program. However, there is an area which was "sort of" addressed by an unidentified IBM spokesman who is quoted as saying ". . . the new law should encourage investment in the creation of new programs. . . ."

The question that I am sure is in the minds of most software vendors (and I am one) is the effect of the new law on the value of copyrighted software. That is, if a software package is copyrightable, can it then be considered an asset of the vendor corporation, and if so, how is its value determined?

The only analogy I can find to this situation is in the motion picture industry, where the president of a large film producing and distributing corporation indicated in a recent issue of a business magazine that his company valued its film library at 10 times annual rentals. I trust that this issue will be of interest to your readership, if only because of its impact on software pricing.

PETER A. POLHEMUS
Transportation Concepts and Services
Metuchen, New Jersey

NEW TECHNIQUES

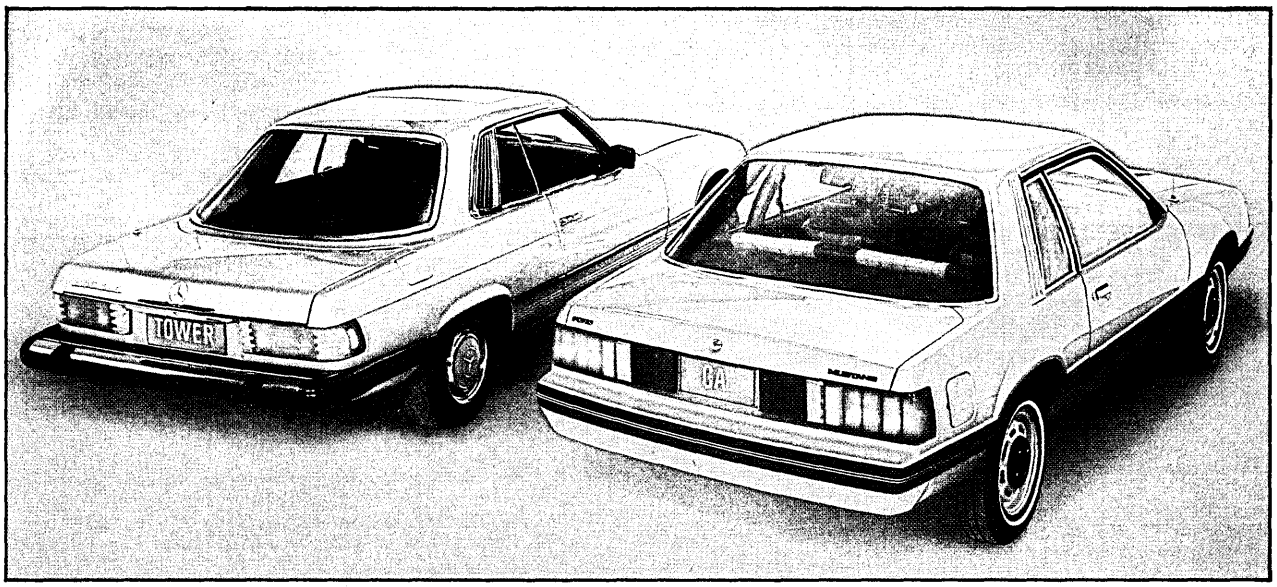
Re: "Systems Analysis: Key to the Future" (Oct., p. 145) in the mid-1970s, Exxon's computer scientists set as an objective the improvement of software development methods. Six of the eight techniques cited in Mr. Townsend's article were evaluated. The study team concluded that none of these techniques were broad enough to cover a wide range of applications. Structured Systems Analysis (SSA) is a technique for improving the definition of business requirements for computer applications. It combines a graphical language and a step-by-step procedure. We believe that SSA addresses many of the shortcomings of the other techniques cited by Mr. Townsend in his article. SSA is a scalable technique and can be used on projects which vary in size, orientation, and level of complexity. Also, it has the facilities for capturing data flow, control decisions, geographic dispersion, time delays, and organizational responsibilities which Mr. Townsend notes are omitted from some techniques.

KATHLEEN S. MENDES
Communications and Computer Sciences Dept.
Exxon Corp.
Florham Park, New Jersey

CORRECTION

It has come to my attention that there is an error in my article ("The Loss Generation," Mar., p. 203). Among those lessors with Lloyd's policies, I listed Finalco. That is not the case. Finalco never had a Lloyd's policy.

HESH WIENER



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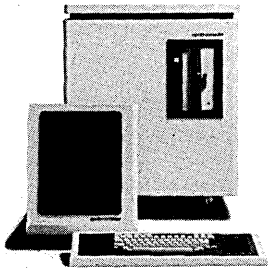

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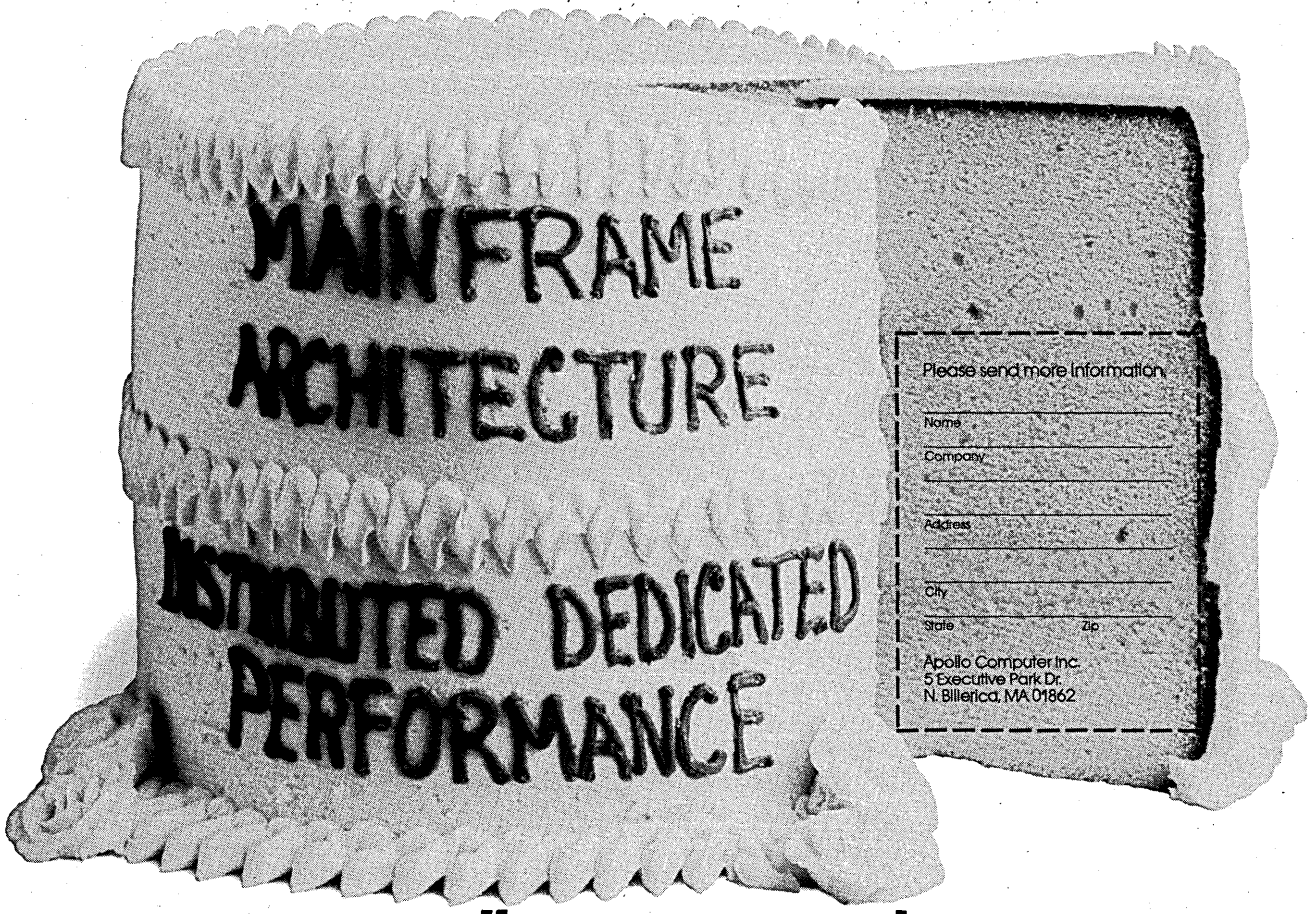

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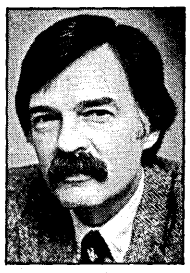
CIRCLE 27 ON READER CARD

John L. Kirkley, Editor

EDITOR'S READOUT



MAKING THE HARD CHOICE

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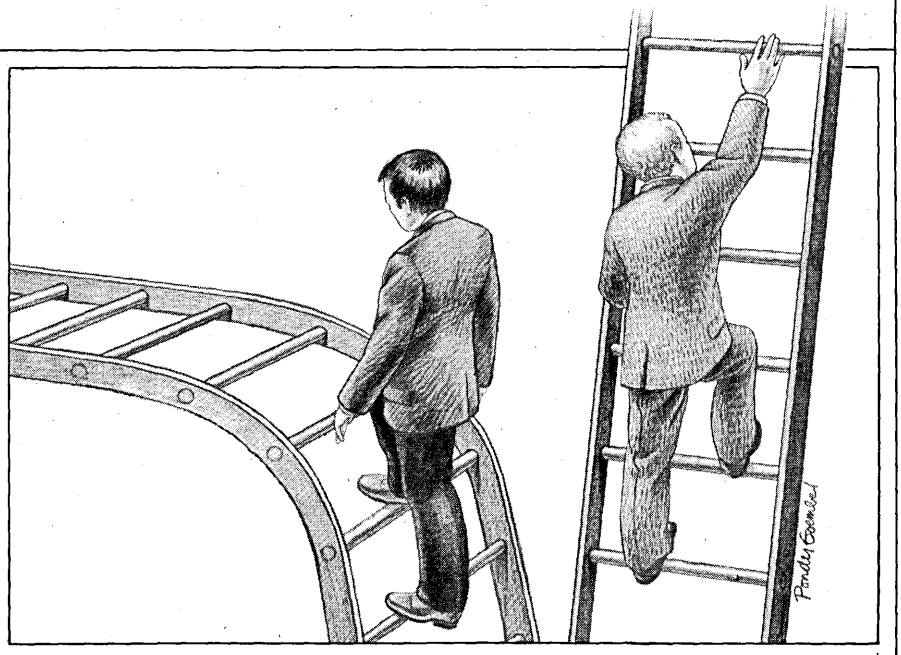

"If you're no good with people, you ain't never goin' to be rich."

This is not a bit of Ozark folk wisdom; rather, it's an observation culled from this year's DATAMATION salary survey which begins on p. 98.

Author Janet Crane is reacting to the "generally modest sums" paid to dp managers, even to many of those at the top. According to our sample—and it represents a cross-section of DATAMATION's audience of computer industry professionals—the really big bucks are not in the data processing function. It's true that dp managers and directors of MIS are well paid, but their jobs do not command the kinds of numbers that bespeak tax shelters, hand-tooled Italian shoes, and BMWs nestling snugly in the reserved corporate parking space three paces from the front lobby door.

In all fairness, there are a goodly number of top dp executives that make handsome salaries. In a highly biased, unstatistical survey of one, we asked a friend of ours who is with a large executive search firm to riffle through available openings and give us a quick fix. His firm handles jobs that pay $40,000 and up. With just a cursory glance at his run sheets, he unearthed a dozen jobs calling for directors of MIS, systems managers, managers of data services, and the like.

So the good money jobs are there. But, according to our survey, there just are not that many opportunities to move into the over $50,000 range within the data processing hierarchy. Less than 4% of our sample have scaled those rarefied heights.

The big money, as Crane discovered in her research, is not generally paid for technical skills. Rather, the rewards are granted for a major change in professional emphasis—the top dollars are paid to the managers of people rather than the manipulators of machines.

And this is why trade journals such as this one urge dp managers to develop the administrative, business, and psychological skills that will allow them to move into the corporate executive ranks rather than be chained to the technology.

We mean well. We want the best for our readers as they climb the corporate ladder. But, we may be doing some of you a disservice. We may be recommending a course of action that will ultimately make you miserable.

Many people have chosen the dp profession because they are fascinated by the technology. They like working with machines; they like the challenge inherent in dealing with complex inanimate structures. And they feel highly uncomfortable in the manager's world, which deals with that most ambiguous of entities—people.

When the opportunity comes, it's a hard choice. It's a choice that must be made about yourself; your real preferences, your fundamental nature, the way you want to live your life.

In our psychologically-oriented and money driven society, there is a stigma attached to those who are not people oriented and who opt to stay with the machines and, horror of horrors, do not constantly strive to climb the ladder of corporate success.

But despite the exhortations of the American Management Association, the glittering profiles of those who have "made it" in the business press, the promises of the MBA programs, the trade journals' urging . . . and the lure of the money, the psychic price may be too high to pay.

If you find through intensive introspection that you really prefer the technical path to the managerial, maybe you ain't never goin' to be rich, but you will probably find joy and fulfillment in your day-to-day working existence instead of profound discontent.*

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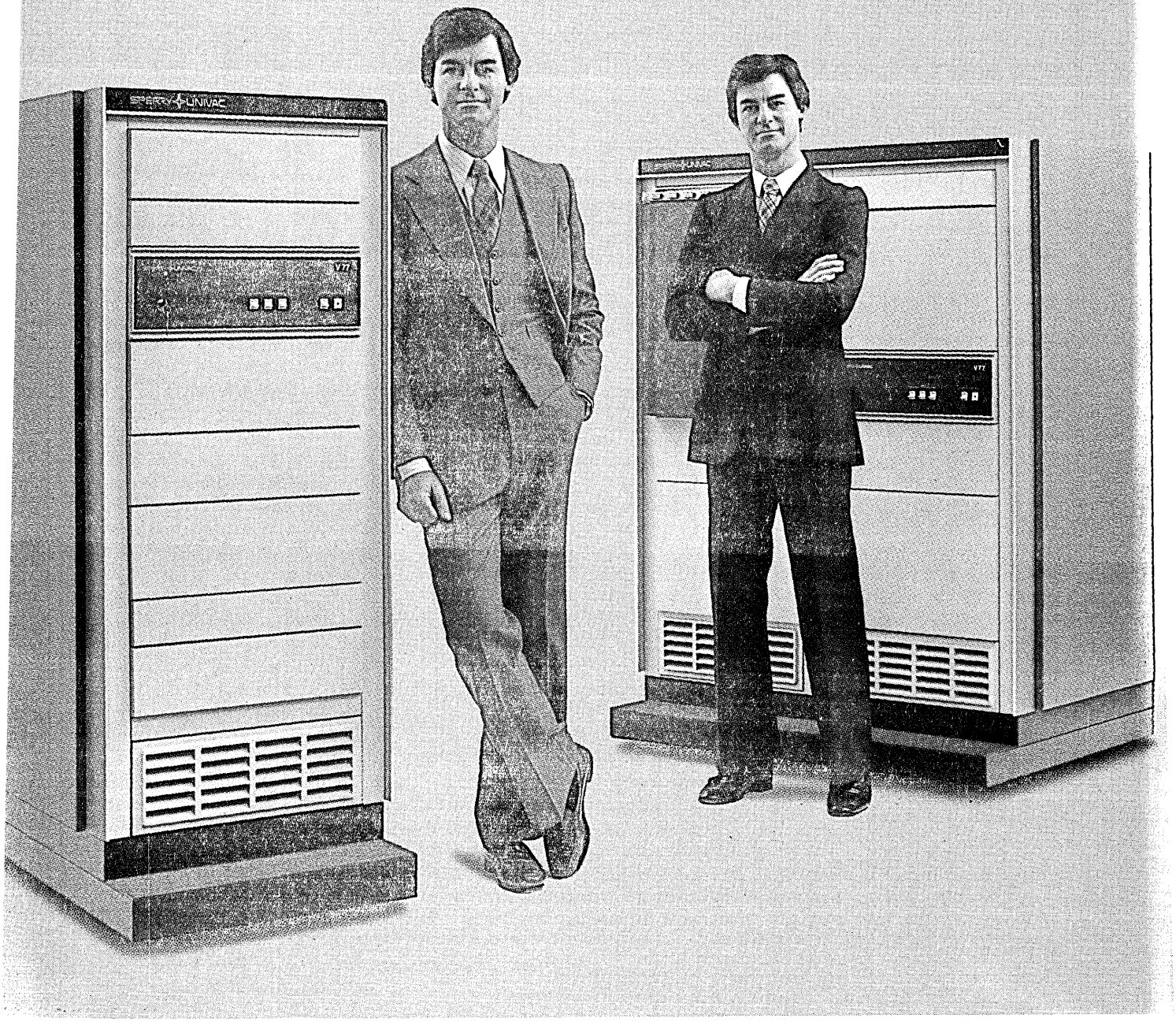

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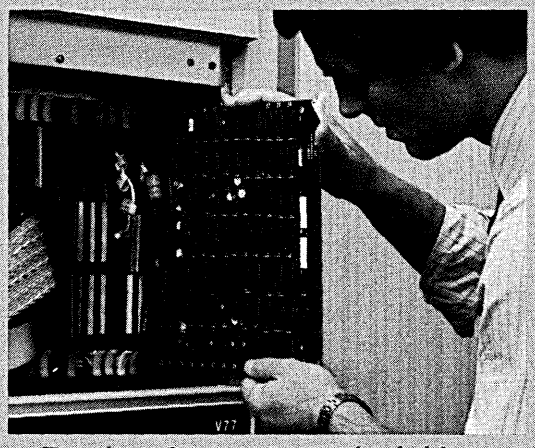

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IN FOCUS

HEALTH HAZARD OR HYPE?

Whether cancer or cataracts, researchers have been unable to diagnose the ills of the information age.

In 1962, researchers at the University of Chicago found that 100 milligrams of a synthetic substance, Trinitrofluorenone, dissolved in sesame oil and administered to a group of female rats, produced mammary cancer in 35% of the test animals. Today, IBM uses the chemical, also known as TNF, in its 3800 laser printer.

In May 1980, four women from the classified advertising department of the *Toronto Star* newspaper bore children with birth defects. All of them had spent part of their work days in front of video display terminals (VDTs) suspected of emitting radiation.

Also in the spring of 1980 a woman who had worked as a clerk for the Ontario provincial government's Ministry of Transportation & Communication developed eye cataracts.

These problems are peculiar to our time. Not only do they arise from the use of new technologies, they can also only be detected by relatively new techniques. Thus, modern science has enabled us to measure the dangers of modern science.

One result has been the discovery of subtle occupational dangers. In part because it affects the workplace so dramatically, computer equipment is immediately suspect when health problems occur.

It's generally agreed that computers are safe to use unless one has an aversion to glaring fluorescent lights and frigid air conditioning. But not everybody agrees on the safety of two important computer peripherals—laser printers and VDTs. Both pieces of equipment are now under investigation to determine potential dangers.

Laser printers, specifically IBM's laser printers, form the core of what is probably the most highly publicized potential health hazard in the history of computers. And yet, the matter is still far from resolved.

The controversy began, at least officially, last June when IBM reported to the Environmental Protection Agency that it used TNF in its 3800 printer and in its Copier One and Copier Two. IBM also told the EPA that its recent tests indicated that the chemical altered the cells of laboratory animals, but that the amount, which it estimated at a maximum of three micrograms per page, was too small to pose any threat to humans.

Under a process IBM patented in December 1969, TNF is used to coat a photoconductor belt, which creates a pattern of toner. The toner is then transferred onto the paper. The implication is that people handling papers printed on these IBM printers would get TNF on their hands, thus risking ingestion of a mutagen.

IBM officials, including Frank Cary, John Opel, Thomas Watson, Jr. and Nicholas deB. Katzenbach, reportedly knew back in 1970 that TNF was carcinogenic to animals. That same year IBM began using TNF in its Model 6800 copier.

In 1976, one year after IBM introduced the 3800 laser printer with TNF, the Toxic Substance Control Act was passed. The law requires manufacturers to report their intent to market goods with potentially hazardous materials to the EPA at least 90 days in advance. The law, however, is not retroactive; therefore, anything sold before it went into effect need not be reported.

One clause in the act did require companies to submit any new findings on substances they used and sold. In April 1980, IBM made further discoveries on TNF, and duly notified the EPA: the company found that TNF altered laboratory-prepared rodent cells.

A few months later, IBM was the center of a stormy debate over the use of TNF. Taking part in that debate is the U.S. government, through the EPA, the National Institute for Occupational Safety and Health (NIOSH), and the Occupational Safety and Health Administration (OSHA).

For its part, the EPA is a central agency that is not really doing very much about TNF, nor does it claim to know very much about the substance. An EPA spokesman remarks: "We can't say now how serious the risk of TNF is." Further, under the Substance Control Act, testing potentially hazardous chemicals is up to companies, not up to the EPA.

OSHA and its research arm, NIOSH, are now trying to develop an analytical way of determining if TNF is getting into the air around the IBM machines. Several users of the 3800 printer have asked NIOSH to carry out tests at their sites. When a method for conducting these tests is finally devised (a job that could take months), NIOSH will go in and test.

Top IBM officials reportedly knew that TNF was carcinogenic to animals.

Of course, one problem NIOSH will face is that there is no standard for airborne TNF emissions. OSHA has the ability to set such a standard, but the evidence needed to do so is far from complete. For one thing, the chemical must be tested on other animal species; to date, all the authorized tests have been on rats.

PHOTOGRAPH BY JAMES JOERN

Other vendors also use hazardous substances in their copiers. Xerox, for example, uses arsenic as well as two suspected carcinogens, nickel and selenium, in its 9700 laser printer. Last year in a press release, the company maintained that none of these elements were emitted in amounts that exceeded those allowed by U.S. standards.

In the meantime, IBM has responded to the brouhaha. It has begun to recover and dispose of the used photoconductors from the 3800. This was done because some of the TNF originally present remains after the sheet is spent. In the past, the photoconductor was simply thrown away. And in at least one case, a discarded sheet was used in an unconventional way: an EPA inspector discovered someone from a company's computer room cutting the sheet into thin strips for Christmas tree decorations.

IBM is also requiring its service people to wear gloves when replacing or maintaining the photoconductors. It has also affixed "proper use" labels to the photoconductors, developer containers, and toner disposal bags.

The other piece of computer gear now under scrutiny as a potential health menace is the flickering VDT screen. Despite nearly 10 years of tests, the quest to find dangerous VDTs has turned up a lot of smoke, but not much fire.

VDTs, nevertheless, are a suspected source of harmful radiation, and are claimed to cause a long list of ailments, ranging from cancer to headaches. One of the more frightening incidents was the one involving the four *Toronto Star* mothers. After the defective births the VDTs were checked and, as usual, vindicated.

Explains John Brooks, the *Star*'s communications director: "We have four computer systems and close to 300 terminals. The Ontario Ministry of Labor's Special Studies Branch came in and tested every terminal. They found no indication of any harmful emissions." The labor agency checked for X-ray, radio frequency (RF), and microwave emissions.

A University of Wisconsin study will attempt to spot such VDT hazards as eye fatigue, headaches, and backaches.

But the Canadian government's Health Advocacy Unit is not particularly happy with the *Star*'s study. In an attempt to placate the agency, the newspaper has invited four experts to review the findings. Their results are expected before the end of the year.

The *Toronto Star* incident, which received a lot of press coverage in Canada, also caused much concern. One worried company was Metropolitan Life Insurance, which uses VDTs in its Ottawa and Mississauga offices. The firm called in an independent consultancy, Technetronic Inc., for help. Using radiation detection instruments, the consultants tested 86 of Met Life's VDTs (most of them IBM terminals) for ionizing gamma and X-ray radiation and for nonionizing RF radiation. In all cases, the emission levels were well below those allowed by law.

VDTs were also the center of attention last January, when Darlene Weiss, a former Ontario government worker, filed for workers' compensation due to cataracts. Her doctor believes the disorder resulted from VDT usage. Weiss' union, the Ontario Public Service Employees Union, also suspecting the serious conditon could have come from terminal usage, had the former clerk examined by its own doctors as well as Dr. Milton M. Zaret, an expert on the effects of eye radiation.

The Ontario Workmen's Compensation Board is expected to rule on Weiss' claim shortly. If damages are awarded, Weiss may receive some unsought recognition, since her claim is the first of its kind in Canada. In the meantime, a branch of the Ontario Ministry of Labor testing the terminals where Weiss worked is also due to report on its findings soon.

In both the U.S. and Canada, several labor unions are investigating the potential health risks involved in using VDTs. One labor group, the Ontario Public Service Employees Union, which represents all provincial employees in Ontario, is surveying its members who operate VDTs, looking for signs of ailments caused by radiation. "We're trying to pinpoint problems, which we hope will lead to further clinical study of the matter."

In the U.S., the Communications Workers of America has launched a study of about 150 of its members in Madison, Wis., who use VDTs. The study, to be conducted by the department of preventative medicine at the University of Wisconsin (Madison), will attempt to spot such hazards as eye fatigue, headaches, and backaches. Addressing key ergonomic concerns, the effort is aimed at coming up with better workplace design concepts.

Other unions looking at possible VDT health risks include American Newspaper Publishers Assn. and the Office & Professional Employees International Union. The Canadian Labor Congress (CLC), a federated body of all Canadian labor movements, also recently surveyed 3,000 VDT users at 15 sites across the country. The CLC hopes to begin interpreting the data sometime this spring.

NIOSH has done some research of its own on VDTs. Dr. Wordie Parr, of NIOSH's Physical Agents Branch, says the agency has tested VDTs from about 18 vendors and found no radiation problems.

Still another group looking at the possible ill effects of VDTs is Working Women, a 10,000 member national association of office workers. In its 1980 booklet, "Race Against Time: Automation in the Office," the association points out that office automation, including VDTs, may indeed be a health hazard. "A great many of the problems have to do with low quality [VDT] machines and improper workstation design, particularly poor or improper lighting," the report notes.

Working Women has also received OSHA money to conduct a year-long educational campaign to inform and counsel office employees, employers, and the general public on office health risks. To that end, they are surveying their members and are now drafting reports.

One of those reports will include the following pointed but pragmatic advice: "We urge office workers to beware of other potential problems with crts. Inadequate breaks, poor chairs, and unadjustable machines can cause back, neck and shoulder strain to operators. And though preliminary government reports suggest that the low level radiation emitted by these machines is not harmful, we emphasize the need for careful and regular maintenance to insure complete safety."

—Peter Krass

EUROPE'S HUMAN APPROACH

Concerned Europeans are expanding their ergonomic horizons into the workplace.

In Europe, where ergonomic considerations in the design and usage of computer systems are more imperative issues than in the U.S., there is a growing awareness of the need to view human factors in a much broader context. As part of that trend, Europeans are increasingly expanding their ergonomic horizons to encompass such crucial concerns as the quality of the working environment and its impact on human needs and job effectiveness.

Reports from the U.S on possible eye damage from video display terminals (VDTs) triggered union concern over the health and safety aspects of computers. But the European emphasis has now shifted away from the physical design characteristics of equipment that can cause such health hazards. Instead, the new focus is on other factors such as job design, work organization, and staff psychological satisfaction. Also under scrutiny is the role of the systems designer in shaping the work practices of other people.

Managers who think that such concerns are irrelevant to business needs should heed the warning sounded by Tom Stewart,

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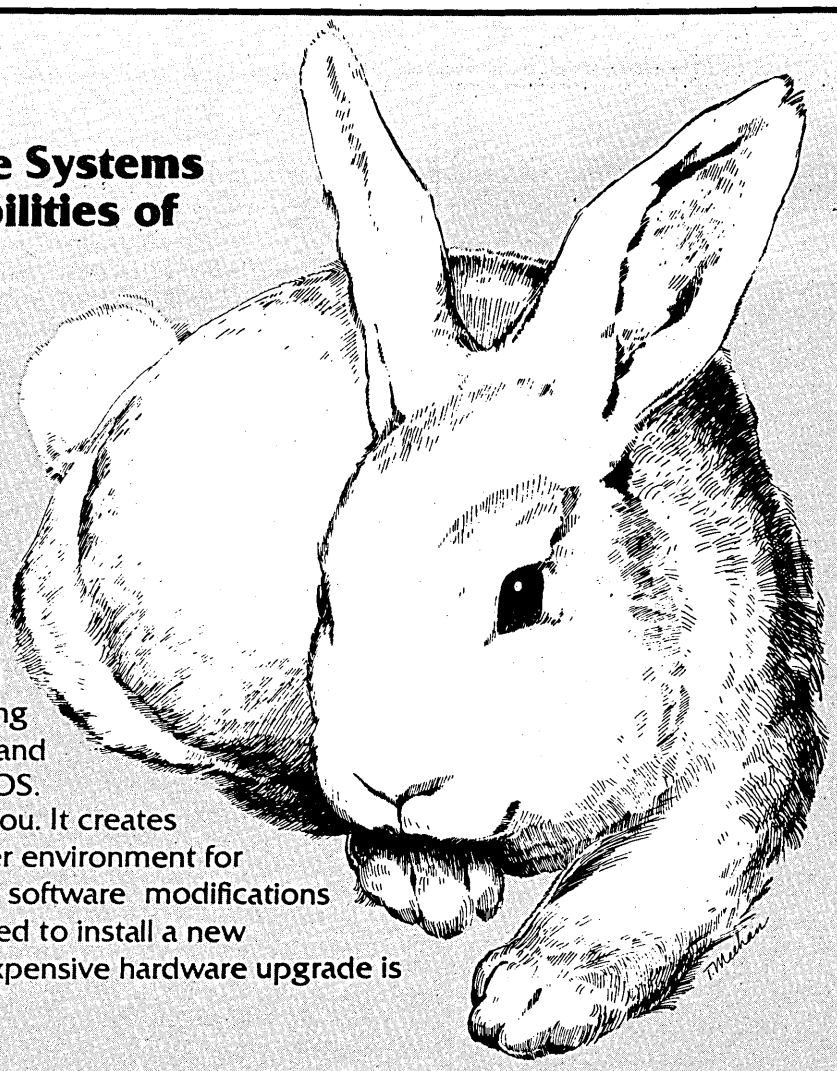

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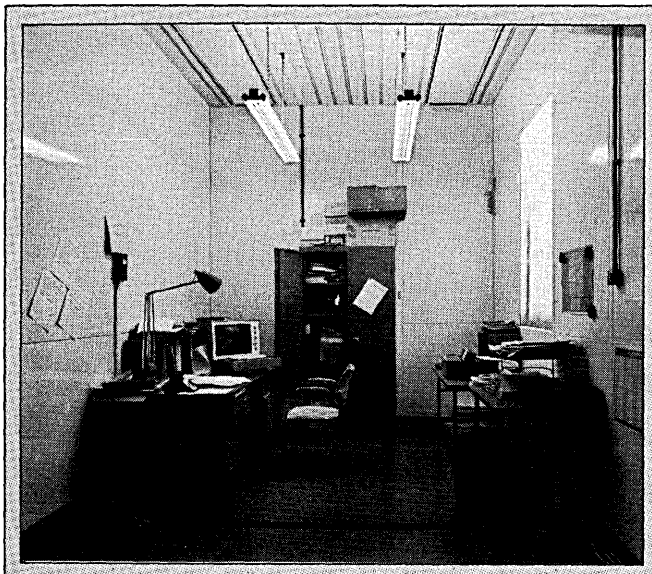

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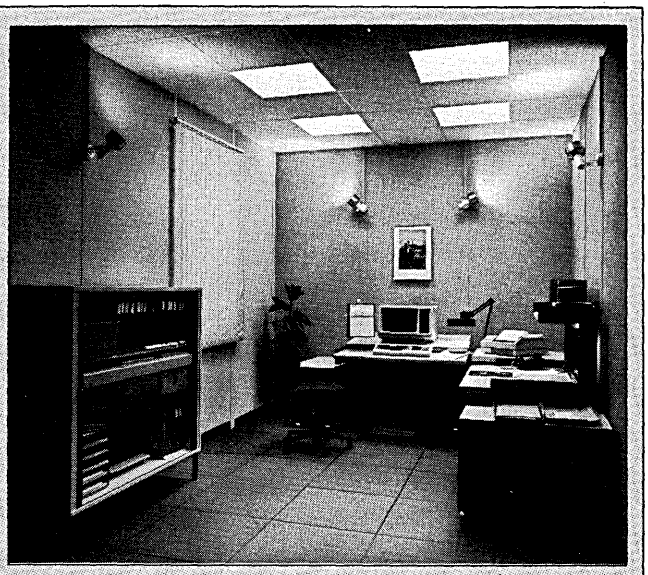

What's right with this picture?

THE GOOD, THE BAD, AND THE UGLY

An office environment must be carefully designed to make sure that the maximum benefits result from the use of computer systems. British Telecom was trying to make this exact point when its human factors division recently created contrasting office scenes for an exhibition to show the right and wrong ways to set up an office.

The poorly designed office (left) is proof of what happens when human factors are ignored. A close look shows that the video display terminal (VDT) screen is attached to a thick keyboard which is raised to the right height with the help of a book. All of this makes it difficult to position the VDT comfortably.

Some more no-no's: the screen is fixed in a vertical position and is shiny. The artificial lights are also too strong, and variable lighting is coming through the window. Such bad lighting causes glare and screen reflections, which in turn could cause eye strain. To make matters worse, the characters displayed on the screen are blurred at the edges and difficult to read.

The keyboard itself (which cannot be seen) has a nonstandard layout, with no differentiation between control keys and the alphabetic and numeric keys. This leads to inaccurate and inefficient keying. There are other problems with the printer, which is illogically located on the far right side of the room—a situation which means the operator either has to turn around or stand up to check the output. You have to hear it to believe it, but the printer is also extremely noisy.

The operator's chair, which may look modern, cannot be adjusted. Input documents must be placed flat on the desktop, forcing the operator to sit in an uncomfortable position when keying in the input.

What looks like a trip wire running across the floor is actually—you guessed it—a cable. Besides being unsightly, it's also dangerous. You'll also notice there's scant work space or storage room for computer media, documents, or books.

All in all, the whole environment exhibits a total lack of concern for the operator. It's unhealthy, uncomfortable, inefficient, and plain ugly.

The opposite picture is presented by the model of the optimum office (right). There the detachable VDT screen can be tilted and has a nonglare surface. The keyboard also scores points for its streamlined design and standard layout which features separate, easily identifiable control keys.

The document holder to the left of the screen helps ease eye movement during the input process. The quiet printer is also conveniently located to the right of the screen, enabling the operator to take quick looks at the output.

Another ergonomic plus is the operator's chair, which has a height adjustment and caster for easy movement. You won't see any cables either, because they are hidden under a false floor. But what you should be able to see is the lighting, which is carefully positioned and controlled to avoid eye trouble. There's sufficient work space and storage.

The systems in this setting have been designed to provide the most efficient and effective, as well as humane environment. In an environment like this, the operator is made to feel comfortable. The likelihood of illness is minimized, while the opportunity for job satisfaction is maximized. It may not be home, but it could be heaven to a terminal operator.

—M.P.

one of Europe's leading ergonomic experts: "Ergonomics is seen by some as an expensive luxury which cannot be afforded during a period of economic recession. This is far from true. Ergonomics can be highly cost-effective through reduced error rates, increased productivity, and improved staff morale and motivation."

A consultant with Butler Cox & Partners of London, Stewart recommends a formal ergonomic review be an integral part of systems development. This review, he points out, must cover more than the physical hardware. He explains why: "In many systems, the software dialog defines the user's job. Yet, the software designers are usually unaware that they are designing someone's job. It is not surprising, therefore, that many computer-based jobs are neither efficient nor satisfying."

Stewart was chairman of the U.K.'s VDT Eye Test (VET) Advisory Group, which was formed in 1968 to investigate fears that VDTs damage eyesight. The group's conclusion mirrors the findings of many other studies—there was little evidence that VDTs are directly harmful to the eyesight of most operators.

An extensive study by the British government's Health and Safety Executive turned up the same conclusion. After examining over 200 types of terminals, the agency found that radiation emissions from correctly operated VDTs were well within international standards and "do not pose a hazard to operators either in the long or short term."

On the other hand, the VET group confirmed that various environmental and physical factors relative to VDT usage can cause strain on the operator's body and mind. To avoid this, the group recommends regular eye tests for people who work with VDTs intensively.

Problems with poor posture, bad

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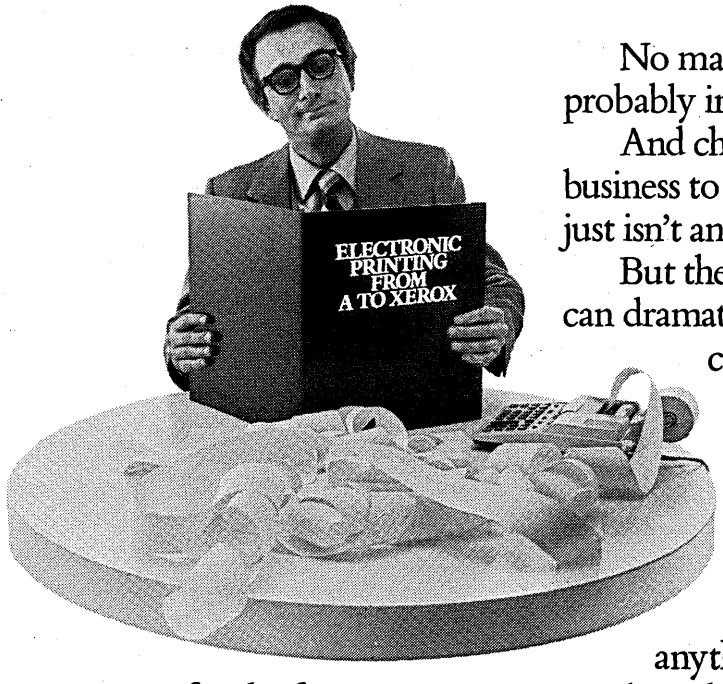

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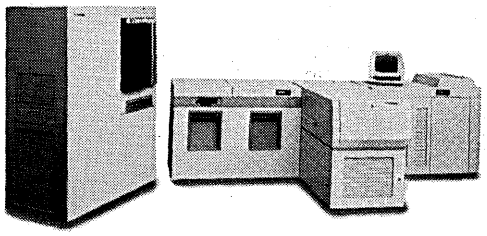

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ent in a poorly designed workplace are certainly not unique to VDT operations. Continuous usage of the terminal for long periods, however, can raise the risk of health dangers if ergonomic guidelines are ignored. A West German study in fact reported that "working at display screens subjects the eyes to strains that extend them to the limits of their capabilities."

In Norway, where regular health checkups for workers is mandatory, evidence has emerged that indicates VDTs can cause skin rashes. According to Dr. Hans Tjϕhn of the Norwegian Directorate of Labor Inspection, about 35 cases of facial rashes were discovered among VDT operators in that country in 1979 and 1980. Out of the total number of incidents, just under half were found to be directly caused by the working environment.

While the actual reason for the rashes has yet to be revealed, Dr. Tjϕhn believes the controlled atmospheric environment (air conditioning in winter) around the VDTs could have created static electric fields which attract dust to the skin.

The rash rumor spread to the U.K. where several cases were also spotted. Far more serious than skin irritations is the VDTs' possible impact on epilepsy. British research has shown that the terminals can cause seizures in epileptics if such factors as the refresh rate and luminescence are incorrectly adjusted.

Starting in the early '70s, Scandinavian countries, with their long tradition of staff involvement in work matters, began pioneering union-management agreements and government legislation which sets minimum ergonomic, health, and safety standards.

The rash rumor spread from Norway to Britain where several cases were spotted.

West Germany is following the Scandinavian example. In the U.K., trade unions have also been pushing for technology agreements. These pacts call for staff consultation and representation on technical design teams. They also spell out minimum specifications for VDTs, noise levels, and other ergonomic and environmental issues.

But the real ergonomic innovator remains Norway. In 1977 the country hammered out a national union-management agreement on the introduction of computer-based systems. The Working Environment Act was subsequently ratified into law which requires technology be introduced in a way that "employees are not exposed to undesirable physical or mental strain."

The law stipulates also that "efforts will be made to avoid undiversified, repetitive work" governed by a machine. The union-management accord specifies that dp-based systems be evaluated not only on technical and economic criteria, but also on their social and human effects.

As pointed out by ergonomic specialist Stewart, such requirements give important new objectives to systems designers. If they choose not to consider these needs, data processing staff and unions could show increasing resistance to technological innovation.

The complexity of these issues is indicated by fears expressed by some European union leaders. Eberhard Fehrmann of the West German Assn. of Labor Unions believes there is "indisputable damage to health" caused by computer systems which force people to work in environments with "unrestricted demands for exactness, quick reactions, concentration, and complete automatic control over job routines."

Mike Cooley, former president of the white collar section of the British Amalgamated Union of Engineering Workers, claims that many systems are designed with optimized response times that could force older people out of jobs. As people age, he explains, their operational response time on complex tasks at a terminal shows a marked increase. When they are past their "peak performance age," however, the pace of the system, he points out, could make them a candidate for the unemployment line.

Cooley takes an extreme stand on these social questions. "It is possible," he declares, "to design systems to enhance human beings, rather than diminish them and subordinate them to the machine. I do not believe that such desirable human-enhancing systems, however desirable, will be developed because those with power in society are concerned with extending that power and gaining control over human beings, rather than liberating them."

Cooley's pessimism is countered by the optimism of others who believe the sensitive human issues are not being totally ignored. Evidence of this comes from Europe, where several hopeful government and union efforts have been launched—efforts that will try to ensure that human factors are not trampled on in the stampede to jump on board the computer bandwagon.

—Malcolm Peltu

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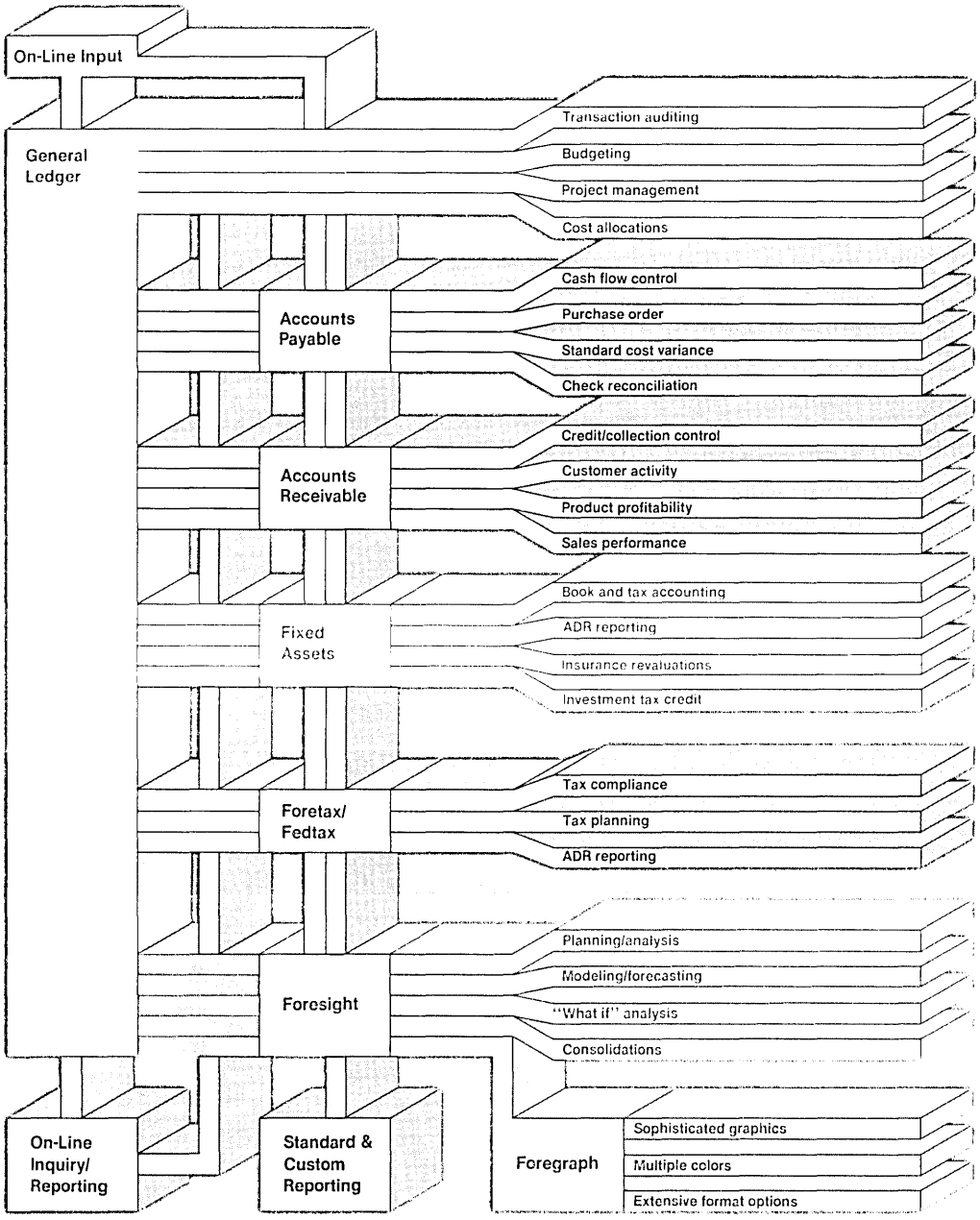

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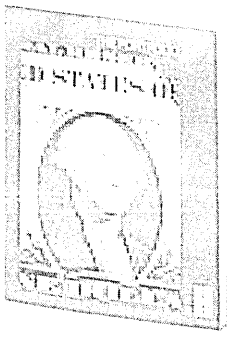

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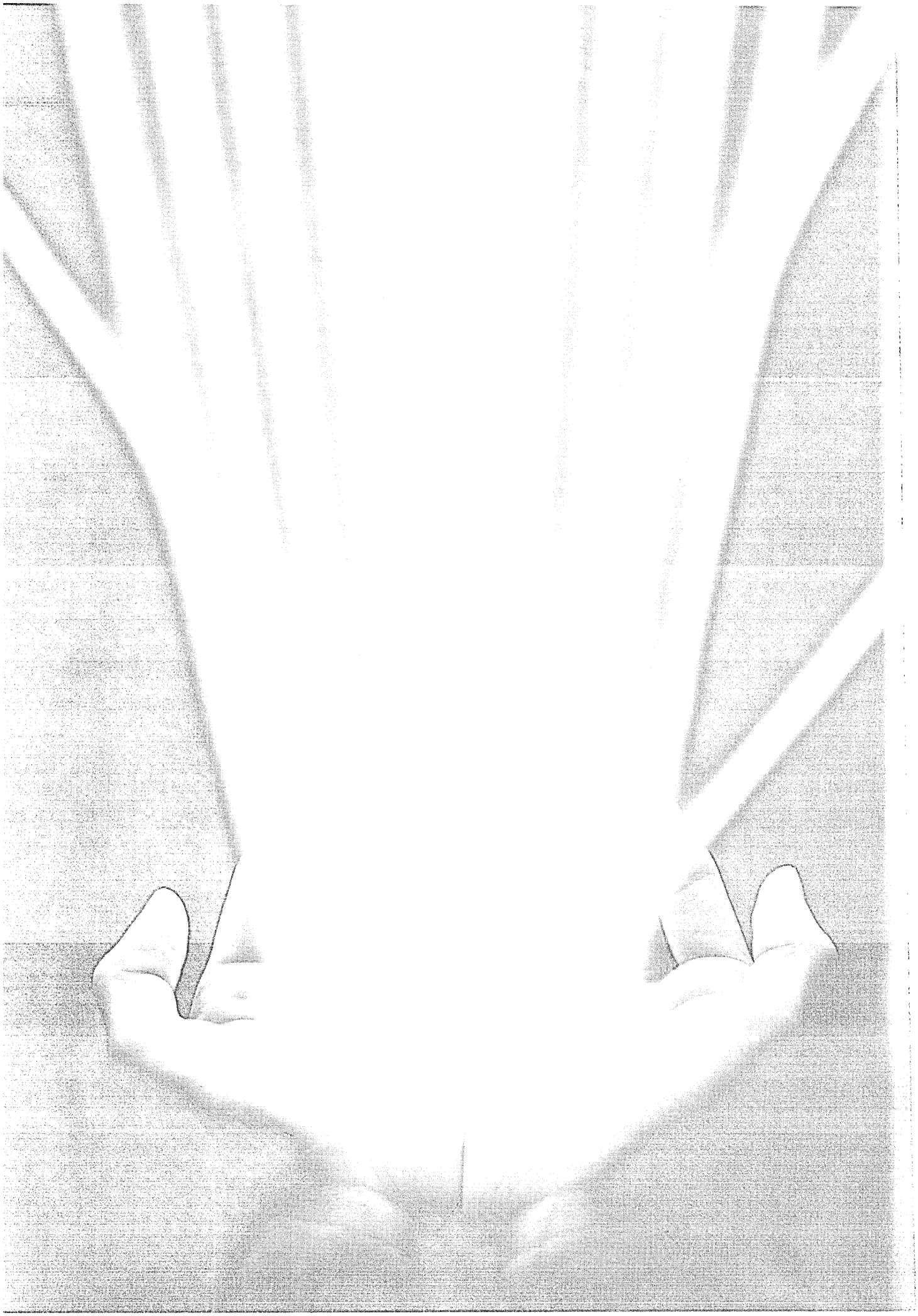

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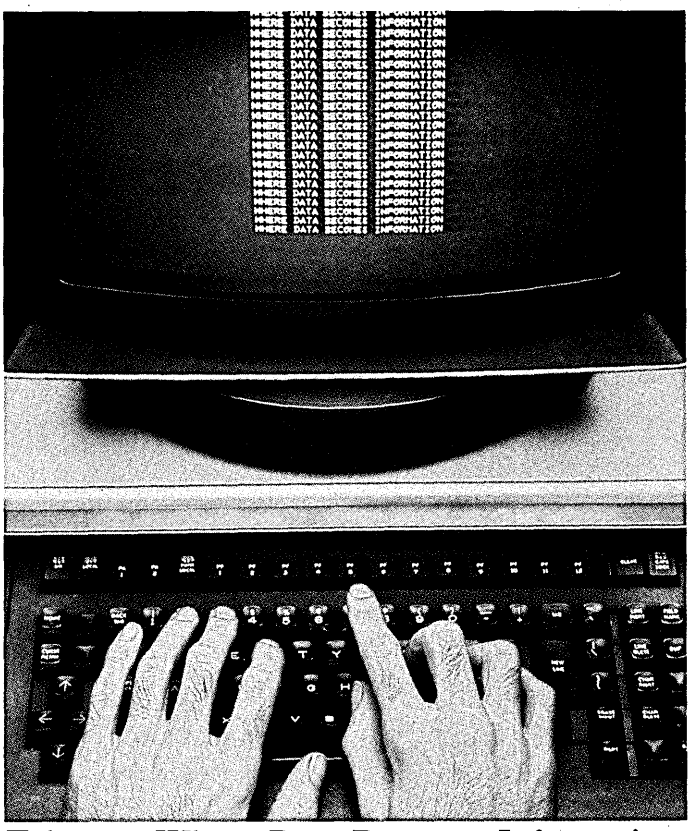

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NEWS IN PERSPECTIVE

OFFICE AUTOMATION

OFIS FOR OFFICE IN OFFING

With lots of know-how under its belt, Burroughs Corp. is readying a new assault on the office automation market.

Once an uncontested leader in office automation, Burroughs Corp. has seen its position eroded over the past few years as IBM, Wang, Xerox, and a host of other companies have moved aggressively into markets Burroughs had pioneered. Plagued by the loss of top executives, mismanagement of several of its subsidiaries, and sagging profitability, the Detroit mainframer has let the burgeoning office market slip by it even as that market accelerated into the '80s.

Next month, however, the firm will launch a new integrated office system, called OFIS, which is understood to rely heavily on know-how acquired from System Development Corp., the Santa Monica systems house Burroughs acquired last year for $98 million.

OFIS, the first major product offering to be introduced under the reins of the new chief executive, W. Michael Blumenthal, will be a key element in what insiders say is a concerted effort to reestablish Burroughs in the office automation arena.

Burroughs officially declines to comment on the planned OFIS system, but company sources have revealed that the hardware will center on a System Development-engineered "electronic filing cabinet," or Data Vault.

The machine, designed by System Development (several years before Burroughs even approached the West Coast company) but never brought to market, is a content-addressable storage device which can simplify the process of filing and retrieving information. Burroughs is expected to link the machine to word processors, digital facsimile and optical character recognition systems to form an integrated office system. The key facility of the system will be that users can share files and retrieve them easily, without having to know where or how they are stored.

In addition, Burroughs is expected to support links with other vendors' computers, word processors, and perhaps other office systems through standard protocols. And, if all goes as planned, say sources, OFIS will communicate with mainframes and small computers linked in networks under the firm's BNA network architecture.

The strategic importance of the new office hardware to the "new Burroughs," as some insiders call it, cannot be overestimated, suggested one Blumenthal aide. He pointed out that until the System Development acquisition, Burroughs' office automation efforts had been accorded only divisional status. But now in the wake of Blumenthal's appointment of former SDC Products head Roger Johnson as general manager of the division, the Burroughs ceo has elevated it to full group status and made Johnson a Burroughs vice president.

The Burrough spokesman also confirmed that a special Detroit task force under Jack Ault, corporate manager, office systems, has been formed at HQ to look into the problems of marrying the company's dp operation to the new office commitment.

What so far hasn't been confirmed is the existence of a conceptual think tank and development group—Business Communications Division (BCD)—located close to the Office Automation Group HQ in Danbury, Conn. This division is believed to be working on the problems of interconnecting elements of the office of tomorrow.

The company's problems (see April, p. 40) has made it a "trifle paranoid" about headhunters, said one insider, "so it never talks about the existence of this division. But they've lost people from here too."

The source added that BCD had alternately scrapped and resurrected a desktop terminal for storing and forwarding voice, "which should eventually be an integral part of the new thrust." The whole weight of these new initiatives has now fallen squarely on Johnson and a small but dedicated nucleus of SDC products people that is relocating with him to the East Coast.

Blumenthal's acquistion of SDC has been described by some observers as a "merger made in heaven." But then much

A rethinking of its approach to the office market has been prompted by the firm's new leader, W. Michael Blumenthal.

the same sort of things were said about Burroughs' mid-'70s acquisition of Redactron (word processors), Graphic Sciences (facsimile devices), and Context Corp. (optical reading equipment), which gave Burroughs such a strong early position.

Burroughs is still sensitive to charges that it has "buried" these three concerns and taken them out as factors in the business.

Burroughs' initial dive into offices was planned around the Redactron Rl word processor (the Redactor), which one advisor recalled as the "only" communicating word processor at that time. But rather than pump in much needed product development funding to capitalize on the R1's software

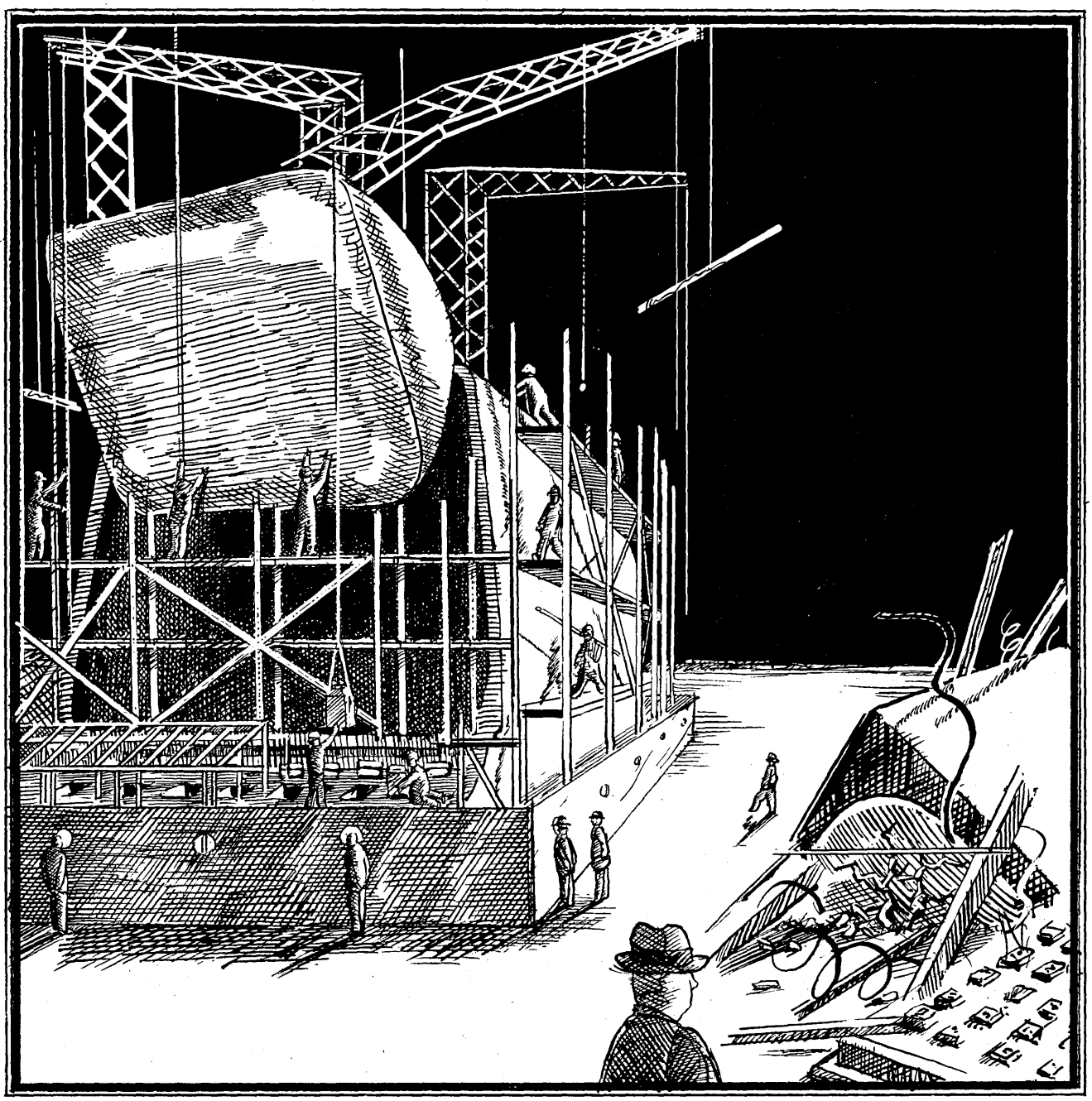

ILLUSTRATION BY ANDREJ DUDZINSKI

lead, "Burrough's closed the bank," remembered one observer.

In a recent burst of candor, Blumenthal talked of the mishandling of these acquisitions. He said the company had lost valuable ground as a result.

"We hadn't the experience of managing small entrepreneurial companies," said a Burroughs spokesman. "We admit this. But we've learned a useful lesson. We're much better at it now."

"When I came in here," said Johnson, "I found a new infrastructure in place, and ready to respond to me." (He added that the momentum behind SDC's two-year development of its file manager had taken it to the point where it needed a new setting to flourish.)

"I discovered just the right compatibility of focus within Burroughs' own product plans—a synergy with our own," he said. He declined to elaborate.

The fact that the Burroughs office strategy is back to square one, but this time with a new focus, doesn't seem to concern Johnson.

The military and other government bodies seem to be likely candidates for early versions of the OFIS system.

"There are those who claim that Burroughs has fallen too far behind," he said. "But I don't subscribe to this view."

Johnson explained that the current "leaders" or first wave will reach the marketplace with a range of products in the middle '80s. "Their technology will open up the first big markets—but these systems won't be as easy to use as they could be."

He added that soon after would come a second wave of more user-friendly products that will be much more "invisible" to the user. "And these, including our own products, will open up further big markets," he claimed.

"So it doesn't matter if you are a little behind the first wave. The market will always be there for anyone who can offer the user what he needs most—ease of use."

Johnson has already started to put his theory into practice, say sources. They claim that the new OFIS file manager has been put through its paces at select user sites over the past eight months to tune its final design around customer responsiveness.

Johnson said he intends to work very closely with Burroughs users "on site" in an effort to codesign the systems they need.

An added bonus for Burroughs is that the bulk of these initial customers for its OFIS family is likely to be the military and the government, a potential gold mine that Burroughs has so far been unable to penetrate, but which has been responsive to SDC software in the past.

Sources point out that several of the test sites for the new office system—from the government area—could be preparing fat contracts to buy the fruits of the new Burroughs/SDC partnership.

If that's true, Burroughs might find a pair of wings added to its efforts to catch IBM.

—Ralph Emmett

HARDWARE

IBM SLIPS A DISK

Delay in shipping the 3380 disk drive gives PCMs a chance to gain market share and profits.

With appetites for disk storage growing at about 40% a year, there was a good deal of scrambling as users reacted to an early-March statement that IBM's new 3380 disk would be delayed as much as nine months. The scrambling was mostly in the direction of plug-compatible disk suppliers, who have, however smugly, jumped at the chance to win new accounts, gain market share, and boost sagging profits, all at the expense of IBM. It may add up to one of the costliest slips IBM has ever made.

More than the System/38, which in 1979 missed its original delivery date by a full year due to software problems, the 3380 delay has left IBM highly vulnerable to plug-compatible attacks. Storage Technology, Control Data, and Memorex each appear able to beat IBM in delivering the next best thing to a 3380, the five year old 3350 disk. In addition to having the jump on IBM in delivering 3350 drives —IBM quotes up to a 24-month wait for a new 3350, compared to the two- to three-month lead time claimed by PCMs—its disk rivals e able to deliver double-density versions of the 3350. IBM has never offered such a drive, having counted on the 3380 to take up where the 3350 left off. Moreover, industry analysts point out that IBM's delay of the 3380, for whatever reason, may affect large systems sales, particularly those of its recently introduced 3081 cpu, the first of the H Series machines. If users can't get the 2.5-gigabyte 3380 disks to hang on the cpu, they may delay installing the new processors.

The 3380, IBM's largest disk yet, was scheduled to leave the factory floor for customer sites by the first quarter of this year, but that date has been pushed back to sometime in the fourth quarter of the year. Similarly affected is the firm's 3880 disk controller. Customers have been told they will retain their original places in a long queue of orders and will be notified in the third quarter of '81 of specific delivery dates, according to IBM. But that's about all the firm would say about the delay.

Speculation on IBM's problems centered primarily on the 3380's use of thin-film read/write heads, but a variety of other explanations were put forth. The thin-film troubles, some observers guessed, had to do with low yields from the semiconductor process used to produce the heads. Low yields could prevent the manufacturer from producing the drives in high enough volumes, it was thought. IBM, however, has been able to ship its 3370 disk drives, which also use the thin-film devices, without difficulty, according to observers.

James Porter, a Silicon Valley consultant who tracks the disk industry, said the 3380 problems are probably the kind that would only show up after the disk had been used for a long time. Most likely, he said, would be mechanical resonances, or vibrations, in the disk platters that would cause the heads to touch the platter surfaces and remove data. Industry sources have speculated that the new heads "fly" at about 10 microinches from the platter surface, riding the film of air that moves as the platter rotates. Typical flying height for older 3350-type heads is about 20 microinches, it was noted. The lower flying height, some said, could create heat problems because of increased air resistance, or, due to faulty decontamination of the disk's sealed enclosure, dirt could make the heads crash.

David Stein, industry analyst with The Gartner Group in Greenwich, Conn., said the 3380's slip may be symptomatic of

Users and analysts speculate that the 3380 has run into problems in its use of thin-film read/write heads.

a fundamental change within the computer industry, that of highly automated high-volume production. IBM, he said, is moving quickly to automate its assembly lines more than ever before in an attempt to meet unprecedented customer demand. The very nature of the new manufacturing techniques makes changes in product design and assembly take longer to perform since "robot tools" can require extensive reprogramming to correct small modifications, Stein noted. "It takes quite a while to learn how to make a product on an automated assembly line. It's a high art form with a lot of science underneath."

The Gartner analyst noted that IBM has run into similar problems with other products such as the H Series mainframes, which use new circuit board and wiring technology. Although not publicly discussed in the same manner as the 3380 snag, the first H machine is thought to have been delayed due to manufacturing problems stemming from snafus in automated assembly. The 3081, he noted, was delayed by as much as a year due to the problems.

"IBM was trying to do too much," he said. "Their schedule was too tight and

Large-scale, automated manufacturing methods bring with them the problem of reprogramming when design changes are implemented.

they missed badly. It depressed overall earnings."

Whatever the reasons for the 3380 delay, however, analysts agreed that it will be a costly one for IBM, one that will most likely affect earnings for a quarter or two. In addition to losing revenues that would normally be gained from selling 3380s and related cpus, IBM may well lose several percentage points in overall disk market share, create bad feelings among users, and lose some of its marketing head start to PCMs. It all depends, observers said, on how the firm plays what's left of its hand.

Although IBM dominates the 3350 disk market, it has come under particularly strong attack from Storage Technology, which was able to get a head start on its independent rivals in bringing a look-alike product to market. Storage Tech estimates it currently has 26% of the domestic market for the 317.5-megabyte drives. The firm has recently been touting a user survey that showed its disks slightly more reliable than IBM's and it has been quite successful in marketing a double-density version of the 3350-type drive.

Jim Fleming, in charge of disk marketing at Storage Tech, said the firm in recent weeks has been approached by "a lot of" DASD-hungry users who have so far remained "true-blue" IBM shops but are being forced to consider plug-compatible drives due to a shortage of 3350s from IBM and the delay in 3380 shipments.

One such user is New York-based Manufacturers Hanover Trust, which, a bank source said, is "evaluating plug-compatible drives for the first time."

Noting that the bank had ordered some 85 IBM 3380s, the source said it will probably be able to manage with additional 3350s and another disk model, the IBM 3375. "If the [3380] delay is more than a year, we're in big trouble," the source said, requesting anonymity.

Storage Tech's Fleming said, "We're feeling very, very positive about [the IBM delay]. It effectively extends the

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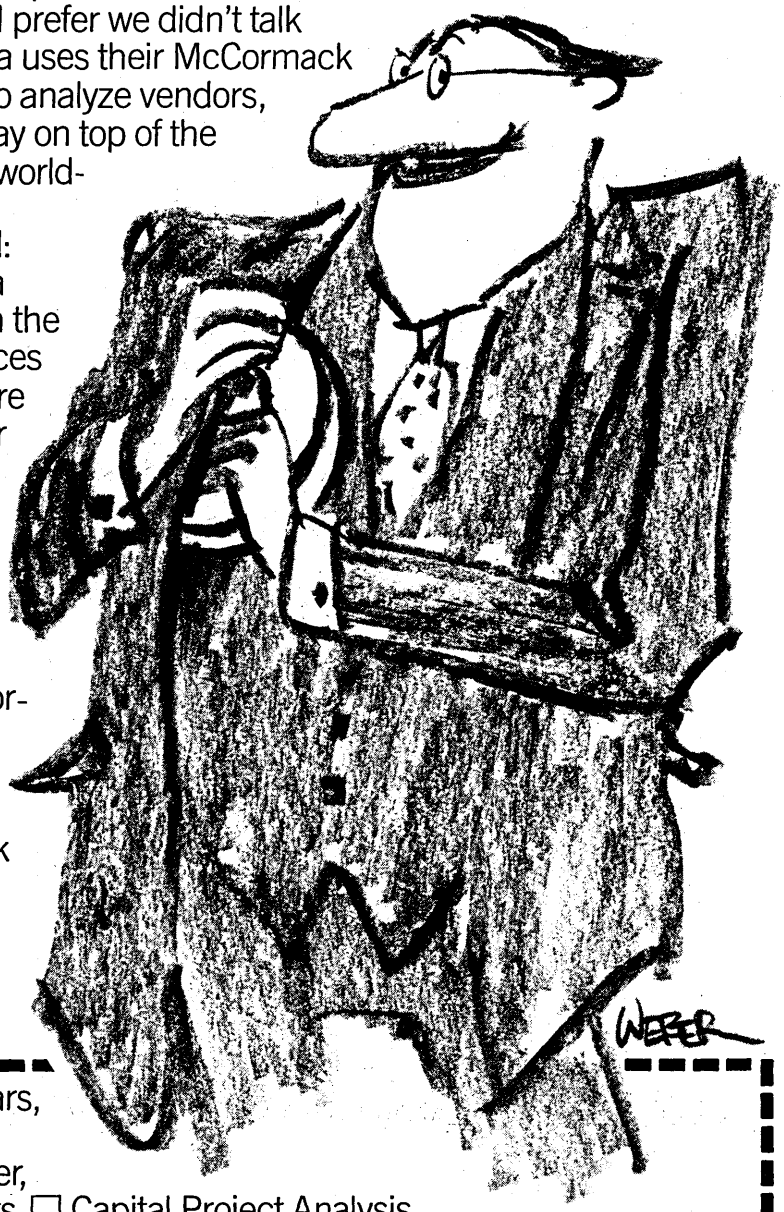

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DA5

life of the 3350 and the double-density versions are selling better than ever."

"We're just a little disappointed IBM halted shipments before we could get our hands on one of the drives," he joked.

He said the Colorado company is doing a "land office business" in 8350 and 8650 drives (which compete with IBM's 3350s), especially compared to a slack period in mid-'80, when users apparently put

Control Data, Storage Technology, and Memorex have seen increased order rates due to the lack of drives from IBM.

off buying decisions while waiting for IBM to unveil the 3380 and the H Series. Fleming was reluctant to disclose delivery lead times on the disk products or say how much extra manufacturing capacity the firm is adding to meet the upsurge in 3350 demand, but he said the backlog stretches well into 1982.

He added that an additional factor exacerbating the disk shortage is that the market for used 3350s has all but dried up. Normally, IBM and its rivals expect some drives to be returned for reconditioning and resale, but that is not happening since users are in such need of on-line storage.

Industry analysts pointed out that since Storage Tech has been so successful in the 3350 market, its production lines would be nearing full capacity, and that therefore its plug-compatible companions, Memorex and Control Data, may have more room to expand and gain from IBM's slip. "It's a windfall for both these vendors," said Robert Fertig, president of Advanced Computer Techniques' Technology Analysis Group. "It gives Memorex a reprieve," he commented, referring to that firm's recent losses and an exodus of top marketing personnel.

Memorex agrees. Gary Land, vp for program management, said the shortfall in IBM disks has been a "good thing" for the firm since it lengthens "the 3350 technology window" and has promoted more users than usual to consider a product IBM hasn't "blessed": the double-density 3652 drive. That product, he noted, has had slower acceptance than hoped for since it was introduced two years ago. And, outsiders point out, such drives can be sold at higher profit margins than the single-density versions.

A spokesman for Control Data in Minneapolis said that the firm's peripherals operation saw a "significant increase" in 3350-type disk orders, both single- and double-density, beginning early this year, when IBM's lead time on the 3350 began stretching out to its current 24 months. "We are in the process of expanding production of those products to meet demand," the company said. Delivery on new orders is currently quoted at between 60 and 120 days.

How the IBM delay will affect the PCMs' plan to come out with 3380-type disk has been hard to figure. It is generally accepted that competitors take about 18 months to copy an IBM disk, starting from when IBM makes first customer deliveries. All three PCMs have disclosed plans to meet the 3380 challenge—Memorex and Control Data have even joined forces in working on thin-film head technology—but none said the IBM delay would help them significantly. It may turn out, however, that their projects will be given more time to incubate and therefore will be ready earlier than usual with marketable products. Control Data said it still plans to meet its original planned delivery date of second quarter of '82 for a 33800 drive designed to match IBM's machine, despite the 3380 not being ready for market deliveries until late this year.

And what is IBM doing in the meantime? In addition to "exploring all possible avenues" for additional 3350 production, the industry leader may shift emphasis to what has previously been seen as a "gap-filler," the 3375 disk. Designed to store 819 megabytes of data, the 3375 also uses thin-film heads and is in volume production, according to a company spokesman. Called a sleeper by disk consultant Porter, the 3375 offers many of the advantages of the 3380 over the 3350: longer potential product life, count-key data formatting, and, most important to users, better price-performance. PCMs, too, could make a go of it in the 3375 market, he noted.

Not too surprisingly, IBM in late March came out with a new model of the 3375, the D1, which provides a dual-porting feature so that two disk controllers can share a string of drives concurrently. That is a new feature for IBM, but something the PCMs have been offering as an option for several years. Who says you can't teach an old dog new tricks?

—John W. Verity

STRATEGIES

FRANCE INVADES U.S.

France's computer and telecom industries are rallying for a concerted drive for sales on American shores.

It used to be a one-way business. IBM and Honeywell dominated the French computer market, ITT accounted for almost half the French telecommunications business, and what data processing activity there was in France relied heavily on U.S. know-how.

But thanks to General de Gaulle's Plan Calcul and President Valery Giscard d'Estaing's ambitious telephone expansion program, France has regained control of its domestic computer and telecommunications industry and is readying a challenge to the U.S. companies on their own ground. The counterattack is coming essentially in that marriage of telecommunications and data processing the French call telematique. In this fast-growing market, which includes business and consumer equipment, the French believe they have a technological lead of about two years over their U.S. rivals.

Thomson-CSF recently announced that it plans to team up with the fourth largest U.S. public telephone company, Continental Telephone, in hopes of developing U.S. sales of private telephone exchanges, terminals, and other telematics products. Under the planned deal, which is expected to involve Thomson in a $200 million investment over the next five years, the French company would acquire a 49% stake in a joint marketing company to be formed from the 130 outlets acquired by Continental when it bought up Executant. Initially

Office automation, home information terminals, videotex systems, and PBXs are among the goods the French hope to push in the U.S. market.

the company is to market some of Thomson's products, but eventually it will deal in products to be developed and manufactured by another joint subsidiary in which Thomson will hold 51%.

This is only one of the more spectacular examples of the interest in the U.S. market now being shown by French telematics manufacturers. Thomson has already won a firm contract from GTE for 35,000 terminals, while CIT-Alcatel has reached an agreement with Source Telecomputing, which has since become a subsidiary of Reader's Digest, the U.S.-based magazine operation. Under that agreement, the French company may sell as many as 250,000 such terminals during the next three years. Source is due to start tests with the terminals this month.

Last November, the French staged a demonstration of a videotex electronics directory system based on interactive terminals at Big Bear Lake, Calif. Efforts are also being made to promote the more conventional, tv-based, interactive videotex system called Télétel. CBS is due to test a modified version of Télétel's broadcasting equivalent of the noninteractive Antiope, which is marketed by Sofratev, the subsidiary of Telediffusion de France. One feature of Antiope is that it is compatible with Télétel.

This sudden desire to break into the U.S. market comes just as French industry is beginning to test its new systems at home. Already heavily in deficit in the consumer

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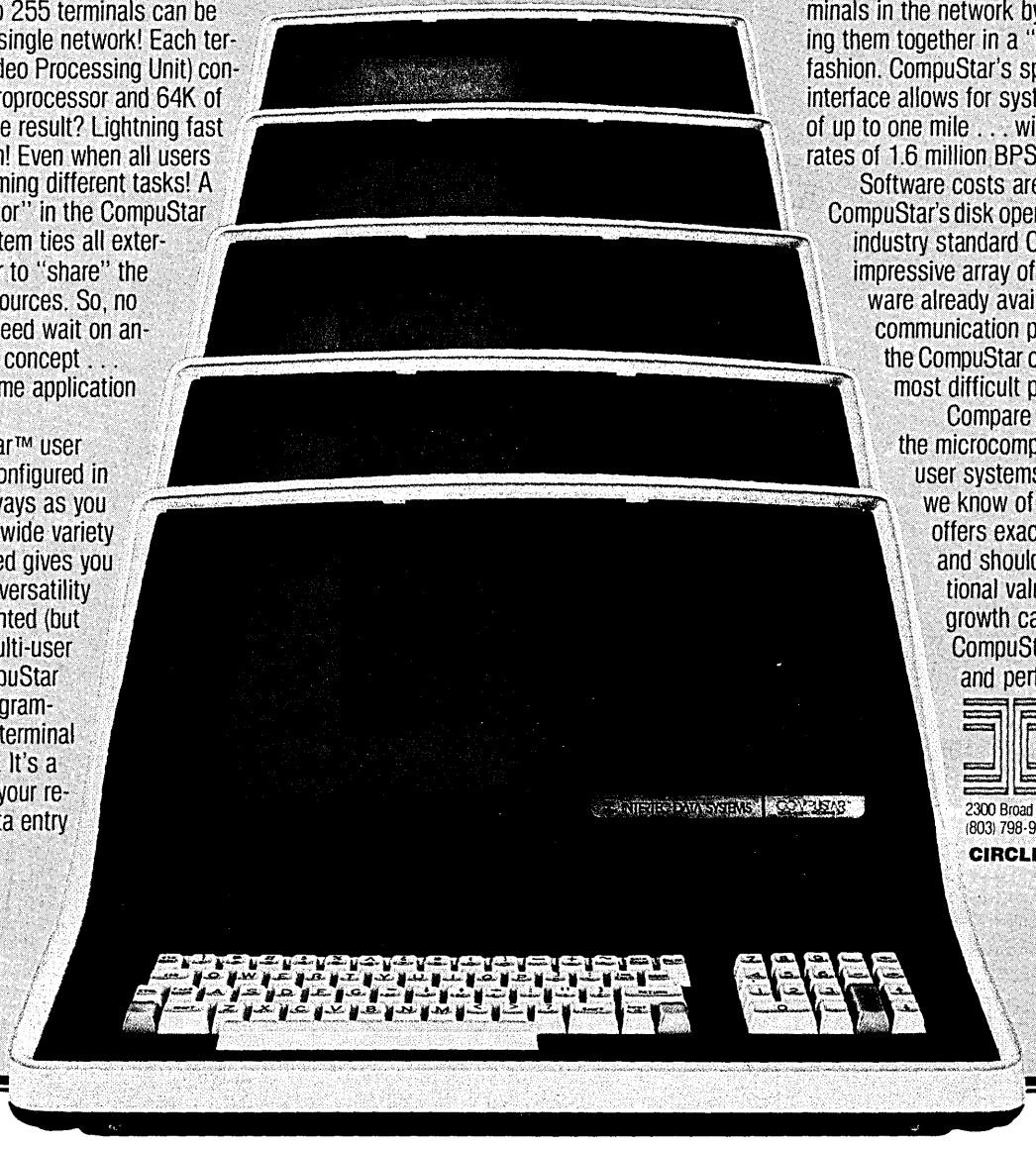

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electronics field, France desperately wants to make sure it notches up surpluses in data processing, telecommunications, and telematics. As one French civil servant remarked, "We have to export because of the limited nature of the French market. The U.S. represents 55% of the world dp market. It is also an important source of technology. We have to be there."

By 1987 the French government would like to see French telecommunication and telematics companies making 50% of their sales abroad compared to 19% last year. In this way they should be able to obtain a return on their R&D investments and secure greater economies of scale.

It is only during the last couple of years that the French have started preparing the way for their counterattack. In software, Europe's biggest software house, CAP-Gemini-Sogeti, recently acquired the Milwaukee-based DASD, Inc., with its $22 million in sales last year, its 29 branches, and 500 employes. Europe's second biggest service bureau CISI, the subsidiary of the French Atomic Energy Authority, acquired the Los Angeles firm Proprietary Computer Systems, and the CIT-Alcatel subsidiary SESA has just set up a joint venture with Honeywell which is to market the French company's DPS 25 Transpac packet-switched networking system in the U.S. Transpac is already used by some 3000 French subscribers.

In hardware Cii-Honeywell Bull has just acquired a $10 million stake in Amdahl Computer Systems (ACSYS), mainly as a means of gaining access to the company's technology. Chase Manhattan Bank is to try out a French-designed microprocessor-based payments card system. The French computer graphics company Benson has acquired Varian's graphics business and the French chemical group Rhone-Poulens has teamed up with Dysan, a California maker of magnetic media.

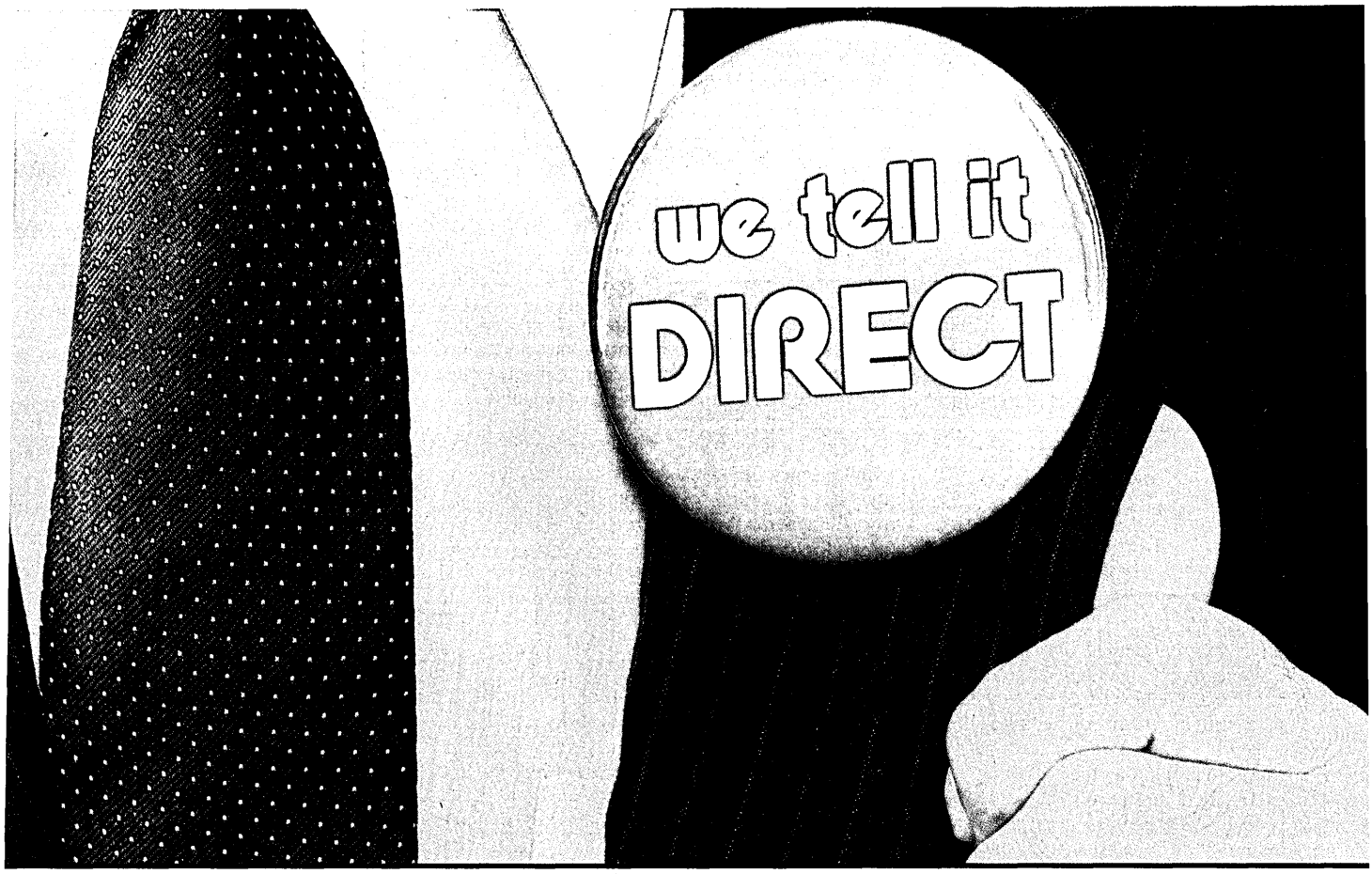
With only 1% of the U.S. import market, French computer firms will have a long, hard, uphill battle.

In the office automation field, CIT-Alcatel has bought up the mailing equipment company Friden with its 73 sales outlets, Thomson-CSF has reached an agreement with 3M for the marketing of its telecopier Thomfax 2000, and Matra is trying to complete a similar deal with Exxon's Qwip fax equipment operation. Thomson also has signed a cooperative agreement with Xerox in the field of digital optical disks. In the PABX area, CIT-Alcatel markets its products through its Chicago subsidiary RCPC, and Jeumont-Schneider and Matra have made marketing agreements with TIE and Digital Telephone System respectively. It now looks as if Thomson has found an outlet for its equipment through Continental. If these deals do not immediately involve telematic products they show great potential to do so.

The French comeback in the data processing sector can be traced to the early 1960s, when General de Gaulle launched his plan Calcul in disgust at the U.S. refusal to sell a Control Data computer to the French Atomic Energy Authority. Although the state company CII created under the plan was to prove somewhat of a white elephant financially, it was sufficiently strong in 1976 to enable the French government to merge it with Honeywell-Bull, which is now controlled by Saint Gobain Pont à Mousson. Thanks to a four-year program to boost minicomputers and peripherals equipment industries, France has maintained a stake in this field, and software companies are now benefiting from a national campaign to encourage France's small and medium-sized firms to use computers.

But what was really to boost France's chances in the computer sector was Giscard d'Estaing's ambitious telephone equipment programs and France's bold decision to move straight from mechanical analog switches to fully electronic digital time-division ones. Within the last six years the number of French telephone subscribers has increased to 16 million from 6 million and starting next year the French postal and telecommunications authority (PTT) will only be ordering time-division exchanges. By obliging Ericsson and ITT to surrender some of their French telephone equipment manufacturing business to Thomson, the company now shares the bulk of French contracts with CIT-Alcatel. And as one country after another opts for time-division technology, the French have been winning an impressive number of export orders.

What could give the French the real breakthrough in the U.S. market, however, is their commitment to telematics. Having been one of the pioneers of the digital time-division system, it was hardly surprising that the French were quick to seize on the possibilities offered by connecting cheap terminals to the telephone system. Last year the French government made a decision which was comparable in its importance to that made 10 years ago in the field of telephone equipment. In April, select customers in the Brittany region of Ille-et-Vilaine will abandon their printed telephone directories and use special terminals connected to an electronic directory. If the experiment is a success, it is planned to give every subscriber in France such a terminal, thereby dispensing with costly printed directories and opening up a whole range of telematics possibilities. With 8 million to 10 million telephone subscribers expected to receive such terminals by 1990, this terminal alone is expected to generate nearly a billion dollars in business.



Some straight talk about computer terminals

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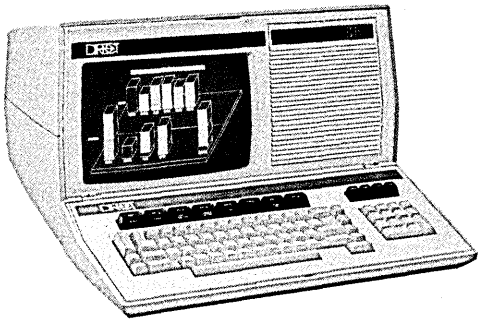

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On top of this, the French have just started testing the French tv-based videotex system Télétel in the Paris region. Telediffusion is gradually increasing the number of French subscribers to its Antiope broadcasting system. Just as France's commitment to nuclear power has enabled the French nuclear industry to overtake U.S. plant manufacturing in world markets, so the commitment to telematics could give France an important edge in this market of the future.

A combination of innovative technology, government funding, and joint ventures with U.S. concerns may help the French assault.

But the battle is far from won. Last year France represented only 1% of total U.S. telecommunications imports compared to 80% held by Canada and Japan. France still has some difficulty in being accepted by Americans as a technolgically advanced nation rather than just a purveyor of champagne and perfume. French firms are not always as aggressive as they ought to be and they have had difficulties adjusting to the American business scene. "French people are brilliant and well-trained in terms of philosophy, but they need a class in international marketing," observes Tom Lawrence, Apple Corp.'s managing director for Europe.

The main reasons for the modest French performance up to now have been the weakness of French companies at home, the lack of U.S. sales networks, and the absence of any original products to sell.

But all that has begun to change. Thanks to French government support for the country's computer, telecommunications, and telematics industries, French firms can afford to attack the export markets. And now that they have developed a whole range of products for the French PTT, they have something original to offer. Only by selling abroad will they be able to secure a good return on their investments.

French industry is ready, but is it really prepared to foresake the lush pastures at home for the uncertainties of as competitive a market as the U.S.? The government, which holds the purse strings, is unequivocal: if France is to survive, it must export. In May 1979 the government opened its telecommunications liason office in New York and has its agency set up to promote French telematics products. Intelmatique is looking for a New York office to share with Sofratev. With the U.S. taking up around 60% of Intelmatique's efforts and over a million dollars of promotional spending, France's 50-odd telematics companies can at last hope to make a dent in the U.S. market.

But if Intelmatique is proving a useful contact point for potential U.S. customers, sooner or later French firms will have to stand on their own feet. They will have to acquire a U.S. base, develop a U.S. marketing network, and sell locally manufactured products, observers say. There is even some concern among French firms that the state's involvement in promoting their products could turn out to be counterproductive.

As one French executive remarked, "I don't really know why the French government is making such a fuss about exporting to the U.S. We will only really succeed if we can become completely American and then we won't need products made in France anyway." That appears to be the route being taken by companies like Thomson-CSF and CIT-Alcatel, but wouldn't that be proof that the French counterattack had really succeeded? For as the French say of their American uncles, "If you can succeed in the U.S., you can succeed anywhere."

—Michael Parrott

LEGALITIES

PATENTS FOR SOFTWARE

Two recent rulings by the Supreme Court uphold the patentability of software, but industry leaders are looking for additional and stronger protective measures.

A March Supreme Court ruling that machine processes implemented in software are patentable brought cheers from many quarters of the software industry, but champions of across-the-board protection of proprietary rights to software feel the big fight is far from won.

"It's [the Court ruling] a step toward giving software the same protection hardware has and it's helpful to software, but it only covers a small percentage of products developed each year," said Bruce Coleman, group vice president, Informatics, Woodland Hills, Calif.

The Supreme Court held that a machine or process that otherwise meets the requirements for patentability cannot be denied patent protection merely because the machine involves a computer program. During 15 years of debate which included rulings in 1972 and 1978 that divided the Patent and Trademark Office and the U.S. Court of Customs and Patent Appeals, the high Court had upheld Patent Office deci-

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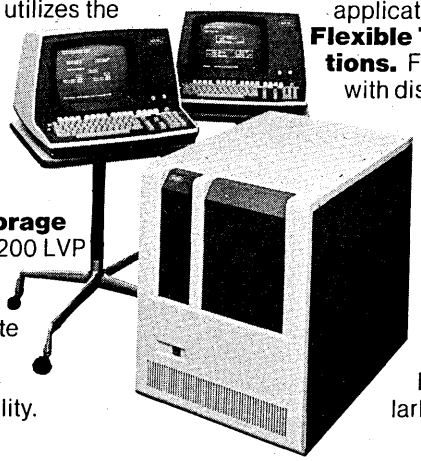

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sions not to award patents to processes which included software. In the latest decisions the opposite happened: the Court upheld CCPA and went against the Patent Office.

One of the latest cases was that of Diamond vs. Diehr, in which two scientists at Federal Mogul Corp., Detroit, were denied a patent by the Patent Office on a process that includes use of computer software to cure synthetic rubber.

The denial was overturned in late 1979 by the CCPA. The Patent Office immediately filed a writ of certiorari (a petition to have the Supreme Court hear an appeal) which said, in part, "the Patents and Trademarks Office presently has pending more than 3,000 patent applications where patentability of computer software is a potential issue. Some 1,200 applications include mathematical algorithms; over 1,800 include nonmathematical algorithms." The petition was granted in early 1980 and the case got under way last spring.

In the Supreme Court decision in the Diehr case with Justice William Rehnquist writing the majority opinion, the key point was that processes or inventions that use computers must be considered as a whole.

"Our conclusion regarding respondents' claims is not altered by the fact that in several steps of the process a mathematical equation and a programmed digital computer are used," the opinion stated.

". . . a claim drawn to subject matter otherwise statutory [patentable] does not become unstatutory [unpatentable] simply because it uses a mathematical formula, a computer program, or digital computer."

"The Diehr opinion clearly rebuffs the position of the Patent Office," said Morton Jacobs, Philadelphia attorney who is patent counsel for Applied Data Research, Princeton, N.J. "It now supports the position of CCPA that there is no disabling patenting of a computer system because part of it is implemented in software. In a nutshell that's what we've been asking for."

"Most of what we do is not new or unique. We're just developing old things in new and clever ways," says Lee Keet.

Jacobs wrote an amicus curiae (friend of the court) brief for ADR in both the Diehr case and the other recent case, that of Diamond vs. Bradley.

In the Bradley case the Supreme Court vote was 4 to 4 because Justice Warren Burger disqualified himself. "But everybody knew his position," said Jacobs. Burger was on the majority side in the Diehr case.

"It [the Bradley decision] effectively reaffirmed the rule and impact of the Diehr case," said Martin Goetz, senior vice president of ADR and a longtime proponent of patent protection for software.

Goetz himself is the holder of the first software patent ever granted. He actually holds two, one granted in 1968 for a sorting system and one granted in 1970 for Autoflow, a flow charting process. There was a window of time during the late '60s and early '70s during which the Patent Office was looking at software as patentable. Goetz said he believes several hundred patents were granted during that time.

Coleman of Informatics said he was granted one in 1971, when he was with Boole and Babbage, for a sampling technique in a performance modeling product.

The Diehr and Bradley cases were argued together. The Bradley case stemmed from a patent application filed by John J. Bradley and Benjamin S. Franklin, Honeywell computer scientists. They applied for a patent on an invention described as "an apparatus permanently incorporated into the Honeywell Level 64 medium-scale computer which can dynamically change the physical capabilities of the computer machine. The invention, among other things, enables the computer to operate as a business model or alternately as a scientific model, according to the computer workload or application requirements."

Said N. Prasinos, a Honeywell patent lawyer who represented the company before the Supreme Court, "It is now clear [because of the decision] that a process or a machine is patentable—as they always have been—even though they involve a computer program."

Jacobs called both decisions "a tremendous victory for innovation in the software field. The cloud that has hung over the patentability of inventions embodied in computer software systems has finally dispersed."

He feels it will lead to more commitment of resources to innovative projects.

ADR's Goetz said he was never unhappy with the earlier Supreme Court decisions in which patents were denied to processes that include software. "They were good decisions. They did not say that a machine process was unpatentable, only that you can't patent a formula."

He referred to an earlier case, the so-called Flook case, in which Dale R. Flook, an employee of Atlantic Richfield, was denied a patent for a computer program for readjusting the warning alarms used in a hydrocarbon processing system. In this case, Goetz said, the decision was based on the nonpatentability of formulas.

Justice John Paul Stevens, writing for the majority in the Flook case back in up with a narrow legislative approach to 1978, said, "The question in this case is whether the identification of a limited cate-

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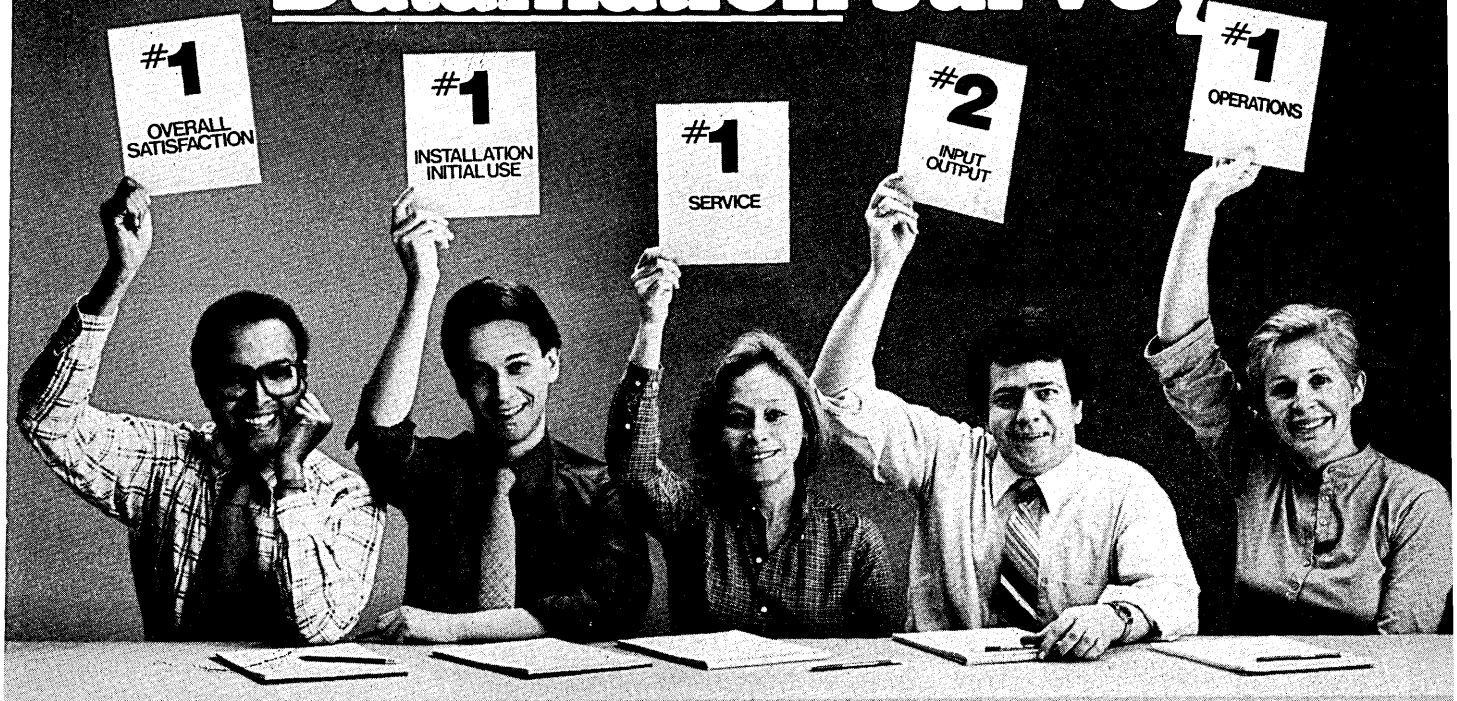

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1980's survey was conducted jointly by Data Decisions and Beta Research. It was published in the December issue of Datamation and is the most comprehensive evaluation of off-the-shelf software ever compiled. Over 5,000 users of 161 different packages at over 4,700 sites were asked to rate their software with respect to features, functions, and performance. It was a tough competition, and IDMS came out the winner in the IBM category.

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gory of useful, though conventional, post-solution applications of such formulas makes respondent's method eligible for patent protection. The answer in this case is no."

In both the Diehr and Bradley cases, both patent applications go back to the Patent Office, where they will be put to the test of novelty and uniqueness.

Until now, many contend, the Patent Office delayed making searches and other tests for these qualities on applications involving software, relying only on the unpatentability of software to deny the patent.

"They [the Patent Office] interpreted them [earlier Supreme Court decisions] narrowly and they really were broad decisions," said Goetz.

How the Patent Office will interpret the latest rulings is as yet unclear, but indications are it will cease to regard software as unpatentable material. In the past, as a result of other Supreme Court rulings which have overruled its patent denials, the office has issued guidelines which include an analysis of the law and instructions for examiners on how to treat certain applications technically.

Joe Nakamura, chief Patent Office attorney, said in March this is something that might be done in this case. He said inclusion of some new kinds of instructions in the *Manual of Patent Procedure* also was being considered. "We will do something but I'm not at liberty to say how we will do it."

But there is still the test of novelty and uniqueness and that's the concern of those who see the software protection fight as far from over.

"Most of what we do is not new or unique. We're just developing old things in new and clever ways," said Lee Keet, president of TSI International, Norwalk, Conn., a division of National CSS, Wilton, Conn.

Keet heads up a software protection task force under the auspices of the Association of Data Processing Service Organizations (ADAPSO). He feels some kind of legislative action is what is needed. He said only 1% of all software in the industry will be helped by the patent decisions.

"There are holes in current protection that are of significant size, particularly with the advent of mass merchandising." He noted that copyright only protects the form of expression, and trade secrets require "huge amounts of contractual and other protectionist things. Most of us rely on trade secrets but with more and more mass merchandising we could end up with no protection whatsoever just because of the mass of products out there." Trade secret protection can be lost with wide dissemination, he explained.

"Our committee's goal is to come plug up a few holes. There is a consensus on the legislative approach but some disagreement on how to do it," he added.

Keet said his committee represents a mix of hardware and software vendors and custom developers of programs. IBM, Honeywell, and Burroughs are among the hardware vendors represented. In addition to his own company, software vendors represented include University Computing, INS, Informatics, and Management Science America, Inc. "On the custom side we have Applied Computer Techniques, among others," he explained.

The committee hopes to gain support formatics, and Management Science America, Inc. "On the custom side we have Applied Computer Techniques, among others," he explained.

He said the software industry is a $2 billion industry now and should be an $8 billion industry in five years. "We all fear that if there is no abrogation of this problem [of protection of proprietary interests] a big base of that $8 billion will go away."

Even in the patent area there are those who don't see the Supreme Court decisions as the landmarks that many believe them to be. "It's a door opener but not very much beyond that at the Supreme Court level," said Susan Nycum, an attorney specializing in computer law with the firm of Gaston, Snow, Ely & Bartlett, Palo Alto, Calif. She doesn't feel things were that bleak before. "The CCPA has allowed patents in the past. People were framing their claims to look more like hardware. They were maneuvering within the system."

What does Nycum think would be an ultimate victory for software patentability? "For the Supreme Court to say explicitly that software is patentable."

—Edith Myers

APPLICATIONS

GETTING TOO OLD TO FLY?

The software industry is "after legislative mechanisms, not automated techniques like encryption."

Halloween 1979. If witches were about in the sky over North Carolina, they surely would have fallen off their brooms.

On their left, a Delta Airlines L-1011. On their right, an Air Florida 737. Unknown to the pilots, their crafts' next stop was unscheduled. They would meet at 30,000 feet within seconds, and no one would live to tell about it.

At almost the last possible instant, one pilot saw the other plane and pulled away, barely avoiding a head-on collision. The feeling of relief proved fleeting, however. Fallout from the incident continues to pollute current flying condition.

The Federal Aviation Administration (FAA) initially blamed the near-miss on an air traffic controller. The Professional Air Traffic Controllers Association (Patco) said the failure of the IBM 360/65 in the Air Route Traffic Control Center (ARTCC) was the culprit. An FAA investigation concluded both controller and computer were at fault. Since then, the agency and the union have hurled invective at each other with zest equaling that of most classic labor-management disputes.

The FAA's 23 traffic control centers use 360/65 machines which often go down for as much as a half-hour at a time.

Patco alleges the computer system is adequate, when it works, but is too often unreliable and overworked. Controllers complain they don't know where or when, in any of the 23 ARTCCs across the country, a computer will abruptly decide to take a few minutes, or hours, off. It could be Halloween, Christmas, Memorial Day, or any other time people fly. The FAA argues that the system is safe, reliable, and perfectly capable of handling the demands placed on it. It accuses its employees of purposely exacerbating the computer issue and using it as a bargaining chip in contract negotiations. The last pact technically expired March 15 this year, but its provisions continue in effect. The controllers, who initiated "informational picketing" at various ARTCCs and airports to dramatize their situation, are seeking a $10,000 across-the-board raise, a 32-hour work week and 75% retirement pay after 20 years on the job. Because they are at the top of their government pay scale, gaining such benefits will require an Act of Congress. Rep. William Clay (D-Mo.) recently introduced legislation that would grant the controllers' demands. The FAA doesn't seem about to accede. The last negotiations between the groups took 7½ months, and the latest could equal or surpass those.

"I've never been into a tower yet where I didn't hear a controller complain about something," FAA spokesman John Layden says. "People think they sit glued to their radar screens eight hours a day and make life and death decisions every minute. They really work about four or five hours a day. It's quite possible they'll never be satisfied.

"They're using the computers as a smokescreen to win sympathy for their contract demands. They talk like the system is falling apart and they're the ones holding it together."

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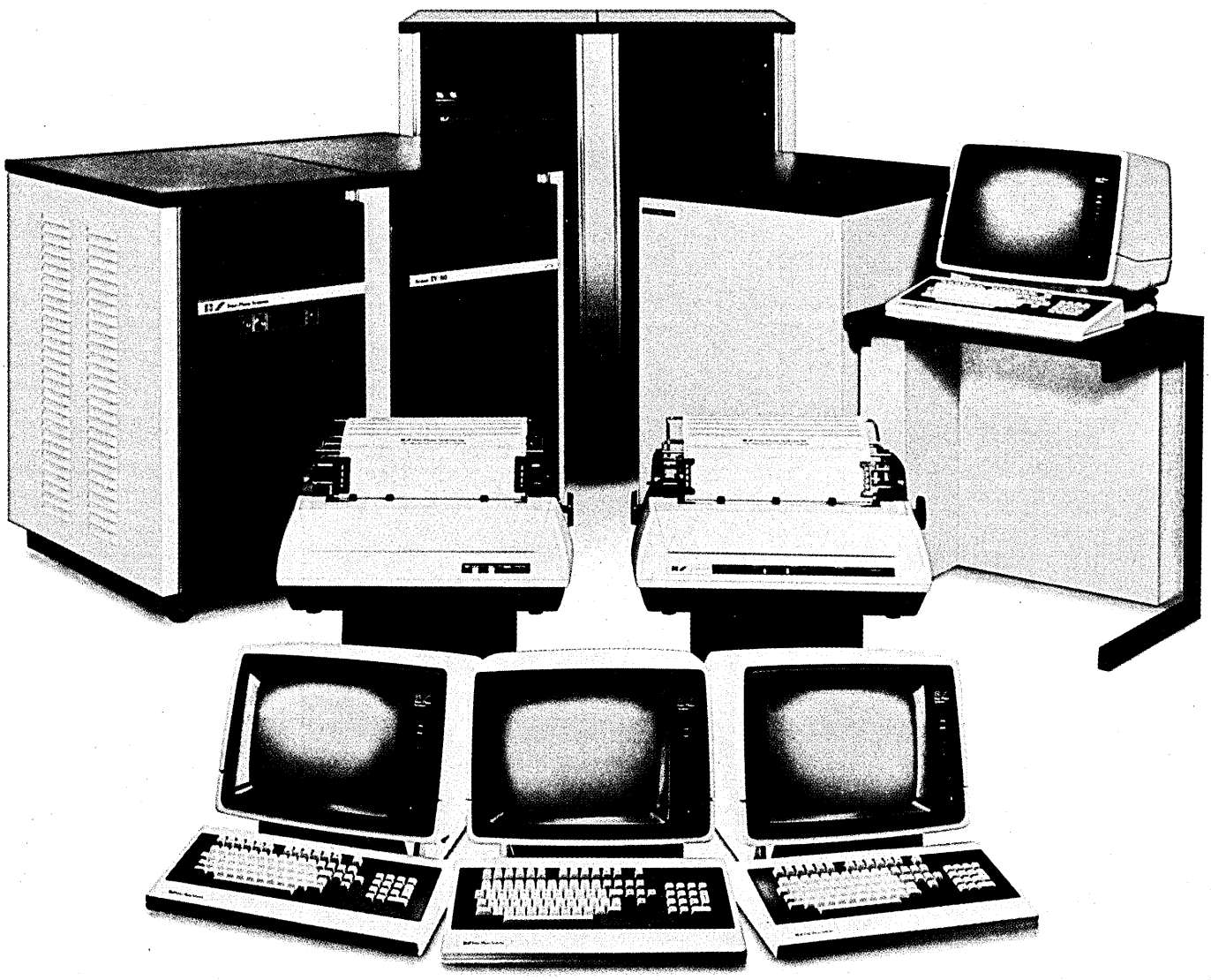

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NEWS IN PERSPECTIVE

"We don't think the FAA is discharging its responsibility adequately," says Mike Simons, Patco's air safety director. "There's no way the current generation [of computers] is going to last 10 years, which is when they plan to finish replacing it. They're not at all responsive to the situation.

"If we knew when the system was going to go down, we could slow down traffic and accommodate it. But we never know when or how long it's going to go down. It increases the complexity of our work unnecessarily, and it's a lot more stress-producing."

Hearings last summer in the House and a report by the Senate Appropriations investigative staff indicated the controllers' complaints were more than a ploy to get a larger share of the government's payroll. At the hearings, the FAA blithely indicated that controllers were adequately trained in using the backup system (an old-fashioned broadband, as opposed to the primary system's more advanced narrowband), then immediately instituted new techniques once the hearings ended. The agency also had previously stated it was impossible to get a wrong blip on a radar screen, then sang a different tune under oath to the House Aviation subcommittee.

Information uncovered at those hearings led to an investigation by Rep. Bob Whittaker (R.-Kan.), who accused the FAA of possible criminality in submission of apparently discrepant data relating to computer outages (defined as any computer failure of longer than one minute) and the apparent changing of maintenance logs at the various ARTCCs reflecting routine maintenance rather than unscheduled maintenance or computer outages. A lengthy review by the Department of Transportation's Office of Inspector General cleared the agency of any criminal intent.

The Senate report was far more condemning. "FAA has not done an effective job of managing the current en route computerized air traffic control system," the staff wrote. "Because of weaknesses in reporting equipment outages, lack of planning, and the absence of a well-defined approach to managing system operations and software changes, FAA cannot be certain that the current system will operate at a level that will assure the air safety of the traveling public until the proposed replacement system is operational.

"FAA's planned replacement of the en route air traffic control computer system lacks a managed, coordinated, and well-conceived planning process. FAA plans to replace the computers at 23 Air Route Traffic Control Centers at an estimated cost of $2.8 billion, not including the software and other costs for futuristic automated features which FAA hopes to add in the follow-on stages. FAA has made this proposal without identifying the problems in the current sys-

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tem which need correction, or complying with prescribed and valid policy and procedures of OMB Circular A-109 and the Federal Property Management Regulations.

"We find that the transition to and operation of FAA's current backup air traffic control system, which is used whenever the en route computer system fails, is an uncertain and complicated process at best."

The report made nine specific recommendations, including one that FAA determine a short-range alternative to total replacement of the current system, the feasibility and funding requirements of buying and leasing computers for centers determined to exceed capacity in the 1980s and of functionally splitting and upgrading the software, and another that the agency establish a computer performance management function to systematically evaluate the capacity and performance of its computer systems and give top priority to developing an adequate backup capability for the current en route computer system.

"That confirmed all the things we'd been saying for a year," Simons claims. "When we do it, we're just a disgruntled union using computers as a bargaining chip for a new contract. When the Senate Appropriations staff says it, all of a sudden we become more creditable."

"The guy who wrote that report had a personal bias against us," Layden counters. "He was a GAO-type on loan, and I think he had it in for us."

Perhaps. But in this case, words apparently spoke louder than action. As part of its response to Congressional scrutiny—the official answer to the Senate report is "floating around somewhere," according to Layden—the agency issued "A Plan for Improvement" on its en route ATC computer operations.

"We find ourselves in the ironic position of having become victims of our own success," FAA complains. "We operate the largest, most complex computer system in the world. It involves the twenty 9020 (360/65) computer systems interacting with each other and over 100 large terminal computer systems (made by Univac and generally praised for their performance by both the agency and Patco). In addition to these interactions, the 9020 handles data from over 100 long-range radar systems and several thousand other data input and display devices on a continuous basis. Despite the size, complexity, and real-time operation, we have achieved the very highest degree of success.

Controllers claim their systems are too unreliable and that they often have to make complex decisions without computer help.

"The picture which has emerged is that no matter how well the system operates, it will never be good enough until there are virtually no random, unpredictable interruptions of service.

"Rather than continuing to defend our past performance, we have decided to take the initiative to determine what additional actions can and must be taken to assure continued and improved operation of the en route automation system through the 1980s."

The agency listed 11 actions, ranging from "complete staff work on all organizational options" to "improve modeling and machine performance management." The only ones with direct impact on the computer systems are proceeding with basic direct access radar channel (DARC, a new backup system which the Senate report said "is plagued with problems and will be delayed due to design and operational problems, hardware and software problems, and a lack of critical hardware"), and improving modeling and performance measurement, in which the agency proposes to develop an equivalent set of 9020 algorithms "which will be used to accurately predict the effects of any proposed system changes on core channel use and processor efficiency."

Promises, promises, promises, perhaps to soften the controllers' ire. But the words are little comfort to those in jumbo jets and tiny prop planes who, if the controllers are to be believed, never know when they may make an unscheduled crash landing because a 360 decided to call it a day.

The replacements for the 360, most of which are third generation, aren't expected to be on line until 1988 nor fully implemented until four years later. There is growing concern among pilots as well as controllers that shortly the skies will be crowded day and night and the 360s will be unable to cope.

"We have found that FAA does not have adequate information, detailed justification, and knowledge to make any informed decisions on whether, when, or how the current en route computer system should be replaced," the Senate report concluded. Mitre Corp., a consulting group, is developing prototypes for the next generation, which will be called Automated En Route Air Traffic Control (AERA). It will perform every function of the 360 and several others in what the FAA hopes will be the first step to a fully automated system, rather than the current hybrid.

"We believe there is no question that the equipment will ultimately need to be replaced," the Senate staff said. "However, before any additional money is spent on developing a replacement system, FAA needs to develop a strategy that will enable it to 'get well' in the interim, in addition to developing a long-range plan. We believe it to be in the best interests of the government

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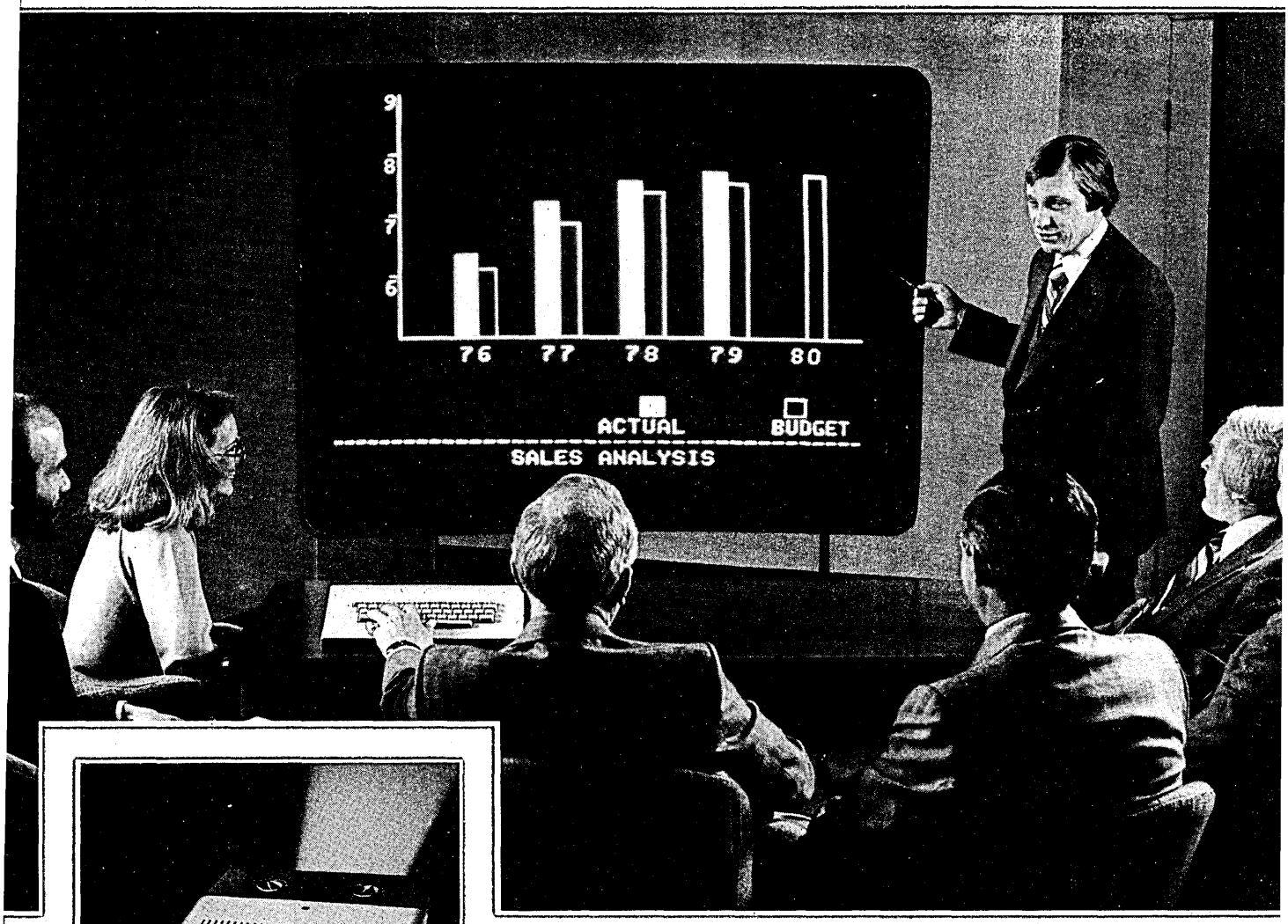

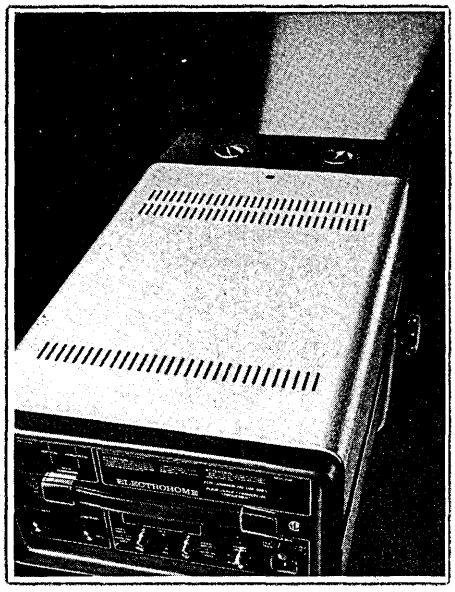

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and air safety that FAA buy an interim replacement system."

Those folks undoubtedly ride trains, not planes. At some point, the interim may become the present and future. Until then, what?

"Every time a machine goes down, it's very unsafe," insists controller Ken Webb, safety committee chair for the Washington ARTCC. "It's a wonder no one gets killed. Recently we lost an entire machine for 35 minutes. It causes a hair-raising situation. We really earn our money in those situations. If we get the wrong plan when we go to DARC after we've reidentified all the aircraft, it can be 15 to 20 minutes of absolute chaos. It can delay a lot of flights. And this sector [Wilmington, Del. to Wilmington, N.C.] is especially critical because it's one of the busiest in the country."

Replacements for the 360s aren't expected to be on-line until 1988 or fully implemented until four years after that.

Minimum standard separation between aircraft is five miles. On takeoffs and landings, most are spaced that closely because of congestion. At the minimum distance, planes on a collision course would hit in 36 seconds. Every mile brings a collision 7.2 seconds closer.

Since the FAA doesn't consider any computer failure of less than a minute to be an outage, only the pilots can avoid disaster at those distances.

"The FAA is downplaying the situation and saying it's simple for the controllers to go from the computer to the backup system," says Vic Krupinski of the Air Line Pilots Association (ALPA), "but it depends on the number of planes involved. You can live with complete computer failure for a period of time if you're only working with one or two planes.

"We're concerned about the situation. It's serious. If the controllers indicated that computer outages are a safety problem, we agree with them. If it gives them safety concerns, they're the ones who ought to know. After all, they're the ones in the towers."

And there they will stay, probably with their current equipment for the foreseeable future. When IBM stopped making replacement parts for the 360, the FAA bought the remaining inventory, hardly an auspicious omen for those awaiting the next generation. With the government on an austerity program, funds are unlikely to come flowing to the rescue.

"I think the controller's biggest stress is bitching about FAA," says a Congressional source. "The FAA's statistics are getting better. Patco hasn't convinced anyone in responsible positions that things are actually as bad as it says. I don't think people here are convinced that there's an unsafe situation. And the public doesn't seem to be worried that planes are about to run into each other."

"The solution is for the government to come up with the money right now," Webb insists, "instead of bits and pieces down the road. Being 10 years away from new computers is a joke."

"People think air traffic control is like Space Invaders," Layden says. "We finished last year with the best safety record ever—5 million flights and one crash. There's a great difference between perception and reality here."

Possibly. It hardly matters at 30,000 feet.

—Willie Schatz

CONFERENCES

HOUSTON WP SHOW A HIT

Integrated office systems draw 8,000 attendees to AFIPS Office Automation Conference, where 102 companies show their wares.

Quality, not quantity, seemed to be the key phrase of Houston's mid-March Office Automation Conference (OAC), the second such show put on by AFIPS. Although attendance was roughly the same as at the first show last year—some 8,000 people showed up to wander among 102 exhibits—there appeared to be more people with money in their pockets.

"There are more decision makers here this year," said one booth attendant. "Last year it was mostly word processing supervisors."

His sentiments were echoed around the floor. "They're top people and they've got that gleam in their eye," said Ed Greer of Burroughs. "They've been told to get into office automation and they want to learn what it's all about. It's a good show, much better than Syntopican [run by the International Word Processing Association], where all you get is word processing supervisors."

And the attendees did seem anxious to learn. They crowded big booths, asking the right questions. They also crowded the sessions and stayed, a repeat of the situation last year when exhibitors complained that the sessions kept people off the show floor.

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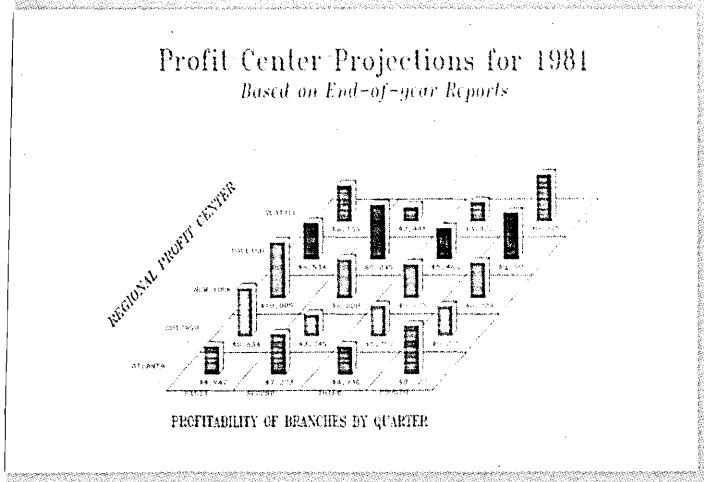

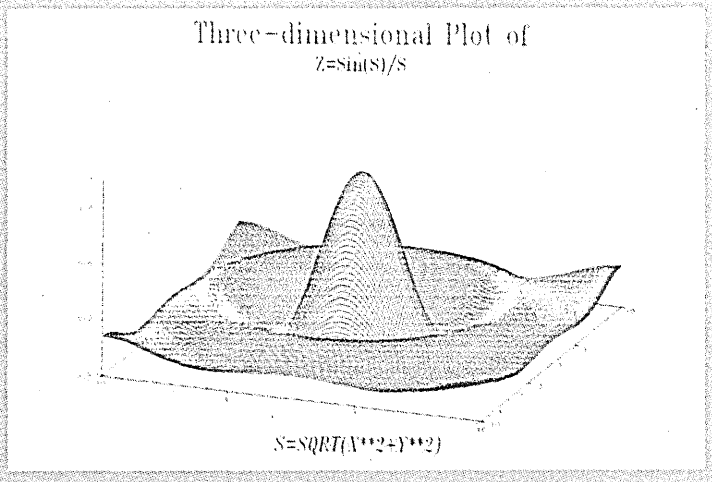

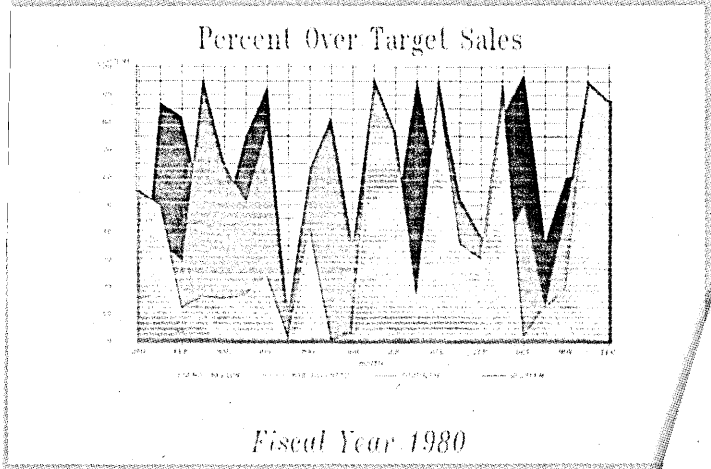

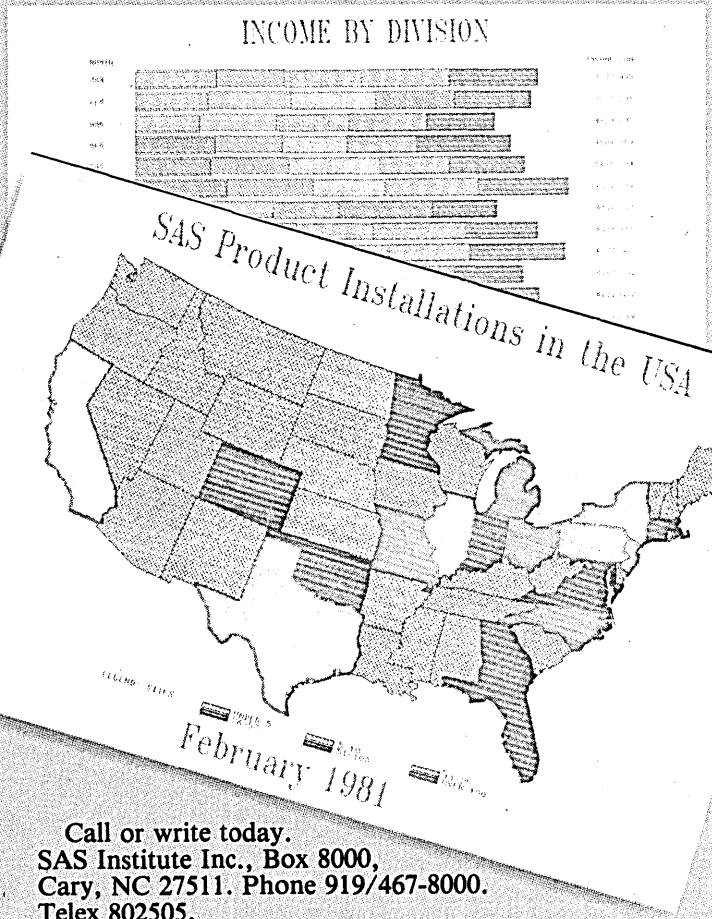

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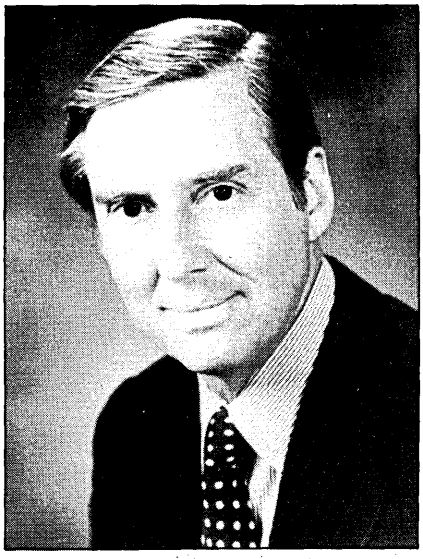


SENATOR LLOYD BENTSEN: "After a decade of drifting the nation is ready to pull together to increase the declining U.S. productivity rate."

AFIPS tried to do something about that this year. There was more time between sessions for exhibit viewing. It helped. Mostly it helped those exhibitors on the mezzanine level in the West Hall of Houston's Albert Thomas Convention Center. This area was to the back of the main exhibit area and adjacent to the meeting rooms. At any given time during the conference it was easy to see that the heaviest traffic was here.

"And to think I didn't want to be up here," said a spokesman for Artelonics of Santa Clara, Calif.

AFIPS tried other tactics to prevent recurrence of last year's problems. That year they lost money. This year they charged for cocktails at an exhibitors' reception and gave free copies of the *Conference Digest* only to those participants whose papers were published in it.

There was another departure from last year. Then the talk was of the need to integrate all the elements of an automated

In Houston, the word was "integration is here."

office. In Houston the word was "integration is here." Sessions with the word integration in their titles were assured of standing-room-only crowds. And exhibitors were pushing the word in touting their wares.

"We are providing the market with integrated word and data processing, list processing, communications options, and a commitment to service and support unmatched in the industry," said C. M. Brooks, manager of Digital Equipment Corp.'s Word Processing Product Group. Digital's exhibit featured its WS78 standalone word processor, the WS224 multiterminal word processing system, and demonstrations of such office software as Datatrieve, a high-level query, report, and data maintenance language, and Applicant Tracking, a personnel management system.

Northern Telecom Inc. also was pushing integration of word processing and data processing systems. The show marked the first formal showing of its Omniword Model 445 system, for both wp and dp.

Interactive Systems Corp., Santa Monica, Calif., introduced its IDEA (Interactive Distributed Electronic Alternative) machine, which also does both. The machine, a Z8000 microprocessor-based system, supports up to eight users. It runs Interactive's IS/1 system, which is based on the UNIX operating system developed at Bell Laboratories. In a distributed configuration it can be linked in local Ethernet-like area networks with gateways to distant networks for communication, remote printing, and file transfer between users on other IDEA machines or on DEC PDP-11 and VAX computers running interactive software.

Prime Computer, Natick, Mass., called its exhibit a demonstration of its "integrated approach to office automation."

"At present, office automation is characterized by small, single-application components," said Peter J. Schlegel, manager of Prime's office automation products. "These are generally used by secretaries and clerical workers and have limited impact on productivity because they are not integrated into the automated environment. The next wave in the office market will be led by companies looking for strategic, corporate-wide approaches to automation from OAC vendors. The suppliers that will do well in the future are those with strong multiprocessing and communications capabilities such as Prime."

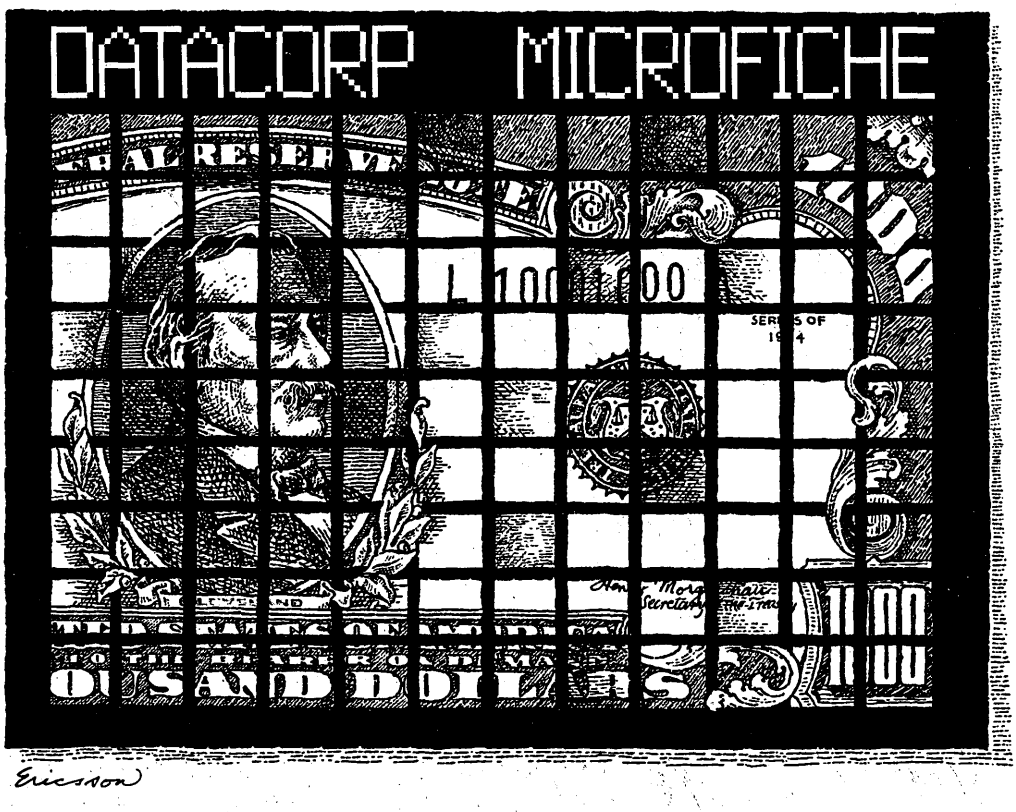
A company that has such a system, one definitely not aimed primarily at secretaries, is Bunker Ramo Corp., which didn't exhibit but wanted to. "We were told it was too late to get in and when we found out it wasn't, it was too late for us to arrange to

Integration was a key word as many firms displayed systems that automate several office tasks in a single machine.

exhibit," said Max L. Blankenzee, manager, Office Automation Systems, Advanced Programs. The company did demonstrate its system in a nearby hotel room.

It's not an announced product yet. Bunker Ramo developed the system under contract to the Air Force and currently is evaluating aiming it at the commercial market. The Air Force system is called LONEX (for Laboratory Office Network Experiment). Using crts, personnel enter information into the system and can electronically

PROFIT PICTURES



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prepare documents, send messages, retrieve data, and compile daily calendars in support of major office tasks being automated. The system combines word processing, data processing, graphics, and communications.

One OAC exhibitor, Honeywell, was a beginner. The show marked the firm's first public showing of office automation products introduced in December. The company showed its Administrative System

Bunker Ramo may offer commercially an office system it has developed for the Air Force.

and an integrated word processing/data processing multifunction system.

For Burroughs Corp. the show might have been termed a second beginning. Said one booth staffer, "We're trying to get back our leadership position in office automation." The firm showed word processing systems, a facsimile network, and its Optical Page Reader in a spacious booth. It did not show its Record Manager, an electronic file cabinet it acquired with the acquisition of System Development Corp., Santa Monica. This product is expected to be a cornerstone in Burroughs' new Office Systems Group.

While there was little technically new at OAC, the older equipment drew attentive crowds. IBM's Displaywriter, introduced last summer, was constantly surrounded by interested crowds, indicating it may after all put IBM back into the number one spot in office automation.

Xerox had two booths and demonstrations of its 5700 document processing system and of the capabilities of its Ethernet local area network drew 30 or more observers for every presentation.

But Xerox had an even more popular offering, Brother Dominick from its copier commercials. Brother Dominick wasn't always there, but when he was, there was always a lineup for his autographs.

Second only to integration, the word productivity was the byword at OAC. In fact it was a part of the theme "Invest in Productivity."

In the opening address, Sen. Lloyd Bentsen (D-Texas) sounded an optimistic note: "After a decade of drifting, the nation is ready to pull together to increase the declining U.S. productivity rate. We're seeing a major change in the philosophical direction of this country. We're finally prepared to make the short-term sacrifices needed for the long-term growth of this country."

Another conference speaker, Harvey L. Poppel, senior vice president of Booz Allen & Hamilton, said U.S. business, with the proper use of automated office systems, could save billions of dollars annually and increase productivity of white collar workers by 15%.

He described the results of a $1.5 million study which was designed as "a hard-nosed approach to find out whether spending all this money on fancy automated office systems is worth it." The study was funded by 20 major suppliers of office equipment and services, including American Telephone & Telegraph, Bell & Howell, Burroughs, and IBM. It focused on how 300 managers at 15 major manufacturing, banking, insurance and government or-

Burroughs was at the show, but didn't show the "electronic filing cabinet" developed by its recently acquired System Development Corp. subsidiary.

ganizations spent their time. The study found that managers spend about 46% of their time in fairly constructive meetings, including those conducted on the telephone.

But the second largest chunk of their time is frittered away in less productive activities that have nothing to do with their jobs or that could be done by lower-paid employees, he said.

In another kind of productivity, the consensus among OAC exhibitors seemed to be that the show was a productive one for them. For most this meant attracting interest in their wares.

—Edith Myers

NCC '82 MOVES TO HOUSTON

The ayes of Texas had it. At least they did in Houston in late March during AFIPS' Office Automation Conference, when the NCC exhibitors' committee voted unamimously to switch the 1982 National Computer Conference from New York to Houston. An informal poll of other NCC exhibitors backed up the vote.

It could be that the committee simply likes Houston. More likely they didn't particularly relish the idea of New York—or rather the prospect of being scattered among four locations in the city including one site on a pier. And the planned New York NCC '82 was 200 booths short of those scheduled for this year's show in Chicago.

An NCC board vote by telephone on April 2 made it official. NCC '82 will be held in Houston's Astro World Complex. The site had been put on hold previously as a backup location for the 1982 show and thus was readily available when the committee decided to make the switch.

AFIPS last sojourn in Houston was with a Fall Joint Computer Conference in 1970; the last NCC in Texas was the Dallas show in 1977.

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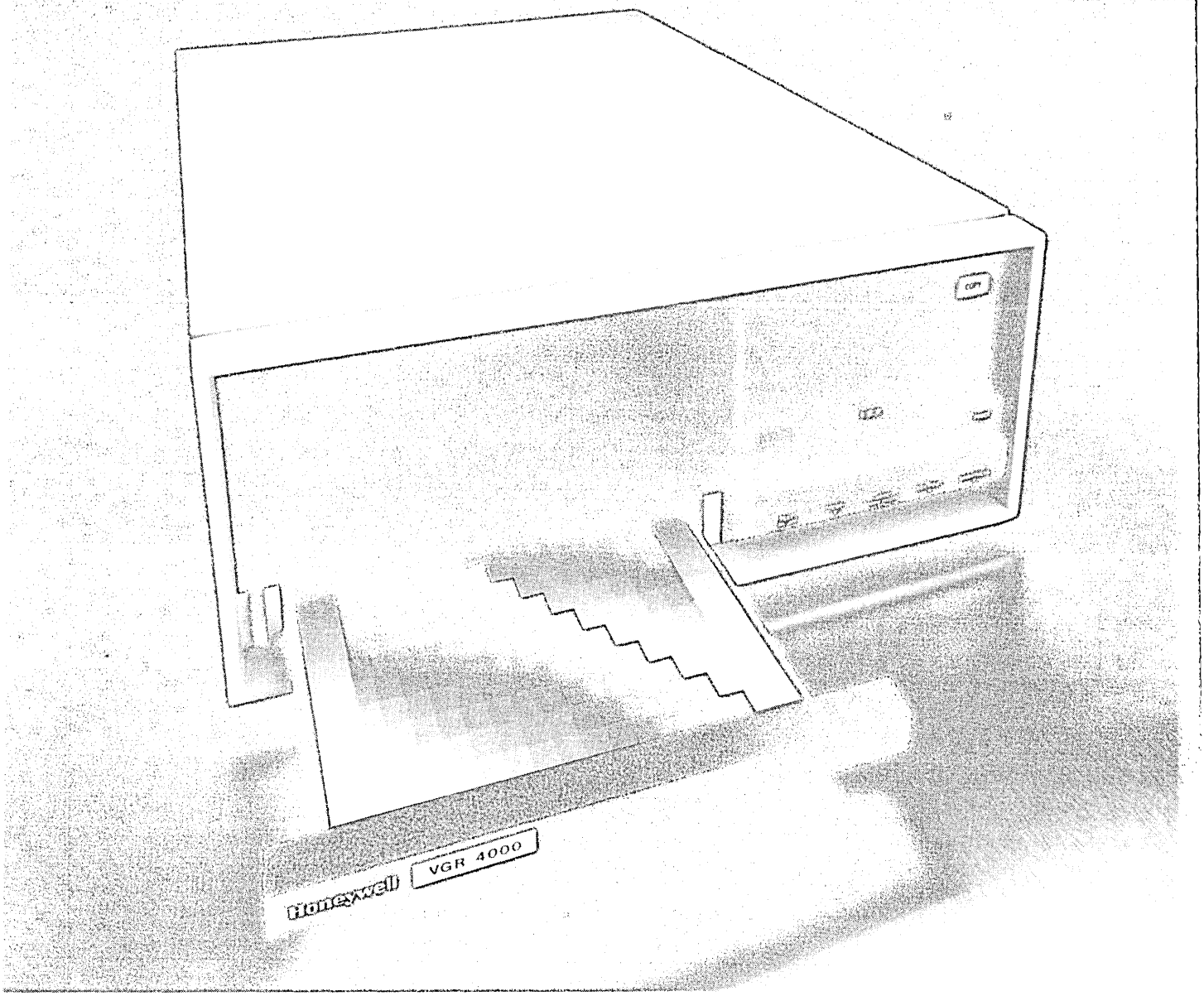

VGR 4000, Honeywell's new and advanced video graphic recorder, provides fast, crisp, 8½ x 11" hard copies on dry silver paper from most CRT's and other video sources.

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SERVICES

MCAUTO ON THE MOVE

"Confidence and commitment" are the reasons cited for investing $70 million in what it calls the world's largest computer center.

Twenty-one years ago this March, a memo was placed on the desk of James S. McDonnell, founder of McDonnell Aircraft Co. It read: "I responsibly recommend that we go into the data processing services business." It was signed by William R. Orthwein, Jr., then vice president for personnel and general services.

Orthwein, now chairman of the resulting McDonnell Douglas Automation Co. (MCAUTO), recalls with great pride the response he got to that memo: "It simply said, 'Okay,' and was signed 'J.S.M.' You didn't get a response like that too often."

Twenty-one years later, the company officially opened what it touts as the world's largest computer center. "So you ask why we would invest $70 million in a new facility at a time when everyone else is cutting back," Orthwein says. "For two reasons," he answers, "confidence and commitment."

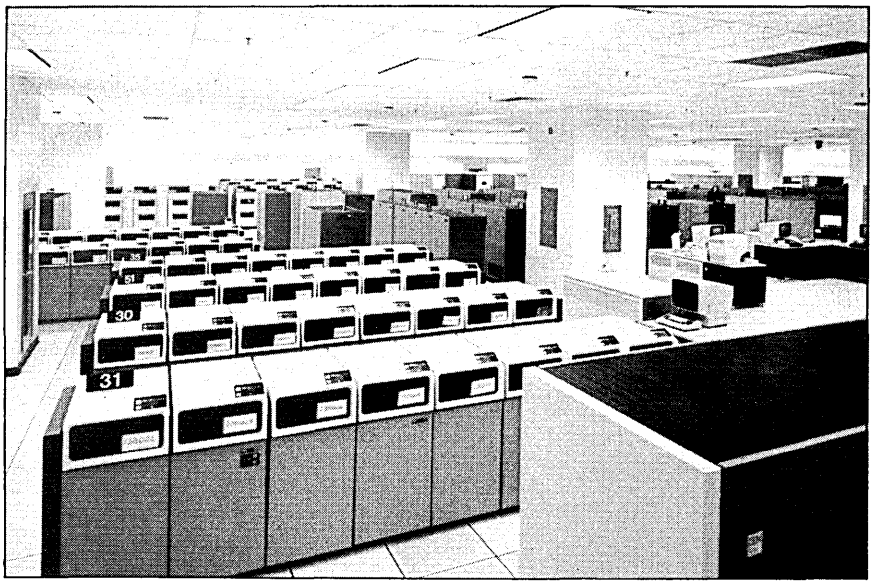
The company certainly appears to have an abundance of both. MCAUTO presently serves some 3,000 commercial customers as well as other components of McDonnell Douglas Corp. For years, the value of its services to the parent company far outstripped the revenues derived from services to the outside. But that too is changing.

Revenues from all commercial services rose by 19% in 1980 to $179.6 million.

In 1980 MCAUTO supplied $227 million worth of services to other divisions of McDonnell Douglas Corp. Revenues from all commercial services rose by 19% over the previous year to $179.6 million.

"That makes us the seventh or eighth largest computer services company," executive vp Robert L. Harmon boasts of the company's commercial business. What's more, president A. Joseph Quackenbush contends that the internal/commercial services mix "may be equal within two years."

MCAUTO not only provides remote data processing services, but it also markets applications software to the engineering,



MCAUTO CENTRAL: Cpus valued at more than $130 million are housed in McDonnell Douglas Automation Co.'s brand-new computer center, touted as the world's largest under one roof. The 13 large-scale IBM and Control Data computers, which have the equivalent processing power of 23 IBM 370/168s, include seven IBM 3033s in two clusters, two CDC Cyber 750s, a Cyber 175, a Cyber 730, a standalone IBM 3033, and an IBM 3031. The computer clusters are linked through MCAUTO's datacom network to two additional IBM 3033 clusters in Long Beach, Calif., and to some 16,000 McDonnell Douglas and customer terminals in North America. In an average week, the St. Louis clusters process over 50,000 batch jobs, 30,000 timesharing jobs, and 6.5 million IMS database transactions.

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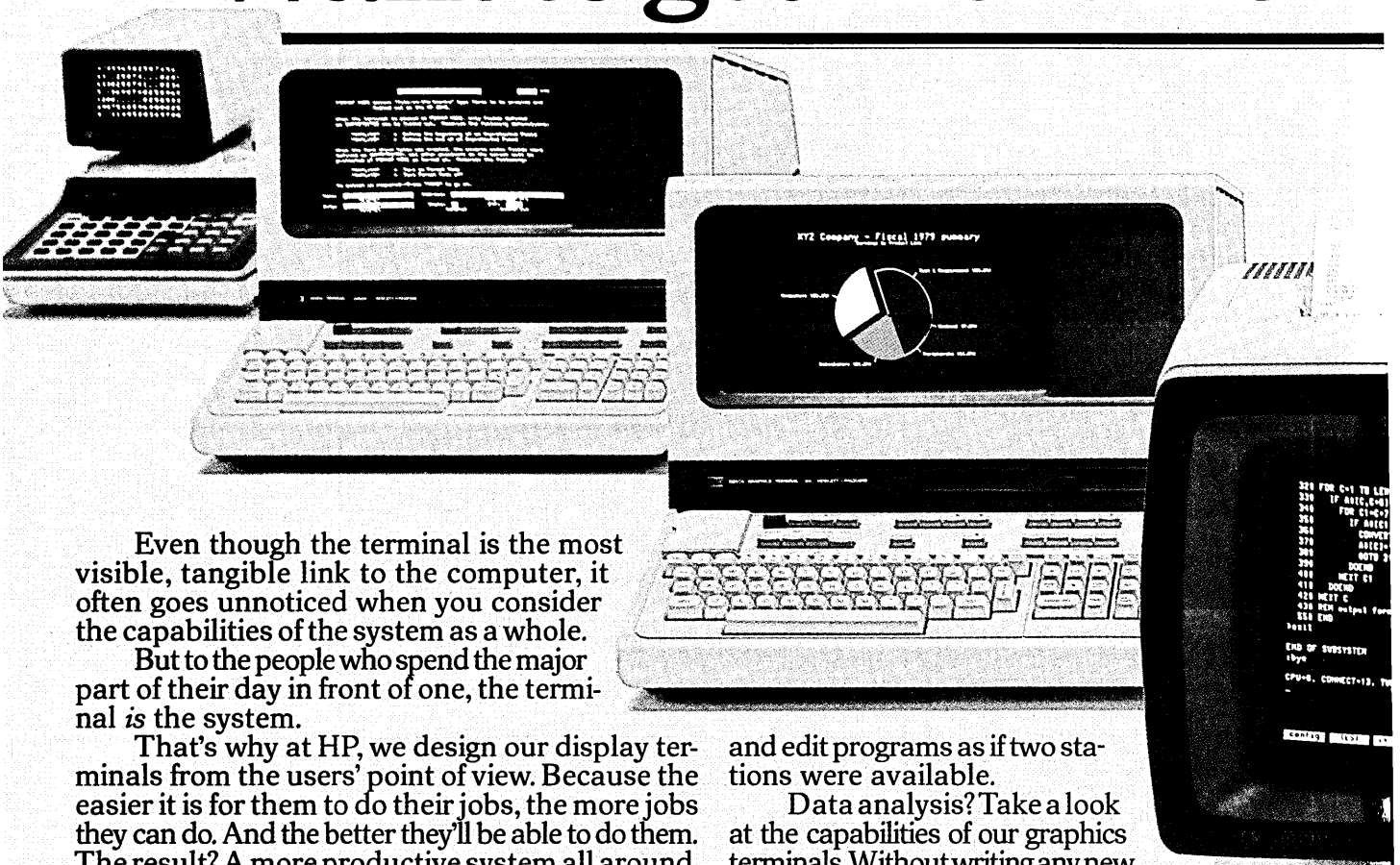

Even though the terminal is the most visible, tangible link to the computer, it often goes unnoticed when you consider the capabilities of the system as a whole.

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

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

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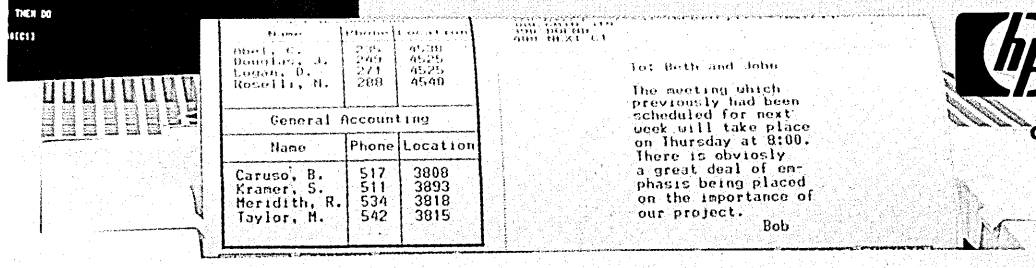

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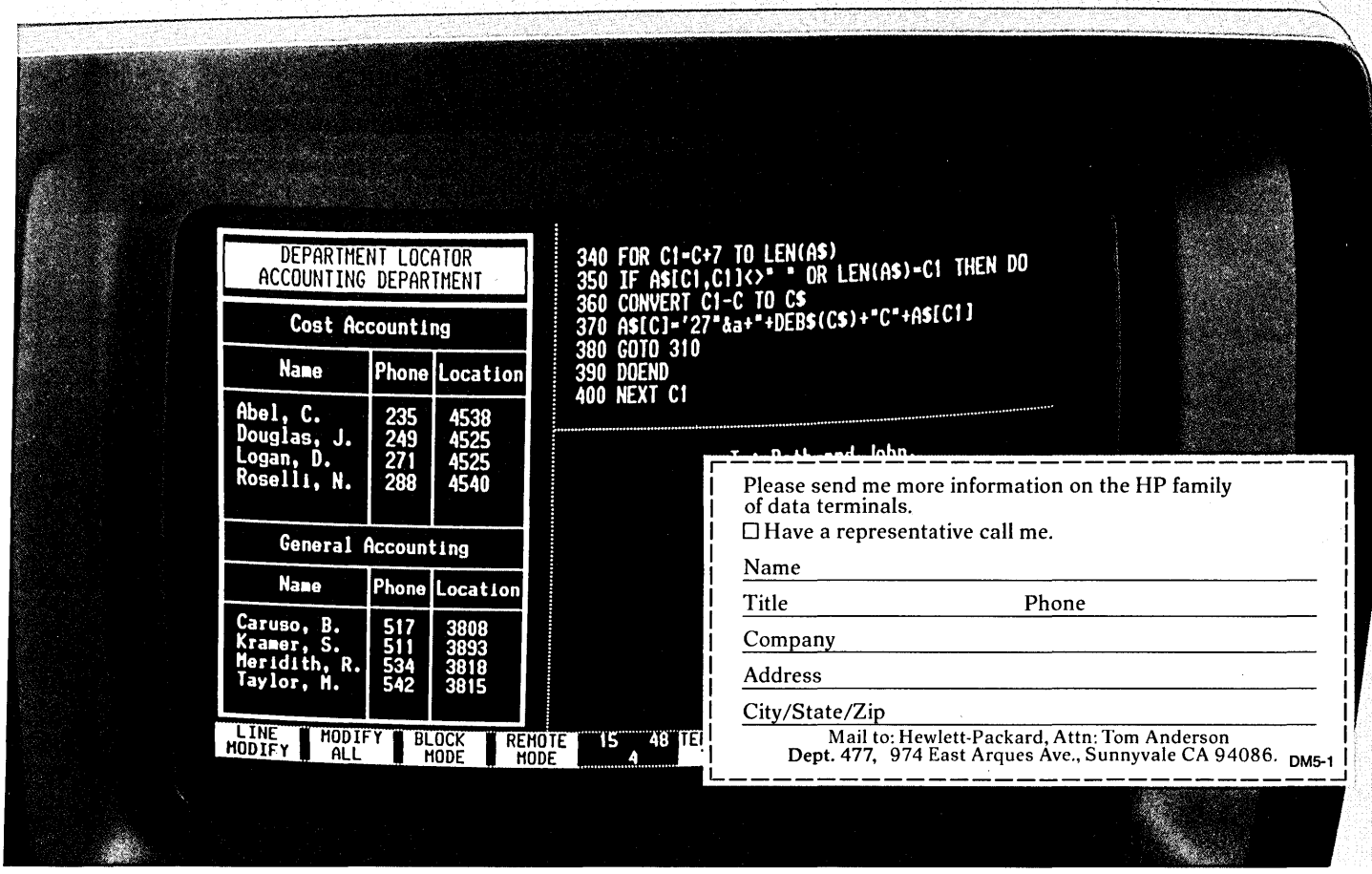

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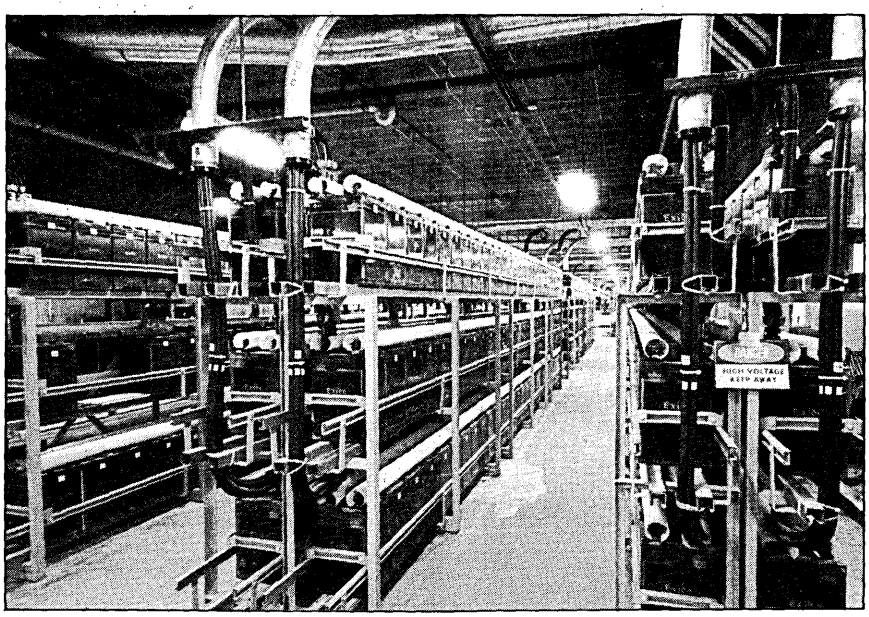

BACKED UP WITH POWER: At the new MCAUTO computer center, backup power is provided by 3,480 two-volt batteries which are automatically drawn on to operate computers in the event of a power failure. Four diesel generators are also installed to provide emergency power.

construction, insurance, manufacturing, and distribution industries, as well as offering various computer-related consulting services to all industries. That means the company is always on the lookout to acquire marketing rights to new programs and methodologies.

In March the firm acquired exclusive rights in the U.S. to market two drafting and building design systems developed for architects and engineers by Applied Research Ltd. of Cambridge (ARC), England. Both systems, the general drafting system and a three-dimensional building design system, were demonstrated last month in Los Angeles at the American Institute for Design and Drafting show.

What MCAUTO considers an even greater coup was its acquisition, also in March, of the assets of Improved System Technologies, New York. Formed in 1977 by Chris Gane and Trish Sarson, IST specialized in the development and teaching of structured systems analysis and design techniques used in the development and implementation of computer systems.

Always with an eye toward improving programmer productivity, IST's Gane, who is currently training MCAUTO employees in the IST techniques, says, "We've just about squeezed everything we can out of the programming end. Our emphasis is in the areas of analysis and design."

Working with several of its clients, IST developed a formal step-by-step set of procedures for using its structured technique to build high-quality systems. The resulting methodology, called Stradis (Structured Analysis, Design and Implementation of Information Systems) integrates the use of data flow analysis, data dictionaries, logical data design, structured software design, structured programming, structured walk-throughs, and top-down development. It specifies a number of processing activities that must be performed for a new system development project, spells out the processes in detail, shows how they relate to one another, who should perform and review them, and specifies the major deliverables.

"This is one of the few acquisitions MCAUTO has made," commented Howard M. Greer, MCAUTO's manager of business applications. "Now we'll be looking to enhancements."

—Becky Barna

SOFTWARE

SOFTWARE SUPER-MARKET

The country's first retail center devoted to computer software has been opened by none other than Cut & Curl.

What do cutting hair and personal computing have in common? Each offers a great franchising opportunity, hopes Cut & Curl, Inc., a Jericho, Long Island, firm that plans to open a chain of "software supermarkets" along the same lines as its 500 Edie Adams' Cut & Curl and Great Expectations Precision Haircutting salons. The idea is to offer personal computer owners a one-stop source for all their software needs, from children's games to complete small business applications.

The first Programs Unlimited store opened in March and is to be followed shortly by a sister store. Both are located near New York City under the close scrutiny of Cut & Curl executives who speak of eventually franchising some 100 software outlets. The 25-year-old firm, with revenues topping $10 million, has identified software as one of several diversifications it wants to pursue, despite hair still being a "growing market," according to Don von Liebermann, vice president. If nothing else, the projected three year quintupling in home computer installations—some 2.5 million machines in place by 1984—makes a software venture seem to lend itself to Cut & Curl's franchising methods.

Few of the Programs Unlimited owners are expected to be computer hobbyists.

Among those methods is the firm's knack for getting franchise owners in business without making them learn the particular trade they're selling. Just as very few of the Edie Adams salon owners actually know how to cut hair, very few of the Programs Unlimited owners are expected to be computer hobbyists, von Liebermann states.

"We want to set up running businesses, not hobby shops run by enthusiasts. I expect most of the owners will be absentee entrepreneurs who will handle business aspects of the stores but won't have to know how the inside of a computer works." The stores' staff, however, will be knowledgeable in computing, he adds, enough to help customers find and install the right software package for their needs.

Another Cut & Curl method being applied to Programs Unlimited is the marketing of an exclusive line of products packaged with trademark identity and centrally managed advertising and promotional efforts. The central staff also will help franchisees pick proper locations for their stores, design store layouts, hire necessary staff, and plan inventories.

Heading up the software operation, which is being run as a wholly owned subsidiary of Cut & Curl, is Richard Taylor, former New York City Opera tenor and developer of an "electronic bulletin board" for CompuServe, Inc., the Columbus, Ohio, timesharing firm. In fact, it was through that bulletin board that Taylor met Richard Stanley, the son of one of Cut & Curl's founders, and together they came up with the idea of retailing software through franchises.

Von Liebermann says that marketing strategies are still in the formative stages and that franchising may not prove the best

route to go—wholly owned stores or joint ventures are other possibilities. However, Programs Unlimited will be able to offer a twist not yet available in hair styling: in addition to dropping in for some software on the way home from the grocery store, customers at home will be able to establish a computer link with Programs Unlimited, browse electronically through the catalog of 600 or so packages, and, after ordering, be billed via credit card. Supermarket of the future?

—John W. Verity

COMMUNICATIONS

DATACOM GAMBLES IN VEGAS

Interface '81 draws crowd demanding standards action.

Anchor Pad International drew a crowd to its Interface '81 booth in a way it no doubt would have preferred not to. The company had come to Las Vegas to show its security products via closed-circuit tv, but when President Reagan was shot on Monday, the first day of the conference, booth staffers switched to a commercial channel and people came from all corners of the hall to watch and worry.

The assassination attempt was the most compelling but not the only reason for attendees to direct their attention toward Washington. For one thing, there was the continuing uncertainty about the outcome of the antitrust suit against AT&T. And earlier in the day, NCR chairman William Anderson, in a well-attended keynote session, called for Washington to join with users and vendors in setting firm, foward-looking communications policies that would include the adoption of international standards.

Anderson's address followed one by Robert Hall, president of Satellite Business Systems. Hall's theme was "Harnessing the Bandwidth Boom," and he spoke of a bright future for telecommunications. Anderson, by contrast, made a bit of a splash by pointing out the substantial obstacles in the path to that future. He called systems incompatibility "the curse of today's information processing world," and said, "Continued insistence by each railroad that it have its own gauge has become philosophically ludicrous and economically extravagant." He admitted the road to standardization is a long one, but he pointed out that European and Japanese manufacturers, with the active support of their governments, have already traveled quite a bit further on that road than U.S. companies have. He went so far as to say that American indifference to that fact has put U.S. leadership in information processing and communications at risk.

Anderson said progress has been made with the adoption of the X.25 framework for public data networks, X.21 common protocols for circuit switching, and X.75 for transnational network linkups. He is also encouraged by the guidelines recently issued by the Justice Department to encourage joint basic research among noncompetitive companies. But the British-born Anderson sees other countries, especially Japan, moving much faster, and he fears that American firms may find rough going in an increasingly international marketplace.

NCR's chairman, William Anderson, called systems incompatability "the curse of today's information processing world."

Some people were quick to point out that Anderson has somewhat of a hatchet to grind. NCR has become something of a born-again standardizer since its acquisition of Comten two years ago. That was a move that helped bring about a "180-degree turn" for NCR, according to one Comten officer. He added that NCR had probably not anticipated this when it made the acquisition. Anderson himself said he was "reluctant to cast any sizable stones" because of NCR's foot-dragging adoption of COBOL. NCR finally offered COBOL in the mid-'70s, some 10 to 15 years after the other mainframers had made the language available. These days, NCR Comten's 3600 line of communications processors and its Communications Network Architecture scheme, marketed with a map of the world and the promise of support for the interface requirements of the "dominant forces" in the datacom industry, leave little doubt as to where the company wants to go.

And what about those dominant forces? IBM, AT&T, Tymnet, and GTE-Telenet were among those at Interface, but the few company representatives who had heard the addresss were mostly unimpressed. Some AEG Telefunken representatives who came from Germany to demonstrate fiber optics components speculated that the American datacom industry, like the auto industry before it, might be tending toward complacency because of a large domestic market.

But Richard L. Deal of Systems Technology Forum took a different view. In a session he conducted, he once again saw a member of the audience stand up and call for a universal standard for the interconnec-

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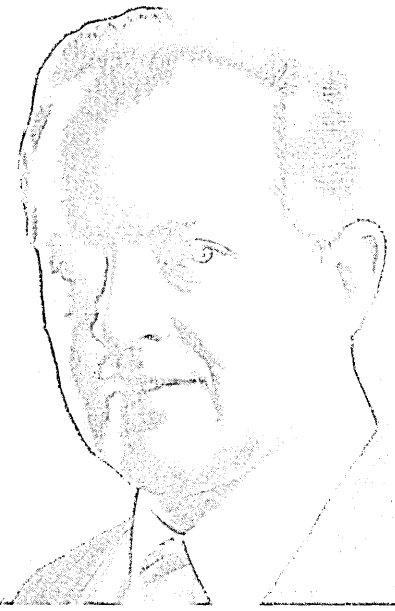

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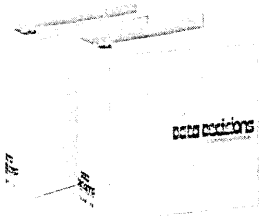

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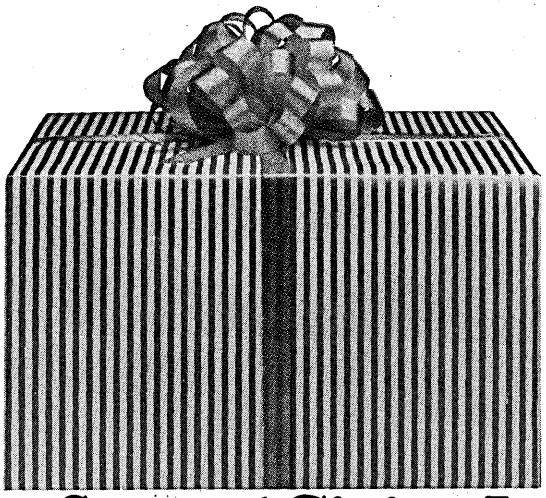

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CIRCLE 77 ON READER CARD

INTERFACE BOX SCORE

Interface show officials claimed this year's session attendance was the best ever with over 2,500 people registered for the conference. Total show attendance broke the 9,000 mark, with 203 vendors plying their wares inside the Las Vegas Convention Center.

The keynote speech drew 1,750; sessions on local networks, the emergence of voice/data systems, and the reorganization of AT&T were best attended.

Although an informal survey of booth personnel produced the usual responses about this year's show ("The quality of the people stopping by is quite high" or "We're here because our competitors are"), at least two exhibitors noted some changes.

"This show's changed through the years," said Bill Rosenstein, of NEC Information Systems, Inc., Lexington, Mass. "It used to be a hard communications show. The people who came were technicians. The things you saw were modems. Now, I don't know. There don't seem to be any experts here. There aren't many lookers. For a booth salesman who doesn't want to get tired, it's a great show." NEC was showing its small business systems, personal computers, and peripherals.

"We came to the show to reach the MIS guys and we're finding them here," said Gary M. Winkler, director of product marketing, Rapicom, Inc., Fairfield, N.J. Rapicom was introducing two new digital facsimile transmission systems and was demonstrating for show goers how facsimile units function through message switching devices.

Next year's show will be held March 22 through 25 in Dallas, at the Dallas Convention Center.

—J.K.

tion of all networks. He says he's been hearing that for 25 years. "I love motherhood, America, apple pie, and standards," he said, "but to me most of the standards efforts are a form of high-class welfare. It makes for some very nice trips to places like Geneva and Brussels, but the reality is that standards are derived outside the public forums and implemented haphazardly." As an example he cited the several versions of X.25, each vendor implementing this "universal" standard in his own way.

"Real standards are a manifestation of economic reality," said Deal. The companies who use money and market muscle to get the equipment out are the ones who really create the standards. IBM's ubiquitous 3270 terminal is an in-place standard; it came about because IBM poured money and talent into the product, not because a standards body was able to reach agreement."

"I love motherhood, America, apple pie, and standards, but to me most of the standards efforts are a form of high-class welfare."

IBM currently has two versions of the X.25 interface, and is expected to announce a much improved version for domestic use. This will be for use on the 3705 front-end and will be similar to the approach taken to X.25 by domestic carriers Tymnet and Telenet. IBM has reached agreement with those two companies on the form the domestic version will take, and Deal looks for a third-quarter 1981 announcement. While large users can afford to put their own SNA nets in place, the new version will enable medium to small users to go through the public packet-switching networks to get into the larger IBM SNA network, Deal said.

Discussion of IBM's implementation of X.25 in the U.S. dominated a session called "Vendor Network Architectures: More Freedom or Restraints?" Several attendees commented that IBM had assured them of its intent to implement X.25 here. "So has Burroughs and so have others," said session chairman Gary Audin, president of Delphi, Inc., Pompton Lakes, N.J. "Intent is nondeliverable. I believe it will happen, but the big question is when?"

Ronald C. Sander, senior information systems project manager, Library of Congress, had some criticism of IBM's support of X.25 in other countries: "There's a whole set of features in X.25 that IBM has never addressed. They're addressing subsets and subsets of subsets." He said IBM and Burroughs, in responding to the Federal Reserve Board's RFQ for a system for Fed Wire which must be X.25 compatible, were committed to X.25 on "an RFQ level."

Sander said IBM is having problems taking its French version of X.25 to Canada. He said he believes IBM will have to include X.25 in the access method, and "I'm not sure how long it's going to take. I can't see how they can afford to implement except in the front-end."

Another session speaker, David M. Rappaport, manager of the Information Consulting Division of Arthur Anderson & Co., made the case for standards. "The business community wants, needs, and desires more standards," said Rappaport, a member of ANSI's X.375, which is working on an open systems interconnect model. This, he explained, is a computer model of how to handle the interconnection of different computer systems. Rappaport said business needs standards because data is more distributed and there are more multivendor

environments. He deplores a lack of user participation in standard setting, and exhorts: "Anyone can participate. Just attend a meeting."

While incompatible systems mean headaches for some people, they mean opportunity for others. One such is Charles Askansas, president of Datastream Communications of Santa Clara, Calif. Datastream was formed in 1978 to provide software for datacom applications. "Data communications users are being forced by a variety of offerings into many different directions," Askansas told a press conference. That fact has created a market for his firm's products, which he described as "network access systems, as differentiated from protocol converters. We do that and a lot more."

Askansas said that Datastream T7CM Network access display system, which the company was demonstrating at the show, allows dumb terminals to access IBM 3270 applications programs. Datastream is now looking beyond 3270s and a variety of terminals it now emulates. Askansas notes the trend toward SNA, and said that Datastream will introduce an SNA product this year. He also anticipates an Ethernet product, because "with DEC and Intel support, Ethernet will be a standard for local networks."

Conference attendees were concerned over IBM's actions vis-à-vis the X.25 networking standard.

The sophistication gap between data communications in the U.S. and other countries was pointed up at an Interface '81 press conference by Bertil D. Nordin, new president and chief operating officer of Digital Communications Associates, Inc., Norcross, Ga. "Communications in Japan, Germany, England, and the Scandinavian countries are very sophisticated—of high quality," Nordin said. "German switches have a higher proportion of electronics than you get in the U.S."

Nordin thinks DCA has a quality product, particularly with the introduction of an X.25 interface which can connect its private networks to such public networks as Telenet, Tymnet, and Datapac. "This enables users to funnel light traffic through the public networks into their private networks," said Gary Cedarquist, DCA's vice president of product research.

As for getting a bigger international market share, Nordin said, "we're taking marketing steps to do that and we hope by two or three years from now one-third of our total sales will be international." He said DCA's international sales till now "have not been significant."

Contributing to this article were Kenneth Klee, Edith Myers, and John Kirkley.

MEETING NETWORK NEEDS

Codex's long-range strategy is based on the company's conviction that users will need increasingly sophisticated networks.

The modem industry is changing from being merely a provider of black boxes to becoming the supplier of complete systems for complex data communications networks. Thus the emerging leaders will be those companies that can meet the increasingly sophisticated networking needs of users, according to Arthur Carr, president of Codex Corp., Mansfield, Mass.

Last fall when Codex announced its systems orientation with a concept called Integrated Communications, it was actually the culmination of an in-house evolution that had been building for more than five years, Carr said in a recent interview. "It's been a long, slogging process and we have not had sufficient identification on the part of users on just how capable and broad we were to develop that strategy," he explained.

The increased importance of networks is based on the idea that computers and data processing will become more and more like a commodity while the ability to transport information between cpus and terminals will become "a paramount issue."

Supplying network systems is really nothing new to Codex since it was providing data communications systems to the military in the 1960s before it entered the commercial arena to take advantage of the opportunities opened up by the Carterfone decision.

The ability of the phone company to subsidize a competitive subsidiary and thus provide an unfair advantage is still very real.

While Carr does not predict that modem companies that don't adapt to the systems approach will fall by the wayside, he makes it clear that the new leaders of the industry will be those vendors that can provide complete solutions. In that regard, Carr sees few firms competing with his company within the ranks of today's more conventional modem vendors. While he acknowledges that firms like Racal-Milgo and Paradyne have the needed capabilities, he sees the major competitors as being Northern Telecom, Wang Lab, and Datapoint.

Actually the Codex Integrated Communications strategy is meant to meet the trend toward integrated corporate networks which combine dp, office automation, document transfer, and communications functions onto a single corporate network. So far the integrated network has been an elusive goal in many industries, Carr said, but multifunction nets will grow in importance during the 1980s, he predicted. Rather than being phased in over the broad range of dp users, Carr said, the innovative industries in insurance and banking will lead the way.

One area of continuing concern to the modern industry is what shape the structure of a new competitive Baby Bell subsidiary will take. Explaining that the ability of the phone company to subsidize a competitive subsidiary and thus provide an unfair advantage is still very real, Carr remains optimistic that a reasonable structure will emerge.

Computers and data processing will become more like a commodity while transporting information between cpus and terminals will become a paramount issue.

"We've had a lot of water under the bridge since the original Bell Bill and there is now a much greater understanding of the controls that are needed among users and legislators. I think it's going to come out pretty much on the side of a reasonable structure. If that's the case, all the companies that want to participate are going to do well. Eventually Bell will do well but not immediately," he predicted, adding that Baby Bell will have to develop the motivated, aggressive attitude needed to operate in an open competitive market. Existing Bell products like the Dataphone II network control system are still a generation behind comparable products from independent suppliers, and it will take a concerted effort for Baby Bell to become a real threat. "Over time as they get competitive, they'll have to survive and they'll stimulate the industry," he said.

Carr said a key element in the Codex evolution into network systems was its merger with Motorola in 1977. "It gives us access to vertical integration right from the semiconductor level on up. It positions us with capabilities and resources that most of our traditional competitors do not have." Today Carr heads up the Motorola data communications division, which includes the Codex operations, ESE Ltd., a Canadian firm that specializes in telephone accounting and digital electronic systems for utilities, and Universal Data Systems, in Alabama, an oem modem supplier. Together with the semiconductor skills of parent Motorola, the data communications divi-

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sion is a formidable operation, according to Carr.

Keeping up with increasingly sophisticated network requirements of users might well put Codex into some new areas. Carr does not rule this out during the 1980s as integrated networks become more prevalent. "Integrated communications is the transportation of information and if the information source is a fax machine, a human larynx, a Teletype, or a keyboard, our business is transporting that information," he concluded.

—Ronald A. Frank

GOVERNMENT

FROST IS OFF ADP PUMPKIN

OMB has dropped its freeze on the procurement of adp equipment, but the government's long-standing problem with antiquated dp gear remains.

The freeze is over, but the memory lingers on.

Bulletin No. 81-9, the Office of Management and Budget's moratorium on procurement of general purpose adp equipment, software, supplies, and support by Executive Branch departments and agencies, now belongs to the dead letter file. In its three months of life, it wreaked havoc on vendors' procurements and accounts receivable. The effects of its demise remain uncertain.

The moratorium prevented "each Executive Branch department and establishment [from incurring] new obligations for the purchasing, leasing, or rental of equipment until a plan for the reduction of obligations for procurement of such equipment in fiscal year 1981 has been approved by OMB." Military equipment, equipment required for direct support of military operations, and equipment needed to protect human life, health and safety, and property were excluded. The moratorium was effective Jan. 30, and eventually was lifted on an agency-by-agency basis as each complied with the required provisions.

"It was an overreaction by the Administration to achieve its ultimate goal," said Paul Barrett, director of federal government marketing for Mohawk Data Sciences. "It showed gross ignorance of the procurement process. There were many ways to do it other than the shotgun approach. It threw everything into a cocked hat. It was completely counterproductive. It completely turned off procurements that had already begun. Everybody ended up right where they started. It cost the government more work and more money than it would if they had gone ahead and started replacing what they have."

What the government has is ancient history. According to figures compiled by the General Accounting Office in a survey of the April 1979 federal inventory of general purpose computers, over half of the medium and large-scale mainframes were based on 1971 or earlier technology; nearly a third were 15 years old or older, and only 2% used 1975 or later technology. The government has an estimated 18,000 computers and $15 billion annual procurement budget. Of the 1,366 medium and large-scale computers, nearly 1,000 were manufactured by four major vendors (which went unnamed in the report). Sixty percent of those were first available in 1966 or earlier; 95% were first available in 1974 or before. An OMB analysis of small computers obtained by GAO showed the average age of small computers to be 6.5 years; the average of medium and large-scale computers was seven years.

"After 15 years of the Brooks Act, we have found that problems still persist in all facets of adp activities," James Watts, group director of GAO's accounting and financial management division, told a recent meeting of the Computer and Communications Industry Association. "Despite dozens of GAO reports, there is still a lack of clear and concise guidance from the central executive agencies.

"So we do have an obsolescence problem. Why? Part of the problem is that agency adp managers have failed to identify all the costs and problems associated with using outmoded equipment. Top agency management has not provided the oversight and direction to assure that total operating costs are identified and assessed in managing federal adp resources. However, and probably more importantly, the central agencies have not issued policy and guidance for replacing older equipment when changes in current technology make it economical to do so."

"It was an overreaction by the Administration to achieve its ultimate goal ... it shows gross ignorance of the procurement process."

With a report on the subject —"Continued Use of Costly, Outmoded Computers in Federal Agencies Can Be Avoided"—GAO hopes to rectify what is universally acknowledged to be a situation rapidly going from horrible to horrendous. Both GAO and vendors feared OMB's moratorium would further accelerate the rush to obsolescence.

"Business in the civilian agencies came to a direct halt," said Joe Carini, Univac's director of marketing for federal systems. "There were delays in procurements and awards planned to be made that weren't.

"But the most important issue is that the government has an aged and antiquated system. They absolutely need to update their computer inventory. Keeping the aged inventory in there is costing them more than they're saving with the freeze. They could save a lot more by replacing the inventory."

"I think government business is going to go up, not down ... It's going to have to because of the obsolescence problem."

"The freeze was a big stumbling block," Watts admitted. "Our concern was that it would delay any improvement.

"To get the government back on the proper track," Watts said, "we believe two things need to be done. First, we must replace obsolete computers with modern, economical equipment *now*, where it is economically feasible. Secondly, we must improve the management of federal adp resources so that obsolescence does not happen again."

As part of its report, GAO suggested that the General Services Administration issue to the agencies guidelines incorporating these principles: existing applications and workloads need not be rejustified; replacement systems should have approximately the same relative computer power as the old system; the replacement system's memory storage (core and disk) capacity should be restricted to the existing amount, and replacement systems be capable of using existing software including, where possible, plug-compatible or emulation processors.

"The fundamental point is that agencies should be allowed to update their equipment, without upgrading their capacity," Watts said. "We do not want to reward agencies for past bad management."

GAO also recommended that OMB require agencies to assess their adp requirements for the 1980s, plan their procurement strategies, and improve management's knowledge and involvement. In addition, Comptroller General Elmer Staats wrote to OMB director David Stockman to remind him that it costs more to operate and maintain the older inventory than to lease, operate, and maintain current generation equipment of similar capacity.

How, or even whether all this will translate into hardware and software is unclear. With the administration pressing for budget cuts and slashes, and agencies being required to have their reduced 1981 budgets approved by OMB, what will be in the data processing kitty for 1982?

"I think you're going to see less government procurement," an OMB source

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said. "Firms that depend strictly on the government for business are going to be in trouble. OMB is going to be much more stringent on agency procurement in the dp area."

"We definitely figure government business will be less than it used to be," Barrett said. "The way the freeze was approached scared everybody. Government people want to maintain a low profile anyway. The intimidation of it will delay upgrading the current system. Will a person really want to take a chance on going to the agency head, or will that person, even if he agrees with the request, really want to go to OMB and say, 'We need this'? I doubt it. I think it was a dumb move. Even with the freeze over we don't anticipate picking up business to make up for the money lost during it. I don't expect a full procurement cycle until the end of the first quarter of 1982."

Others, however, saw even the permafrost melting.

"I think the freeze proved difficult for those who lived off civilian agencies," admitted Thomas Finn of CPT Corp., a word processing company, and head of CCIA's federal procurement committee. "But it's allowed us to increase our tempo in other places and enter foreign markets we have not been in before. So when we net it out on the corporate level it won't bother us at all and may even help us."

"I think government business is going to go up, not down," said GAO's Ken Pollack, who wrote the majority of the report. "It's going to have to because of the obsolescence problem. Stockman has told us he agrees with the goals of the report and wants to get them accomplished within the planning requirements of the agencies. It's clear the agencies will save money by replacing the old gear."

"I think our timing was real good on this," Watts said. "This has been a disaster despite all our other reports, but this time there's real interest by both GAO and OMB. This report is different. I think we've got something going. I hope so."

—Willie Schatz

COMPANIES

B&B BEEFS UP ITS PRODUCTS

Boole & Babbage is targeting data center managers as prospects for its new capacity planning system.

At some point in the past, many of us hand-drafted a letter, dropped a report in the mailbox, or estimated when a computer system would run out of steam. Progress has brought us word processing systems, electronic mail, and now capacity planning systems. The latter, it appears, is the latest industry buzzword.

But while a leading vendor of software that extracts systems performance data has been catering to the highly technical types at a computer center, it now is posturing itself to serve directly the management of a data center. It aims to do this by providing both a performance database with appropriate DBMS and a predictive model.

The next round of software products will produce output that is meaningful to management without the efforts of an intermediary.

"This predictive model will operate against the performance database and allow the customer to model his system and predict the effects of changing hardware and changing workloads," explains Jack E. van Kinsbergen, president of Boole & Babbage

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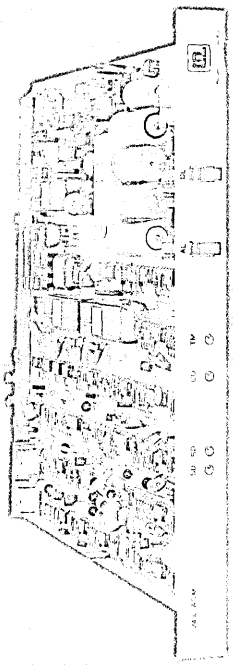

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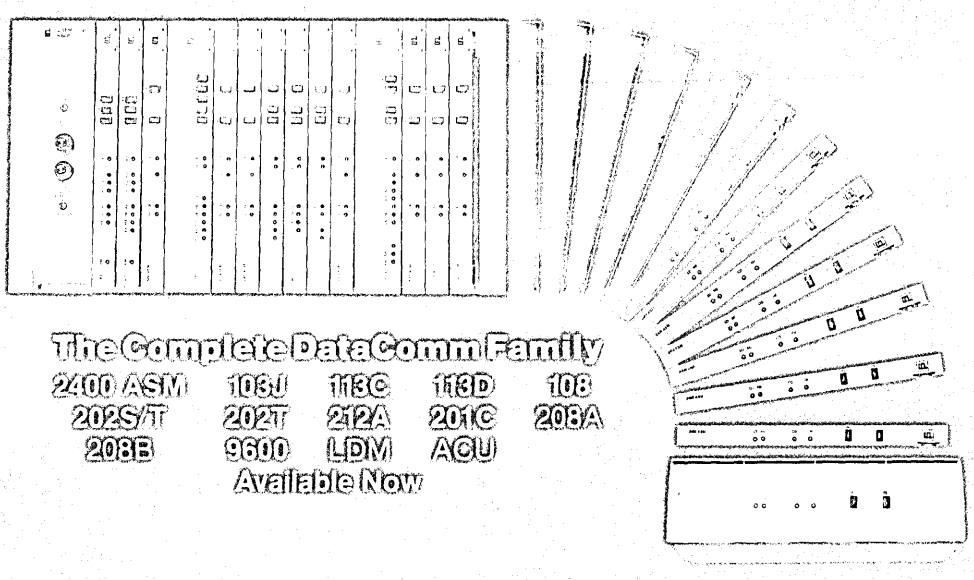

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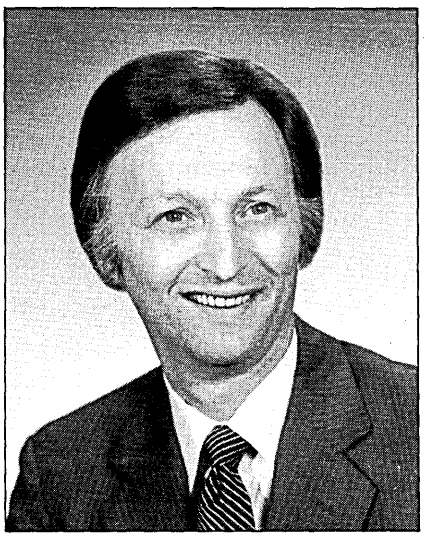
CIRCLE 83 ON READER CARD

Inc., Sunnyvale, Calif. He wants to make it possible to answer what-if type questions: what if we added a meg here, two gigabytes of disk there?

From the start of the company more than 12 years ago, Boole & Babbage has been developing software that pulls utilization data out of the operating environment of a computer. With this data, the user could produce overnight reports on system performance, for accounting and tuning purposes and to see how the workload was being handled. More recently the company has made it possible to feed this extracted data to real-time analyzers, on-line displays that show what's going on while it's going on. These are products that not only allow an operator to see what's happening but also provide some tools to diagnose certain classes of problems.

"Now we're putting together a performance database that allows the customer to collect the data and then look at trends," says van Kinsbergen. Until now the company's line-up of software for the users of IBM's largest systems has produced data and reports that could be used for capacity planning. "But you had to have a couple of pretty good whiz kids in the organization to take the data and put it in a form that meant anything at the management level," he adds. "We see capacity management not so much as a different discipline but as an opportunity to bring our capabilities up to the management level, rather than the technician's level." The next round of software products, slated for introduction late this year, will produce output that is meaningful to management without the efforts of an intermediary. "That's the next step in the evolution of this business," he says.



JACK E. VAN KINSBERGEN: "The state of the art of communications performance technology is where dp performance technology was when Boole & Babbage started 12 years ago."

At the larger installations, there seems to be a demand for such products. "Capacity management is the big need in the industry," says one user who asks not to be identified. Adds David R. Morley, manager of capacity management systems at Tymshare Inc., "The idea of a performance database is critical. We need it very badly."

The problem is that people in capacity planning are getting pieces of performance data from every little extraction product and lack the means to produce a meaningful picture from these data. They find themselves examining data from numerous sources, comparing them and doing some correlation analysis. But if the technical people with years of experience behind them are having difficulty making heads or tails of the data presented to them, it becomes apparent what a tough technical job it will be to piece together performance data so that they have relevance to the less technical people in data center management.

Boole & Babbage, like Applied Data Research and a few other software companies, is one of the few that have been around since before IBM unbundled its software. And yet in its latest fiscal year the privately held company chalked up revenues of only some $12 million. "The recognition of Boole & Babbage as a company

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far exceeds the success we've had," admits van Kinsbergen, now completing his first year as the company's president. The company has restricted itself to users of IBM's and plug-compatible vendors' largest systems, the OS-based systems. That's something like 1,500 domestic and 1,000 European sites, a market said to be growing about 20% a year in terms of mainframe installed-base power or budgets.

But the software house, which has penetrated no more than 15% of that market, finds itself no longer the trailblazer in the field of computer performance measurement and analysis. A performance database, for example, has been available from Morino Associates Inc. of Vienna, Va.

But B & B is also looking to offer other products to its existing customers. A natural extension is to acquire and sell software that will extract data from communications subsystems such as VTAM and NCP and make it possible to feed those data to batch and real-time analyzers, as well as the upcoming performance database and predictive model.

"We feel that today, in the communications area, the state of the art of performance technology is probably about where data processing performance technology was when Boole & Babbage started 12 years ago," says van Kinsbergen.

—Edward K. Yasaki

BENCHMARKS

ADA UNDER FIRE: "Do not allow this language in its present state to be used in applications where reliability is critical, e.g., nuclear power stations, cruise missles, early warning systems, antiballistic missle defense systems. The next rocket to go astray as a result of a programming language error may not be an exploratory space rocket on a harmless trip to Venus; it may be a nuclear warhead exploding over one of our own cities." So spoke Charles "Tony" Hoare, Oxford professor, authority on programming language design, and winner of the ACM's 1980 Turing Award. In a lecture given in October, as he accepted the award, Dr. Hoare blasted Ada, the Defense Department's much-heralded programming language, as trying to incorporate too many features in a single package. In what is thought to be the strongest criticism so far of the language developed by Cii-Honeywell Bull, the professor said such a language can fail at critical times and therefore "constitutes a far greater risk to our environment and to our society than unsafe cars, toxic pesticides, or accidents at nuclear power stations." The language, which has been designed for commercial, scientific and control applications, looks as if it may be too comprehensive for its own good, said Dr. Hoare, who noted that DOD has prohibited Ada subsets from being accredited. The English authority, however, added that with "careful pruning," an Ada subset could be developed that would be "reliable and efficient in implementation and safe and economic in use. If you want a language with no subsets, you must make it small," he concluded.

STC RAISES $50 MILLION: Storage Technology Corp. raised $50 million for the development of an IBM-compatible large computer. Research financing came from a partnership called Storage Technology Partners; individual investors purchased "units" at $50,000 per unit; the minimum purchase was three units. These investors were told the compounded annual return on their investment (over the 7½ year payout period) would be somewhere between 44% and 56%. STC Computer Research president Fred K. Buelow stepped into another presidency when STC Computer Systems was created to purchase developments from STC Computer Research. In addition to those two presidential roles, Buelow is president of STC Microtechnology (acquired from Amdahl), and a corporate vice president of STC. The STC Computer Research staff is presently just over 75 persons, including 14 former Amdahl employees and 20 from STC. Employment on the research staff is expected to reach 170 by the end of '81.

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NEW ISSUE

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Once the large plug-compatible system has made it to the prototype stage, STC will be able to buy part or all of the technology, and Storage Technology Partners may operate the business hand-in-hand with STC.

MAINFRAME MANUFACTURERS: The U.S. appeals court upheld the Federal Court's decision (in January '80) affirming the Commerce Department's authority to implement federal I/O standards. The four manufacturers bucking the government were Control Data Corp., Sperry Corp., Honeywell Information Systems, Inc., and Burroughs Corp. The four fighters complained the IBM System 360/370-based standards were both anticompetitive and outmoded. They claimed these standards would take years to implement and would keep them from competing in the federal dp procurement market. The appeals court decision is subject to revision or withdrawal three years from its effective date if "technological trends or other factors so require." Also, if competition is discouraged by the ruling, Congress will most likely intervene and take any "necessary corrective measures." For now, the case is at a standstill, although the four manufacturers can still ask for a rehearing or take their argument to the Supreme Court.

ADAPSO COMPLAINT: ADAPSO (The Association of Data Processing Service Organizations) submitted an "informal complaint" to the FCC, challenging AT&T and Southwestern Bell's Electronic Information Service II (EIS II) offering. EIS II involves the placement of electronic terminal equipment at customer sites, enabling users to access databases in centrally located computers. For example, Southwestern Bell plans to offer the following services: standard white pages, standard yellow pages, sales/special advertisements, electronic merchandise catalogs, call guide information, and a personal database. ADAPSO claims EIS II is "inconsistent with the Federal Communications Act, the FCC's Rules and Regulations, and established commission policy." Specifically, Southwestern Bell and AT&T are not allowed to provide enhanced services other than through a separate subsidiary. ADAPSO is looking to the FCC to force AT&T and Southwestern Bell to restructure EIS II or cease that service offering. Jerome L. Dreyer, ADAPSO president, stated, "Although this is a relatively small offering, it is indicative of a much larger problem—can the FCC appropriately control and monitor AT&T's computer services offerings?" Dreyer also said ADAPSO will continue to bring these "breaches of regulation" to the attention of the FCC.

SHIFTING THE RANKS: Sperry Univac has changed leadership in its computer division. Richard L. Gehring was moved to a corporate staff position and replaced as president by Joseph J. Kroger, former Univac marketing chief. The changeover came at the closing of Sperry Corp.'s fiscal year, and the company's chairman and chief executive, J. Paul Lyet, said the change was part of planned management succession and an attempt to move up young, talented people within the corporation. Kroger is 46 and Gehring is 57. Management succession activities began at Sperry Univac in 1979, when the office of the chairman was formed.

Gehring will be reporting directly to Lyet, and will assume "corporate-level strategic program responsibilities," analyzing new business possibilities for the company. Kroger, who was president of worldwide marketing and services, will be succeeded by John C. Butler, vice president and former general manager of Sperry Univac's Americas National division. Industry observers view Gehring's move as a positive one, because he will continue as corporate executive vice president and a member of the office of the chairman. When Lyet retires next year at 65 (mandatory at Univac), Gerald G. Probst, president and chief operating officer, is expected to take over as chairman and ceo, leaving the presidential slot vacant. The indications are that Gehring will have a shot at the presidency.

ORGANIZATIONAL REORGANIZATION: On the theory that grouping leads to more effective use of top management capabilities, Centronics Data Computer Corp. has an office of the president instead of only a president. Since Centronics lost $9.3 million before taxes in its last quarter, president Michael Kaufman has had his duties realigned. Management is now divided into two categories: outside operations—areas such as marketing and planning—under Kaufman's jurisdiction, and Inside Operations—manufacturing, engineering, and business planning—under John Tincler's jurisdiction. (Tincler was recently promoted to executive vice president.) Robert Howard, chairman, is the third member of Centronic's office of the president. The reorganization also hit at the vice presidential level. Seven officials were either promoted or received a change in title to reflect the company's new inside and outside operations categories.

PICTUREPHONE PROPOSAL: Ma Bell has requested FCC permission to construct and operate facilities for video teleconferencing services. The service (Picturephone Meeting Service) is scheduled to begin operation in December '81, if approved by the FCC. Initially, New York and Washington, D.C. will be linked, and by late '83, AT&T plans to add over 30 cities to the network. Both public conference rooms and private customer rooms will be offered. Each will be equipped with a graphics display unit and camera to transmit images of three-dimensional objects and assorted graphic materials, a hardcopy machine, a conference table with the main control panel, seven color television cameras, three television monitors, and microphones. Video tape recording capabilities will be available in all public rooms but will be optional at customer sites. Although tariffs haven't yet been approved, AT&T said a typical 30 minute hookup between New York and San Francisco would cost the customer about $840 for the first 30 minutes and $800 for each additional half-hour. That would be on top of a one-time equipment charge of $117,600 for a private conference room and a monthly charge of $11,950.

TECHWEENIES IN DEMAND: The demand for technical talent is above normal for the third consecutive year, states the High Technology Recruitment index by Deutsch, Shea & Evans, Inc., New York City. The HTRI average for 1980 was 138—the fourth highest year since the index's inception. According to Professor Derek de Solla Price of Yale University, DS&E's consultant on the index, "a very clear picture emerges of the great boom plateau in technical demand which lasted through 1978, '79, and '80. This three-year long plateau around the 140 mark has been unprecedented in the 20-year history of the index." The average for 1978 was 139, and for '79 it was 144. Quarterly averages for '80 were 150, 140, 132, and 128, showing a decline in the search for technical talent. However, in December '80 the average unexpectedly moved up seven points to end the year at 135, and jumped up to 147 in January '81.

GROWING RATES: The personal computer market will continue as one of the fastest growing segments of the computer industry. From approximately 400,000 units shipped in 1980, the figure will increase to almost 2 million by 1985, reaching an annual growth of over 37%. This information is from a Venture Development Corp., Wellesley, Mass., report, entitled "The Personal Computer Industry II: A Strategic Analysis." The study examines four segments of the personal computer industry, and predicts how each segment will develop in the next few years. The business user segment will be the fastest growing of the four segments, with shipments increasing 52% annually. Shipments to the home/hobby category will grow by 26.2% annually, showing the lowest growth rate of any end-user segment. The engineering/scientific segment will show shipment increases of 30% annually, while the edcucation segment (the smallest of the four in terms of total units) will grow by 34% annually. In addition, the study discusses industry structure, channels of distribution, technologies, and markets.

—Deborah Sojka

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1981 DP SALARY SURVEY

As the data processing industry reaches midlife, salaries are increasing, but paycheck ranges are becoming narrower.

by Janet Crane

For the last few months, the annual U.S. consumer price index has oscillated between 10% and 12%. Industries have been plagued by low productivity, roaring inflation, and nagging foreign competition. Dp managers classify their own problems as paralleling the industries they serve, but they increasingly single out personnel management as perhaps the single biggest challenge of their jobs.

At the same time, news is being widely published about the high demand for and scarcity of computer specialists. Salary competition, lack of job challenge, and unsatisfactory work environment have caused the industry to sustain one of the highest turnover rates among professional fields. This comes at a time when the pressure to expand dp services through a broad range of business environments and to generally tighten dp operations has never been higher.

How, then, are data processing professionals faring—after another year wrestling with both general economic malaise and specific dp problems?

DATAMATION has just completed its annual survey of industry salaries in an attempt to find out. This year, questionnaires were sent to a randomly selected sample among DATAMATION's end-user readership, with attention to a representative geographic and industrial mix. Analysis shows that returns closely parallel the DATAMATION population along geographic and industrial lines, and we assume that installation size results are likewise representative.

The individual who received the questionnaire was asked to match his staff to our job descriptions by job expertise, functions, and responsibilities. He was then asked to provide the annual salary range for personnel filling each of the 47 job categories, as well as to indicate the number of individuals filling that position on his payroll.

Only a few returned questionnaires have been eliminated from our calculations because of incompleteness. The information contained in the majority has been processed into the accompanying tables—dividing the returns along industry, installation size, and geographic lines.

Our job categories have been updated. We have eliminated the "lead" and "trainee" titles from many job groupings, believing these job functions to be largely filled by personnel in other positions. The small number of returns with information in-

cluded for the "trainees" left on the questionnaire would seem to justify this decision.

New titles such as "Remote Site Administrator," "Minicomputer Specialist," and "Account Executive" reflect an attempt to document the growth, dispersal, and recent modifications of the dp function, its managers, and practitioners. Many of these "newer" job titles are neither industry standardized nor widely reported by respondents. Some are primarily associated with larger installations.

Because we have subdivided and processed salary information as finely as possible to increase usefulness of the data, some categories have a necessarily low representation. For job titles where fewer than three completed questionnaires have entered into calculations, we have noted the entry with an "a" so readers will be aware that the information is based on scanty input.

Believing that neither ranges nor means completely describe the information received, we have published both. Ranges are based on the absolute minimums and maximums—the "reported extremes" paid within any given job title. The means were calculated from the average base salary, which was determined from the range of each reported case. We urge readers to cross-reference their own locations on all three charts to receive the most accurate approximation of where his/her installation stands relative to others.

300 REPLIES RECEIVED

About 300 questionnaires were returned. As they are presented in the three tables, approximately 1,350 job positions can be cross-referenced. Tabulations show that annual base salaries have an absolute range from $5,750 to $100,000. The mean for all jobs at all installations is $21,587; the median (midpoint) is $19,300. Two entries with salaries ranging to $120,000 cause the much higher mean. The average spread between the minimum and maximum salary given for a single job is $6,100. Generally, the higher paying jobs report much larger spreads. For example, many clerk and operator positions were characterized by ranges of less than $800 (even with several dozen people employed at that job), while vice presidents and dp managers (of which there is generally only one per installation) often have reported ranges in excess of $25,000.

Generally, salaries—both means and absolute ranges—performed as expected, although there are always a few surprises and deviations. A few—very few—individuals reporting salaries over $60,000 manage to skew the results wherever they appear. We have chosen to include these values, rather than to smoothe the tabulations and thus make everyone appear equal. After all, someone has to be the highest paid, and why shouldn't the entire field admire those real and valid celestial paychecks?

Certainly not all dp jobholders are highly paid—not by a long shot. The word processing operators, keypunchers, computer operations clerks, and production control clerks have average salaries well below $15,000 across region, industry, and installation size. These people form the base of the dp pyramid for both numbers employed and salaries paid. Yet, because many jobholders in these positions are secretaries and clerks retrained to dp work and relocated from other divisions of the companies they work for, managers indicate they are among the most productive and stable of all dp employees.

The data communications subfield is represented by positions 2, 22, and 23. Here, returns from only a handful of installations

PHOTOGRAPH BY RONALD DE MILT

Generally modest sums are paid even the highest ranking reported managers.

that report widely varying salaries accompanied by large salary ranges cause great unevenness in tabulated means. It is perhaps because some datacom operations are located in corporate departments other than dp and because the field is still in a period of rapid growth and development that salaries are characterized by such great variation. Nonetheless, communications specialists appear to rival dp managers for top salaries in the industry.

Word processing, after several years' inclusion in our surveys, still shows up on only a few questionnaires. Here, too, salaries are characterized by great variations and lack of any discernible norm.

This year we have organized installations by the amount allotted for all dp department expenditures, including hardware, software, personnel, and all other incurred costs. Because hardware increasingly occupies a smaller percentage of the annual budget at most installations, total budget seems a more accurate measure of the actual size of a dp operation. Reported budgets were divided into five categories to enable isolation of salaries paid at all points along the size spectrum. For each of the categories there is good geographic and industrial representation. The returns fell into the following distribution:

Size Number	Annual Dp Budget	% of Returned Questionnaires
1	To $99,999	12.5%
2	$100,000-$499,999	48.6%
3	$500,000-$999,999	15.3%
4	$1,000,000-$9,999,999	20.8%
5	Over $10 million	2.8%

Typically size 1 installations employ only one to four people in dp jobs, while the largest of reporting size 5 installations employs more than 1,900 individuals. The personnel portion of the budget at a small installation is generally in excess of 55%, while the largest firms average closer to 45%. Anticipated departmental budgets for 1981 at respondent installations range from $14,100 to $125 million.

SALARY INCREASES By PERCENT

Trade: Whlse. and Retail

BY INDUSTRY	1978	1979	1980	1981	1981 Ranges
All Installations	7.9%	8.0%	10.2%	10.2%	0000-25%
DP Mfg. and Services	11.5	10.3	9.6	10.5	00-24.
Other Mfg. and Process	8.5	8.4	10.1	9.8	00-16.
Federal Government	6.2	6.8	8.5	6.5	00-15.
State and Local Govt.	6.2	6.0	10.4	10.3	5-25.
Educational	6.9	6.7	9.7	9.2	6-14.
Finance	9.5	8.4	10.9	11.8	7-20.
Trade: Whlse. and Retail	8.5	8.7	11.1	10.7	7-25.
Medical and Legal Serv.	—	—	10.4	10.6	9-13.
Transportation Services	—	—	13.0	12.4	8-19.
Utilities	8.4	8.4	8.9	9.6	8-12.
Constr., Mining, Agric.	—	—	11.5	11.3	10-12.
Other Business Services	—	—	9.9	10.8	6-20.

BY REGION	1980	1981	1981 Ranges
All Installations	10.2%	10.2%	0-25%
New England	9.5	10.0	8-13
Mid-Atlantic	9.6	10.1	0-20
East North Central	9.8	9.9	0-20
West North Central	10.8	10.3	5.5-15
South Atlantic	10.5	10.8	9-25
East South Central	9.4	8.6	5-11
Mountain	10.9	10.4	5-16
West South Central	10.7	10.1	0-15
Pacific	10.5	10.1	0-25
Canada	10.6	11.3	8-17

BY INSTALLATION SIZE	1980	1981	1981 Range
Budget to $99,999	9.2%	9.3%	5-20%
$100,000-$499,999	10.4%	10.6%	0-25%
$500,000-$999,999	10.2%	10.3%	5-19%
$1,000,000-$9,999,999	10.6%	10.1%	5-17%
$10,000,000 and above	10.2%	10.8%	5.5-18%

SITE SIZE DICTATES SALARIES

Installation size is certainly the greatest discriminator of salaries given for any single position; regional and industrial breakdowns show a far less pronounced pattern. Many salaries increase dramatically as the size of the installation in which the individual works increases. This is most pronounced in managerial positions: dp managers and managers in each of the major job groupings are paid far more in size 4 and 5 installations then their counterparts at smaller companies—witness the $23,000 to $52,000 range in average salaries for dp managers moving from size 1 to size 5 installations. Managers are clearly paid both for technical expertise and administrative responsibility—the numbers of people and complexity of the installation managed logically increase in larger departments.

For positions in the middle and at the bottom of the job tree, where pay is less but numbers employed are far greater, there is much less variation in salaries among the several installation sizes. While there is a perceptible rise in pay among the nonmanagerial professional positions that involve some leadership capabilities—senior and lead categories, for example—it is neither as consistent nor as pronounced as the observed differences in managerial salaries. If one is armed only with highly developed technical skills, there appears to be a well-defined limit to the salaries one can command, even in highly competitive analyst and programmer positions, when one works for someone else.

Overall, we are struck by the generally modest sums paid even the highest ranking of our reported managers. Dp and/or MIS, according to our returns, does not harbor many of the truly well-paid corporate executives. It is an industry that is not the on the ladder to top management. We might speculate that the brilliant dp professional, by nature, is not a "corporate man." If he is a talented and dedicated technician, he only rarely displays the personality attributes necessary to be a successful manager. High salaries—truly top-notch salaries—appear to be paid for general management skills, not technical expertise. Put another way, despite all the hoopla about high-flying dp salaries, if you're no good with people, you ain't never gonna be rich.

We also discovered, in processing salary information, that decentralization in dp has led to some anomalies in job categoriza-

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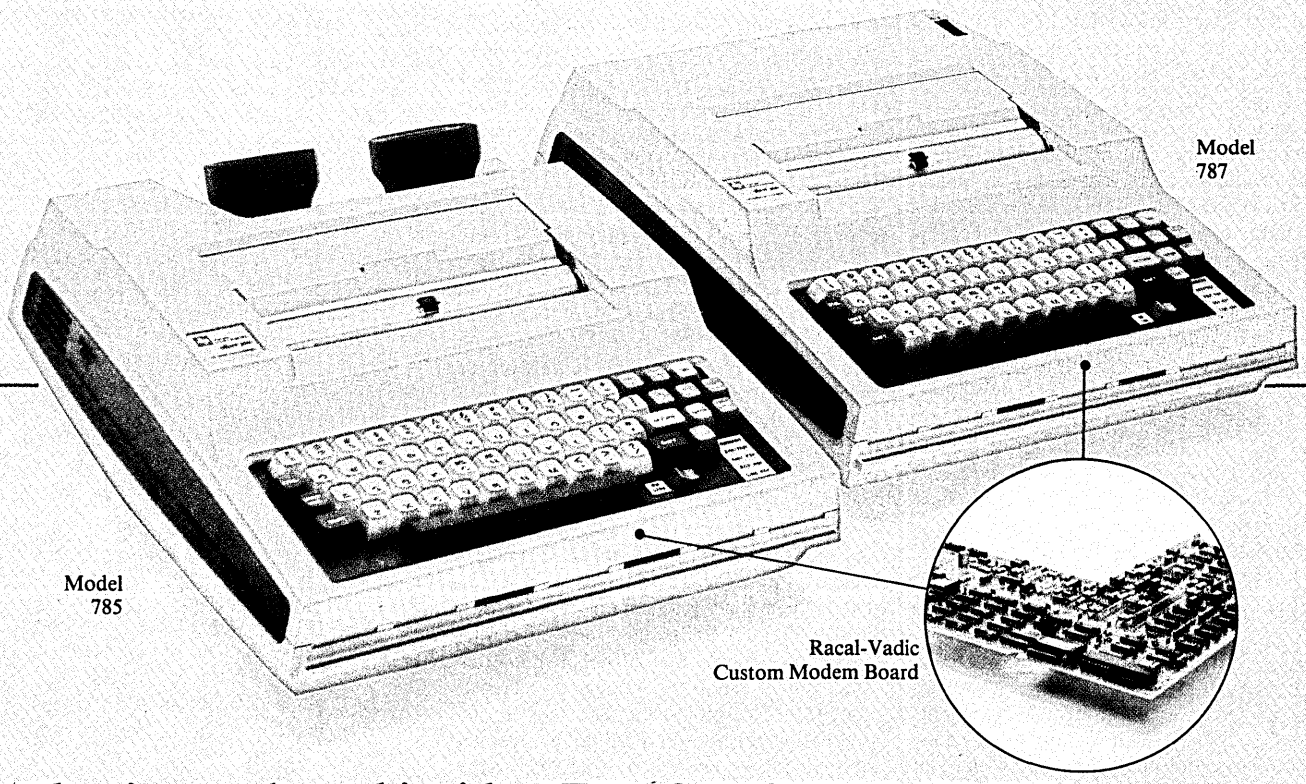

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CIRCLE 87 ON READER CARD

Getting a handle on the relative well-being of the industry's practitioners is an invaluable gauge for the industry as a whole.

tion and budget reporting that have affected our survey results. This is particularly true among installations reporting budgets of less than $100,000. Having a "vp of MIS" making $38,000 at an installation with a negligible budget just didn't make sense; examination of the questionnaires uncovered the incompatibilities. Persons answering to that title are often veritable vice presidents, but at branch offices of banks, insurance companies, and government offices, for example. They are in charge of small dp installations —but only as one of many listed duties. Some are controllers, others are business managers, but in every case they supervise no more than a handful of dp jobholders on a minuscule budget. In no way should such executives be viewed as being in positions truly comparable to those occupied by vice presidents of MIS at size 4 and 5 installations. The locations of these two groups, both within the corporate hierarchy and the dp industry, are radically different. Most of the "small-site administrators" are managing satellite, on-line installations and receive much of their dp advice and support from the central staff and equipment. For our purposes they should probably be placed under "Remote Site Administrator," our Job 44 title, but for the time being we have left the data as they were reported.

STANDARD BREAKDOWN USED

Our geographic breakdown is based on standard government divisions. Each region is represented by both large and small firms and with representation proportionate to their share of DATAMATION's readership. There is no statistically reliable pattern among salaries given by region, but a few statements can be made. Of the heavily industrialized regions, where the great bulk of dp jobs are located, New England and the mid-Atlantic states show mean salaries consistently at or slightly below the national mean. The Pacific Coast and East North Central (Chicago-Detroit corridor) salaries are generally above it. Most of the other regions, characterized by far fewer returns, show far greater variation in salaries given. For these areas, one person receiving a super-salary, or an installation reporting very low salaries, has a visible impact on overall averages. Canadian salaries likewise show no consistent trend.

While all industries are represented by returns from both large and small installations, the medical, utilities, and construction industries are represented by only a handful of returns. While this is an accurate portrayal of their share of the industry population, it makes finding a discernible pattern in our results less easy. The transporation industry is represented by many returns from large, well-endowed installations and the industry shows extremely high salaries across most job titles. The federal government, despite four years of reported low raises, remains more than competitive across most job categories. By comparison, and with the exception of a few managerial categories, state and local government personnel are consistently below the overall industry means. Computer firms tend to vary widely, giving extremely high salaries for some positions and quite low ones for others.

We requested salary increase information for both 1980 and 1981 on this year's questionnaire. Results are printed in the tables accompanying the text. Averages for both years weigh in at 10.2%, with most firms reporting similar numbers for the two years. While raises for 1980 ranged from 0% to 35% and projected increases for 1981 range from 0% to 25%, the vast majority of all firms fell into the 8% to 12% range. While across industry and region 1980 and 1981 show similar figures, there is a discernible jump from the much lower raises reported from a comparable survey two years ago. It is, however, only the occasional company that is giving raises above 15%, and such a high number often was shown to follow a year of far lower, or even negligible, increases.

No valid statistical inferences can be made on raises across industry type, except that the federal government reports sticking to the Carter guidelines and is giving significantly lower raises than all other industries. Analyzed by region, projected increases show few discernible patterns, except for the slightly lower East South Central number and the high raises reported by Canadian firms. The latter perhaps reflect the weakened position of the Canadian dollar. There is no statistically significant correlation between installation size and salary increases, although smaller firms appear to be awarding slightly lower raises than their larger counterparts. In sum, salary increases appear to be growing no more rapidly than dp budgets in general.

Are there any lessons from all of these exercises? Of course. Getting a handle on the relative well-being of the industry's practitioners is an invaluable gauge for the industry as a whole. All indications from this-year's budgets and salary surveys are that—across region, industry, and size of installation —salaries are up, budgets are up, and total numbers of jobs are up. The field isn't doing much better than staying abreast of the general inflation rate, but some industries certainly aren't doing even that. ❋

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JOB DESCRIPTION GUIDE

The following 47 job descriptions were used for classification of data processing personnel on the 1981 salary questionnaire. Respondents were asked to match their persoonel to our job descriptions as closely as possible.

1. *Vice President of MIS:* The senior executive for all corporate information systems. Responsible for long range planning, budgeting, and operations.
2. *Director of Communications:* Responsible for planning, implementing, and managing all corporate telecommunications facilities.
3. *Director of DP:* In charge of all dp at the divisional/departmental level. Responsibilities parallel those of corporate officers, but may be at least partially guided by decisions made at corporate level.
4. *Business Manager/Associate Director:* Concerned with preparation and review of dp budget and business plan; controls pricing and billing of computer services; negotiates vendor contracts; prepares estimates; and develops optimum product and service acquisition methods.
5. *Manager of Systems Analysis:* Responsible for development of data processing applied to specific user problems and for the design of dp solutions. Produces designs or specifications for programs to be used by other sections, such as Applications Programming.
6. *Senior Systems Analyst:* Leads analysis effort on major projects. Confers with users to define dp projects, formulates statements of problems or objectives, and designs solutions.
7. *Systems Analyst:* Works with senior analyst on large projects or solo on small efforts to define dp projects or project segments, or to iron out details in specifications.
8. *Manager of Applications Programming:* Responsible for the development of well-documented programs. Often works from program specifications and designs prepared by Systems Analysis section.
9. *Senior Applications Programmer:* Works with a variety of program designs or specifications of program changes to maintain existing programs.
10. *Applications Programmer:* Usually works on only one or a few types

of applications; qualified to work alone.

11. *Applications Programmer Trainee:* Learning to program. Usually works on one item at a time under direct supervision.

12. *Manager of Systems Analysis/Programming:* Responsible for the design and development of effective and efficient dp programs applied to specific user problems. Involved in both analysis and program formulation.

13. *Senior Systems Analyst/Programmer:* Leads analysis and formulation of program design on major projects. Confers with users to formulate statement of objectives, designs solutions, and develops effective programs.

14. *Systems Analyst/Programmer:* Works with senior analyst/programmer on large projects or solo on small efforts to define dp projects and develop applications.

15. *Systems Analyst/Programmer Trainee:* Learning to define problems, design solutions, and program. Works under direct supervision on one item at a time.

16. *Manager of Systems Programming:* Responsible for managing operating system software environment and for selection, installation, and maintenance of operating systems and utilities. Participates in projecting hardware and software requirements.

17. *Senior Systems Programmer:* Technical specialist in one or more components of systems software. Excells in problem determination and repair.

18. *Systems Programmer:* Specializes in the support of one operating system component or subsystem such as a compiler. Capable of modifying utilities or installing changes to operating system.

19. *Systems Programmer Trainee:* Has a good background in dp and knows or is learning assembler language.

20. *Manager of Data Base Administration:* Responsible for file organizations for shared data, creation of data dictionaries, standards for the use of data, and insurance of data integrity and security.

21. *Data Base Administrator:* Analyzes an application's computerized information requirements, coordinates data collection and storage needs; organizes data.

22. *Data Communications/Telecommunications Manager:* Responsible for the design of data communications networks and the installation and operation of data links.

23. *Data Communications Analyst:* Specializes in network design, traffic analysis, and data communications software. Performs simulation and modeling tasks, defines standard block sizes and message formats, and works with persons in other departments on the evaluation and selection of communications processors, telecommunications access methods, and protocols.

24. *Technical Control Specialist:* Diagnoses problems with common carrier communications equipment, deals with service interruptions and outages, examines and validates carrier chargers, monitors on-order equipment status, and installs independently-obtained equipment.

25. *Manager of Computer Operations:* Responsible for the operation of computers, including operation scheduling, assignment of operators, and monitoring of operations efficiency.

26. *Shift Supervisor:* Responsible for all computer, support, and peripheral operations during the work shift. Assigns operators as needed, deals with vendor engineers, and insures that corporate and dp department rules and procedures are followed.

27. *Lead Computer Operator:* Responsible for the operation of large-scale computers for an 8-hour shift or for the operation of one computer system at a multisystem site.

28. *Computer Operator:* Assists in running computers and may operate the central console in the absence of the lead operator; mounts and dismounts magnetic media, monitors and logs events, and services printers. Works with production controls and scheduling staff.

29. *Magnetic Media Librarian:* Maintains the library of magnetic tapes, disks, and/or cartridges.

30. *Production and I/O Control Supervisor:* Responsible for setting up and scheduling jobs for processing.

31. *Lead Production Control Clerk:* Responsible for the data control function during an eight-hour shift or for the data control function of a single site in a multisite organization.

32. *Production Control Clerk:* Prepares jobs for processing, enters the appropriate job commands, and gathers output for post processing.

33. *User Liaison:* Acts as first level interface between dp department and end users; represents users when operational problems occur.

34. *Data Entry Supervisor:* Responsible for a staff which performs keyboarding and verification.

35. *Data Entry Operator:* Operates one or more data entry devices, requires only general supervision.

36. *Word Processing Supervisor:* Responsible for supervising word processing equipment, operators, work flow, set-up, and distribution of results.

37. *Word Processing Operator:* Qualify to operate intelligent typewriters, WP systems, terminals for text-editing and word processing.

38. *Account Executive:* Responsible for all computer services to a particular segment of the end-user community.

39. *User Services Staff:* Knowledgeable in broad aspects of dp; provides guidance to users; helps in debugging specific problems and understanding system procedures.

40. *Technical Writer:* Writes manuals for application systems for user and internal reference.

41. *Librarian:* Responsible for organizing and maintaining the library of technical documentation.

42. *Remote Site Administrator:* In a distributed environment, often not a dp professional, but manages a remote site as an additional duty. Responsible for physical security, sets operational priorities, supervises operations, and initiates problem determination actions as required.

43. *Remote Terminal Operator:* Operates terminal and telecomm facilities remote from central site.

44. *Minicomputer Specialist:* Generalist in a single make/model/configuration of minicomputer hardware installation, application design, programming, testing, and initial production operation. Can troubleshoot, diagnose, and frequently can repair hardware and software as required.

45. *Training and Education Specialist:* Charged with upgrading programmer's skills.

46. *Computer Security Specialist:* Concerned with protection of data and computer resources.

47. *Field Service Engineer:* Vendor-trained electronic technician who can service mechanical equipment, repair/replace malfunctioning electronic components, and perform software problem determination.

SALARIES BY INSTALLATION SIZE DETERMINED BY TOTAL ANNUAL DP DEPARTMENT BUDGET*

	ALL INSTALLATIONS		$0 to $99,999		$100,000 to $499,999	
	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean
1. Vice President of MIS	16,286-120,000	40,753	21,000-38,000	30,657	16,286-63,000	34,925
2. Director of Communications	22,078- 70,000	41,120	— —	—	— —	27,000[a]
DIVISION OR DEPARTMENTAL STAFF						
3. Director of DP	14,400- 80,000	32,125	14,500-31,000	23,695	14,400-42,053	28,241
4. Business Manager	14,196- 55,000	27,073	22,000-26,000	24,610[a]	17,800-35,000	26,018
SYSTEMS ANALYSIS						
5. Manager	12,000- 59,000	31,005	12,000-28,000	20,333	20,000-48,000	28,388
6. Senior	12,000- 60,000	27,251	20,000-28,000	24,000[a]	12,000-35,000	23,196
7. Analyst	12,000- 45,000	24,454	15,000-24,000	19,500[a]	12,000-30,000	21,271
APPLICATIONS PROGRAMMING						
8. Manager	15,500- 49,229	28,550	— —	17,400[a]	15,500-40,000	26,904
9. Senior	10,000- 55,000	22,991	— —	—	10,000-29,000	19,417
10. Applications Programmer	8,500- 40,000	18,611	15,000-25,000	17,967	8,500-34,000	17,074
11. Trainee	9,000- 30,000	15,795	9,000-16,000	13,050	9,000-20,000	14,109
SYSTEM ANALYSIS/PROGRAMMING						
12. Manager	16,500- 60,000	31,071	18,000-18,600	18,300[a]	18,500-40,000	28,266
13. Senior	11,000- 55,000	26,343	— —	—	11,000-35,000	22,583
14. Analyst/Programmer	11,000- 45,000	21,806	12,000-18,000	15,360	11,000-41,000	20,143
15. Trainee	11,000- 28,000	16,787	— —	12,500[a]	11,000-22,680	15,664
OPERATING SYSTEMS PROGRAMMING						
16. Manager	12,000- 54,000	30,569	— —	—	12,000-30,000	21,200
17. Senior	9,000- 70,000	28,237	— —	—	9,000-30,120	17,555[a]
18. Systems Programmer	13,000- 50,000	23,959	— —	—	15,000-35,000	26,250[a]
19. Trainee	10,000- 28,000	16,880	10,000-12,000	10,500[a]	10,000-15,000	12,500[a]
DATA BASE ADMINISTRATION						
20. Manager	18,000- 48,000	31,686	— —	—	29,000-38,000	34,500[a]
21. Administrator	15,579- 48,000	27,513	— —	—	23,000-28,000	25,500[a]
DATA COMMUNICATIONS						
22. Manager	21,000-120,000	39,794	— —	—	— —	43,600[a]
23. Analyst	15,204- 75,000	29,862	— —	—	— —	—
24. Technical Control Specialist	13,000- 34,200	21,834	— —	—	— —	—
COMPUTER OPERATIONS						
25. Manager	9,543- 59,000	23,838	11,500-23,000	16,250	10,000-41,000	19,915
26. Shift Supervisor	8,775- 36,900	19,255	— —	—	10,000-25,000	15,465
27. Lead	8,000- 31,500	15,085	8,000-18,200	11,102	8,940-22,000	13,804
28. Operator	5,750- 26,400	13,254	9,000-18,000	11,937	5,750-23,800	12,636
29. Magnetic Media Librarian	7,700- 23,208	13,254	— —	—	— —	—
PRODUCTION AND I/O CONTROL						
30. Supervisor	10,000- 35,688	19,695	17,000-17,500	17,250[a]	10,000-18,000	14,750
31. Lead Production Control Clerk	9,000- 23,592	14,585	— —	—	9,000-15,000	11,365
32. Clerk	6,841- 20,500	11,613	— —	—	7,650-11,000	8,975
33. Liaison	7,200- 25,600	14,729	14,000-16,000	15,000[a]	— —	—
DATA ENTRY						
34. Supervisor	7,735- 37,200	14,524	7,735-17,776	12,074	8,000-18,000	11,964
35. Operator	6,384- 37,600	11,162	7,000-16,000	10,556	6,750-37,600	10,971
OTHER						
36. Word Processing Supervisor	9,500- 35,000	18,214	18,000-25,000	21,500[a]	10,000-20,000	15,500
37. Word Processing Operator	7,000- 26,252	14,028	13,200-13,200	13,200[a]	8,000-19,000	13,250[a]
38. Account Executive	13,524- 45,000	27,056	— —	—	13,524-19,452	16,488[a]
39. User Services Staff	8,000- 32,130	16,502	— —	—	8,000-22,000	13,708
40. Technical Writer	7,000- 31,080	17,264	— —	—	15,000-31,000	21,500[a]
41. Librarian	7,500- 32,000	17,964	9,766-19,747	14,756[a]	7,500-32,000	17,050
42. Remote Site Administrator	10,000- 41,660	25,029	— —	—	10,000-41,660	27,016[a]
43. Remote Terminal Operator	9,000- 19,747	12,288	— —	—	9,000-19,747	12,514
44. Minicomputer Specialist	9,500- 25,000	18,068	— —	—	9,500-17,776	13,637[a]
45. Training and Education Specialist	13,000- 32,000	23,646	— —	—	13,000-25,000	19,000[a]
46. Computer Security Specialist	18,600- 44,400	28,086	— —	—	— —	30,000[a]
47. Field Service Engineer	15,750- 23,000	18,050	— —	—	— —	15,750[a]

*Includes hardware, software, personnel, and all other costs. [a] Based on fewer than 3 installations reporting

$500,000 to $999,999		$1,000,000 to $9,999,999		$10,000,000 and above	
Reported Range	Mean	Reported Range	Mean	Reported Range	Mean
28,000-70,000	49,295	25,428-120,000	49,295	38,000-65,000	51,000[a]
60,000-70,000	65,000[a]	22,078- 52,900	34,811[a]	28,000-58,800	42,550[a]
24,108-73,600	35,772	24,000- 65,000	38,848	15,841-80,000	52,758
20,000-55,000	34,500	14,196- 36,500	24,934	23,784-38,196	30,990[a]
20,000-51,000	31,264	19,800- 47,200	31,976	34,000-59,000	43,633
19,500-42,500	27,183	17,250- 45,000	28,221	19,800-40,000	30,021
16,000-37,000	24,877	13,584- 43,000	26,148	15,732-36,000	26,227
24,400-42,500	30,162	20,000- 38,700	26,447	27,100-49,229	36,630
13,900-37,000	22,822	15,579- 45,000	23,613	16,620-36,000	30,235
11,900-32,000	19,127	11,900- 36,000	19,926	13,464-31,500	23,065
10,000-24,500	15,602	10,500- 25,000	17,019	10,104-30,000	18,116
21,694-60,000	32,179	16,500- 58,800	32,419	23,784-54,000	33,863
20,000-55,000	29,001	15,250- 45,000	27,500	24,000-44,400	29,800
15,212-45,000	23,246	13,584- 36,000	22,827	20,400-36,900	25,133
16,000-28,000	19,231	11,424- 21,064	17,532	12,744-18,450	16,072[a]
21,000-36,700	27,420	19,224- 45,500	30,766	25,428-54,000	36,464
20,000-43,200	29,231	19,224- 70,000	28,853	21,036-36,100	29,911
17,000-37,000	24,291	13,000- 36,000	23,636	16,620-32,000	25,195
11,000-16,000	13,500[a]	13,584- 24,000	19,343	— —	28,000[a]
24,500-38,000	29,375[a]	18,000- 37,404	28,744	23,784-48,000	34,427
20,000-33,000	25,816	15,579- 41,000	26,842	20,400-48,000	31,075
— —	—	21,000-120,000	42,020	23,784-54,000	36,807
— —	—	15,204- 75,000	31,053	21,900-36,900	28,672
18,000-25,000[a]	—	16,620- 27,000	21,848	13,000-34,200	21,905
10,132-37,800	22,043	13,000- 42,300	26,264	9,543-59,000	35,944
8,775-22,000	17,075	13,000- 30,000	19,462	12,804-36,900	24,667
8,775-24,500	15,016	9,600- 25,000	16,632	12,000-31,500	20,114
8,075-25,000	13,518	7,500- 25,668	14,488	8,123-26,400	15,766
7,700-16,236	11,688	8,450- 23,208	13,194	8,580-20,000	15,027
12,000-24,600	17,300	11,400- 32,100	20,480	15,000-35,688	24,511
11,800-17,600	14,075[a]	10,000- 23,592	15,168	11,000-20,916	16,904
7,000-20,500	11,624	8,000- 18,516	11,974	6,841-20,000	13,757
12,900-25,600	16,925[a]	7,200- 24,370	14,275	11,500-18,500	15,000[a]
8,590-20,000	13,505	8,000- 37,200	16,899	10,464-29,100	20,276
6,700-25,000	11,525	7,000- 16,680	11,347	6,384-20,000	11,832
19,000-35,000	27,750[a]	12,250- 24,700	16,557	9,500-29,100	17,725[a]
— —	17,500[a]	8,060- 26,252	13,629	7,000-18,180	11,981
— —	—	— —	22,000[a]	23,784-45,000	34,868[a]
8,917-27,300	20,202	12,400- 32,130	17,918	— —	—
7,000-12,000	9,500[a]	18,000- 21,000	19,500[a]	18,600-31,080	25,055[a]
— —	—	9,400- 23,448	14,863	12,000-26,400	19,152
— —	—	15,732- 26,040	20,886[a]	23,160-41,660	31,027[a]
— —	—	9,792- 15,996	11,838	— —	—
— —	—	19,000- 25,000	22,500[a]	13,000-25,000	19,000[a]
20,000-25,000	22,500[a]	14,000- 30,244	21,328	19,000-32,000	27,586
— —	—	18,600- 33,200	23,987	21,000-44,400	30,682
— —	—	17,700- 23,000	20,350[a]	— —	—

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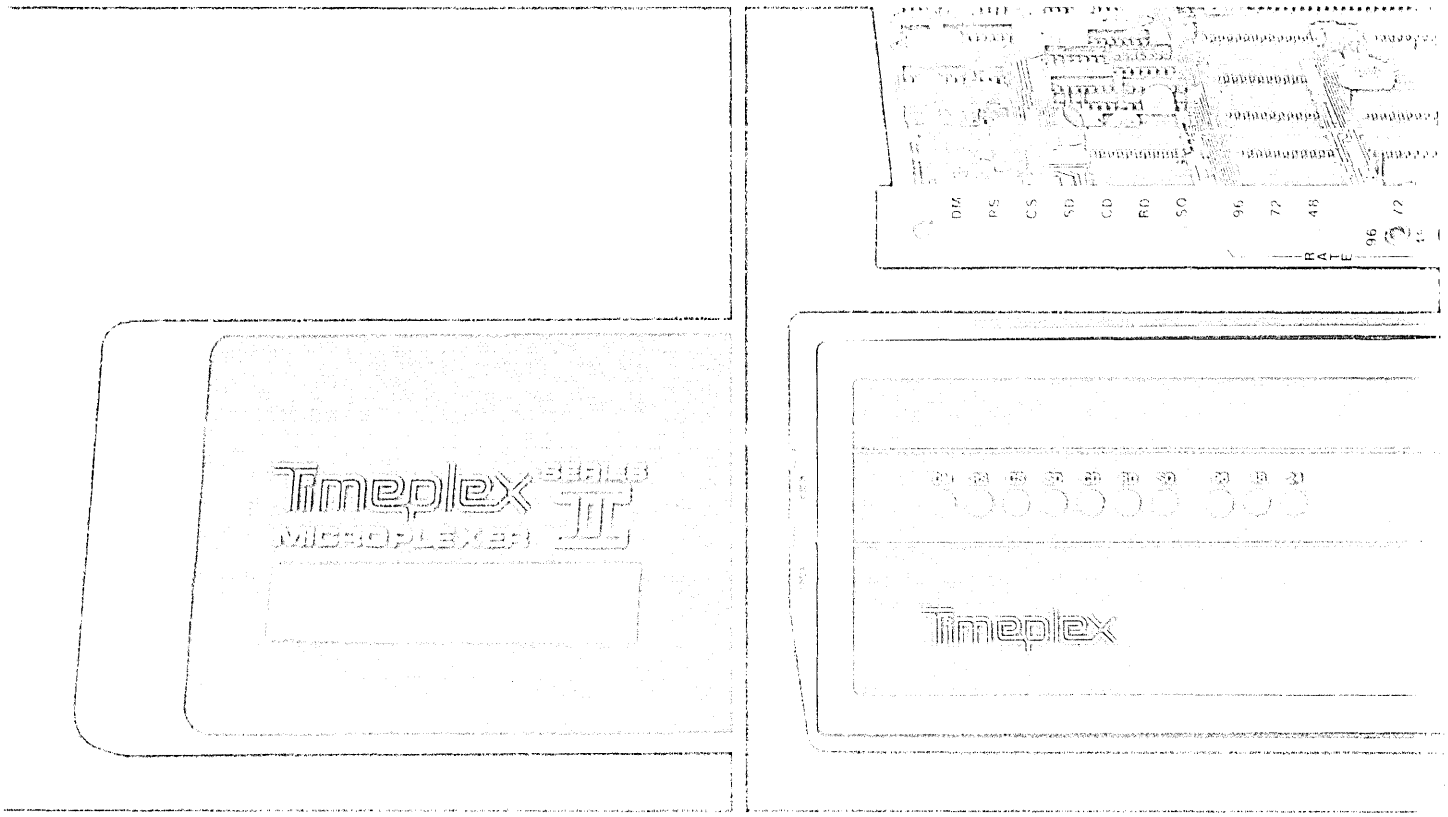

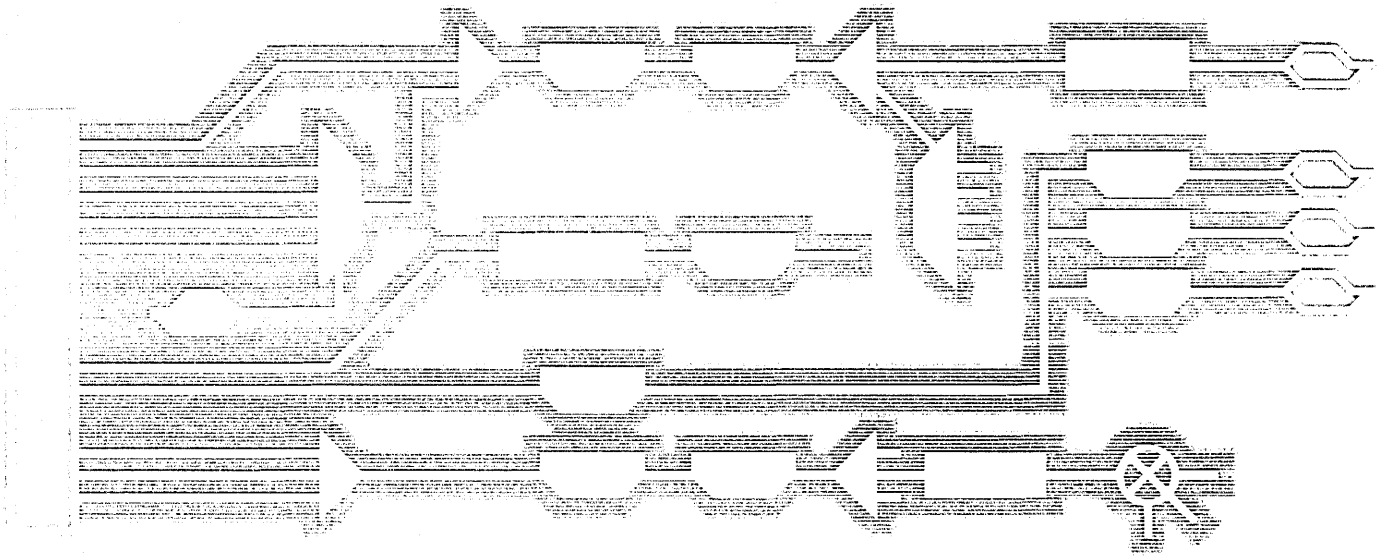

[illegible] the diagram above [illegible] for virtually every part of [illegible] the Timeplex systems [illegible] your network. We have a free [illegible] employs a data communications [illegible] information to assist you in design- [illegible]

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CIRCLE 118 ON READER CARD

AVERAGE SALARY BY INDUSTRY

JOB TITLE	All Installations	Computer Mfg. and Services	Other Mfg. and Processing	Fedl Govt.	State and Local Govt.
CORPORATE STAFF					
1. Vice President of MIS	40,753	32,400	48,000	38,120	46,833
2. Director of Communications	41,120	—	35,550[a]	—	31,761[a]
DIVISION or DEPARTMENTAL STAFF					
3. Director of DP	32,150	30,250	32,297	36,086	29,318
4. Business Manager	27,073	19,000[a]	26,374	17,556[a]	30,520[a]
SYSTEMS ANALYSIS					
5. Manager	31,005	28,464	32,409	30,649	29,596
6. Senior	27,251	31,770	26,102	28,661	24,613
7. Analyst	24,454	23,975	24,599	24,620	23,522
APPLICATIONS PROGRAMMING					
8. Manager	28,550	27,578	26,766	34,025[a]	31,093
9. Senior	22,991	27,700	22,157	24,609	21,329
10. Programmer	18,611	18,777	17,275	21,567	17,842
11. Trainee	15,795	12,513	15,260	16,408	14,535
SYSTEMS ANALYSIS/PROGRAMMING					
12. Manager	31,071	32,200	33,991	32,951	25,774
13. Senior	26,343	26,500	25,513	27,699	22,017
14. Analyst/Programmer	21,806	22,187	21,135	23,204	20,802
15. Trainee	16,787	18,000[a]	16,567	17,666	14,478
OPERATING SYSTEMS PROGRAMMING					
16. Manager	30,569	30,000[a]	27,943	30,507	29,898
17. Senior	28,237	31,250[a]	33,175	28,848	25,646
18. Programmer	23,959	34,500[a]	21,524	25,805	21,411
19. Trainee	16,880	—	11,750[a]	21,000[a]	17,677[a]
DATABASE ADMINISTRATION					
20. Manager	31,686	—	32,633	31,000[a]	33,868[a]
21. DB Administrator	27,513	25,500	25,316	36,500[a]	34,025[a]
DATA COMMUNICATIONS					
22. Manager	39,794	90,000[a]	27,550	—	40,000[a]
23. Analyst	29,862	60,000[a]	28,200[a]	—	28,452
24. Technical Control Specialist	21,834	—	—	20,556[a]	18,968[a]
COMPUTER OPERATIONS					
25. Manager	23,838	21,450	22,349	27,612	25,447
26. Shift Supervisor	19,255	22,500[a]	18,547	22,129	17,551
27. Lead Computer Operator	15,085	14,624	14,458	16,751	15,054
28. Operator	13,254	12,794	13,124	15,175	13,357
29. Magnetic Media Librarian	13,254	9,100[a]	11,036	15,135[a]	13,142
PRODUCTION AND I/O CONTROL					
30. Supervisor	19,695	24,400	20,350	19,028[a]	21,834
31. Lead Production Control Clerk	14,585	11,500[a]	14,295	12,658	15,520
32. Clerk	11,613	11,540	11,739	11,301	11,602
33. User Liaison	14,727	10,050[a]	12,243	—	18,235[a]
DATA ENTRY					
34. Supervisor	14,524	12,700	13,433	16,112[a]	12,352
35. Operator	11,162	10,920	10,892	11,527	10,382
OTHERS					
36. Word Processing Supervisor	18,214	15,000[a]	23,050[a]	—	13,773[a]
37. Word Processing Operator	14,028	13,800[a]	13,920[a]	21,500[a]	11,351
38. Account Executive	27,056	22,000[a]	—	—	29,736[a]
39. User Services Staff	16,502	17,060	18,500[a]	—	10,808[a]
40. Technical Writer	17,264	17,500	19,500[a]	—	—
41. Librarian	15,580	11,133	10,500[a]	22,878[a]	17,119
42. Remote Site Administrator	25,029	—	—	28,870[a]	17,178[a]
43. Remote Terminal Operator	12,288	12,500[a]	10,775[a]	13,227	—
44. Minicomputer Specialist	18,068	—	18,850	15,724[a]	—
45. Training and Education Specialist	23,646	14,000[a]	28,000	17,470[a]	23,076
46. Computer Security Specialist	28,086	—	—	27,930[a]	28,000[a]
47. Field Service Engineer	18,050	—	—	—	—

[a] Fewer than 3 installations reporting.

Education	Finance	Trade: Wlsle and Retail	Medical and Legal	Transp. Services	Utilities	Constr, Mining, Agric.	Other Business Services
34,642	36,707	40,525	30,750	54,750[a]	36,825	100,000[a]	39,300
—	—	—	—	47,100[a]	—	—	65,000[a]
29,108	33,758	32,708	28,111	47,320	25,050	33,550[a]	39,000
25,750[a]	24,500[a]	35,000[a]	25,250[a]	22,500[a]	24,000[a]	—	42,500[a]
31,315[a]	30,314	34,590	25,500[a]	43,000[a]	30,650[a]	21,500[a]	32,000
28,291	26,070	24,672	24,000	34,250[a]	32,862[a]	37,500[a]	27,667
24,600	20,585	26,468	25,316	36,000[a]	24,900[a]	28,750[a]	22,007
22,850[a]	27,625[a]	30,666	26,850[a]	40,000[a]	—	17,400[a]	31,750[a]
20,033	19,803	20,912	21,545	28,000	18,492[a]	32,000[a]	23,250
17,595	19,384	18,281	17,610	23,750	19,000[a]	22,300	18,356
16,515[a]	14,743	15,941	17,285[a]	20,037	16,850[a]	20,000[a]	16,167
—	29,095	34,307	26,969[a]	37,316	30,800[a]	—	36,750
25,292	26,073	27,176	24,050[a]	30,600	26,350[a]	37,500[a]	30,000
18,884	19,994	22,640	19,666	29,050	24,854[a]	30,000[a]	24,000
12,750[a]	14,980	17,354	—	24,000	19,248[a]	20,000[a]	19,500
31,350[a]	32,687	33,317	27,515[a]	38,650	—	—	28,667
27,150[a]	26,994	26,775[a]	24,050[a]	37,000[a]	—	37,500[a]	26,167
29,700[a]	22,844	24,571 21,925[a]	27,750[a]	—	30,000[a]	20,000	—
13,500[a]	16,569	—	28,000[a]	11,500[a]	20,000[a]	—	
29,200[a]	35,250[a]	30,774[a]	21,750[a]	33,625[a]	—	—	27,500[a]
—	29,875[a]	25,990	23,043[a]	29,650[a]	—	—	22,500[a]
—	40,000[a]	34,320[a]	23,780[a]	41,600[a]	—	—	43,600
—	26,515	19,398[a]	—	28,700[a]	—	—	—
—	22,180	—	—	24,650[a]	—	—	—
23,366	23,523	25,994	18,615	37,462	21,011	—	26,400
20,125[a]	16,614	21,484	16,335	29,700[a]	21,264[a]	—	20,125
13,875	13,116	16,313	14,199	20,637	—	14,300[a]	17,125
13,144	12,015	13,786	13,055	17,700	15,254	12,300	13,619
13,895[a]	13,438	12,757	—	17,342[a]	18,642[a]	—	—
20,866	16,816	24,518[a]	16,332[a]	22,183	—	—	15,417
15,066	13,470	15,648	—	20,000[a]	16,860[a]	—	14,500
14,166	10,454	12,100	10,912	16,325[a]	—	—	8,625[a]
16,375[a]	20,950[a]	—	15,000[a]	—	—	—	—
13,776	15,723	14,588	12,808	19,783	15,286	10,500[a]	21,025
10,718	11,772	10,967	11,081	14,076	11,810	9,500[a]	11,613
—	18,168[a]	—	14,670	23,100[a]	—	—	20,500
10,900[a]	11,364	12,324[a]	16,640[a]	14,685[a]	—	—	17,250[a]
—	40,000[a]	—	16,488[a]	—	—	—	—
14,200[a]	11,124[a]	26,775[a]	—	—	—	—	22,500[a]
—	—	—	25,055	—	—	—	—
—	14,976	11,899[a]	—	21,150[a]	16,860[a]	—	—
—	25,200[a]	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	26,374	—	24,000[a]	30,000	—	—	22,500[a]
—	24,240[a]	—	—	32,175[a]	—	—	—
—	—	20,350[a]	15,750[a]	—	—	—	—

SALARIES BY REGION

JOB TITLE	ALL INSTALLATIONS		NEW ENGLAND		MID-ATLANTIC		EAST NORTH CENTRAL		WEST NORTH CENTRAL	
	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean
CORPORATE STAFF										
1. Vice President of MIS	16,286-120,000	40,753	32,000-70,000	47,250[a]	22,000-65,000	38,881	25,428-58,500	38,513	24,000-44,100	32,300
2. Director of Communications	22,078- 70,000	41,120	33,100-63,000	48,325[a]	28,000-48,000	38,000[a]	— —	27,000[a]	— —	—
DIVISION or DEPARTMENTAL STAFF										
3. Director of Dp	14,400- 80,000	32,125	20,000-49,550	30,991	16,000-73,600	31,450	19,000-76,500	32,830	14,500-37,000	26,420
4. Business Manager	14,196- 55,000	27,073	25,000-35,000	27,610[a]	18,000-22,000	20,000	14,196-38,196	24,774	— —	18,000
SYSTEMS ANALYSIS										
5. Manager	12,000- 59,000	31,005	20,000-51,000	34,475	22,000-59,000	32,916	19,800-48,000	33,666	20,000-20,000	20,000[a]
6. Senior	12,000- 60,000	27,251	19,885-42,500	25,619	12,000-36,000	23,225	19,800-33,400	28,124	25,000-25,000	25,000[a]
7. Analyst	12,000- 45,000	24,454	18,500-37,000	25,170	12,000-34,000	22,278	13,000-35,000	22,761	16,000-26,000	19,000
APPLICATIONS PROGRAMMING										
8. Manager	15,500- 49,229	28,550	17,400-42,500	26,333	20,000-48,000	29,367	22,300-49,229	31,185	21,000-21,000	21,000[a]
9. Senior	10,000- 55,000	22,991	13,400-37,000	22,614	13,900-29,000	21,193	14,000-41,000	22,704	15,000-28,000	19,248
10. Programmer	8,500- 40,000	18,611	11,000-32,000	17,581	10,000-32,000	17,976	12,000-29,236	17,925	12,000-33,500	17,270
11. Trainee	9,000- 30,000	15,795	10,500-24,500	15,699	10,300-25,000	15,338	10,104-24,165	15,435	9,000-16,000	11,625
SYSTEMS ANALYSIS PROGRAMMING										
12. Manager	16,500- 60,000	31,071	23,651-42,900	29,713	18,500-41,000	29,330	18,600-47,356	29,175	32,000-32,000	32,000[a]
13. Senior	11,000- 55,000	26,343	11,000-36,900	25,307	18,000-29,400	22,033	18,000-41,000	27,797	20,000-30,120	23,370
14. Analyst/Programmer	11,000- 45,000	21,806	14,000-35,300	20,314	12,000-30,700	20,264	13,000-35,000	21,555	16,620-24,900	19,190
15. Trainee	11,000- 28,000	16,787	17,100-18,450	17,775[a]	16,000-21,800	18,900[a]	11,000-25,199	17,770	15,000-22,680	16,950[a]
OPERATING SYSTEMS PROGRAMMING										
16. Manager	12,000- 54,000	30,569	21,308-42,900	30,670	26,000-48,000	34,500	18,000-38,700	28,568	30,000-30,000	30,000[a]
17. Senior	9,000- 70,000	28,237	20,000-42,500	30,012	25,400-43,200	34,300[a]	19,800-35,000	27,444	20,100-30,120	25,110[a]
18. Programmer	13,000- 50,000	23,959	14,820-37,000	25,378	16,000-30,000	21,583	16,620-35,000	24,476	22,700-26,100	24,400[a]
19. Trainee	10,000- 28,000	16,880	10,000-22,500	16,250[a]	10,000-13,000	11,500[a]	10,000-24,000	15,237	— —	—
DATABASE ADMINI.										
20. Manager	18,000- 48,000	31,868	30,800-41,000	35,900[a]	28,000-48,000	35,000[a]	18,000-13,688	27,162	— —	—
21. DB Administrator	15,579- 48,000	27,513	15,579-34,000	25,112	21,000-48,000	29,750[a]	18,000-41,000	27,916	— —	—
DATA COMMUNICATIONS										
22. Manager	21,000-120,000	39,794	21,308-37,800	28,440[a]	21,000-48,000	33,333	23,784-35,688	29,736[a]	— —	—
23. Analyst	15,204- 75,000	29,862	24,200-32,200	28,200[a]	22,000-35,000	28,500[a]	23,600-36,500	29,893[a]	— —	—
24. Technical Control Specialist	13,000- 34,200	21,834	— —	—	13,000-27,000	20,500[a]	16,620-24,492	20,556[a]	— —	—
COMPUTER OPERATIONS										
25. Manager	9,543- 59,000	23,838	12,300-41,500	22,589	10,375-59,000	22,112	13,000-42,300	24,769	10,000-30,120	19,040
26. Shift Supervisor	8,775- 36,900	19,255	12,220-27,700	18,084	8,775-30,000	17,862	12,804-30,543	18,888	10,000-27,000	18,050
27. Lead Computer Op'r	8,000- 31,500	15,085	9,700-25,000	15,699	8,775-21,200	13,553	8,940-23,319	14,786	8,000-15,000	11,450
28. Operator	8,000- 26,400	13,254	8,000-25,000	13,064[a]	8,000-22,000	12,780	5,750-21,591	12,710	8,000-18,800	12,376
29. Magnetic Media Librarian	7,700- 23,208	13,254	8,580-11,800	10,345[a]	7,700-17,000	10,531	9,100-14,000	12,190	— —	—
PRODUCTION and I/O CONTROL										
30. Supervisor	10,000- 35,688	19,695	14,035-32,100	20,792	15,000-25,000	21,400	14,000-35,688	21,318	14,000-18,000	16,000[a]
31. Lead	9,000- 23,592	14,585	12,320-16,900	14,610[a]	9,500-22,470	14,095	10,000-21,000	14,925	10,000-15,000	12,500[a]
32. Clerk	6,841- 20,500	11,613	7,904-15,550	10,588	7,000-15,000	11,018	8,000-16,200	11,832	7,652-14,160	9,872[a]
33. User Liason	7,200- 25,600	14,727	14,000-16,000	15,000[a]	7,200-25,600	13,313	— —	—	— —	—
DATA ENTRY										
34. Supervisor	7,735- 37,200	14,524	9,000-36,900	15,073	8,000-25,000	13,536	8,000-25,640	13,045	7,735-15,288	10,764
35. Operator	6,384- 37,600	11,162	6,750-25,000	11,443	6,700-15,000	10,497	7,500-15,055	10,728	7,000-37,600	12,189
OTHERS										
36. Word Processing Supervisor	9,500- 35,000	18,214	15,579-32,000	21,443	9,500-15,200	12,350[a]	— —	—	10,000-15,000	12,500[a]
37. Word Processing Operator	7,000- 26,252	14,028	21,308-26,252	23,780[a]	7,000-12,000	9,500[a]	9,100-13,800	11,450[a]	8,000-11,000	9,500[a]
38. Account Executive	13,524- 45,000	27,056	— —	—	13,524-22,000	19,244[a]	23,784-35,688	29,736[a]	— —	—
39. User Services Staff	8,000- 32,130	16,502	— —	16,000[a]	13,000-22,000	15,750[a]	21,420-32,130	26,775[a]	8,628-24,000	14,949[a]
40. Technical Writer	— —	—	18,000-21,000	19,500[a]	— —	—	— —	—	— —	—
41. Librarian	7,500- 32,000	15,580	13,800-20,600	17,200[a]	9,400-19,500	12,575[a]	10,000-24,492	15,528[a]	— —	—
42. Remote Site Admin.	10,008- 41,660	25,029	— —	—	— —	—	15,732-26,040	20,886[a]	— —	—
43. Remote Site Operator	9,000- 19,747	12,288	— —	—	— —	—	9,500-15,996	11,742	— —	—
44. Minicomputer Spec.	9,500- 25,000	18,068	— —	—	19,000-25,000	22,000[a]	9,500-23,000	17,275[a]	— —	—
45. Training and Education Specialist	13,000- 32,000	23,646	20,000-32,000	26,000[a]	14,000-32,000	19,750[a]	17,900-29,304	23,401[a]	13,000-25,000	19,000[a]
46. Computer Security Specialist	18,600- 44,400	28,086	— —	—	21,000-36,000	28,500[a]	21,800-33,200	27,500[a]	— —	—
47. Field Service Eng'r	15,750- 23,000	18,050	— —	—	15,750-15,750	15,750	— —	—	— —	—
			Maine Vermont Connecticut	Massachusetts Rhode Island New Hampshire	New York New Jersey	Pennsylvania	Ohio Indiana Illinois	Michigan Wisconsin	Minnesota Iowa Missouri Nebraska	South Dakota North Dakota Kansas

a. Fewer than 3 installations reporting

SOUTH ATLANTIC		EAST SOUTH CENTRAL		MOUNTAIN		WEST SOUTH CENTRAL		PACIFIC		CANADA	
Reported Range	Mean	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean	Reported Range	Mean
16,286- 68,000	39,738	30,000-86,000	50,833	25,000-49,229	37,683	30,000-120,000	58,750	19,500-81,600	39,596	33,100-63,000	48,325[a]
22,078- 28,968	25,523[a]	—	—	—	—	35,400- 58,800	47,100[a]	35,300-70,000	54,550[a]	—	—
15,841- 80,000	35,719	27,000-35,000	30,500	20,000-41,660	29,080	14,400- 58,800	30,574	18,000-65,000	34,986	15,000-42,000	31,166
17,800- 26,000	22,575[a]	20,000-25,000	22,500[a]	22,000-35,000	29,750[a]	—	—	17,500-55,000	33,250	20,000-25,000	22,500[a]
16,000- 44,000	28,932	20,000-25,000	22,500[a]	30,000-41,660	33,427[a]	12,000- 35,500	26,760	22,000-47,200	32,350	36,000-48,000	42,000[a]
17,684- 60,000	28,073	35,000-35,000	35,000	25,000-35,033	27,996[a]	17,250- 45,000	26,500	15,000-43,000	28,140	24,900-37,000	30,016
13,584- 45,000	24,610	30,000-30,000	30,000[a]	19,000-29,236	23,680	21,800- 36,000	26,950[a]	15,000-43,000	27,148	20,950-30,500	26,083
15,500- 40,000	27,054	—	—	29,700-30,000	29,850[a]	20,000- 38,500	28,312	18,000-40,000	30,000	—	—
10,000- 55,000	23,549	—	—	23,100-30,000	26,550[a]	18,000- 45,000	25,166	15,000-28,000	21,853	20,950-30,000	24,712
8,500- 40,000	19,430	18,000-25,000	21,250[a]	13,416-24,165	18,415	11,960- 36,000	20,432	15,000-25,000	19,914	14,400-34,000	20,137
9,000- 30,000	16,875	16,000-16,000	16,000[a]	12,000-19,747	14,668	11,250- 26,400	17,030	12,000-22,568	17,682	12,000-19,850	16,258
18,000- 38,000	28,200	25,200-42,000	32,100[a]	32,048-41,660	34,652[a]	16,500- 54,000	31,425[a]	23,652-60,000	38,135	26,600-45,100	32,383
13,000- 32,600	22,572	23,150-30,000	25,075[a]	20,820-35,033	26,750	15,250- 45,000	30,366	14,000-55,000	29,315	20,000-30,000	26,475
11,000- 28,500	19,938	14,000-26,000	18,193	16,000-29,236	20,821	14,250- 36,900	24,787	16,000-45,000	24,931	19,700-41,000	24,946
11,424- 16,473	14,317	12,000-20,000	14,666	12,000-16,000	13,975[a]	16,000- 24,000	20,000[a]	14,340-28,000	20,124	17,000-22,000	19,500[a]
19,224- 44,000	30,888	—	—	32,048-41,660	36,777[a]	22,000- 54,000	31,283	21,700-45,500	32,120	28,250-31,500	29,875[a]
19,224- 70,000	28,461	—	—	26,951-35,033	29,546[a]	30,000- 45,000	37,500[a]	—	—	23,800-32,400	26,425[a]
13,000- 50,000	23,379	15,000-25,000	19,500[a]	22,486-29,236	25,130[a]	17,700- 36,000	22,962	19,700-35,000	27,013	18,500-32,000	25,243
11,000- 28,000	19,301	—	—	—	—	16,000- 24,000	20,000[a]	16,848-22,568	19,708[a]	10,820-16,220	13,520[a]
24,400- 38,000	32,390	—	—	—	—	—	—	24,144-37,404	30,887[a]	30,000-45,100	35,075[a]
20,000- 32,000	26,666	—	—	—	—	20,400- 34,200	27,300[a]	22,100-34,320	28,210[a]	28,250-31,500	23,437[a]
40,000-120,000	65,000[a]	—	—	—	—	32,400- 54,000	43,200[a]	29,120-43,600	38,960[a]	—	—
22,078- 75,000	34,404	—	—	—	—	21,900- 36,900	29,400[a]	15,204-29,300	23,324[a]	25,900-30,500	28,200[a]
17,678- 25,000	21,312	—	—	—	—	20,400- 34,200	27,300[a]	21,300-24,500	22,900[a]	19,140-22,500	20,820[a]
9,543- 48,000	25,158	14,000-32,000	22,500	17,000-37,800	26,100	15,400- 54,000	26,856	10,132-39,520	24,064	15,900-41,000	26,996
12,000- 30,000	19,304	—	—	16,826-26,605	20,682[a]	13,000- 36,900	21,106	16,260-26,268	21,512	21,060-24,720	23,445[a]
10,000- 28,000	16,112	—	—	15,193-24,165	19,679[a]	9,200- 31,500	14,164	13,600-22,308	17,377	13,200-20,280	15,660
8,000- 24,000	13,571	10,000-18,000	14,250	9,600-19,747	12,925	7,500- 26,400	13,051	12,000-25,668	14,268	12,800-23,800	15,587
8,904- 20,000	14,366	—	—	15,793-19,747	17,770	10,000- 18,180	13,842[a]	8,800-23,208	14,367	14,940-17,580	16,260[a]
10,000- 24,000	16,871	14,000-18,000	16,871	17,000-19,000	17,500[a]	12,000- 31,500	19,025[a]	11,400-32,052	22,698	14,580-21,860	18,220[a]
9,000- 20,000	14,431	—	—	10,963-14,248	12,605[a]	11,800- 15,100	13,450[a]	11,000-23,592	15,035	9,880-20,280	15,562[a]
6,841- 20,000	11,857	8,000-10,000	9,000[a]	9,766-13,416	11,275	8,000- 13,200	10,125[a]	8,500-18,516	12,438	8,900-20,500	15,297
11,000- 24,370	17,235[a]	—	—	—	12,900[a]	—	—	17,000-22,500	19,750[a]	—	—
8,590- 37,200	16,308	—	14,500[a]	11,000-15,540	13,084	9,000- 29,100	14,536	10,000-26,000	15,756	15,000-24,720	17,796
6,384- 20,000	11,000	8,000-14,000	11,166	8,000-12,700	10,429	6,968- 18,180	10,874	7,000-16,680	11,608	8,270-19,400	13,006
12,500- 19,536	15,744	—	—	12,250-16,000	14,125[a]	17,100- 29,100	23,100[a]	15,000-35,000	21,150	13,440-20,160	16,800[a]
8,060- 14,872	11,517	—	—	—	—	11,190- 25,000	18,092[a]	10,504-20,000	14,177	9,920-14,880	12,080[a]
—	—	—	—	—	—	—	—	—	—	35,000-45,000	40,000[a]
8,917- 25,000	15,052	—	—	8,000-27,300	20,650[a]	—	—	11,500-12,400	11,950[a]	—	—
7,000- 31,000	18,750[a]	—	—	—	—	—	—	15,000-31,080	20,028[a]	—	—
7,500- 23,448	13,517	—	—	—	—	15,900- 26,400	21,150[a]	11,400-32,000	17,841	—	—
32,048- 41,660	36,854[a]	—	—	—	—	—	—	10,008-24,348	17,178[a]	23,160-27,240	25,200[a]
11,000- 19,747	13,575	—	—	—	—	—	—	9,000-11,000	10,000[a]	—	—
13,672- 17,776	15,724[a]	—	—	—	—	—	—	—	—	—	—
16,560- 30,244	25,687	—	—	15,193-19,747	17,470[a]	—	—	—	—	28,260-31,500	29,880[a]
18,600- 30,000	24,300[a]	—	30,000[a]	22,486-29,236	25,861	24,300- 44,400	34,350[a]	—	—	28,260-31,500	29,880[a]
—	—	—	—	—	—	17,700- 23,000	20,350[a]	—	—	—	—

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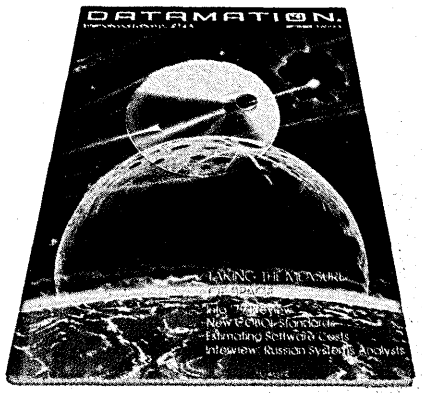

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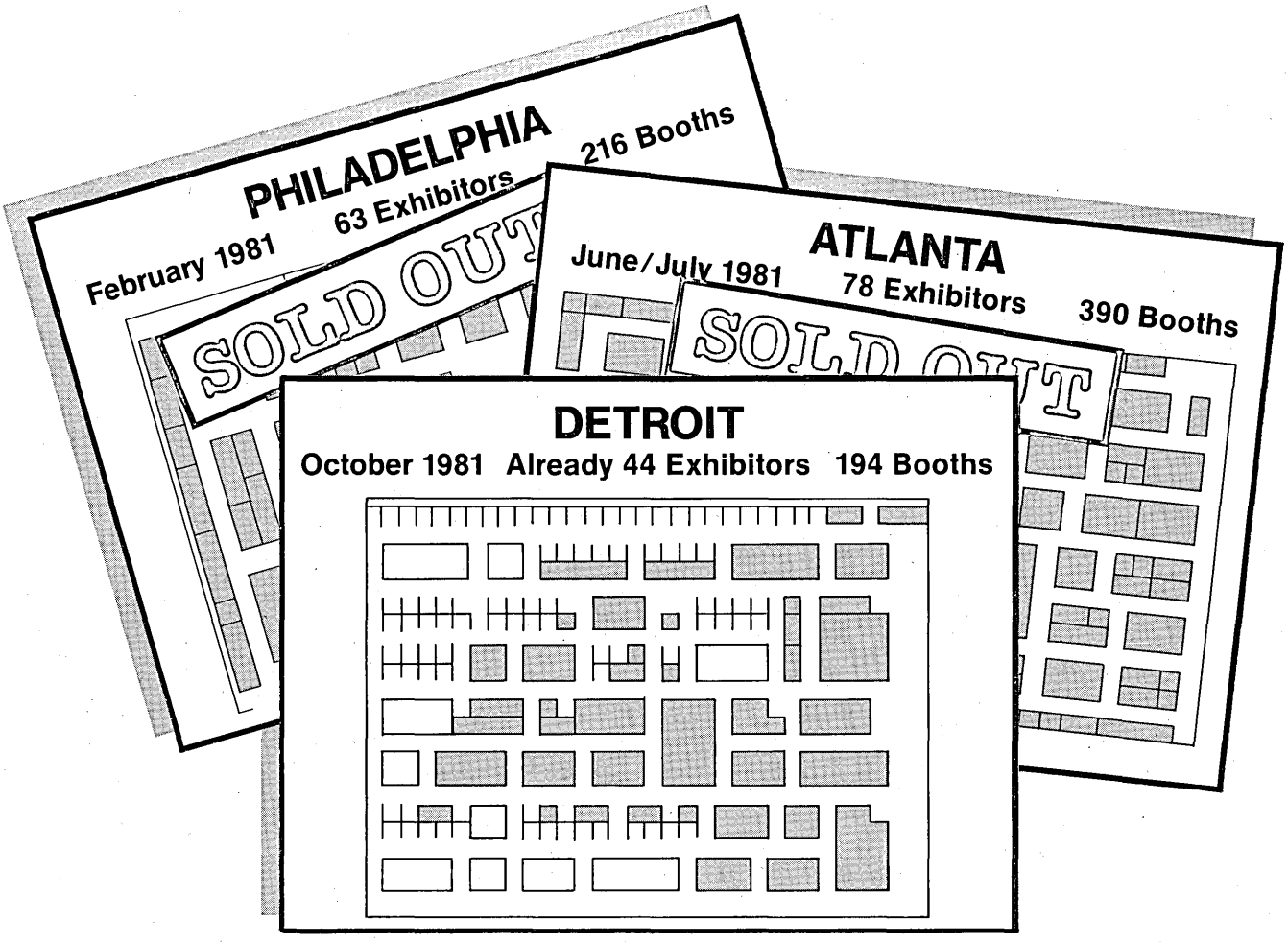

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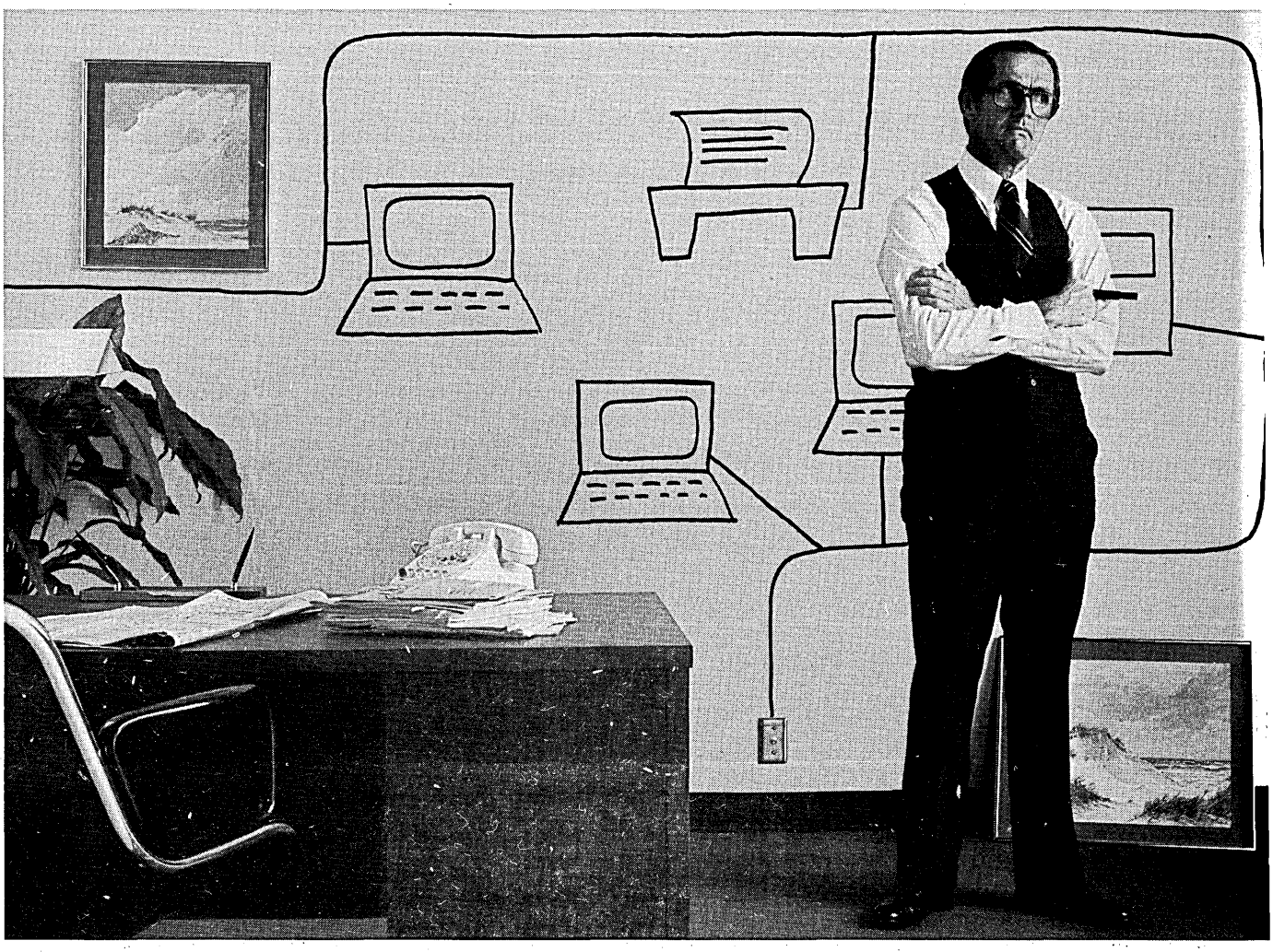

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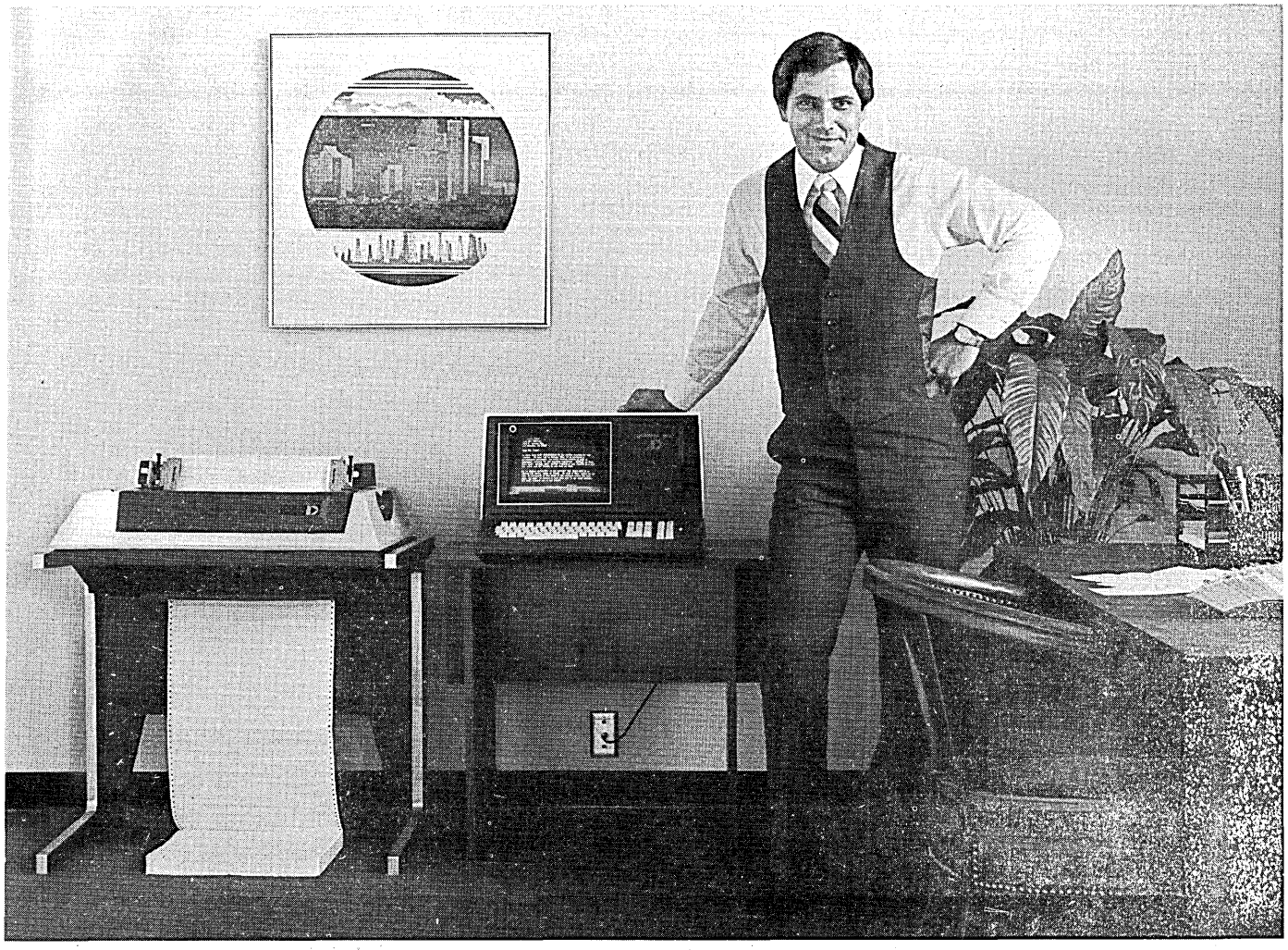

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DATAPOINT

CIRCLE 91 ON READER CARD

A discussion of level, scope, human factors, and other criteria to be used in choosing among the many new tools.

EVALUATING DATABASE LANGUAGES

by Jeffrey Stamen and William Costello

We are all becoming increasingly aware of a new generation of software that promises to break the "applications development bottleneck."

Examples of this software have variously been called nonprocedural languages, very high level languages, and database languages because they combine database management technology with languages of a much higher level than COBOL. Whatever the name, this software promises a greater than 10 to 1 programmer productivity leverage over COBOL applications development.

A number of commercial products featuring this new software are on the market; although attempting to provide the same benefits, these products vary widely on a number of important aspects.

Specifying what is actually wanted as opposed to specifying how to do it is the basis of nonprocedural, rather than procedural, languages. Nonprocedural languages have been applied in the past to narrowly specialized application areas where the underlying concepts and algorithms are few in number and very well defined. Now it is possible to construct more general-purpose nonprocedural systems since we have a better understanding of database modeling and management.

As the evaluation of computer languages has proceeded from machine language to assembly language to FORTRAN to COBOL to PL/1, we have become progressively less concerned with the machine hardware and more attentive to the problems at hand.

To understand the significance of nonprocedural languages in this evolution, we must realize that any language for communicating with computer software embodies some kind of "real world" model. Traditional languages express a model of a real computer more than of a real organization or application. Thus, the programmer is required to mentally construct an application model and to convert that into the model implicit in the language. (While languages such as COBOL have moved us a little closer to the application, there still remains a considerable model translation process for the programmer.) When you add to this model translation the great number of lines of syntactically correct code that has to be written, it is no wonder that the development of application software has been so costly, time consuming, and error prone.

The principal means for building a model of a real world enterprise or application are data and their interrelationships. We build business- or application-oriented data models that incorporate many aspects of the reality being modeled. A typical programming language application essentially involves a set of data structures and some procedures for manipulating those structures. While traditional programming has been concerned primarily with the procedures, the database approach involves a different focus: the data structures and how they express a model of reality. By means of such models, organizations can reflect their actual requirements and procedures more accurately in a way that integrates different parts of an organization supporting common organizational goals.

Initial efforts in developing computer-based applications using the database approach focused on adding database concepts and operations to existing programming languages. This strategy reached its fruition in the widely circulated but controversial proposals of CODASYL standards committees.

During the past decade, much effort has gone into finding alternative strategies for efficient application development which would exploit the benefits of the database approach over more traditional approaches. A central result of this effort was a demonstration of the feasibility of database languages that could faithfully reflect the application model and provide for logical operations on that model. More recently, the database approach and the nonprocedural language approach have converged. The database approach concentrates much of the problem complexity in the data model, which tends to be more well defined and stable than the programs. The programs can then be much simpler and, in fact, become amenable to using the nonprocedural approach.

At present there are a number of products, such as DMS, RAMIS, MAGNUM, NOMAD, and MIMS, that combine powerful expressive data modeling capabilities with very high level nonprocedural languages for manipulating the models. As application development systems, they promise productivity leverage for application software development and maintenance. The applications are waiting. How can we choose among the many new tools available for producing them?

HOW TO EVALUATE LANGUAGE

We will not directly address general criteria for comparing database management systems; these have already been publicized extensively. We will only consider evaluation criteria pertaining to database languages. We will attempt to separate language criteria from more general system criteria. Of course, in practice one would consider both language and general system aspects, for they are usually closely related. Factors to be considered in evaluating the new languages are in Table I.

Perhaps the most obvious distinguishing feature of these database languages is the level of the language. This is mainly a question of the degree of procedurality of the language, i.e., the extent to which the writer must specify how to do something (procedural) as opposed to what is to be done (nonprocedural). In Table II, a request to print information about parts of a database is shown in procedural and nonprocedural forms. The procedural program fragment uses a hypothetical programming language

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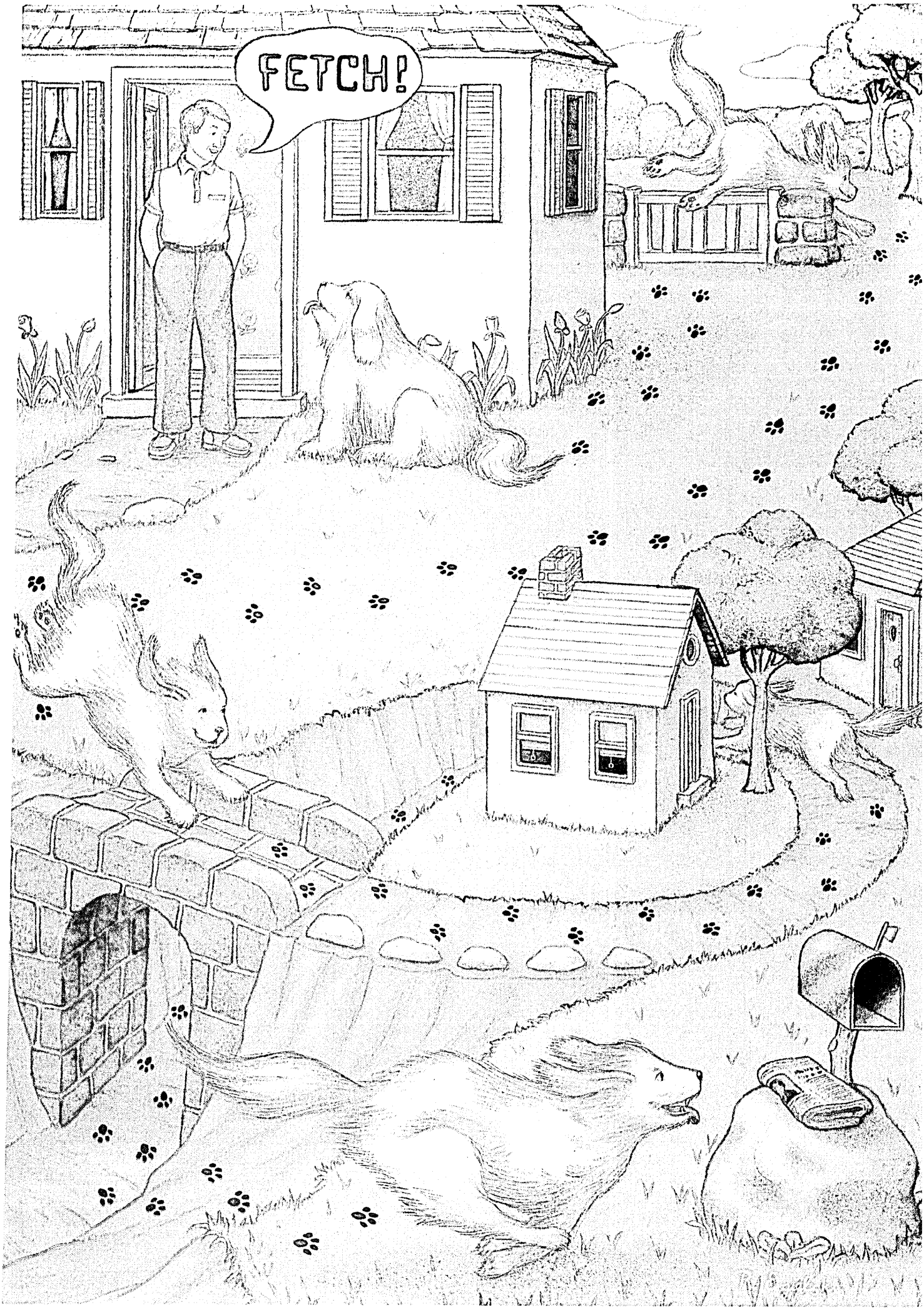

FETCH!

The consistency of a language is determined by the consistency of its syntax, the meaning of its constructs, and the overall style of the language.

with database extensions similar to the CODASYL approach, while the nonprocedural form uses the MIMS database language.

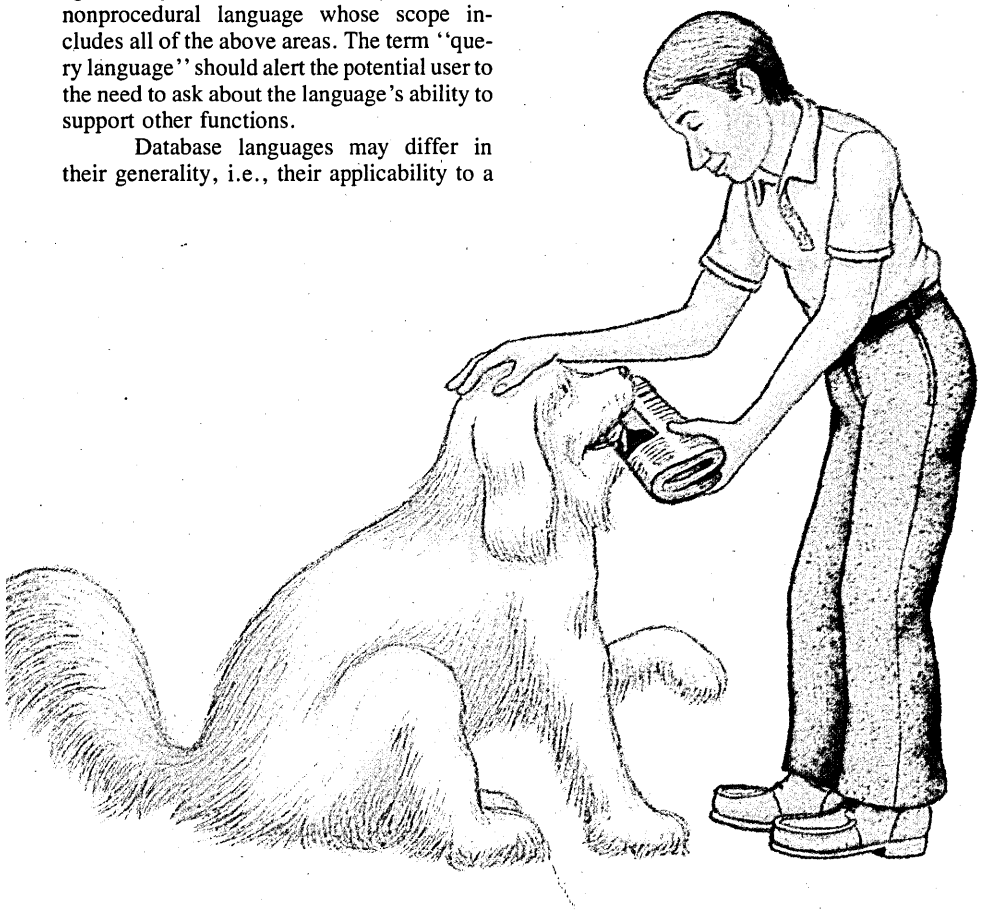
The sheer volume of the pure procedural language statements, combined with their routine nature, is in stark contrast to the brevity of the nonprocedural statements. In the simple example in Table II, the ratio of procedural to nonprocedural "tokens" is about 6:1. Note, however, that we have left out data declarations and error handling code. These comprise a very large portion of typical procedural language programs. On the other hand, the nonprocedural approach will not be burdened by these factors, which are automatically handled by the database management system. For more complex examples, particularly database updating requests, procedural language programs increase in size much more rapidly than their counterparts in a nonprocedural database language.

The scope of a language is its coverage of all the activities required of its underlying software system. For a database language, this includes ad hoc queries, batch reporting, data entry and updating, and decision-making logic or selection. Very often a system will have a nonprocedural query language but all other functions will be performed with a different language, which is procedural. In fact, very few database management systems will have a fully integrated nonprocedural language whose scope includes all of the above areas. The term "query language" should alert the potential user to the need to ask about the language's ability to support other functions.

Database languages may differ in their generality, i.e., their applicability to a variety of application areas. Languages designed specifically for a certain class of applications, say, accounting, may be considerable less useful in other fields. To a great extent, generality is determined by the representational power of the underlying data model of the database management system. Systems that tend to follow the lines of the classical network or relational modeling approaches have powerful and general constructs that may be used for almost any specific interest. Systems based on single file or hierarchical data models, on the other hand, are not powerful enough to represent the interrelationships of data required by many business applications.

The completeness of a language is the degree to which all desired requests, whether queries or updates, may be expressed in that language. If the information desired is available in the database, the language should permit the user to operate on that information in any logical way.*

The consistency of a language is determined by the consistency of its syntax, the meaning of its constructs, and the overall style of the language. Key words should have the same meaning even when they appear in different parts of the language structure. Special symbols, such as commas or parentheses, should be used in the same way throughout.



CONSIDER HUMAN FACTORS

Human factor considerations are of great importance to the ultimate success of application systems. Any application development language should provide features to support enhanced interactions for the end users. One important facility for this purpose is the capability for flexible formatting of display screens. In the spirit of nonprocedural languages, such formatting features should be oriented toward describing the desired result rather than toward requiring detailed screen formatting instructions.

Reasonable default formatting is also important. Other human factor features include dialog management facilities (e.g., menus) and help facilities. The latter provide interactive aids to the user who needs assistance in using the software.

A key human factor is ease of learning. The total number of statement types in a database language, as well as the length of typical statements, may be used to partially gauge the complexity of the language. On the other hand, packing too much language power into too few and/or short statement types may so burden a language that it becomes more difficult to learn, and perhaps to use. In addition, the structure and constraints of a language should be very familiar to the people who will write in the language. Not only does this facilitate learning the language, but it also enables the writer to "think" in terms that are natural to the application. The use of English-like statement structure and wording as well as use of terminology derived from an application area also engender a useful familarity.

Many people think that the language used for database management should be a "natural" language, such as everyday English. In fact, some systems already claim to permit the use of natural languages. A factor that should be kept in mind is that natural language systems are query-only in most cases; updating with a natural language is more difficult than reporting, since updating tends to require much more precision of expression.

If a natural language report does not produce exactly what was intended, one simply tries to refine the request, but if an update attempt is similarly imprecise, changes to the database may have been registered, and may have to be retracted at considerable cost. Even for queries, the precision of natural

* More formally, in language theory, a language is said to be complete if any function that can be performed using the logical predicate calculus can also be performed with a statement in the given language. With database languages, the comparison may be made to statements in relational algebra, which is already known to be complete. Expressing in the language the various operations of relational algebra, such as Cartesian product, selection, projection, division, and various joins, would permit some appreciation of the expressive power of the language. For those unfamiliar with the relational approach, it may be useful to write out several requests of varying complexity in English, and to attempt to formulate them in the languages being compared.

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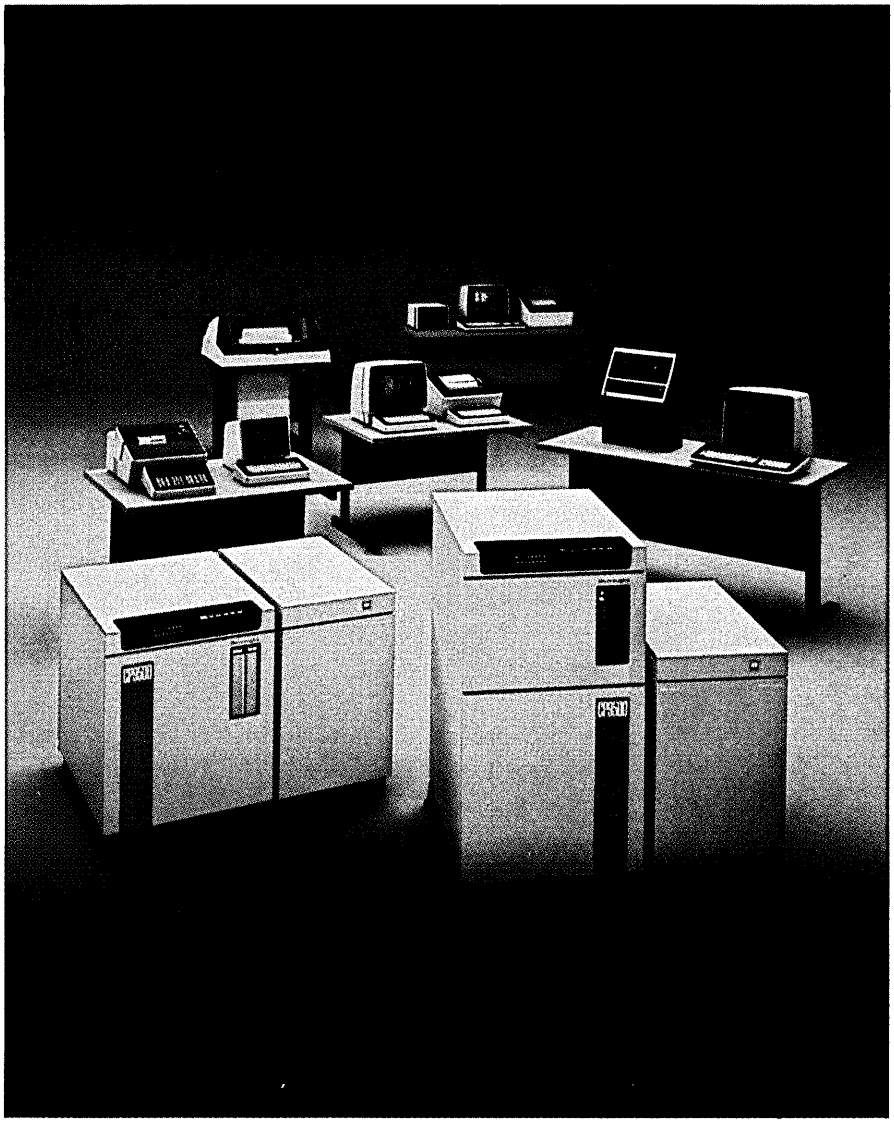

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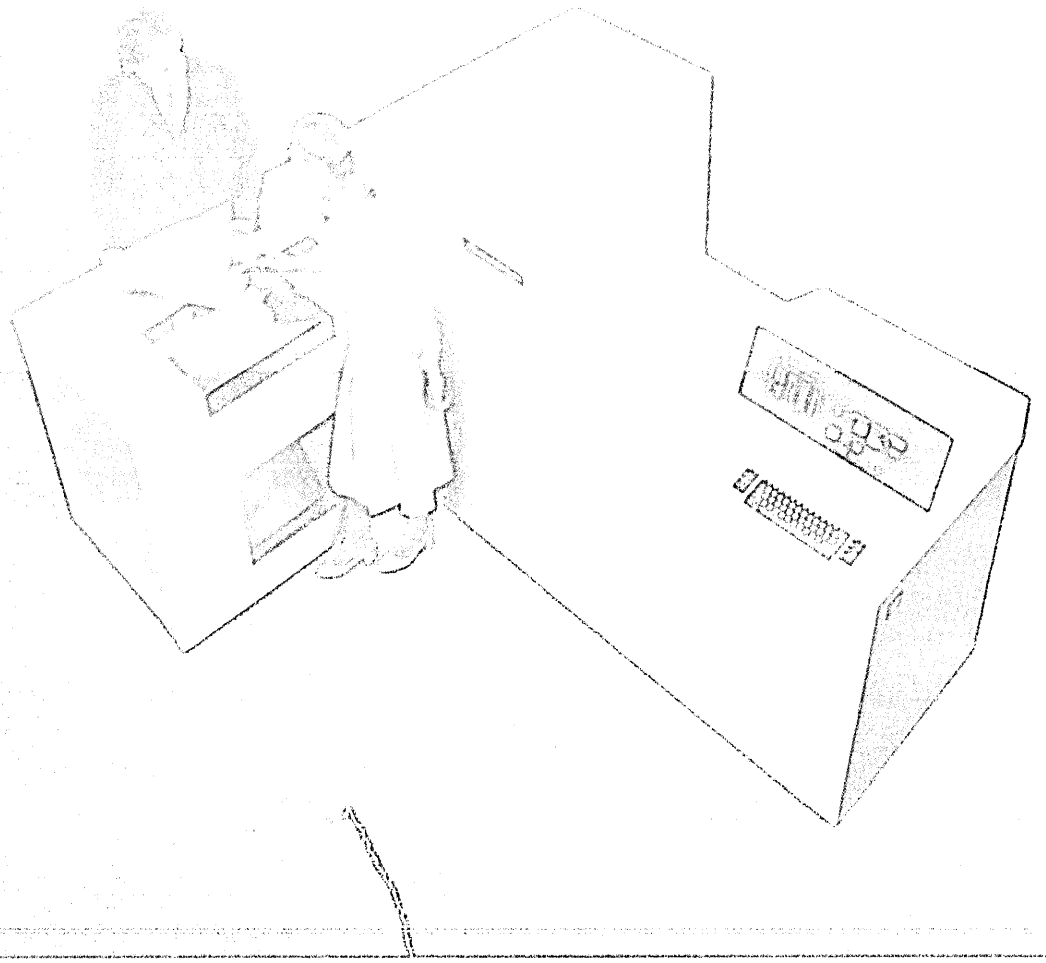

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TABLE I

CRITERIA FOR EVALUATING NONPROCEDURAL DATABASE LANGUAGES

LANGUAGE LEVEL	What is the degree of nonprocedurality? Does the language require the user to specify the details of how to do the job?
GENERALITY	How powerful is the underlying data modeling capability? Can the language be applied to different types of applications, or is it limited to certain classes of applications?
SCOPE	Does the language cover all relevant areas, e.g., query, updating, data definition, decision-making logic? Are they all or only partially nonprocedural?
COMPLETENESS	Can all desired logical requests be expressed in the language? How powerful are the database operations?
CONSISTENCY	Does the language present a unified approach in usage, style, syntax, and meaning?
HUMAN FACTORS	Does the language support features for enhanced human system interaction, e.g., display screen formatting, dialog management, help facilities? Is it easy to learn? Are terms familiar? How English-like is the language?
EFFICIENCY	Is the language translation process done in an efficient manner? Are stored, user-written transactions and reports possible for repeated use? How rapidly can new applications be developed?

TABLE II

TWO PROGRAM FRAGMENTS

NONPROCEDURAL

```
PRINT  part-number description
       on-hand FOR part ALL
```

PROCEDURAL

```
       PRINT 'Part Num' TAB (10)
         'Description' TAB (40) 'OH'
       FIND FIRST part WITHIN parts
loop:  IF db-status NE 0
         THEN GOTO end
       GET part-number, on-hand,
         description
       PRINT part-number TAB (10)
         description TAB (40) on-hand
       FIND NEXT part WITHIN parts
       GOTO loop
end:   /* loop exit */
```

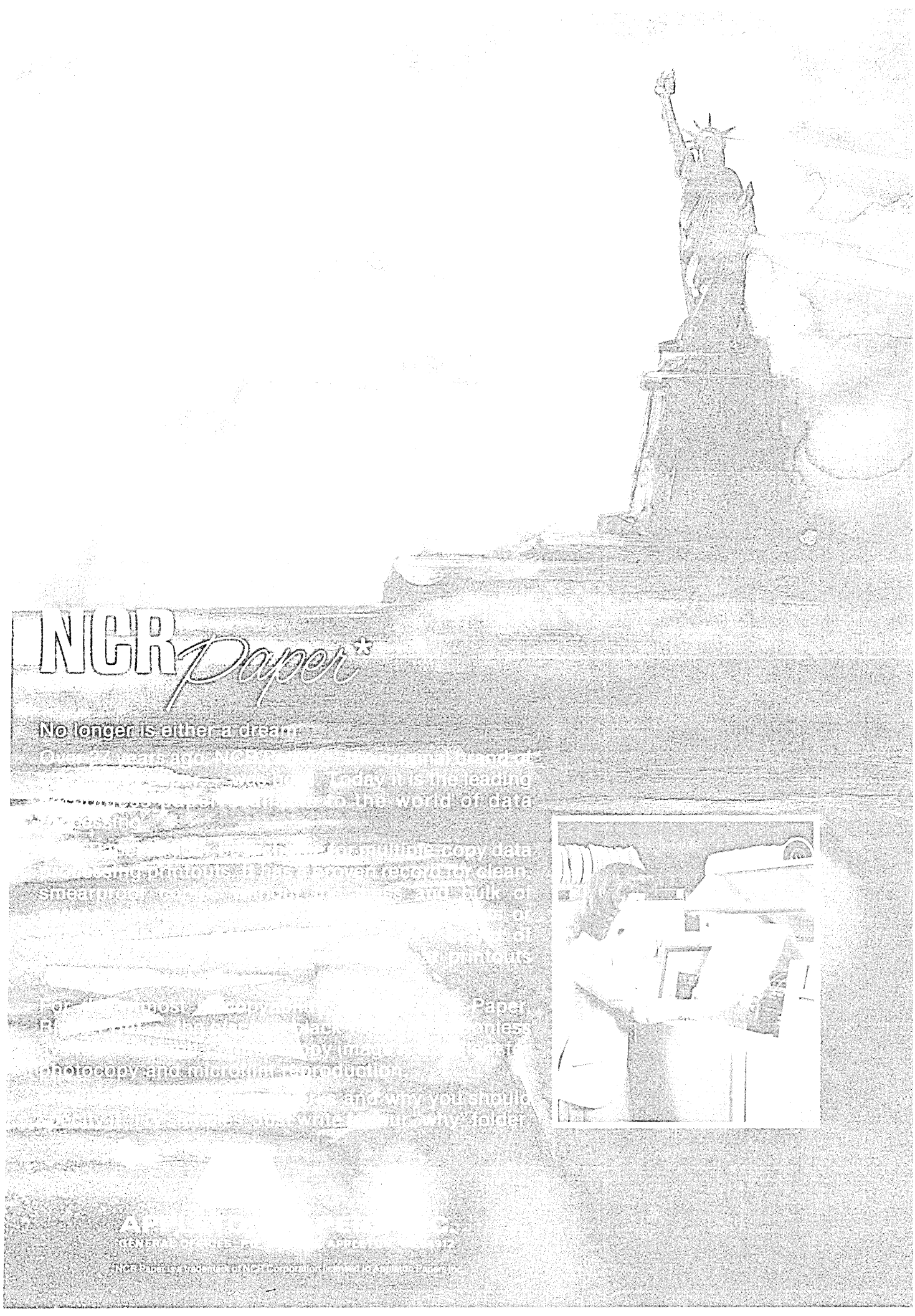
English is notoriously imprecise.

In our everyday lives, the need for exceedingly precise natural language is best exemplified in law, where "legalese" often confounds the lay person (and sometimes the lawyer). It is not clear, therefore, that this should be the goal for application development languages. We do not mean to imply, of course, that the alternative to natural languages is "unnatural languages." There is a gradation in similarity to our natural language among various languages. By adding some structure to the database language, the excessive complexity of a natural language may be alleviated, and the result may be a language easier to learn and to use.

Efficiency considerations that are related to a database language include all costs and benefits of the language over the life cycle of applications development. Short-term costs of language translation and some execution overhead may or may not be significant, depending on the product used and the application it is used for. Even if translation cost is significant, one should not ignore the long-term savings in training, missed time schedules, maintenance, and enhancement, as well as immediate direct savings from dramatically greater programmer productivity.

Mr. Stamen is director of research and development of the Mitrol Operation of the GE Information Services Co., Burlington, Mass. He has been designing and working with nonprocedural DBMS systems for 12 years.

Dr. Costello is a systems designer in the research and development department of Mitrol. Prior to this he was on the faculty of Harvard Univ.



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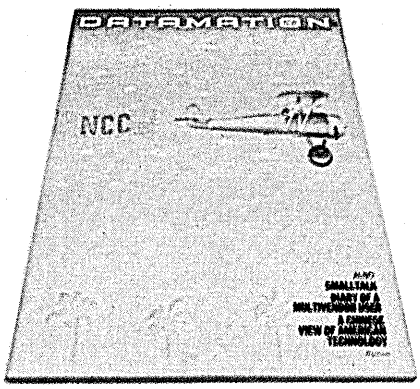

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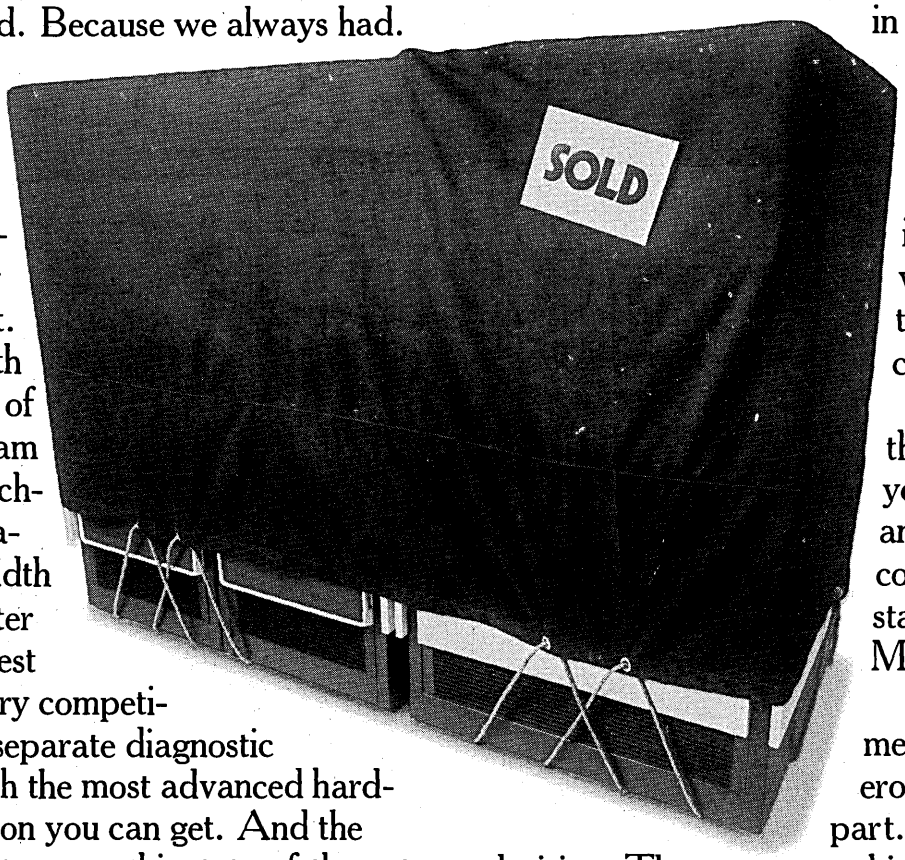

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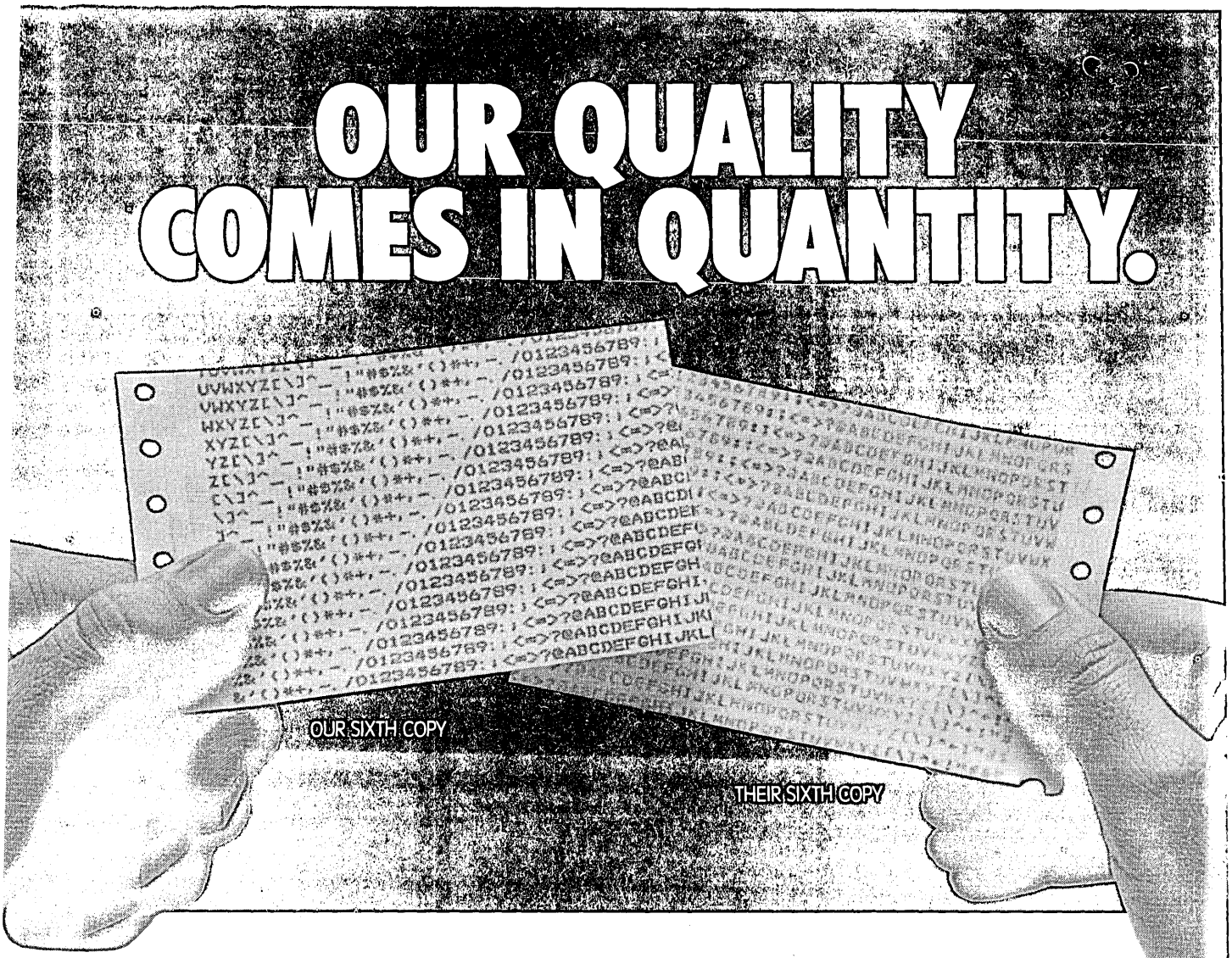

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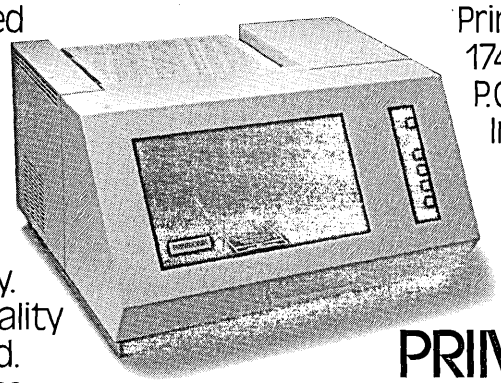

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Taking the time to choose without preconceived notions, a team found the computer system to best serve its needs.

BENCHMARKING FOR THE BEST

by Malcolm A. Gleser, Judith Bayard, and David D. Lang

For four years the U.S. Public Health Service has been developing a medical information system for the nine hospitals and 26 ambulatory care clinics which make up the Bureau of Medical Services; a prototype system has been running on a DEC-10 in a timesharing environment. Written in FORTRAN, with several assembly language subroutines, the system emulates a transaction processing environment on a machine not originally designed for that purpose.

Based on experience with the prototype, we decided to convert our software to a fully supported database management system (DBMS) before branching out to the other hospitals and clinics. During the inevitable major software conversion, we decided to take the time to choose, without preconceived notions, a computer system that would best serve our needs.

We first specified the functional requirements: both those that would determine the amount of equipment needed to support the operational system and those that would determine the difficulty of software development and maintenance.

We based the functional requirements of the operational system on our experiences with the prototype we found we needed:

1. Twenty-four hours a day, seven days a week on-line access to a common database by 72 terminals initially and by over 400 terminals after five years of operation;

2. User interactions via crt terminals employing the formatted screen, block mode transmit approach;

3. Forty different user-initiated transactions executing at the rate of .2 per second during the first year, increasing to over 200 transactions at the rate of 4.5 per second after five years;

4. A DMBS managed database, the largest dataset of which would contain approximately 1 million records after one year, 50 million records after five years, and over 100 million records after seven years;

5. Typical transactions requiring access to three datasets and using 12 disk accesses but involving relatively minor processing; and

6. Rapid response times; the exact requirements varied by transaction type, but overall 90% of all transactions were to be completed in under four seconds.

Our functional needs were:

1. A well-supported DMBS that would allow adding or changing data elements within a dataset without affecting transactions not using the new or altered elements; adding new datasets to the database without affecting transactions that did not use the new datasets; and powerful, easy-to-use ad hoc report generation;

2. Database reorganizations required by scheme alterations that would be handled automatically by the DBMS;

3. Altering or adding a transaction that would not affect any other transaction, and would not cause database inaccessibility;

4. Application software that could be written as though it would be used by only a single user, the system providing the ability for the code to be used by multiple users simultaneously.

CHOOSING THE BEST SYSTEM

We selected the system best suited to our application by making comparisons of total system life cost in dollars. This was done by determining the exact equipment configuration for each competing system which would be needed to support our application over a defined system life, and by assigning a monetary value to desired features of the software development process. To do this, we developed two benchmarks. The first simulated our operational system with estimates of our operational loads at yearly intervals over a five-year system life. The second benchmark determined the software development characteristics of the competing systems.

The operational benchmark was a detailed functional specification of a transaction processing task meant to stimulate our operational load. We wrote no programs, provided no code; those were the tasks of the competing vendors.

The functional spec was the definition of a conceptual database and transactions that would store, retrieve, and update data in the database. Each competing vendor was instructed to use these specs to create a transaction processing system on their computer. We required that the data be maintained on a well-supported DBMS and that the transactions be programmed in a high-level language of the vendor's choosing. We supplied over 1 million data records to load the database, and we provided a scenario of transaction activity, simulating users entering transactions as in the projected operational environment. The vendors were required to use the transaction scenario to choose the necessary hardware configuration. That, in turn, produced the costs.

Eleven datasets were defined as somewhat simplified versions of their operational counterparts. In general, data items were eliminated if they played no role in the access paths to the data records. For example, details of a patient's address might be simplified or eliminated, since no transaction was defined to retrieve patients with certain addresses. On the other hand, a patient's last name and maiden name were included in the dataset, since at least one transaction required the retrieval of all patients with a specified name, either last name or maiden name. Vendors were allowed to organize their databases in any manner they chose. Furthermore, they could choose a hierarchical, network, or relational model to optimize the efficiency of their approach.

Previous experience indicated that our application would be disk-I/O activity of our application, without concern for the simulation of cpu activity. While we wanted the benchmark to be realistic, we wanted to keep its scope reasonable so that vendors could afford to compete in the procurement.

We needed to define a small number of different transactions that would access the database with the same characteristics as the 200 different transactions of the operational system. This was accomplished by studying the prototype system and grouping transactions with similar database access characteris-

The system best suited to the application was selected by making comparisons of total system life cost in dollars.

tics. Groups of two or more transaction would be represented by a single transaction which was assigned the workload, in numbers of invocations per hour, or the whole group. Low-volume transactions were simply eliminated. Eventually we were able to narrow down the benchmark to the definition of 11 datasets and 22 transactions.

DATA ACCESS FEATURES

A data access path determines the circumstances under which the DMBS may efficiently retrieve one or a sequence of records from the database. We wanted a DBMS that would support a variety of efficient paths to data. Therefore, in designing the benchmark special care was given to specify transactions that would operate most efficiently if the DBMS could support access paths to data we felt would be needed to implement our operational system. Systems that provided the most efficient data access methods would be able to complete the benchmark with lower hardware costs than those with less efficient methods. We were particularly concerned that the DBMS be able to full support direct (random) record access and index sequential access.

We defined full support of the direct access feature as a record that could be identified by its record number and retrieved in a single disk access regardless of its location in the dataset. Further, the DBMS had to be able to recognize and support linkage between datasets using the direct access identifier. Support for this feature had to extend to the data maintenance and report generation software.

Index sequential access refers to the ability to access records as if they were physically ordered according to a prespecified key consisting of data items in the records. The DBMS must be able to access any arbitrary record from the dataset in at most a few disk reads, given its key value. We felt that full support of index sequential access should:

1. Provide the ability to define multiple access keys per dataset;

2. Allow an index key to be composed of multiple data elements in the record; ideally the data elements could be located in any positions in the record, i.e., be "noncontiguous," and could be individually and independently defined to be treated as either ascending or descending in sort order;

3. Allow retrieval of the access key itself (if stored separately from the record) without necessitating a read of the data record to which the key applies (this is the functional equivalent of automatically maintaining a subset of data items from a dataset in a different sort order than the parent file, totally under DBMS control); and

4. Allow index sequential access to a subset of records within a dataset.

Each of the 22 benchmark transactions was designed to exercise one or more of the above access properties. Although individual transactions could be done most efficiently on systems providing the desired access paths, the benchmark could run on systems not possessing all features. For example, we tested the "noncontiguous key" feature by specifying two transactions that required access to a given dataset, but accessed records using a different ordering of the same data items within the record (e.g., patient number, date, and drug name).

TABLE I

BENCHMARK TRANSACTIONS

TRAN. NO.	TRANSACTION NAME	TRANS TYPE	DATASETS ACCESSED	EXPECTED I/Os	REQ. RESP TIME-SEC
30	Patient reg.	update	3	10	5
31	Alter reg.	"	3	15	5
32	Admission	"	4	10	5
33	Find reg. by no.	retrieval	2	4	3
34	Find by name	"	2	15	5
35	Bed census	"	2	20	5
40	Create schedule	update	2	100	—
41	Free MD appoint.	retrieval	2	6	5
42	Make apoint.	update	3	10	5
43	Find pt. appoint.	retrieval	3	8	5
44	See schedule	"	3	12	5
45	Delete appoint.	update	1	1,000	—
50	Make visit	"	4	8	3
51	Retrieve visits	retrieval	3	10	5
52	Clinical event	update	4	8	5
53	Retrieve problems	retrieval	4	8	5
54	Lab retrieval	"	4	8	5
60	Prescribe	update	4	20	4
61	Med profile	retrieval	4	25	4
62	Med ingreds.	"	2	8	5
63	Med products	"	2	8	5
64	Problem profile	"	4	7	5

Systems that required all key items to be stored contiguously either could do one transaction efficiently and the other inefficiently or could store data redundantly in the record so that two contiguous keys could be defined. In both cases, the penalty for not having the feature was measurable in terms of either added storage costs or added hardware costs of accomplishing more disk accesses in a given amount of time.

Each transaction had an associated mandatory response time. The response time requirements were set independently of the transaction's resource requirement. Table I lists the benchmark transaction, the type of transaction (update or retrieval), our estimate of the average number of dataset and disk accesses for each, and the response time requirements. We required that 90% of the executions of a transaction be completed within its specified response time. Some transactions, such as 60 and 61, had relatively high resource requirements yet relatively short response time requirements. Transactions 40 and 45 had no response time requirements. We wanted vendors to run these at very low priorities so as to use system resources only when no other transactions were active. We reasoned that systems best able to adjust and to balance transaction priorities would be able to meet response time requirements using less hardware than systems that were less flexible.

DATABASE USAGE PATTERNS

We developed four separate benchmark scenarios to simulate our expected usage patterns one, two, three, and four years after selecting the new computing system. Each scenario simulated the anticipated number of terminal users and their transaction rates during one hour of prime time operation. The year one scenario simulated 72 terminals entering transactions at a rate of .2 transactions per second. Years two, three, and four simulated, respectively, 176, 192, and 400 terminals entering transactions at the rate of 1, 2, and 4.5 transactions per second. Year five was assumed to have identical operational requirements as year four.

To simulate 72 to 400 people using the system simultaneously, the vendors were required to initiate the transaction scenario from an independent computer. Each transaction had an exact start time when it was to be launched from the external computer, and

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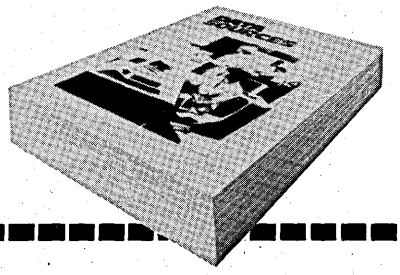

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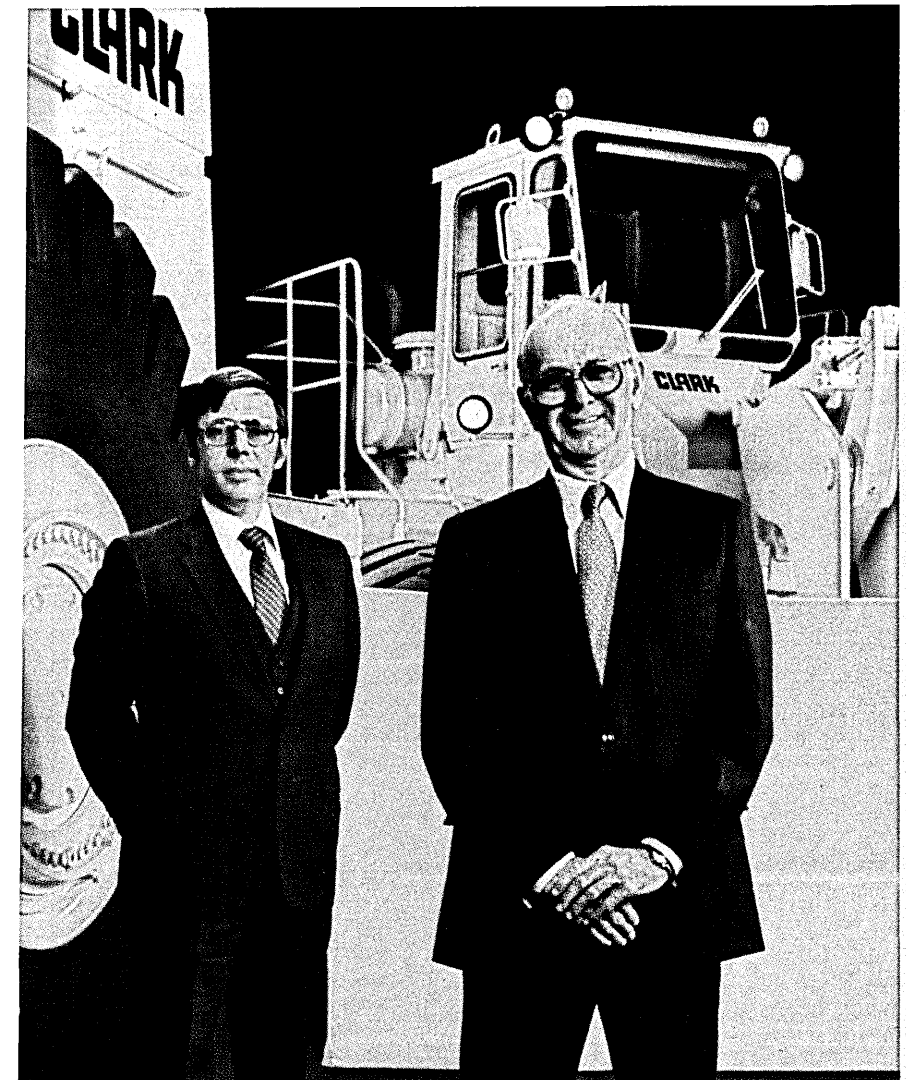

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The functional spec was the definition of a conceptual database and transactions that would store, retrieve, and update data in the database.

response time was determined as the length of time from the specified start time until the result was returned from the benchmark computer. We also required crt terminals to be connected to the benchmark computer for independent response time verification. Each computing vendor was required to run each benchmark scenario within the required response times to determine the configuration of equipment required for each year of the project. This provided a method of determining the five-year system's life costs of the operational system, and was also an excellent functional test of the scalability of the various approaches.

With such a large database to maintain, disk storage is an important contributor to the operational cost of the selected system. Without some form of data compression, the 50 million records expected over the next five years would occupy about 4 billion bytes of storage, not counting the storage necessary for alternate access paths to the data. However, the data contained a high proportion of null fields, blanks, and zeros. We expected that a DBMS that used an effective data compression technique could reduce storage costs by 50% or more over the system's life.

In the benchmark, we estimated the number of data records of each dataset we would accumulate over the next five years. Vendors measured the storage they used for the benchmark data and extrapolated to our expected file sizes. The costs of the disk drives required to store the extrapolated database were included in the operational cost comparison between systems.

The comparison of the system's developmental features was accomplished with a similar functional approach. Based on our estimate of the total cost of program development, we assigned a dollar value to each of the desirable development requirements. We then specified those "development problems" for each competitor to solve. The first involved adding new data items to one of the benchmark datasets and making any resultant modifications necessary to maintain the existing transactions. The second involved programming and installing a new transaction using the existing database. The third problem involved creating four reports from the benchmark database using their report generation software.

All competitors were told in advance the nature of the development problems, but they were not given the specifics until site verification of the benchmark. At this time, they were given the problems one at a time. Each problem was evaluated according to prespecified criteria relating to the ease of solution. In essence, we measured the ability of experts on each system to solve the same development problem and we could then evaluate how we felt each solution would impact our own development cost, if we selected their system.

TABLE II

PROPOSED SYSTEMS

MAKE	MODEL	PROCESSORS	DBMS	TP MONITOR
Burroughs	B-6800	single	DMS-II	GEMCOS
Burroughs	B-7700	dual	DMS-II	GEMCOS
Univac	1180	single	DMS-1100	TIP
Tandem	T-16	fifteen	ENCOMPASS	PATHWAY
IBM	370/168	single	ADABAS	COM-PLETE

TABLE III

YEAR FOUR BENCHMARK RESPONSE TIME SUMMARY
(in seconds)

Number of transactions of the year four benchmark which finished in less than the indicated number of seconds for each vendor. The last column is the number of transactions which took longer than their respective required response times.

EQUIPMENT	1	2	3	4	5 required	
Burroughs (B-6800)	2,008	9,499	12,752	14,080	14,643	700
	13%	63%	85%	94%	97%	5%
Univac	5,221	10,757	13,214	14,104	14,514	692
	35%	72%	88%	94%	97%	5%
Tandem	5,320	12,739	13,996	14,408	14,582	518
	35%	85%	93%	96%	97%	3%

CHOOSING THE VENDOR

The objective of our procurement was to obtain the service of a timesharing computer vendor to supply the computing equipment and a large national telecommunications network. While we are not going to discuss here the evaluation of the telecommunications network or the costs due to the management of the computer facility, it is important to understand that the competing vendors on our procurement were large service bureaus, not hardware manufacturers.

The RFP was sent to over 90 potential vendors. As the cost of the requested services was estimated to be more than $5 million over five years, many vendors were interested. However, only five offerors, using four different brands of hardware, submitted acceptable proposals. Two proposed Burroughs computers; the others proposed Univac, Tandem, and IBM computers.

The computer hardware, DBMS, and transaction processing monitor used in each approach are listed in Table II. The number of processors refers to the number of cpus used to run the year four benchmark, except for the IBM entry, which was only successful in running the year three benchmark. In the case of the Burroughts B-7700 system, the two processors used to do the benchmark were substantially in excess of what was required, as the vendor was proposing we share the system with other users. For that reason, it is difficult to compare the B-7700 with configurations that were finely tuned to exactly do the benchmark. Since another Burroughs system was proposed, we will drop the B-7700 from further discussion.

The vendors' response times for all transactions of the year one benchmark are listed in Table III. The IBM entries are omitted because the vendor was unable to meet the required response times on an IBM 370/168 using version three of ADABAS. Under the ground rules of our procurement, the vendor was allowed to compete because it was willing to guarantee a fixed price to do our job regardless of how much hardware it eventually took to do it. Its experience with the benchmark convinced it that using the yet-to-be-released version four of ADABAS and a larger IBM or Amdahl computer, it could successfully complete the benchmark. However, for purposes of this presentation, the IBM 370/168 using version three of ADABAS was unable to complete the benchmark with the required response times. The other three systems met and exceeded the response time requirements for every transaction.

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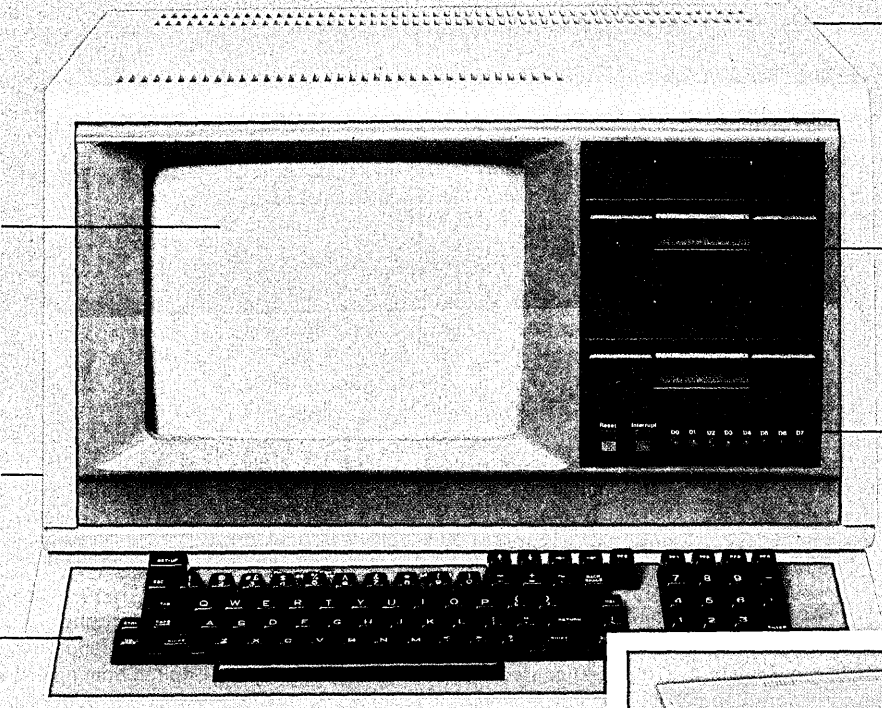

4 BUILT-IN CPU CARD CAGE
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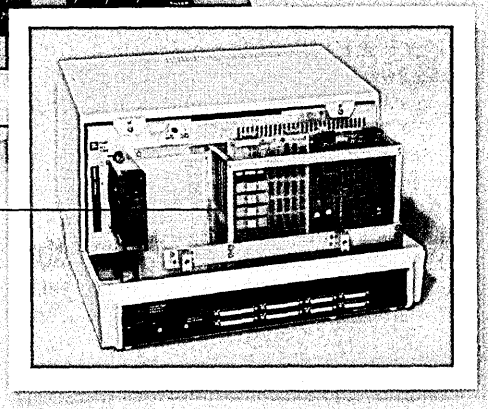

7 RS232 SERIAL INTERFACE
Connects CPU and terminal. Option switches select: 115/230V, baud rate, 7/8 data bits, parity, auto wrap, auto LF, local/self test/on line, other modes.

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CIRCLE 110 ON READER CARD

With such a large database to maintain, disk storage was an important contributor to the operational cost of the selected system.

The approximate manufacturer's list prices of the Burroughs, Univac, and Tandem systems, configured to accomplish the year four benchmark, and the IBM system, configured to accomplish the year three benchmark (excluding the costs of disk drives) were as follows:

Burroughs (6800)	$850,000
Univac	$3 million
Tandem	$1.1 million
IBM	$3.3 million

Note that these prices were not taken from the bidder's proposals, as its prices involved many extraneous factors, such as telecommunications, operations, and facility overhead. These are strictly the manufacturers' quoted prices for the hardware components of the four systems and are presented only for rough comparison. Some or all of these prices may be discountable by the manufacturers under a variety of circumstances.

SYSTEM FEATURES COMPARED

The above price comparison is based on the equipment configuration needed to support our heaviest benchmark load. This level of processing would not be required until after four years of operation. For a typical application, using in-house processing, the true costs of the system would be significantly affected by the scalability of the hardware. Systems that allowed the purchaser to start small and add components as the processing load increased would cost less on an actuarial basis over the life of the project. Over the range of processing loads which we tested with our benchmark, the Tandem system was the most scalable.

Tandem systems start with two processors and allow addition of processors up to a total of 16. On Tandem hardware, the year one benchmark ran on a four-processor system. The yearly cost of the system is approximately proportional to the number of processors used, significantly reducing the average yearly cost of the Tandem solution as compared to other equipment.

The Burroughs large computer systems are also scalable, being able to adjust throughout by over a factor of 10. However, the Burroughs B-6800 system used for the year four benchmark is the smallest of Burroughs' large computers and, therefore, was not scalable downwards for the early years of our application.

The Univac and IBM systems are scalable over wide ranges of processing power. For these systems, major upgrades in throughput are accomplished by conversion to a more powerful processor, as opposed to the Tandem approach of adding increments of the same processor. The Univac vendor did not propose using smaller Univac systems early in the project because of its concern about the disruption caused by a major hardware upgrade. The IBM vendor proposed an upgrade from an IBM 370-168 to an Amdahl 470/V7 during the third year of the project, a two to three fold increase in computing power. (However, it was not clearly established that the Amdahl system would actually meet the benchmark requirements.).

TABLE IV
VENDORS' DISK REQUIREMENTS

HARDWARE	DBMS	STORAGE (Mbytes)	NUMBER OF SPINDLES
Burroughs	DMS-II	6,800	39
Burroughs	DMS-II	4,900	28
Univac	DMS-1100	5,000	24
Tandem	ENCOMPASS	5,500	24
IBM	ADABAS	2,400	10

The vendors' disk requirements to store our expected database are shown in Table IV.

ADABAS provided the most effective data comparison of all of the DBMSs compared. Although DMS-II provides a reasonable data compression technique, the two Burroughs vendors derived widely varying database storage estimates, which were not significantly smaller than ENCOMPASS or DMS-1100 which didn't employ data compression. DMS-1100 can employ a user-written compression scheme, but this was not done in the benchmark. ENCOMPASS's data compression technique was not useful for our database application.

HOW A DBMS WORKS

The database management software is important for both the operational and the developmental efficiency of the system. In approaching the system selection we had several biases about the features a DBMS should have and how it should work. However, in attempting an objective functional evaluation, we tried to compare how easily and efficiently systems could do our job, rather than to demand prespecified features. For example, as discussed above, the data compression feature was tested functionally by comparing systems according to the cost of storing our projected database, giving a realistic appraisal of the value of that feature.

The database access path features were tested directly by the benchmark. Systems that possessed all features were at an advantage in performing the benchmark with a minimum amount of equipment. Of the desired access features, Burroughs DMS-II possess all features; Univac DMS-1100 and ADABAS lacked only automatic subset inversion; while Tandem's ENCOMPASS lacked subset inversion, ascending and descending elements in the same key, and the ability to specify noncontiguous data elements as a key.

We evaluated the ease of schema change by asking each vendor to add a new variable to a particular dataset and to modify all transactions so that the benchmark would run correctly. We were interested in whether the DBMS could manage the database conversion without any user-written software, whether transactions not using the dataset would require change or recompilation; whether transactions using the affected dataset were protected from errors due to use of an out-of-date schema; and our overall assessment of the ease and speed of the conversion effort.

ADABAS was the outstanding system for ease of schema change, because adding a field to the end of an ADABAS record doesn't require dumping and reloading the database. Sinca all ADABAS records are of variable lengths with null data omitted, adding a new field in the schema adds a logically new "null" data item to each record without physically changing the database.

DMS-II and ENCOMPASS tied for second place on the schema change problem. On DMS-1100, the dataset specified to be changed was one which the vendor had defined as hierarchically owned by another dataset. Change to one affected the other, and this affected transactions which did not directly require access to the altered dataset. All of the DBMSs had effective subschema capabilities so programs that did not use a new or altered dataset did not require recompilation.

We tested the desired feature of transaction independence by requiring each vendor to add a new transaction to the benchmark system. We wanted to see if this could be done without affecting other transactions on the system, i.e., if the new transaction could be programmed, tested, and installed without interfering with already existing transactions. Also, we wanted to see if each transaction was programmed as if only one terminal would use it, leaving the multithreading up to the operating system software.

Adding new transactions was easily accomplished on all of the systems. All allowed the programs to be written as if they would be used by only one terminal. The vendors of the IBM and Burroughs systems

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The goal: NonStop operation in an online network.

The network must be able to handle the loss of any critical element without loss or duplication of any transaction in progress and without damage to the data base. Applications must be able to run anywhere and access devices and files anywhere in the system without having specific knowledge of physical location. In fact, the entire network must look like a local resource to every user. This requires complete geographic independence.

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Every Tandem system is effectively a local network comprising two or more processors.

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The results: something really new in online transaction oriented systems: the ability to deal with a remote program, a remote processor, a remote terminal, even remote data as if it were right at the user's fingertips.

Since programs can access devices and files anywhere in the system without having specific knowledge of physical location, the development of applications can be identical for single or multiple system environments. A request for information may originate from any node and that same request can be run on any other system in the network without the need to modify it in any way. And it is incredibly easy to learn. Since the network uses the same inputs and procedures as the minimum individual system, there is no need for special training manuals.

Users can be physically widely dispersed over systems ranging from a single system to a network operation.

The EXPAND network gives users the flexibility to build a network that supports their business and not have to shape their business to the network. Users can place exactly the right amount of computing power at each site.

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NonStop Systems

Using in-house processing, the true costs of the system would be significantly affected by the scalability of the hardware.

chose to implement the benchmark as one large program containing all transactions. This necessitated recompiling the whole application and stopping all processing every time a transaction was altered or added. This was a less desirable approach from a developmental prospective, but was not dictated by either manufacturer's system architecture.

We evaluated the report generation capability of the DBMSs by requiring each vendor to produce four "unknown" reports from the database during our benchmark evaluation visit. The reports chosen to test the generality and flexibility of the report generation capability were typical of those commonly requested of a medical information system. They exercised features we thought would be important in report generation software, including the ability to access data from several unrelated datasets for a single report, the ability to define working subsets of the database for report generation; a built-in flexible sort capability; flexible formatting capability with powerful edit features; a number of built-in functions such as total, subtotal, mean, range, count, etc.; and the ability to assign parameters so that a report could serve a variety of requirements. We assigned each of these attributes a value between 0 and 5 to derive overall scores for comparing systems.

Tandem's ENFORM was by far the best report-generating software as seen by our technical evaluation team. Burroughs' REPORTER II and Software AG's NATURAL were relatively equal, but did not rate as high as ENFORM. Univac's OLP rated substantially lower than the rest. ENFORM had all of the power, flexibility, and ease of use frequently ascribed to relational database systems. It was the only system evaluated that generated all four of the requested reports exactly as specified, using mostly one-statement programs.

The winner was Martin Marietta Data Systems (MMDS). Although MMDS operates several large IBM, CDC, and Prime computer systems, it chose to bid Tandem equipment on this procurement after an in-house competitive analysis. Computer hardware was only one of many factors that determined the final price evaluation; telecommunications, operations support, and profit margin also contributed heavily.

The functional benchmark is an excellent tool for evaluating the many interacting components that make up a good transaction processing system. There is no mathematical method for determining whether a given computer can do the job. An exhaustive comparison of desired features leaves unanswered the question of what each feature is worth. Availability of a particular feature may be far more important on one system than on another. A functionally specified benchmark can put these features into perspective, establishing an approximate cost of each approach to solving your problem.

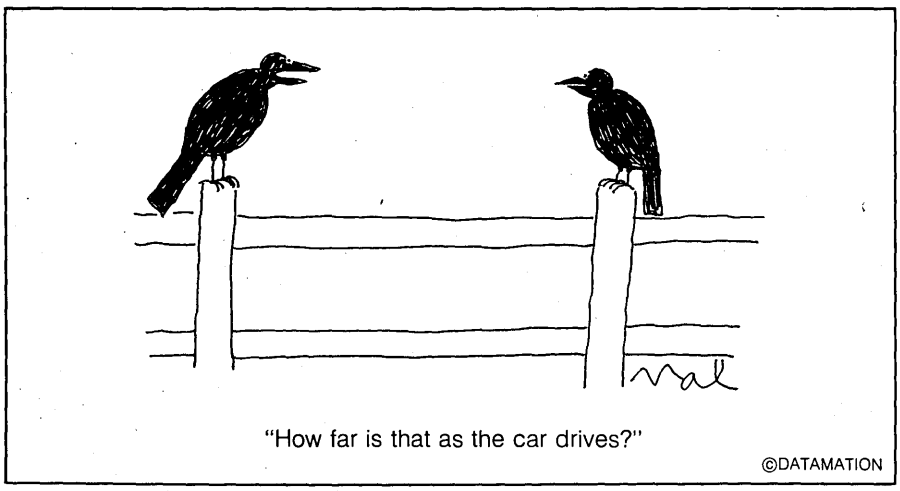
Furthermore, no amount of handwaving, charts, or figures can compare to seeing a simulation of your application run successfully, according to specification, to give confidence that a system can do the job.

To get the broadest possible participation in a procurement involving substantial investment by the vendors, it is important to make the competition fair and objective. It cost each vendor over $100,000 to compete in out procurement. Yet they were willing, in fact, enthusiastic about competing in a procurement with a concise and impartial evaluation plan which specified exacly what was required and how every offeror would be evaluated. Each vendor knew that if its solution could do the specified job most cost-effectively, it would win the business. Each was betting on its technical ability and the quality of its systems, rather than its salesmanship. It was clear that many vendors would not have participated if they had thought we would have selected our "favorite" vendor regardless of the outcome of the benchmark.

Although we compared only those transaction processing systems which competed in our selection process, we feel that this list includes the major transaction processing systems for our site application. Our request for proposals was sent to over 90 major service bureau companies. None of these vendors were constrained to a particular hardware or software approach. Each had the option of determining what it though to be the best technical solution to our application.

Indeed, the winning vendor proposed a system with which it had no previous experience because its analysis indicated it to be the most cost-effective. With a multimillion dollar contract at stake, it is unlikely dors would have overlooked a major competitive alternative.

Our heaviest benchmark load involved the processing of 15,000 transactions in one hour, necessitating an average of 12 disk accesses per transaction, against a test database consisting of over 1 million records, with the requirement that over 90% of the transactions be completed in less than four seconds. At this load, the Burroughs and Tandem systems were able to do the transaction processing benchmark at less than half the cost of the Univac and IBM systems. ❋



"How far is that as the car drives?"

©DATAMATION

CARTOON BY MALCOLM HANCOCK

Malcolm A. Gleser is head of the Department of Health Services Research at the U.S. Public Health Service Hospital, Seattle, and the director of the Public Health Automated Medical Information System project (PHAMIS). Dr. Gleser has been involved in the use of computers for medical applications for 20 years.

Judith Bayard is project officer for the PHAMIS project at the U.S Public Health Service Hospital in Seattle. She was the technical liaison to vendors during the recent PHAMIS TSP procurement. Before settling in Seattle to work at the hospital, Ms. Bayard worked as a programmer with IBM, the Banque de Paris et des Pays Bas in Paris, the University of Bordeaux, Cornell Univ., and Texas Instruments.

David. D. Lang is a systems analyst involved in telecommunications and design, and specification of teleprocessing resources for the development and national deployment of PHAMIS. Prior to his work with the hospital in Seattle, Lang worked with the NASA manned Spacecraft Center on the Gemini, Apollo, and Space Shuttle programs, where he helped develop flight dynamics models and specifications, and handled the procurement and programming of real-time computing systems.

NonStop™ Hardware

The overall goal: a fault-tolerant system with no single point of failure

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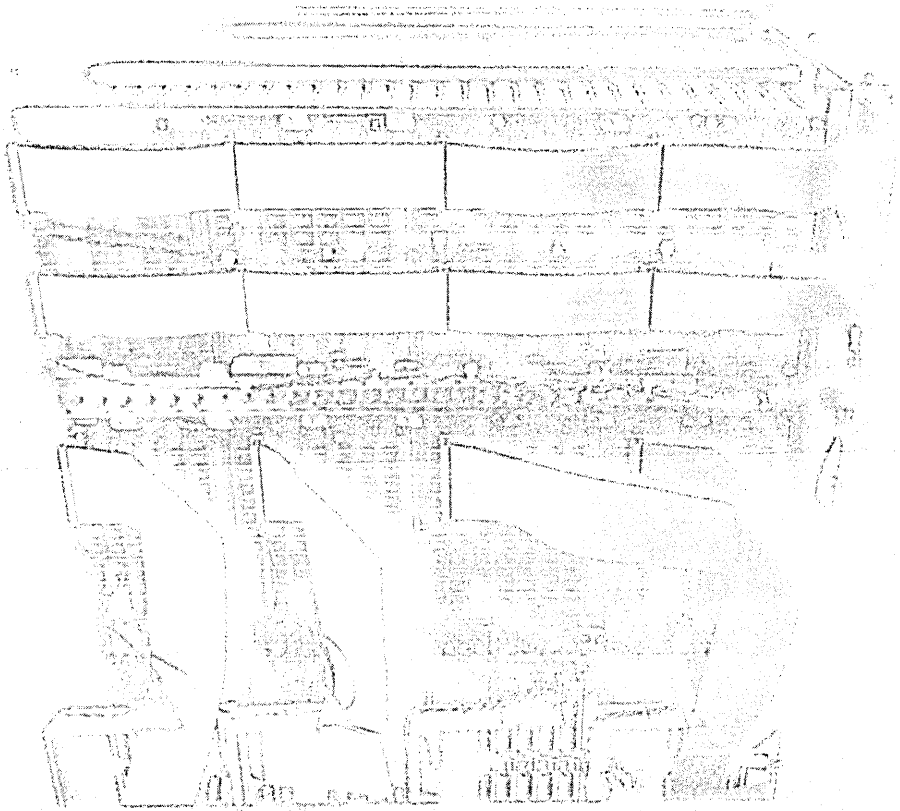

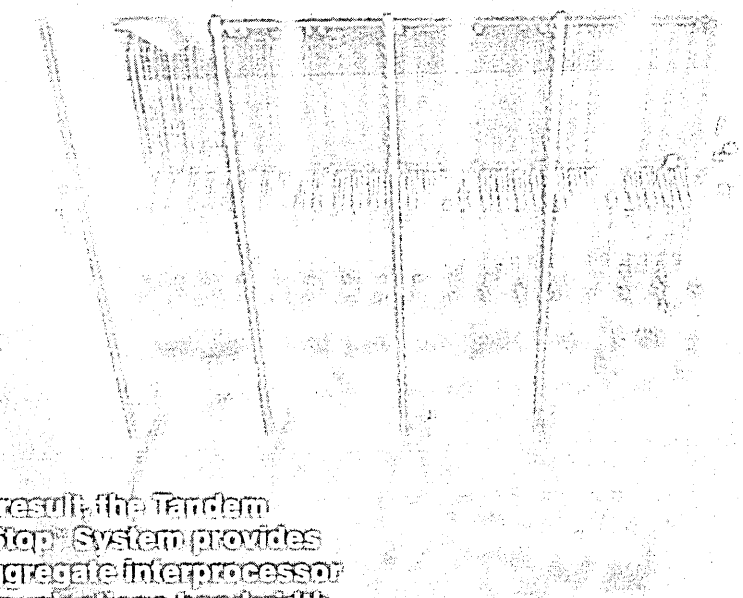

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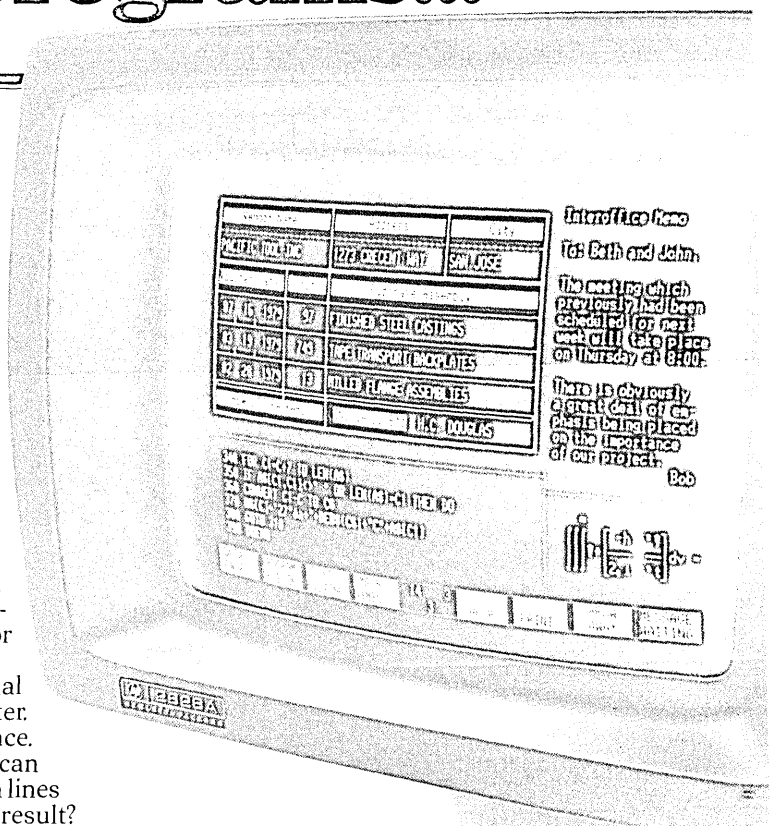

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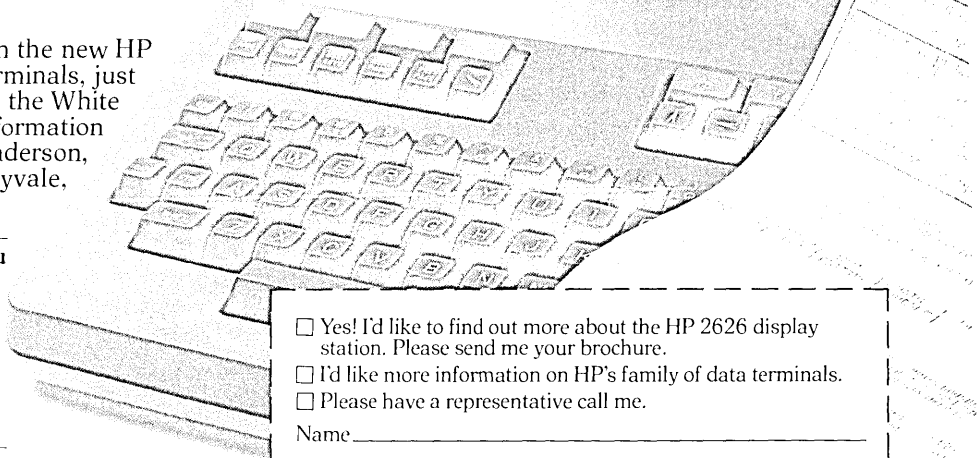

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TRENDS IN DP BUDGETS

Expenditures projected for 1981 will generally continue the developments of the 1970s.

by Janet Crane

We discovered something interesting while doing the 1980-1981 budget review: what had been predicted for years has finally come to pass. The industry—and the industry press—have talked endlessly about centralized, decentralized, and distributed processing as if these were choices still waiting to be made, developments about to occur. While industry observers were talking and writing, management, on the other hand, was choosing and developing. The information resource is currently being managed from centralized bases,

decentralized bases, and from every imaginable intermediate.

So, well into the preparation of our annual budget analysis, it became obvious we were often trying to compare apples and, well, pineapples. The operations (and budgets) to be measured are deceptively similar: after all, they're all data processing. For study purposes, of course, we wanted to ask, "Will the truly 'normal,' 'representative' company please step forward for ready analysis?" But this mythical entity eluded us. Instead, we found companies that don't consolidate projected budgets until they are already last year's expenditures and others that budget all data communications through the communications department.

Many firms leave each corporate division to run its own dp shop with only a small MIS operation serving corporate headquarters. Some companies integrate dp expenditures with the normal costs of doing business and don't treat them separately at all; others report that probably 50% to 60% of all dp expenditures rest with the end user departments, and budgeting is likewise decentralized.

In any given year perhaps one-fifth of all firms are undergoing a major expansion. At such times, their dp expenditures soar, making them "unrepresentative." While this diversity of situation and style is a true reflection of the industry today, it makes life impossible for the would-be survey taker.

The high costs associated with dp personnel have become a constant for the industry and have consistently occupied 45% to

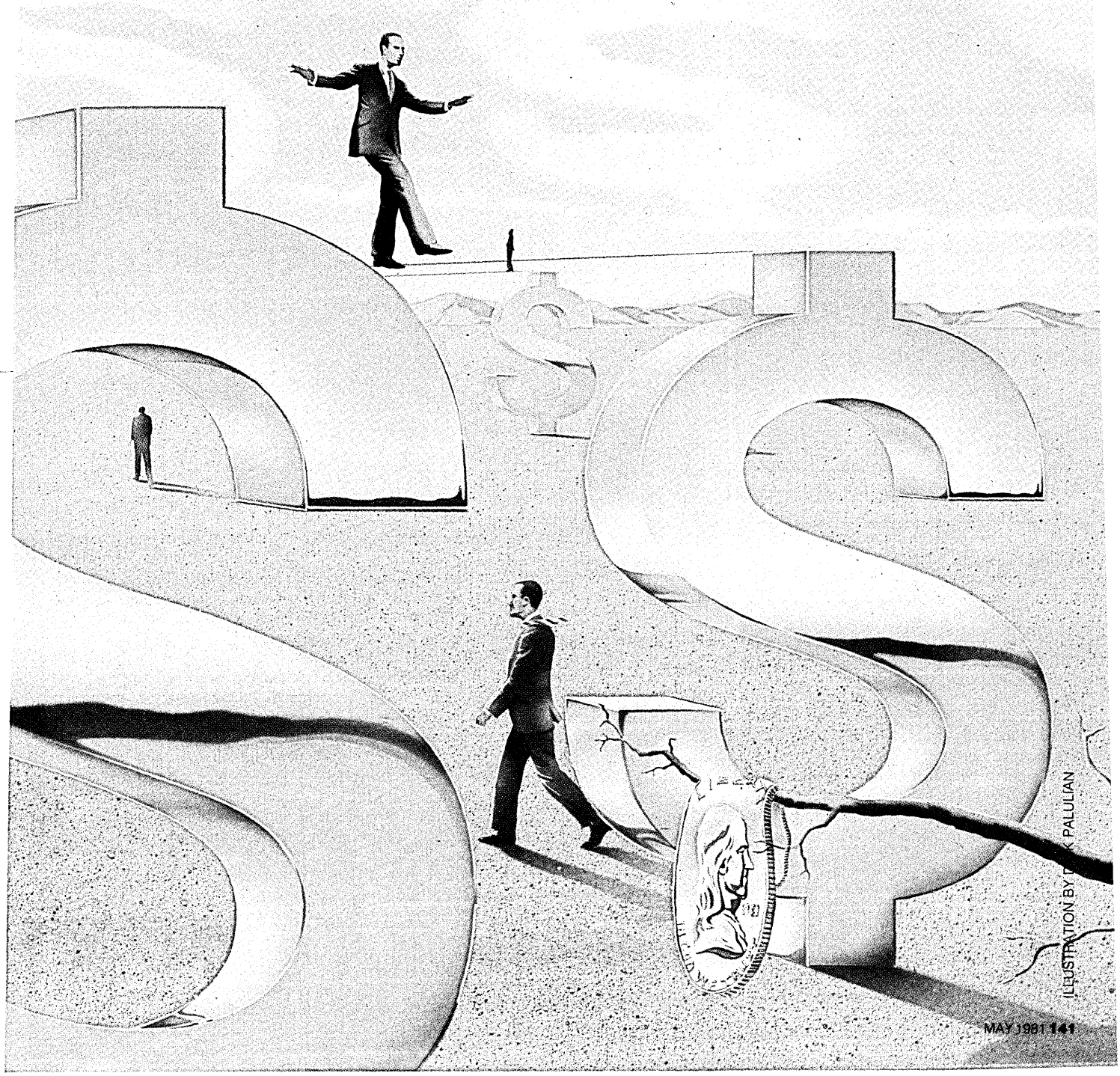


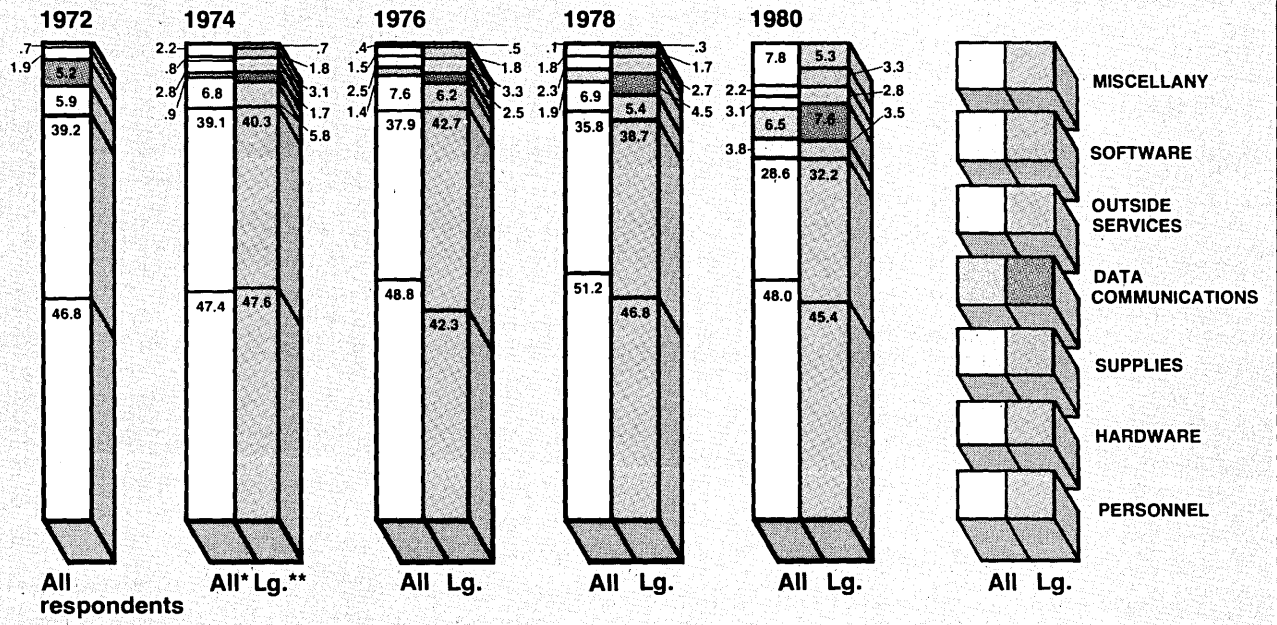
ILLUSTRATION BY [illegible] PALULIAN

The combination of recession and inflation that has depressed sales and increased expenses of most U.S. businesses is reflected in microcosm in dp operations.

FIG. 1

WHERE THE DP DOLLARS WENT

A look at the past eight years by percent of dp budgets devoted to major expenditures



*All survey respondents **Firms with more than $500,000 in annual hardware expenditures

These numbers were generated by more than half a dozen different surveys representing differing sample populations. Thus they are not truly comparable. We have subjected them to as rigorous a statistical testing as feasible and think the industry's salient budgeting trends are rather accurately portrayed.

We have separated out firms with more than $500,000 in annual hardware expenditures, believing their budgeting percentages would vary markedly from those generated by averaging all respondents. The distinctions were less pronounced than we expected.

50% of the total dp budget. Two trends have worked to keep the percentages constant: people have steadily become more expensive both to acquire and to retain. At the same time, head count in the central dp department has stabilized, and large processing centers are far less labor intensive than in the early 1970s.

Many personnel costs have been transferred to and expanded under other departments: data entry people, applications programmers, and word processing staff that are technically part of dp now most often appear on end-user budgets.

Hardware costs have gradually declined over the years, not in dollars allocated, but as a percentage of the dp budget. Thus, while the "computer" share of the budget has dropped from 40% to nearly 30% in the last decade, companies have far greater processing capacity and wider diversity of applications for each dollar spent. Some industry mentors have analyzed the budget commitments to people and hardware by establishing a man/machine ratio. Calculations have showed that over the years it hasn't changed greatly, migrating from 1.19 in the early '70s to 1.26 in 1980. This means that installations today are about 6% less labor intensive than a decade ago.

Reviewing past surveys, the high costs of supplies were a recurring complaint of managers, particularly in smaller installations. Apparently some relief has been realized, as the budget percentage for supplies has dropped measurably from the sizable 6% or 7% it occupied a decade ago.

Outside services—consultants, contract programming, training and education, off-site data entry, and time-sharing—have stabilized to a steady 2.5% to 3% of the dp budget. This perhaps indicates that the services market, while large and essential, will expand no faster than total dp budgets.

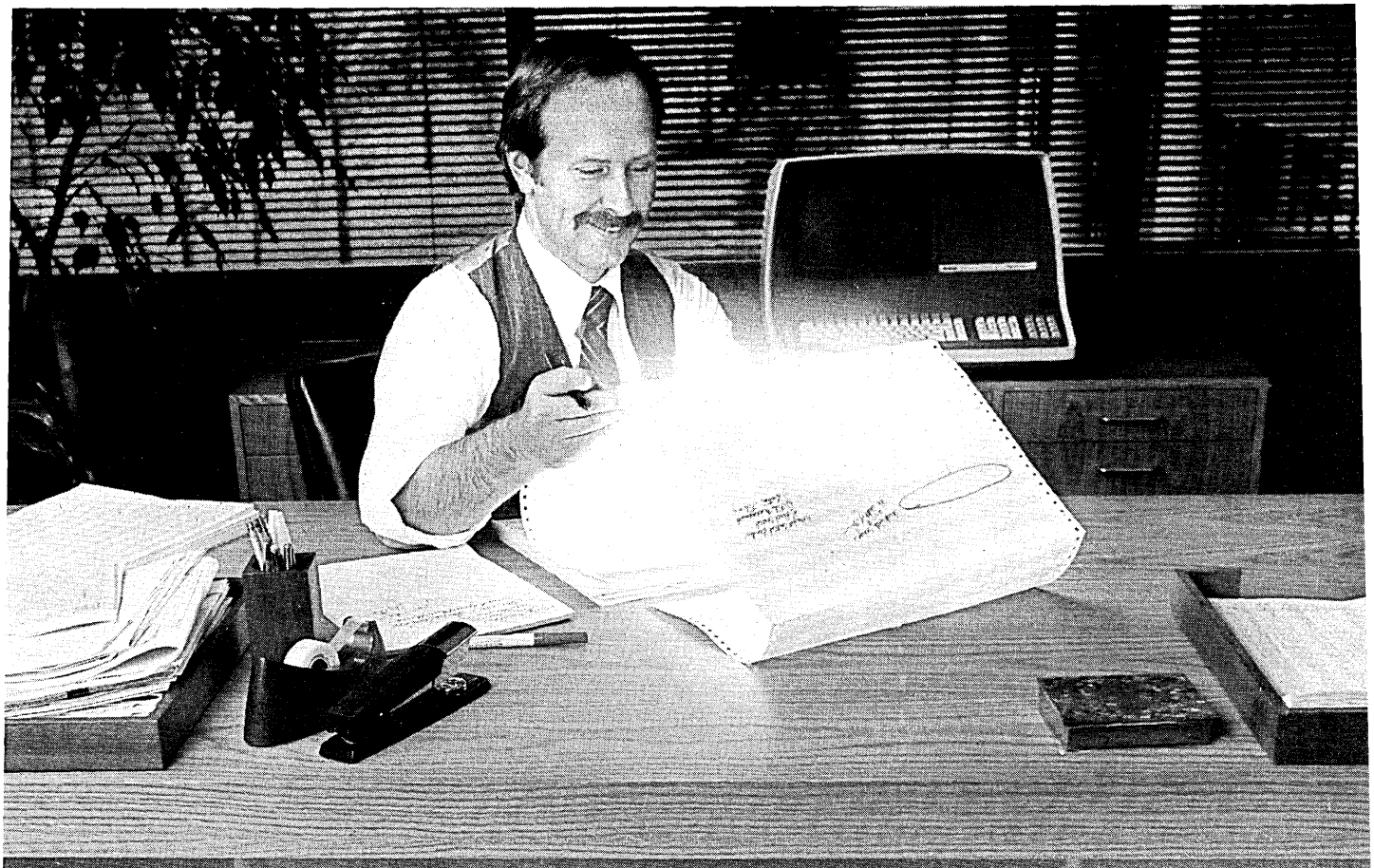
Where have the increases been realized? The rapidly growing data communications field has come into its own, steadily expanding in excess of 20% a year. This explosive growth is masked when only dp budget numbers are considered, since many companies allocate elsewhere line charges, voice services, and even datacom hardware. Unbundled software, too, begins to appear as a significant percentage on most budgets.

The "miscellany" category hides a world of information and appears meaningfully on the chart only in 1980. This undoubtedly reflects a different questioning technique used that year. Nonetheless, traditional survey categories have likely caused underrepresentation of the sizable—and increasing—chunk of budgets earmarked for such items as space rental, light, heat, power, taxes, and UPS systems. Many companies categorize "supplies," "travel," and recurring expenses under "miscellany." However exaggerated the numbers may appear for 1980 and 1981, for many companies, miscellaneous items have apparently replaced supplies as a perplexing but escalating cost.

BUDGETS TODAY & TOMORROW

While alerting readers that 1981 numbers are applicable only for centrally budgeted expenditures of large industrial companies, we climb right back out on a limb to talk about the future. Generally, expenditures projected for 1981 continue the

CHARTS BY CYNTHIA STODDARD



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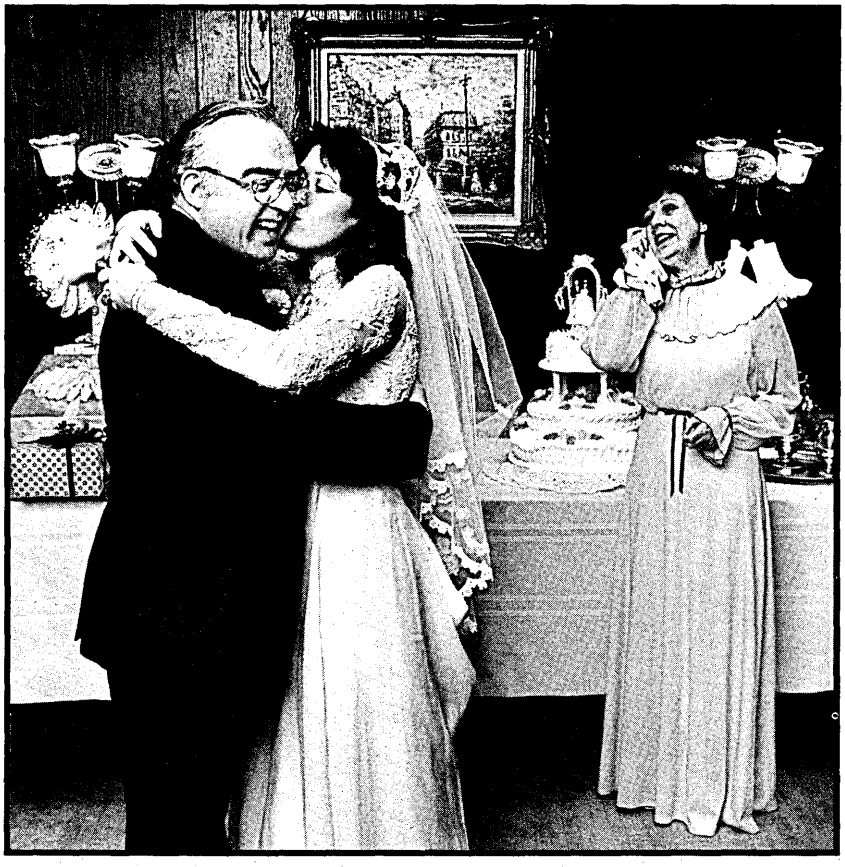

As I waltzed with my daughter, it really did seem worth all the expense. She looked up at me and said, "Thank you, Daddy."

A rainy day.

"Good Lord, Harry, just look at all this. They ought to lock us up. We must have flipped. We really can't afford it!"

I looked around the reception hall of the local country club. Table after table had been set up for the wedding feast. An orchestra was tuning up. Waiters scurried around with buckets of champagne. And it was all on *me*.

Mrs. Hillman, second cousin to the groom, passed by and said something I couldn't understand. I smiled at her while I said to my wife, Martha, "Don't worry. I told you I had a way to pay for it."

"I *do* worry. I'm a *born* worrier. What do you have in mind? Selling the house? Or just taking every last cent out of the bank?"

I wondered what the chances were of getting a glass of the champagne. "Nope, not the house", I said. "But we will have to cash in a large chunk of those U.S. Savings Bonds."

"The Bonds! Oh, Harry, I'd forgotten the Bonds. What a lifesaver!"

That's one of the good things about U.S. Savings Bonds. You can buy 'em and forget 'em. And when you really need 'em, there they are, all grown and matured.

The band struck up as the wedding party came in the door. Everyone applauded. Martha was smiling with a big tear rolling down her cheek.

"Oh, Harry, isn't she beautiful? It's worth it. Even though we were saving those Bonds for a rainy day."

I put my arm around her and said, "Don't worry, I'm still buying them every payday. And as far as rainy days go... take a look out the window."

As I waltzed with my daughter, it really did seem worth all the expense. She looked up at me and said, "Thank you, Daddy. For everything. And especially for today."

I shrugged and said in an offhand manner, "It's nothing, nothing at all."

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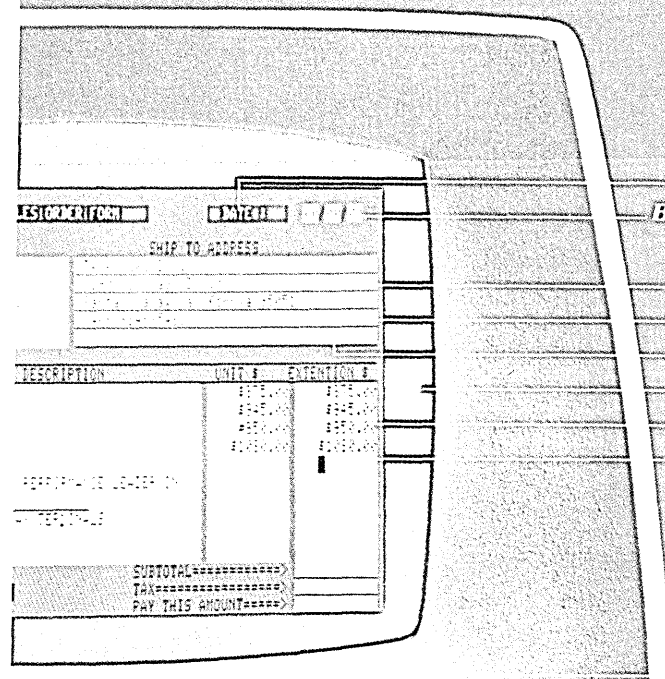
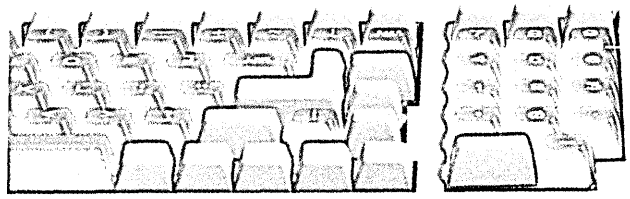
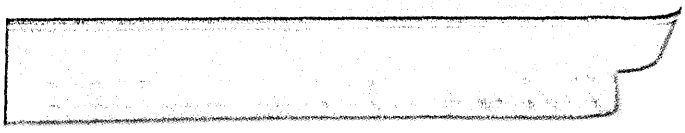
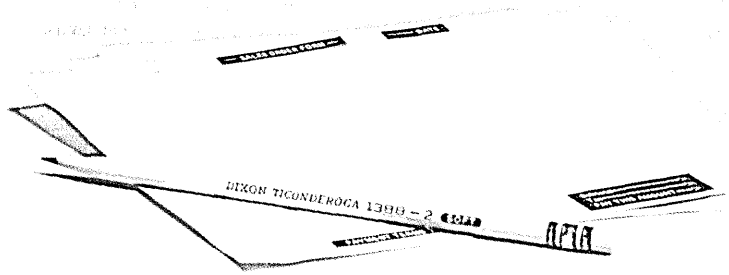


- Reverse video
- Blinking/blank fields
- Upper/lower case char.
- Protected fields
- Underlining
- Non-glare screen
- 12 x 10 char. res.
- Blinking cursor
- 9 Baud rates (75-9600 Baud)
- Self test
- Auxiliary port







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CIRCLE 118 ON READER CARD

Personnel remains the largest single budget item.

developments of the 1970s. The combination of recession and inflation that has depressed sales and increased the expenses of most U.S. business is reflected in microcosm in dp operations.

The name of the game is to absorb through increased efficiency inflation, personnel shortages, higher maintenance costs, and other lurking evils. Many MIS executives believe data processing is one spot where improved technology, coupled with better management, can contribute to sharply increased corporate productivity and an important edge in the marketplace. More than a few have remarked that tight budgeting has challenged them to deliver a better but lower-priced service to their in-house users. In fact, unit costs have declined almost universally over the years.

Personnel remains the largest single budget item. Although the allocated percentage has perhaps declined slightly in the central department as end users have taken up some dp tasks, personnel increasingly poses the biggest challenge to dp management. The shortage of good people, their high salary demands, and the escalating costs for recruitment and training of new employees are issues that occupy increasing amounts of the executive's time and of budget costs. Many 1981 respondents indicated they are countering these trends by cutting back corporate staff salaries and budgets and by further reducing personnel numbers. Other cost containment methods are being adopted to get around the high price of people; buying software packages instead of developing new programs in-house is an example.

Recession-impacted industries are temporarily postponing previously planned major hardware upgrades. Many managers indicate that tight budgeting is encouraging them to approach lease and purchase negotiations with a more practiced, cagey eye. There's a general trend toward more accountability in the acquisition of major new equipment and applications, managers say.

The communications area continues to expand exponentially, and at increasingly faster rates. It is an increasing percentage in the budget of every respondent we reviewed this year. While data communications is recognized as one of the most rapidly growing segments of the industry, the vast disparity in the ways corporations organize and manage the resource means that it is almost impossible to obtain an accurate description of its size and scope.

The almost runaway growth in data communications expenditures is challenged by the rapid rise of separately purchased software acquisitions. Indications are that dollars allotted for software are also increasing at about 20% a year.

On this year's return, again, we noticed more consistent retrenchment in outside services than in any other segment of the industry.

Itemized information on software budgeting for large industrial corporations is quite illuminating. What is so impressive is the ratio of sales going to mainframe vendors —nearly 63 cents of every software dollar spent. Generally, the results indicate that computer vendors such as IBM, DEC, NCR, and Honeywell continue to dominate the market for packages that are machine-specific: operating systems, compilers, and sorts. Concentrating on these universally used items and selling across industry and application lines, hardware companies are now merely selling separately what used to come with the machine. Because most buyers tend to purchase these items from the vendor who sells them computers, independents have never been able to establish a foothold in this segment of the market.

FIG. 2

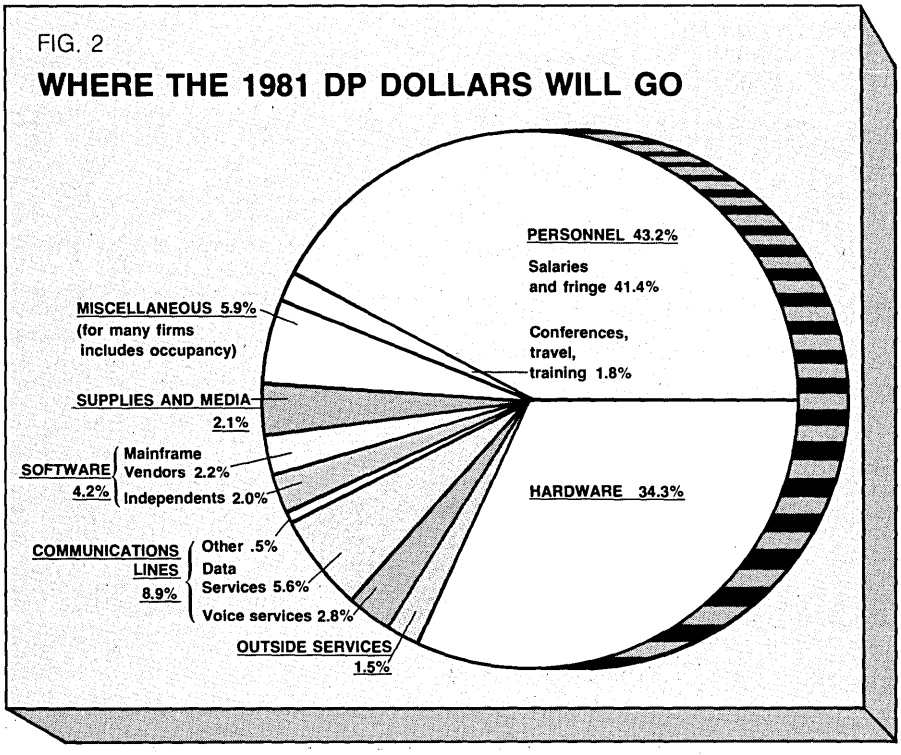
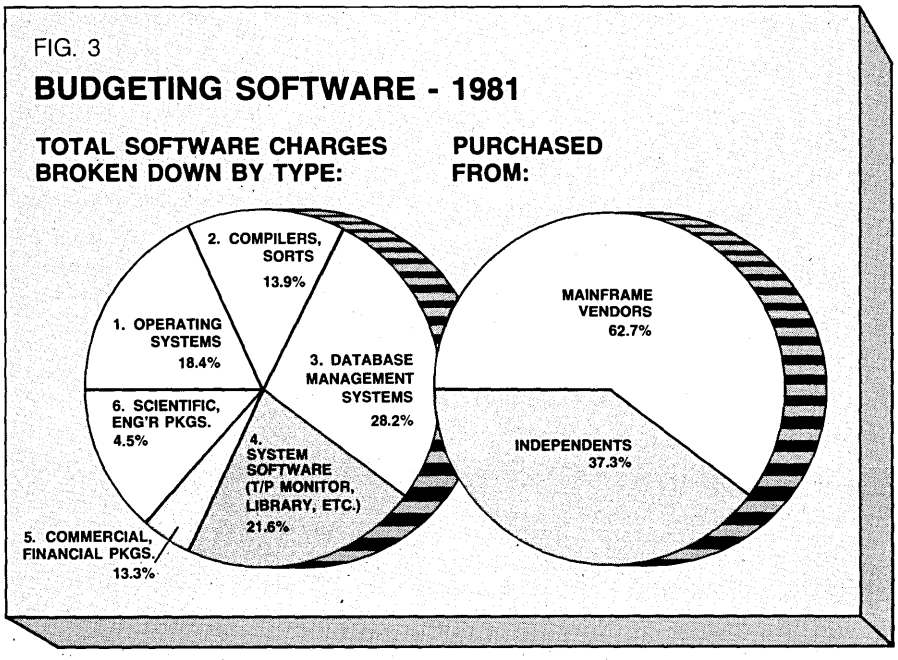


FIG. 3



This is press-on lettering.
This is hand lettering.
This is mechanical drafting lettering.
This is typehouse lettering.
This is Kroy™ lettering.*

*This is Kroy™ lettering enlarged to 124%.

Only one can be done quickly and economically with quality right in your own office.

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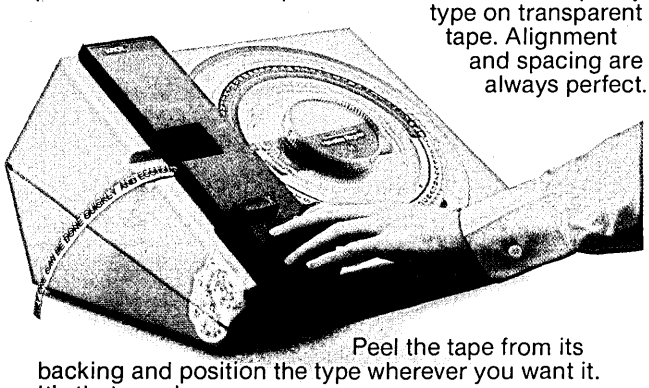
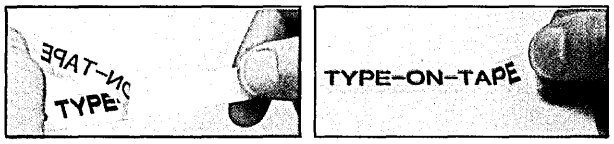
Here's how: Just turn the typedisc to automatically position the letter and push a button. Out comes quality type on transparent tape. Alignment and spacing are always perfect.



Peel the tape from its backing and position the type wherever you want it. It's that easy!



It's 5 times faster. If you've ever used press-on lettering, you know how long it takes to complete the job. And then a letter or an entire line can be crooked. Not so with Kroy lettering. All the letters are always in a straight line. Your job can be completed five times faster than press-ons, and at least twice as fast as mechanical drafting lettering. And there's no lost time waiting for an outside typesetter.

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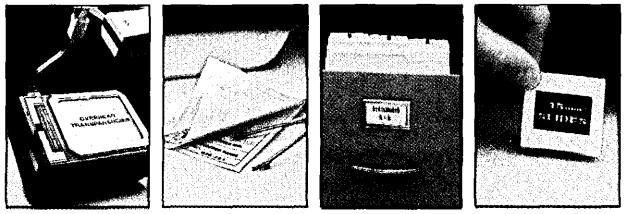

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Company _____

Address _____

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1489

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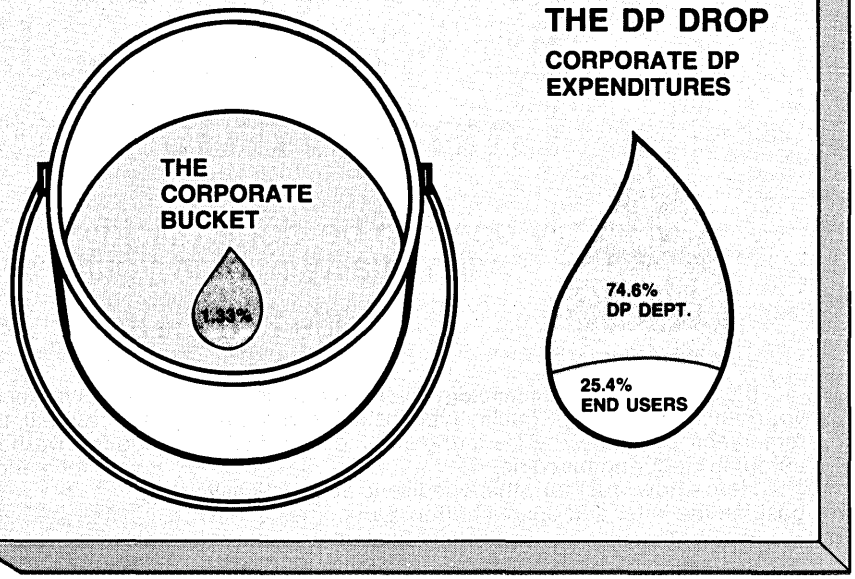
FIG. 4

WHAT DO THE NUMBERS SAY?

TOTAL DP EXPENDITURES AS A PERCENT OF CORPORATE REVENUES



The database management systems and systems software markets are more evenly divided. Although mainframe vendors are a strong, even formidable, presence here too, some independents have garnered substantial shares of the dollars spent.

Accounting/financial and scientific packages have far more limited market potential; thus mainframe vendors have never truly attempted to complete here for the spoils. For these smaller, more specialized markets, programs generally involve higher level languages and can ultimately be adapted for many computer makes and models. Only here are independents left to carve up the markets among themselves.

But how much potential for future growth is there? Even the future appears to lie with the mainframers. Should the market split documented in this year's sample also predict the future, there may be some lean times ahead for many software houses with limited new applications on their drawing boards. Perhaps a long, hard look at the markets, the opportunities, and the competition by many present and would-be software vendors (and backers) is in order.

TRENDS IN DP INDUSTRY

The almost universal obsession with quantification demands an attempt at measurement of the overall size and organization of data processing. For having qualified the accuracy of the numbers, it would be remiss not to attempt to decipher trends in this rapidly modifying business.

After 25 years of fast growth, how big is data processing? No more than a drop in the corporate bucket. For major corporations, central dp department expenditures average about 1% of total corporate revenues. This is a percentage of the likes of postage and phone bills. Even when end-user expenditures are added in (and these are probably grossly underestimated because of the difficulties in monitoring widely dispersed purchases and isolated equipment), dp budgets rise to only 1.3% of annual company revenues. Total dp percentages haven't changed much over the years; the industry is apparently growing in step with the companies it serves.

What is changing significantly is who is spending the dp dollars. Fifteen years ago almost all expenditures originated in the central department. While product selection and utilization may still be guided by central staff, the real growth in the industry is now being experienced among the end users, where dollars spent for people, terminals, and applications have skyrocketed. Central site operations have tightened and stabilized, so that MIS dollars have remained almost constant. End-user growth often exceeds 20% a year.

A few companies—very few—still say that all dp expenditures are budgeted through the central department. At the other extreme, there were respondents reporting company expenditures divided in an 85%/15% split, favoring the end users. One industry spokesperson predicted his company will realize a 16-to-1 split within the next 10 years. "Nothing will have decreased," he emphasized, "but our company's central policy is to sponsor growth, to push out this 'using tool' into the hands of the users as far as possible."

All indications are that dp's share of the corporate budget will not grow much. Better operations management will counter the increased costs realized for purchasing more equipment and applications. But, a drop in the bucket? About 1% to 1.5% of the corporate revenues of every company in the country add up to a very big drop, indeed. ✻

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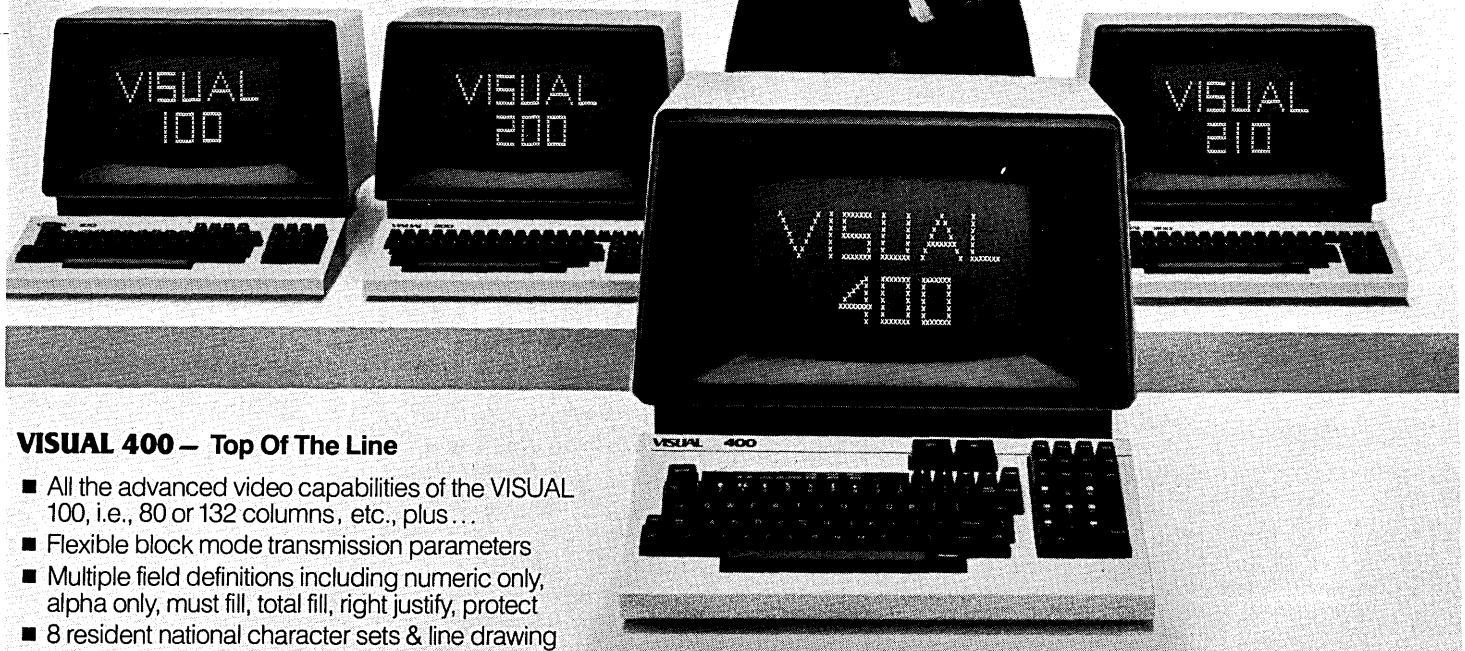

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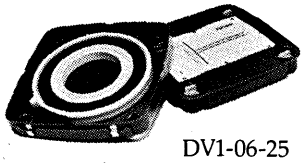
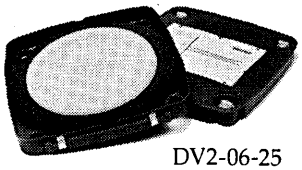
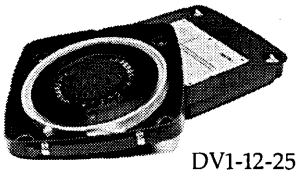


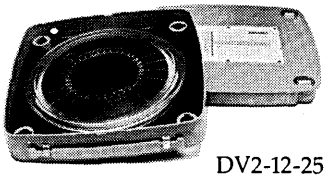
DV1-06-25
Ships one 600' tape reel in tape seal



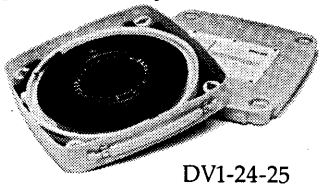
DV2-06-25
Ships one 600' tape reel in canister



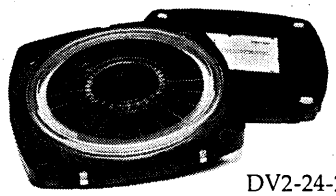
DV1-12-25
Ships one 1200' tape reel in tape seal



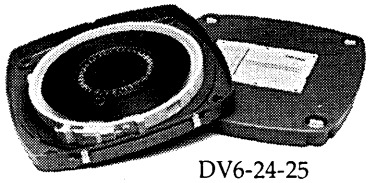
DV2-12-25
Ships one 1200' tape reel in canister



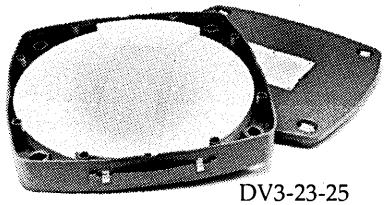
DV1-24-25
Ships one 2400' tape reel in tape seal



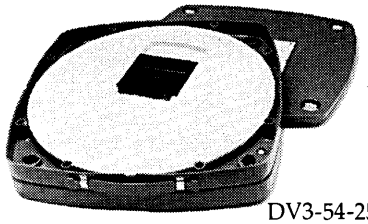
DV2-24-25
Ships one 2400' tape reel in canister



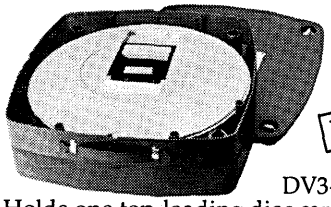
DV6-24-25
Ships one 2400' tape reel in Easy Load II seals



DV3-23-25
Holds one front-loading disc cartridge (IBM type 2315)

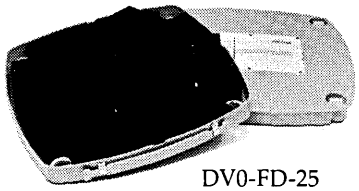


DV3-54-25
Holds one top-loading disc cartridge (IBM type 5440)

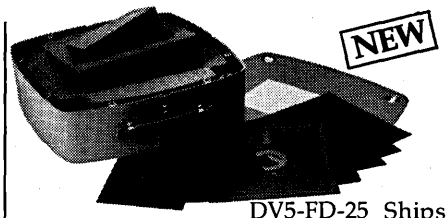


NEW

DV3-67-25
Holds one top-loading disc cartridge (DEC RK06 or RK07)



DV0-FD-25
Ships from 1 to 10 standard or mini floppy discs

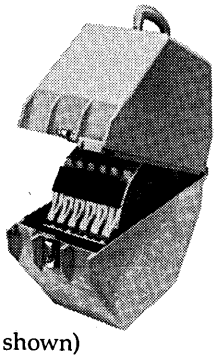


NEW

DV5-FD-25 Ships up to 50 standard or mini floppy discs

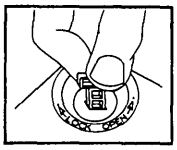
MULTIPLE SHIPPERS AND CARRYING CASES

Two case designs to ship or hold four reels in canisters or Easy Load II tape seals, and six in tape seals.



Shippers
DV4-06-01
ships 600' reels
DV4-12-01
ships 1200' reels
DV4-24-01
ships 2400' reels

Carrying Cases (not shown)
DV5-06-01 holds 600' reels
DV5-12-01 holds 1200' reels
DV5-24-01 holds 2400' reels



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CIRCLE 122 ON READER CARD

Does President Reagan know that the salvation of the American economy may rest in the microprocessor?

THE SOLITARY BEEDEEPER

by Marvin Grosswirth

THURSDAY

Beedeep! Beedeep! Beedeep!

Gently, almost sweetly, the tiny alarm on my digital watch urges me awake. It seems to know that unless I rise within the next five minutes, my digital travel alarm/AM-FM radio will emit a shriek that will disintegrate my cerebral cortex and agitate all the dogs within a one-mile radius. I have difficulty locating the digital travel alarm/AM-FM radio because this is not my bedroom. It is a motel room. I am in Las Vegas.

I am here to work, which is a good thing, because I don't like Las Vegas. (I must remember to say "Vegas"; only the virginal say "Las.") After blackjack, what else is there to do here? There is the annual Winter Consumer Electronics Show. It is the ninth such show, but my first. If I do well, I will perhaps be assigned to the annual Summer Consumer Electronic Show, in Chicago, which, as everyone knows, is a toddlin' town.

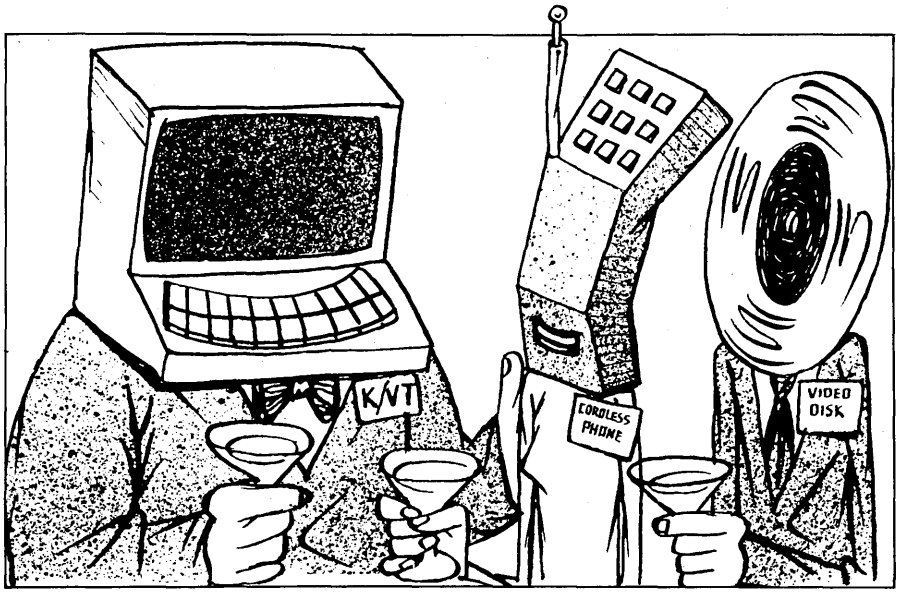
The Convention Center is overwhelming. Never have so many owed so much to such a little chip. Does President Reagan know that the salvation of the American economy may rest in the microprocessor? Manufacturers are showing off chip-driven video devices, electronic games, microwave ovens, audio equipment, calculators, watches, musical instruments.

I look for computers. They are not difficult to find, because several major manufacturers are committed to the concept that no home is complete without a computer. Three companies that started out selling video games have upgraded their systems to home computers. Several other companies are introducing what they describe as full-function computers that can be carried in briefcases. All of them can be hooked up to standard tv sets, so nearly 80 million American homes already have peripherals and most of them don't even know it.

The big push is for the videodisk. It closely resembles a phonograph record and it can store about 55,000 tv "frames" of infor-

ILLUSTRATIONS BY BILL BASSO

Will we wind up wiring our society so that we can be alone with our microprocessors?



mation on each side. Information in this case is video pictures and accompanying audio, but the talk is that if these disks can be improved from read-only to read-and-write, they will revolutionize the computer industry by vastly increasing storage capacity. Videodisk system manufacturers, however, do not want to talk about the computer industry. They are too busy convincing retailers, who comprise most of the 57,000 registrants, that their system is the best. There are three different systems being pushed. Naturally, they are totally incompatible.

The notion of "the wired society" becomes conceivable; just look around. But there is a certain incongruity: with all the technology covering the floors and walls of the Convention Center, the Las Vegas Hilton, and the Jockey Club, it becomes clear that societal wiring is immediately achievable, but everyone playing with the products on display is doing so alone. Will we wind up wiring our society so that we can, ultimately, be alone with our microprocessors? That may be worth considering for further development, but now I have to hurry, or I'll be late for the Personal Communications Conference.

There is not much I can use from the conference. Telephone companies predict that FCC deregulation of telephonic devices (scheduled for March 1982) will spell chaos for the consumer. Manufacturers of telephonic devices predict it will spell a bonanza for retailers.

Jerry Skene, of Northern Telecom, Inc., notes jokingly: "If all the predictions for technology come true, man will evolve into a 97-pound index finger." Everyone laughs.

I play blackjack until 1 a.m. (Lost $27.) That night, I dream that I am a 97-pound index finger.

FRIDAY

In the Press Room I mention to a colleague I am feeling guilty because I am avoiding the Jockey Club, where the audio equipment is displayed. One of my editors has expressed a slight interest in innovations in audio, but the thought of slinking through a forest of throbbing boxes dismays me. My friend assures me that I need not worry—there is nothing innovative at the Jockey Club. I believe him because I want to.

Still, I cannot escape audio. It is all over the place. There is a proliferation of highly portable stereophonic tape cassette-radio combinations with earphones, designed for joggers, cyclists, roller skaters, other physical types, and anyone who wants to listen to music privately. You slip on the earphones and you can listen undisturbed and undisturbing. They are also an excellent means of shutting out unwelcome noises. You can be hard-wired for aural isolation.

Toshiba is showing the ultimate in totally private television viewing—a calculator-size set with an LCD screen. The picture is imperfect, and the device is not yet ready for the market. It is being shown as a teaser. The retailers are going crazy over it because they want to order it and can't, but videonic solitude is only a couple of years away.

SATURDAY

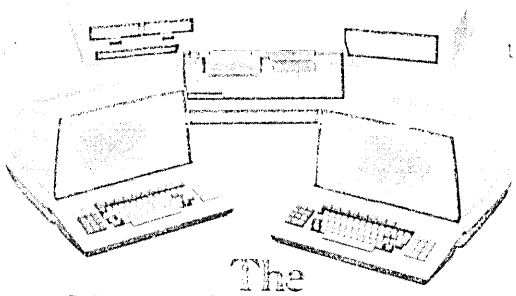
Hundreds of visitors to the show are playing by themselves. Numerous exhibits of electronic games allow the curious to test their skills against what are called—sometimes generously—computers. There are blips with which to hit other blips, versions of chess and checkers, of football, hockey, soccer, and scores of other games. The players are crowded together, but each is involved with his own screen, oblivious to the equally oblivious player alongside him.

Pleasant sounds drift from the Casio display. I wander over to find that the company is introducing a line of electronic musical keyboard instruments. Someone should write a song called "The Microprocessor Blues." Or maybe a rock group should call itself that. Or, maybe, The Chips. Gladys Knight and the Chips. I discover the VL-Tone, described as an "electronic musical instrument and calculator." It is about 12 inches long and 3 inches wide. It allows you to play music. If you don't know how to play music, you can pick out the notes and save the right ones in its memory, and then play them back at the proper tempo, in any one of five voices and accompanied by a choice of nine rhythm backgrounds. I want one desperately, but I know that if I owned one, I would annoy those I live with to distraction. Still, you can get earphones for it, so for a little more money you don't have to disturb anyone. And, not incidentally, no one can disturb you; you can shut people out with the earphones while you play by yourself.

I wander around the show looking at cordless telephones, answering machines, and "personal electronics" like pens with clocks built into them and note-taking calculators and digital travel alarm/AM-FM radios, but I am drawn, again and again, to the VL-Tone. I tell myself that if I owned one, I would be hard-wired in a private musical world. Maybe I could make up for it by playing back the music after I have my technique perfected.

Blackjack till 1:45. (Won $18.)

a two terminal system. Under twenty.



The New DS990 Model 3. For the medium-size businessman.

to 4 terminals so it can grow with your customers. Add to that IBM 3780 communications capability and TI's comprehensive service support, and you've got a best-seller. The DS990 Model 3. It's the right size, at the right price. For more information, contact Texas Instruments Incorporated, Box 202146, Dallas, TX 75220. Phone 1-800/257-7850 (N.J., 1-800/322-8650). Please refer to code #A02-204.

TEXAS INSTRUMENTS
INCORPORATED

CIRCLE 123 ON READER CARD

SUNDAY

I am in the Press Room, having breakfast. My watch *beedeeps*, indicating that I have five minutes to make it to the Personal Electronics Conference. Eight people in the Press Room hear my *beedeeps* and begin looking at their own watches, frantically pushing buttons or hitting their "wrist instruments." (Texas Instruments, according to its display, isn't selling watches anymore; it's selling Wrist Instruments.)

The Personal Electronics Conference is a revelation. John McDonald, president of Casio, Inc., says, cheerfully: "We don't satisfy needs; we satisfy wants." You said it, John. First you create them, then you satisfy them. Like that damned VL-Tone.

TI's Bill Sick goes on at some length about AEGs. "The active element group [AEG]," he explains, "is an electronic circuit at its simplest level. . . . The number of AEGs in a product gives us a measure of its electronic content." He discusses how costs of AEGs have drastically diminished "from about $7 in 1960 to a tenth of a cent today. . . . We expect this cost reduction to reach a hundredth of a cent by 1990." In 1970, he says, the average home had about a hundred AEGs; there are over a thousand per home today. He predicts that in a few years, most homes will have 4,000 AEGs, which he claims "is an electronic circuit equivalent to the most popular general purpose computer of the 1950s, the IBM 650." Sick says that by the end of the decade, "the average household will have almost a half-million AEGs. . . ."

"The key to continued market growth," Sick tells the assembled retailers ". . . will be our competence in building genuine utility into these products. . . ." Not everyone gets his message. Later, in a last-minute walk-through before the show closes, I come across a demonstration of a machine about the size of a handheld printing calculator, only this one prints letters—notes, memos, instructions, etc. I try it myself. "I can write the note in longhand," I tell the salesman, "faster than I can print it out on this thing. Besides, this dinky little piece of paper is likely to get lost or overlooked." He is highly indignant; I have obviously missed the point which has nothing to do with "genuine utility" and everything to do with doing things electronically.

The show is over, at least for six months.

Blackjack until midnight; won $9. Vegas and I are even.

In my room, I set my wrist instrument and the digital travel alarm/AM-FM radio and climb into bed. I keep thinking of the VL-Tone.

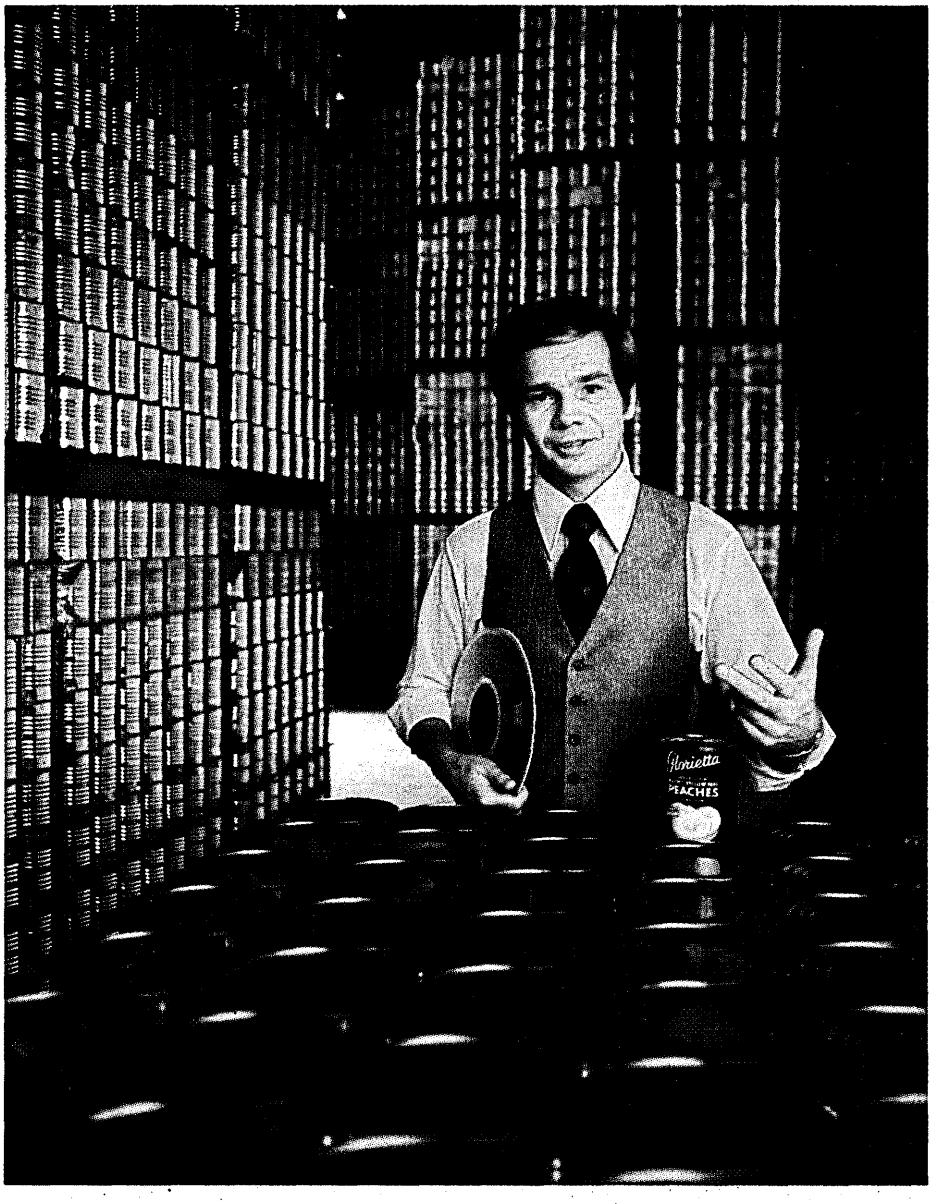
I get out of bed, set the digital travel alarm/AM-FM radio to OFF, pick up the telephone, and leave a wake-up call.

Beedeep. ✻

FAMOUS SAYINGS OF WALTER STEMMLER

"I had a tooth abstracted."

"We match bushels of orders with acres of inventory. Think we'd trust that job to anything less than Scotch® Brand Computer Tape?"



Bob Scully, Marketing Manager
Glorietta Foods, San Jose, CA

Glorietta Foods annually cans over 12 million cases of fruits and vegetables for food distributors across the U.S. Orders are taken, cans labeled, and products shipped to grocers' shelves. The complex order inventory process is put on Scotch 700 Black Watch® Computer Tape.

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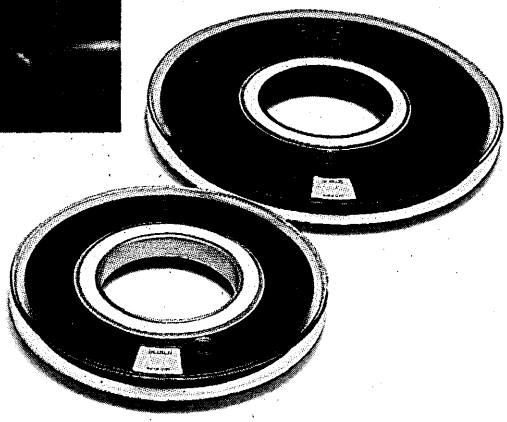
This unique textured backing is a major technical advantage. There is less physical damage to the tape and thus fewer read errors than with ordinary tape. So, you get more reliable, longer-lasting computer tape.

These are the reasons Black Watch computer tape has been used in thousands of data processing installations all over the world for years. It can be used dependably in yours.

For information about how you can purchase Scotch Computer Tape, call toll-free: 800-328-1300. (In Minnesota, call collect: 612-736-9625.) Ask for the Data Recording Products Division. In Canada, write 3M Canada, Inc., London, Ontario N6A 4T1.

If it's worth remembering, it's worth Scotch Data Recording Products.

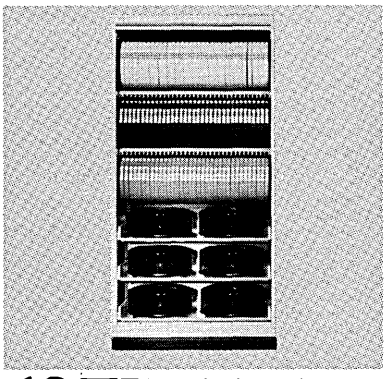


3M Hears You...

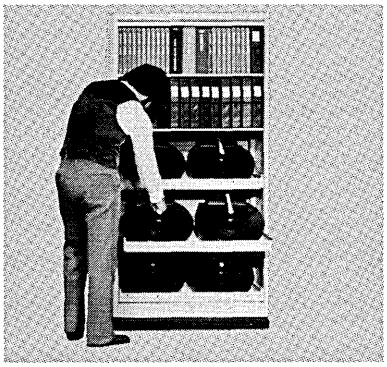
3M

CIRCLE 125 ON READER CARD

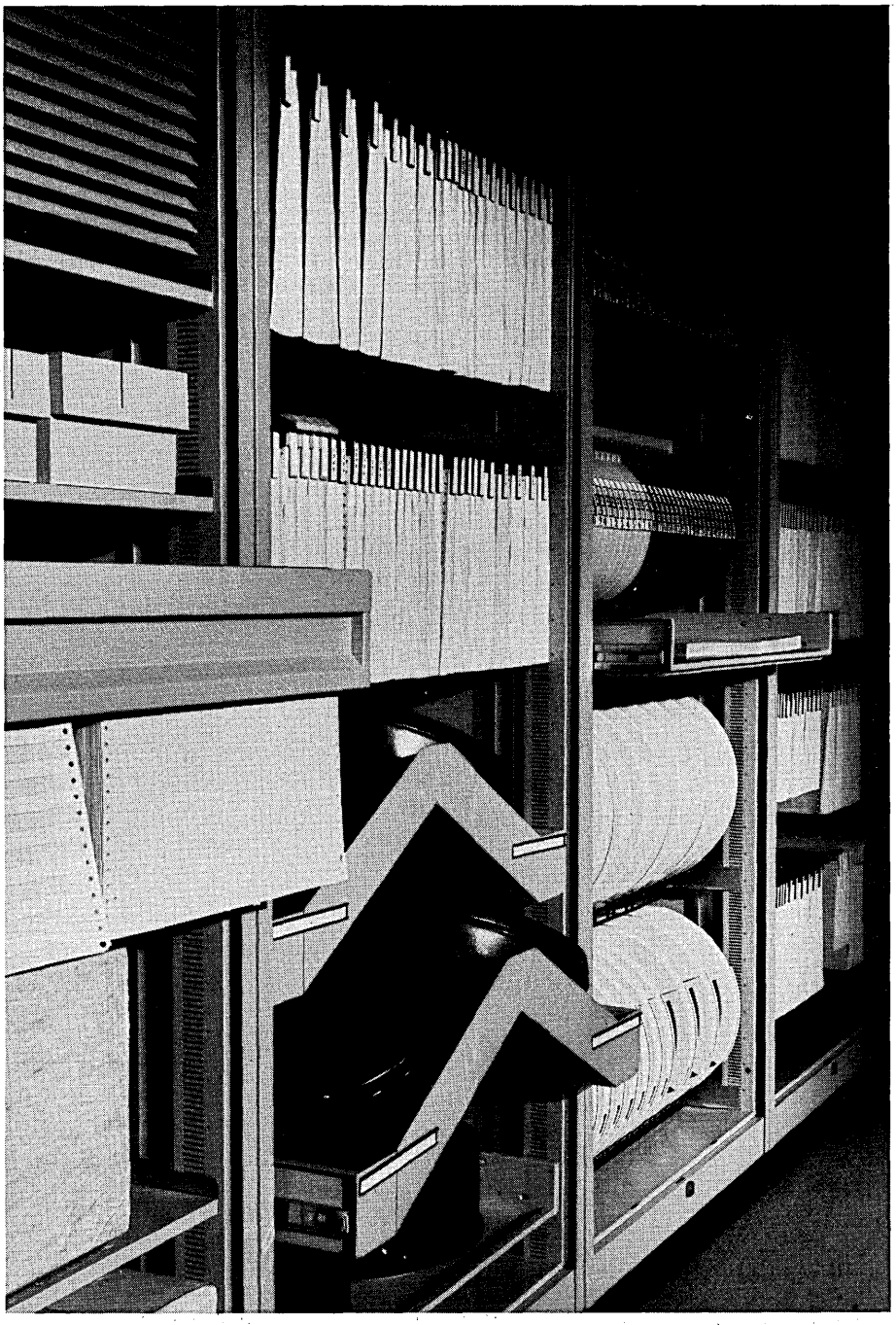
1972 Bought first Optimedia cabinets to file remaining punch cards, 1316 disc packs and reels of 1600 BPI tape.



1975 Media changed to include 3336 packs in addition to tape. Cabinets reconfigured, new cabinets added.



1978 New system required 3348 disks but no tape. Manuals and run books added. Cabinets again adapted to needs.



1981 Optimedia usage has grown to include a wide variety of computer room media, systems and programming documentation and printout reports in all departments of the company. As media has changed, the Optimedia cabinets have been reconfigured to meet each new filing need.

optimedia® cabinets

Because you don't know how your filing requirements may change in years ahead.

The days of single-purpose, soon-to-be-obsolete cabinets for D.P. records, documents and reports were struck a blow in 1972. That's the year Optimedia was introduced to computer rooms. Now these cabinets have become industry standards wherever D.P. media is filed. It's the filing cabinet with 99 lives. Find out why, circle the readers' service number or write today for our free brochure. Wright Line Inc., 160 Gold Star Boulevard, Worcester, Massachusetts 01606.

Wright LINE

a unit of Barry Wright

◀ CIRCLE 126 ON READER CARD

CIRCLE 127 ON READER CARD

Customers will encounter more carriers and services, cheaper hardware—and higher rates.

TELECOM: THE WINDS OF CHANGE

by Michael Korek and Ray Olszewski

The telecommunications industry is poised for a major transformation that will be both a boon and a bane to its business customers. Telecommunications suppliers will offer a fast-expanding range of services and equipment adapted to the needs of electronic information development and transfer, and significant shifts in rate structures will lead to a steep drop in the cost of some services. On the other hand, service quality and reliability could decline considerably, and rates for most services could increase sharply.

At the root of these changes lie two intertwining forces: rapidly advancing electronics and microelectronics technology, and unrelenting political intervention aimed at stimulating greater competition within the industry.

The telecommunications industry has grown and changed in response to the needs of our electronics-driven "information economy." According to a 1977 Commerce Dept. study, the production of information accounts for 46% of U.S. GNP. This includes both information products and services sold to final consumers (25%), and internal information-producing activities in non-information-related companies (21%). Within this large information sector, annual shipments of computer products have grown from $5.5 billion to $18 billion during the past decade, and growth in sales has been accompanied by dramatic declines in prices.

In 1970 the U.S. telecommunications network was oriented toward provision of voice transmission. AT&T and Western Union were the predominant suppliers of voice and telegraph services, respectively, together defining the services and terms available. But microelectronics was beginning to change switching from an electromechanical to an electronic basis, permitting a host of new features in the network and in customer telephone systems (PBXs and smaller multiline systems). Microwave transmission had led the dramatic postwar reduction in transmission costs and had made the construction of multiple, independent telecommunications networks economically feasible. At the local level, cable tv systems were being introduced in many communities, and cable industry pundits were anticipating the creation of a "wired city."

Now, although voice traffic remains preeminent, network technology is moving to accommodate nonvoice traffic, offering end-to-end digital transmission, faster switching, and high-speed data channels. Telecommunications is beginning to replace costly business travel and slow mail delivery with improved facsimile transmission, video services such as AT&T's Picturephone Meeting Service, electronic mail, and voice teleconferencing systems.

In parallel with these developments, aggressive entrepreneurs and political forces have been changing the regulatory ground rules for the telecommunications industry. In 1968, the FCC began the process of making the market for customer-premises equipment fully competitive, allowing interconnect firms to sell or lease terminal equipment directly to telephone users. In 1971, with its specialized common carrier decision, it started down the same road for long-distance telephone services.

Throughout the 1970s, the FCC consistently acted to reduce AT&T's ability to dominate the industry; the company had to set prices according to strict, fully distributed cost standards (rather than the actual cost of service), and had to increase the portion of its interstate revenues used to subsidize local service. This hindered AT&T moves to modernize its service offerings, and had the effect—particularly in the long-distance market—of forcing the company to maintain an artificially high rate structure, thereby offering new competitors a price umbrella under which to compete for business traffic.

Congress, too, has pressed for more competition. Following AT&T's ill-fated attempt to halt the advance of competition through passage of a "Consumer Communications Reform Act," Congress embarked in 1978 on an effort to rewrite the Communications Act to establish a broadly competitive industry. Although legislation has yet to be passed, the proposals have strengthened pressures for limitations on AT&T.

Legal action in the form of a major government antitrust suit against AT&T has also been promoting increased competition (as well as providing an excuse for continued legislative inaction). As of this writing, it is unclear whether U.S. v. AT&T will go to trial or be settled outside of court. But in either case, it has been an additional source of pressure on AT&T, since its 1974 filing, to tread lightly on competitors. Over 60 private suits against AT&T have had a similar effect, whether settled (such as Datran for $50 million, and ITT by an equipment-purchase agreement) or tried and lost (such as MCI, a $1.8 billion judgment currently being appealed).

As evolving business practices and advancing technology place growing demands on the telecommunications industry, political intervention will remain a major factor, causing considerable uncertainty about the industry's ability to respond to those demands. The industry has entered the 1980s facing three major unresolved issues.

ISSUES OF THE '80s

First, the long-heralded merging of the computer and telecommunications industries is at a critical stage. Manufacturers of integrated circuits are looking to telecommunications as a major source of demand for the standardized chips needed to achieve economies of scale in IC production. Companies in each industry look to those in the other as the next natural application of their technical expertise. Events in the next few years—particularly resolution of the AT&T antitrust suit and of the longstanding antitrust suit against IBM—should define the basic terms of interaction between the two industries.

Second, most telecommunications markets are effectively open to competition, and the prospects for reversing this trend are nil. Questions in the 1980s will center on the ground rules for competition: acceptable degrees of vertical and horizontal integration, allowable pricing strategies, and the like.

Third, for AT&T to prosper, it must change radically. The Bell System developed an organization that was well adapted (in a

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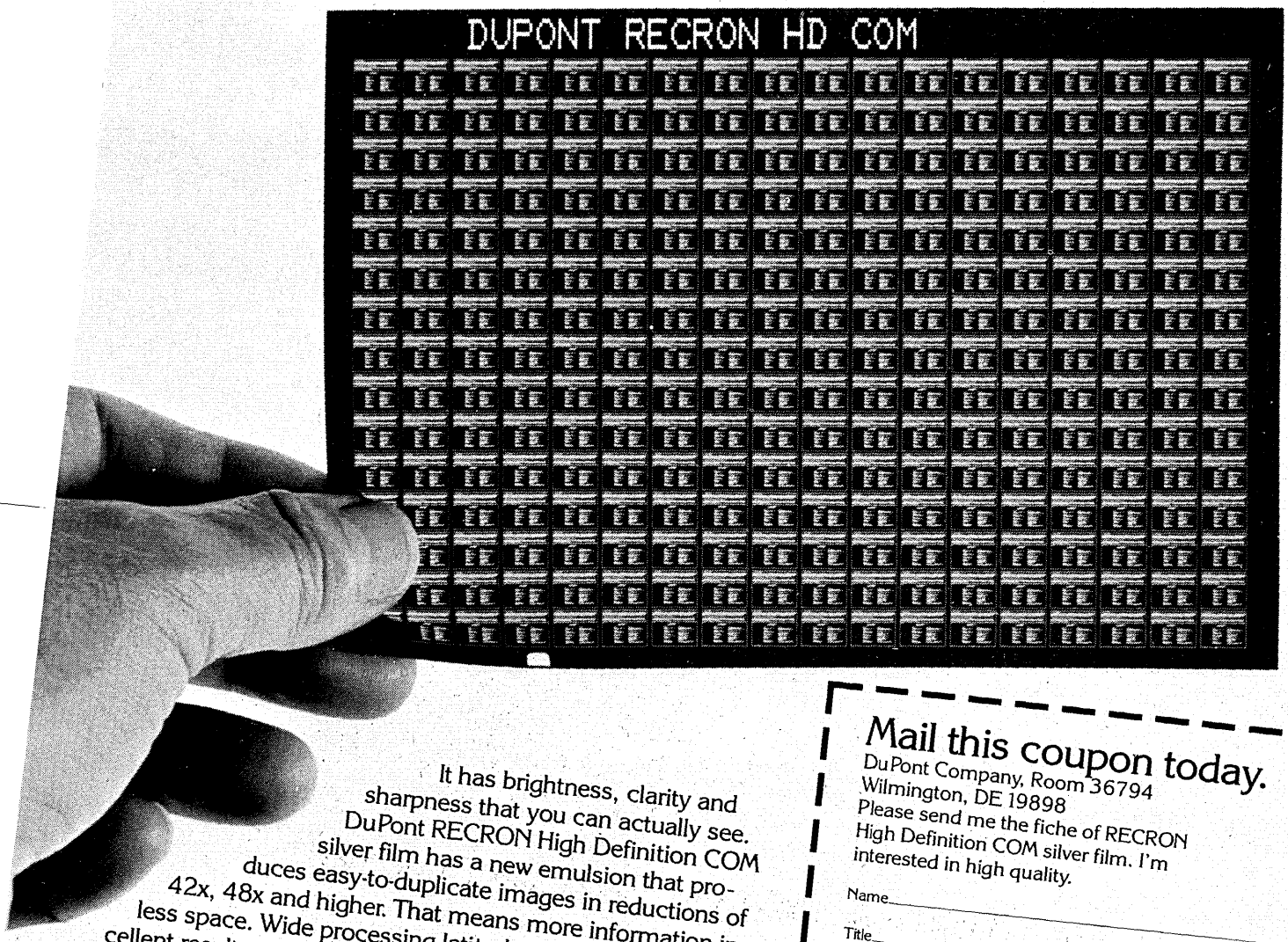

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Over the decade, basic long-distance rates should fall 30% to 50%, while local charges will rise a minimum of 50%.

business sense) to an era of regulated monopoly that no longer exists; marketing and regulatory strategies of the past 50 years are ill suited to the current political climate. At the same time, AT&T's critics in business and government have tied its hands with policies and procedures, such as maintaining uniform nationwide pricing and following time-consuming rules for filing tariffs, that hinder AT&T's efforts to adapt to its new environment. Despite its enormous resources, AT&T faces a formidable set of obstacles.

Given these pressures, we can expect to see fundamental changes in the business practices of telecommunications suppliers in the 1980s. In many ways, this industry will come to resemble the computer industry, with a rapid rate of innovation producing hardware that is technologically complex from the user's perspective, and technical sophistication required on the part of small as well as large customers. We can also expect major changes in industry pricing patterns.

Certainly, the most widely anticipated effect is rapid growth in the variety of services and equipment available to customers. Four major competitors—Southern Pacific Communications, MCI, ITT, and Western Union —now vie with AT&T for message traffic among large cities. And Satellite Business Systems (SBS)—a partnership of Comsat, IBM, and Aetna—has just initiated a wideband service linking scattered locations of large corporations. Through this service, SBS will provide, for the first time, integrated communications capabilities for business that include all-digital transmission of telephone conversations, computer data, electronic mail, and video teleconferencing. (One SBS option for electronic mail is high-speed facsimile, which delivers one letter-size page per second.)

More new service and equipment offerings include:

- viewdata and related interrogatory terminal-based services that provide users with access to many databases via telephone lines and tv screens; users need only inexpensive, nonintelligent terminals and the proper key word and identification codes; thousands of programs in the databases include ticket reservation capabilities, access to the *New York Times* and to college libraries, and computer games
- AT&T's new feature package offerings on its Dimension PBX, which allow the monitoring of security and building controls such as air conditioning, heating, and fire alarms
- advanced PBX systems that allow voice and data signals to be entered simultaneously at the telephone set; these systems also provide remote access to mainframe computers, terminals, and processors, and they can directly provide electronic mail and information retrieval and storage
- voice store-and-forward message systems that convert voice inputs to digital format, which can be readily stored and transmitted anywhere in the world at specified times

While new services and equipment proliferate, they may do so at the expense of quality in the core network services. Basic local and toll voice services, in particular, may suffer a decline in quality and reliability.

AT&T historically strove for extremely high transmission quality and call completion probability. Its competitors, oriented more toward profit than toward service, seem to view these quality standards as excessively high and have engineered to lower traffic performance criteria. Competitors' increasing success in the marketplace indicates that these lower traffic standards are acceptable to significant numbers of customers. Lower network performance (with higher performance possibly available at a premium) could become the norm as AT&T responds to competitive pressures on its profitability.

Of equal importance to customers will be a major realignment of the rates for various types of services. AT&T's existing rate-setting practices embody three principles that are likely to change in this decade.

BASIC CHANGES TO COME

First is the principle that low-cost long-distance services be priced well above cost to permit local services to be priced below cost. This subsidy has been embodied principally in "jurisdictional separations" rules, which allocate over 30% of the fixed costs of the intrastate investment in plant facilities to the interstate rate base and revenue requirement. Bell's competitors have resisted—so far with success —being burdened with similar charges.

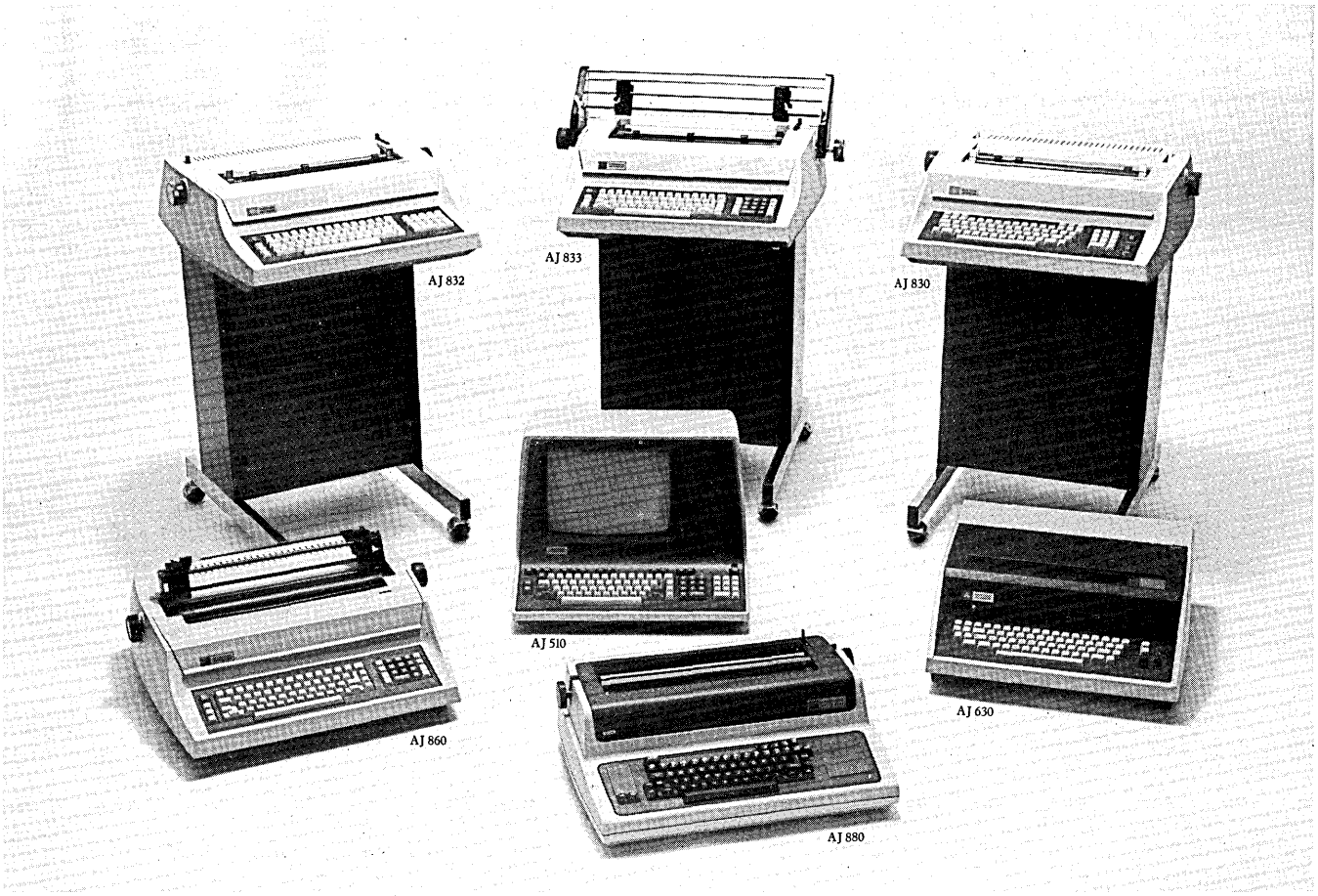
Second is the principle of embedded-cost pricing. Revenue requirements for a given class of service are based on the depreciated historical cost of the plant used to provide the service, not on the true economic cost of expanding capacity. The cost of new long-distance facilities has fallen sharply in the past two decades, while the cost of new local plants has soared because of rising labor costs and the high labor-intensity of local plant installation. Thus, necessary expansions of local service show poor to negative profitability, while long-distance expansion is overly profitable. Competitors rely on AT&T for expensive local distribution but usually provide their own long-distance facilities.

Third is the principle of rate averaging. AT&T and other telephone company tariffs specify service charges that are uniform across broad classes of customers. Intercity switched-service charges, for example, are based on time and point-to-point mileage but are independent of route. Terminal equipment charges are often based on the average

"Oh, yes, J.G. It's business as usual during refurbishing."

©DATAMATION

CARTOON BY HENRY MARTINI



We make all types of terminals so you don't have to deal with all types of companies.

We don't have a lot of axes to grind.

If you need daisy wheel printer terminals, we won't try to force dot matrix printers on you. Or vice versa.

That also holds true if you need quiet thermal printers. Or CRT displays. Or APL.

We've got them all. Together with media storage devices and the widest range of acoustic data couplers and modems available.

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But if you want to take advantage of 1200 bps, we can certainly accommodate you.

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The AJ 832—one of the most widely used 30 cps daisy wheel printers in the world, with excellent features and proven performance. Or the new AJ 833, a step up in capability from the AJ 832: faster at 45 cps, a bigger buffer, proportional spacing, and more. Or the AJ 830 for daisy wheel print quality at a remarkably low price.

Our AJ 860 gives you outstanding dot matrix print quality and 1200 bps capability. The AJ 880, our newest dot matrix printer, offers 110/300 bps operation, desktop portability, and low cost.

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CIRCLE 129 ON READER CARD

By mid-decade, all new terminal equipment will be sold in an unregulated environment by both interconnect firms and telephone companies.

costs of servicing a customer segment, rather than on specific properties of customers such as frequency of service termination.

But Bell's competitors have more latitude in adapting their price structures to specific conditions. Intercity competitors serve dense, low-cost routes, either bypassing smaller cities or using circuits leased from AT&T to serve them. Terminal equipment competitors, which are totally unregulated regarding pricing, are allowed to bid on a case-by-case basis, with no requirement to bid on unprofitable jobs.

The combined effect of moving away from these rate-setting principles will be the establishment of more competitive, cost-based rates. Over the decade, basic long-distance rates (for ordinary, direct distance dialing) should fall 30% to 50% (in 1980 dollars). At the same time, local charges will rise a minimum of 50% (in 1980 dollars) and could more than double.

A major uncertainty is whether AT&T will be able to offer bulk discount services, such as WATS and Telpak, to larger uses. The FCC has long viewed the rates of such services as discriminatory, even in the face of extensive cost support. A 1980 decision requiring AT&T and its competitors to permit resale by customers of all long-distance services should make bulk discounts unattractive to all carriers, and thus increasingly rare.

The change in customer-premises equipment sales will be even more fundamental. In its Second Computer Inquiry decision last year, the FCC ordered an end to regulated sale of teeminal equipment by 1982. Although the order has been modified once and probably will be changed further, its core is likely to survive. By mid-decade, all new terminal equipment will be sold in an unregulated environment by both interconnect firms and telephone companies.

In this unregulated environment, inflation and increasing software costs will push most rates up, while two important forces will tend to hold hardware prices down. One force is the continuing decline in the cost of microelectronic components; historically, microelectronic prices have decreased 20% to 50% annually, while production has doubled about every three years. In addition, a supply glut in the interconnect market is likely, leading to competitive price-cutting as interconnect firms struggle for market share.

The net effect will be slow price rises, much slower than rises in inflation. Users will achieve a much better cost/performance ratio in terms of having advanced features and tighter management control over telecommunications costs.

In short, the next decade holds the promise that telecommunications will further accommodate the needs of business for electronic information development and transfer. But every silver lining has its cloud. In this case, the cloud will be a major transformation of the industry's pricing practices and a possible decline in the performance of the core switched-telephone network. ❋

Michael Korek is project manager and a senior member of SRI International's Telecommunications Industries Research Dept. He has been deeply involved in telecommunications industry studies for the past 15 years.

Ray Olszewski is a partner in Rosse & Olszewski, a firm of consulting economists located in Palo Alto, Calif. He specializes in the economics of information industries.

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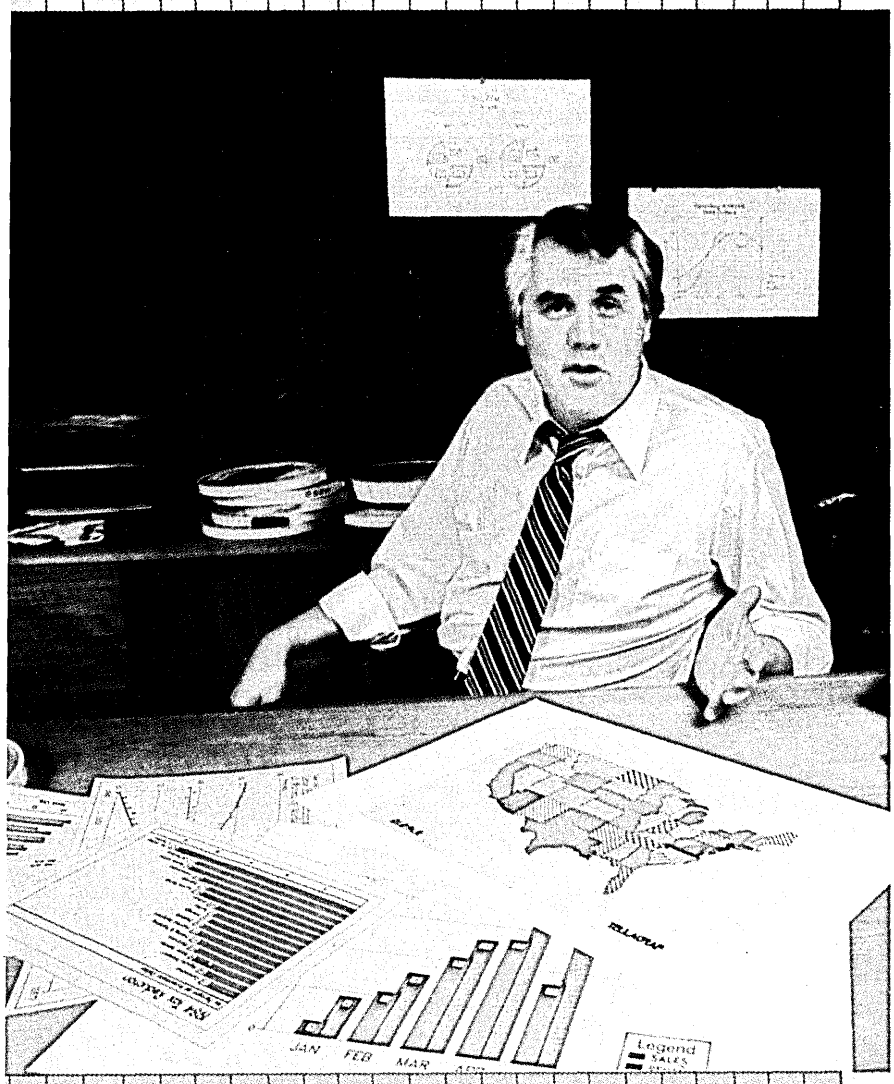

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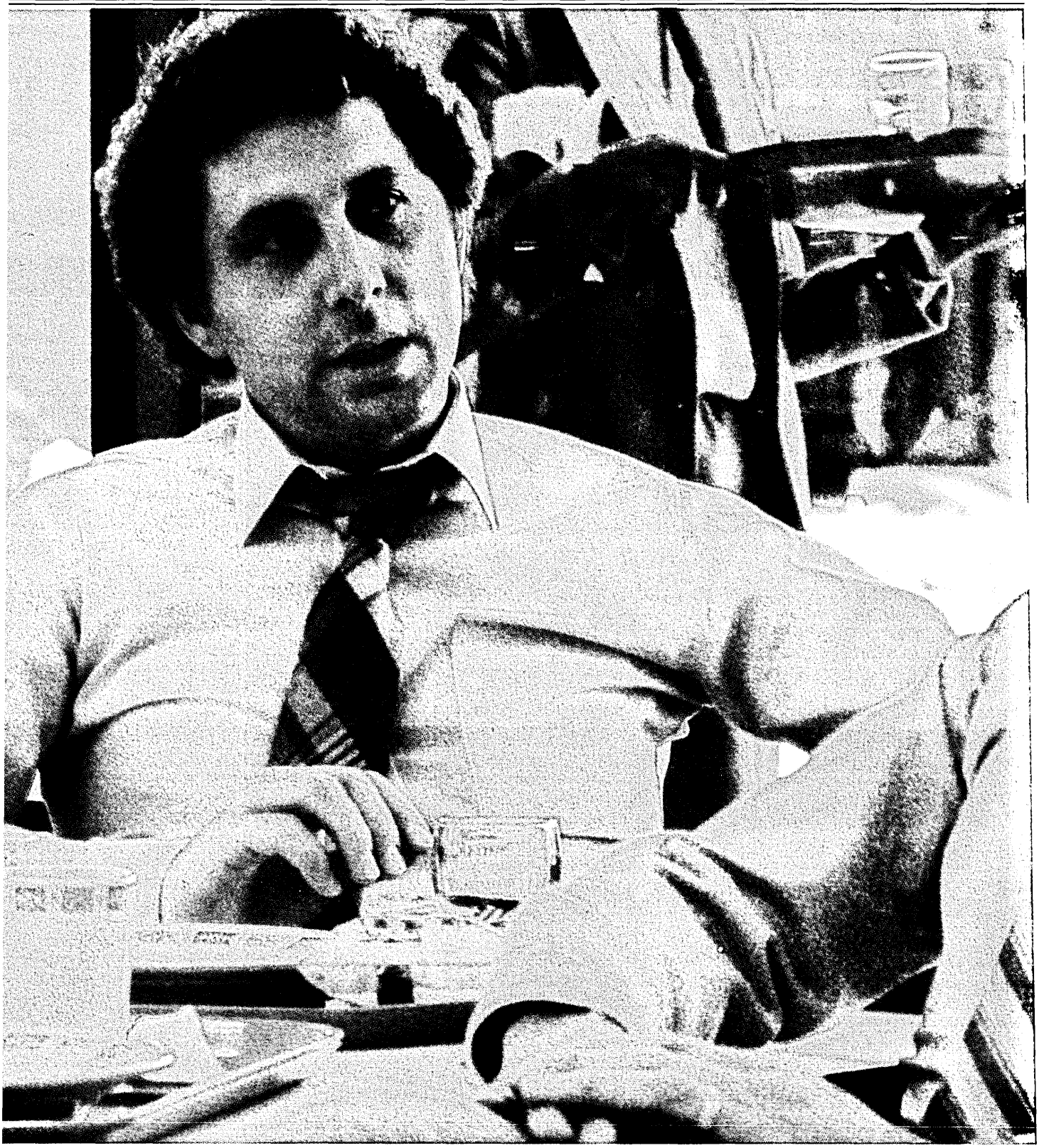

et up our network, o a computer company that's etworking down cold."

At Hewlett-Packard, we've participated in the growth of networking for distributed computer systems right from the start. So we know what it takes to build a successful information network.

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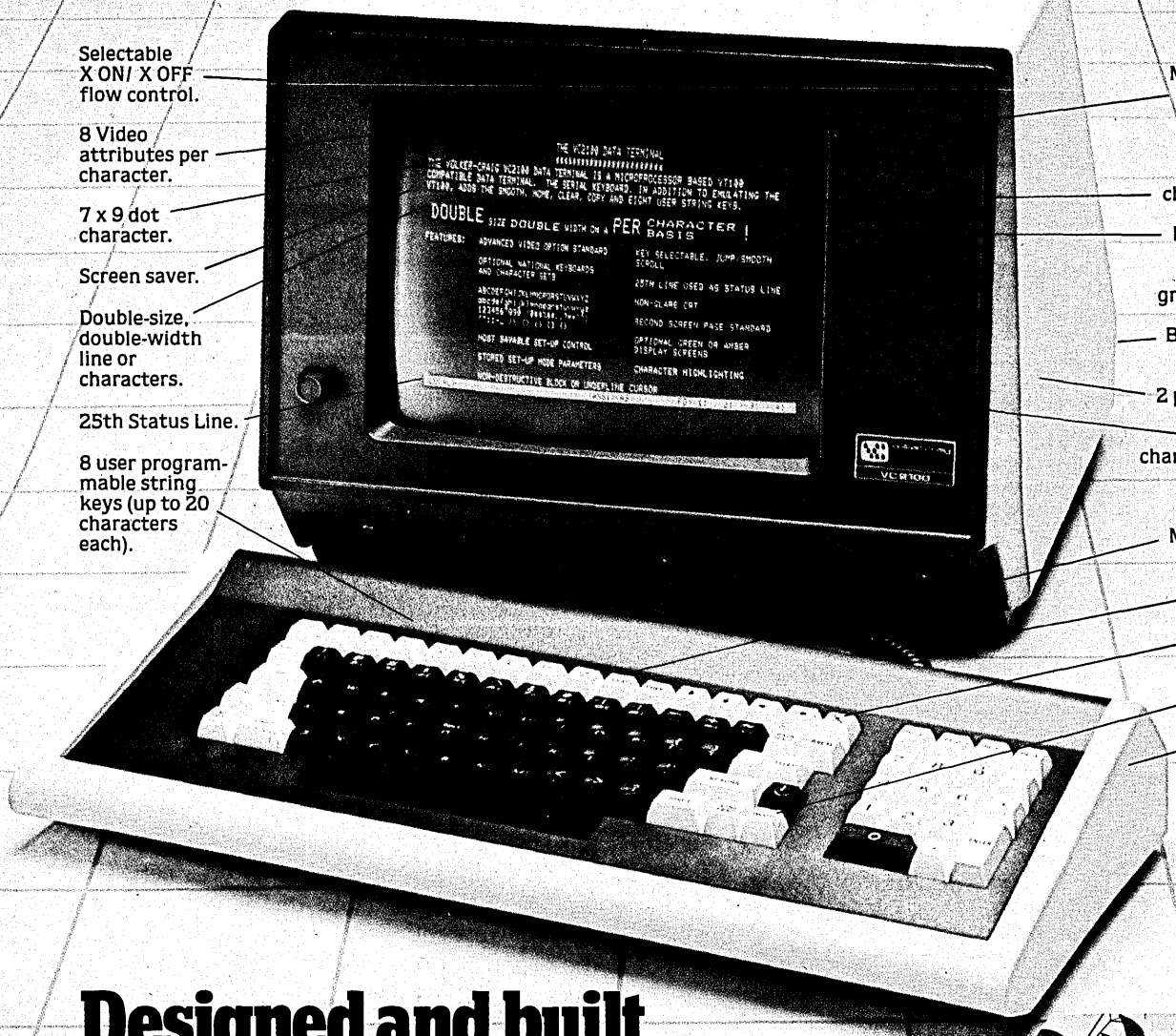
Volker-Craig VC2100.



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which will take care of all your requirements promptly and expertly.

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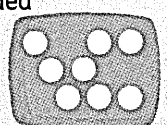

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CIRCLE 133 ON READER CARD

Real-life definitions for those for whom the jargon was not enough . . .

THE DEVIL'S DP DICTIONARY

by Stan Kelly-Bootle

acronym *n.* [Acronym for Alphabetic Collocation Reducing Or Numbering Your Memory.] A memorable word from which a nonmemorable phrase is acrostically generated; a circumlocutory abbreviation often confused with its antonym, MNEMONIC. Devising an acronym is the first step in systems design. Contrary to common belief, acronyms are created by mapping initial letters onto words rather than the reverse. The former mapping is 1-many and therefore easier. This also explains the antimnemonicity of most acronyms. Many design teams manage without a resident full-time acronymist. This is fatal penny-pinching and explains the current low standards in dp acronymity.

Apple *n.* A popular personal computer (made by Apple Computer Inc., Cupertino, Calif. with a refreshingly nonnumeric, nonacronymic apple-ation.

I gave my love an Apple, that had no core;
I gave my love a building, that had no floor;
I wrote my love a program, that had no end;
I gave my love an upgrade, with no cryin'.

How can there be an Apple, that has no core?
How can there be a building, that has no floor?
How can there be a program, that has no end?
How can there be an upgrade, with no cryin'?

An Apple's MOS memory don't use no core!
A building that's perfect, it has no flaw!
A program with GOTOs, it has no end!
I lied about the upgrade, with no crying'!

ARPA *n* [Acronym for Advanced Research Projects Agency.] An agency of the U.S. Department of Defense established in 1968 to test its defenses againust misuse and piracy in the large scale distributed processing environment.

artificial intelligence *n. abbrev.* **AI.** 1. The area researched by the artificial intelligentsia (attributed to Christopher Strachey, 1916-1975). 2. The misguided search for a lower unit cost Homo sapiens at a time when the majority of the species is underexploited [unemployed]. 3. The construction of algorithms for the backleg assembly of wooden building block motor cars.

ASCII *n.*[Acronym for American Standard Code for Information Interchange? Possibly from English comedian Arthur Askey.] A 7- or 8-bit code forced upon the free world by vicious anti-IBM rebels, led by the U.S. government, who held 16 card-carrying EBCDIC hostages at gunpoint in a Washington committee compound for two years.

The ASCII code, which is now with us like death and taxes, provides lexicographers with much-needed diversion and fun in order that "abacus," for example, can be made to precede "ZETA" in their tabulations.

backup *n., v. & adv. all. n.* Any file, device, or person that results from backing up; the total deviance from the original is directly proportional to the number and scale of the catastrophies resulting from copying or matching error. 2. *v.intrans.* To compound errors while merely trying to perpetuate them. 3. *v.trans.* To risk (a file, program) by attempting to copy it. 4. *v.trans.* (Of a programmer, engineer) to specify someone unacquainted with the system, job, and user. *See also* standby. 5. *adv.* Annoyingly, as: "That salesman really got my backup."

base address *n.* Low-rent accommodation of the kind frequented by operators, programmers, and other no-collar workers. Even cheaper accommodation is possible—a *relative address*—if you have an aunt or an uncle living in the area.

bubble memory *n.* A storage device developed by South Sea Memory Products Inc.

The chief advantage of bubbles over floppies is that they cannot be folded by the mailman. Whether bubbles will ever replace the hard disk (which is also beyond the bending power of most postal workers) depends on the relative strength of the semiconductor and metallurgical lobbies.

bundled *adj.* [From the verb *bundle* "to throw together in haphazard fashion."] Of or relating to an arbitrary collection of software items offered as seen, without charge or warranty, to certain prospects in a competitive environment.

Of interest to sociolinguists is the fact that the dp usage of *bundled* was triggered by the prior introduction of the antonym *unbundled* by IBM the previous day. *See* UNBUNDLING.

CAI, *n.* [Acronym for Computer-Aided Instruction.] The misguided attempt to replace each teacher in the Bronx with 60 online terminals.

crash *n & v.* 1. *n. Software.* An audible warning that it's DOWNTIME again. In excessively unstable environments the warnings combine to give the illusion of a continuous tone, e.g., middle C for Exec 8, A above middle C for OS/360, and so on, but cases have been reported in which the human audio range has been exceeded. Some Chronos II sites have specially trained watchdogs to alert the operator. The legendary St. Paul Breakpointer, it is claimed, not only whines suggestively, *before* the system dies, but also points at the offending line of code.

2. *n. Hardware.* The distinctive sound made by drums and disks when heads drop. Head crashes serve to resolve fundamental problems in maintaining dynamic equilibrium while the head is aquaplaning over the ill-defined magnetic oxide impurities which sometimes accumulate on the drum or disk surface. These rustlike layers are not intrinsically harmful—indeed, some claim that they actually protect the costly metal below—but they can acquire spurious, palimpsestuous images, known variously as tracks, sectors, or records. If the normal head-burnishing action fails to correct these aberrations, a head crash is initiated, signaled by a triumphant rasp (the French call it "un pet de sou-

"Firmware: A neutral, noware zone between hardware and software, free to deflect blame in either direction."

langement"). Well-designed drum/disk subsystems will demagnetize the surface before removing the fetid strata. Many variants are available: read after crash, crash before write, crash after crash, etc.

3. *v.trans.* To put down (a system or device). 4. *v.trans.* (Of people) to lapse suddenly into a state of intense abulia, *especially* at vital moments during a highly structured walk-through.

Typical crash triggers are voices (including your own) announcing that 1) "we now need to look at the DMS sub-sub-sub-schema definitions"; 2) "When I took over the payroll package maintenance responsibility 12 years ago. . ."

computer science *n.* [Origin possibly Prof. P.B. Fellgett's rhetorical question, "Is computer science?"] 1. A study akin to numerology and astrology, but lacking the precision of the former and the success of the latter. 2. The protracted value analysis of algorithms. 3. The costly enumeration of the obvious. 4. The boring art of coping with a large number of trivialities. 5. Tautology harnessed in the service of man at the speed of light. 6. The post turning decline in formal systems theory. "Science is to computer science as hydrodynamics is to plumbing" [Prof. M. Thump].

The only universally accepted computer scientific theorem to emerge, so far, is my own rather depressing one:

Theorem: *All programs are dull.*

Proof: Assume the contrary; i.e., the set of interesting programs is non-empty. Arrange them (or it) in order of interest (note that all sets can be well ordered, so do it properly). The minimal element is the *least interesting program*, the obvious dullness of which provides the contradictorey denouement we so devoutly seek.

Some plagiarists have tried to reverse this argument to show that all programs are interesting, but all they actually prove is that there exists a *least dull program*. This I am willing to accept, since I wrote it in 1954—and I can assure you that it is no longer of any interest to me or anyone.

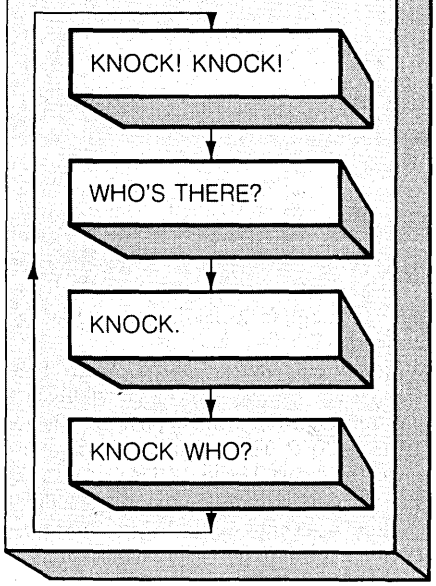
cursor address *n.* "Hello, cursor!"

Database Management System *n. Also* DBMS.. [Origin: DATA + Latin *basus* "low, mean, vile, menial, degrading, counterfeit."] 1. *Marketing.* Any filing system. 2. *Software.* A complex set of interrelational data structures, allowing data to be lost in many convenient sequences while retaining a complete record of the logical relations between the missing items.

endless loop *n.* **see** LOOP, ENDLESS.

In YOUR PROGRAM an endless loop is an *elementary blunder,* whereas in MY PROGRAM it is a DYNAMIC HALT (see Fig.1).

FIG. 1
ENDLESS LOOP



Extended BASIC *n.* [From *extended* "fully stretched, prolonged" + BASIC] Any BASIC compiler or interpreter enhanced with features stolen from COBOL and meeting any two of the following conditions: 1) the cost exceeds $40; 2) line numbers can be incremented automatically or omitted; 3) tape cassettes are not supported.

firmware *n.* A neutral, noware zone between hardware and software, free to deflect blame in either direction, and enabling problems to be solved by three sets of modifications rather than one.

FORTRAN *n.* [Acronym for **FOR**mula **TRAN**slating system.] One of the earliest languages of any real height, level-wise, developed out of Speedcoding by Backus and Ziller for the IBM/704 in the mid-1950s in order to boost the sales of 80-column cards to engineers.

GIGO *n.* Acronym for Gospel In, Garbage Out.

Godot *n.* A sarcastic name applied generally to any project or device that fails to materialize after the nth deadline.

hardware *n.* The easy part of the system. *Compare* FIRMWARE, MIDDLEWARE, SOFTWARE.

IBM *n.* [International Business Machines Corporation]. *Also called* **Itty Bitty Machines, Snow White, The VS Pioneer, The Lawyer's Friend.** The dominant force in computer marketing, having supplied worldwide some 75% of all known hardware and 10% of all software. To protect itself from the litigious envy of less successful organizations, such as the U.S. government, IBM employs 68% of all known ex-Attorneys General.

impersonal computing *n.* Routine, run-of-the-mill commercial data processing, in which the scrawled schedules Scotch-taped to the console have not been changed for three years. *Compare* PERSONAL COMPUTING.

JCL *n.* [Abbreviation for Job Control Language.] A deliberately abstruse software barrier between the USER and the OPERATING SYSTEM, set up to prevent ordinary programmers from running their own programs. As the name implies, JCL was devised to create jobs for otherwise displaced intellectuals, and to thwart the gloomy predictions of computer-induced unemployment made in the 1950s.

KSAM file *n.* [Acronym for Key Sequential Access Method.] A place where only key items get lost.

LIFO *adj.* [Acronym for Last In, First Out]. 1. (Of a STACK) being analogous to the central deck of cards in gin rummy, where (pace card sharping) cards are taken from or placed on top of the position only. As with gin rummy, the top item in the stack has usually been discarded by someone else and is not the item you are seeking. *Compare* FIFO, LINO in table of ACRONYMS. 2. (Of industrial relations) related to a commonly observed situation where the most recently hired employees are the first to strike.

machine-independent *adj.* Being or pertaining to a software or hardware element that will not work on any computer.

man-hour *n.* A sexist, obsolete measure of macho effort, equal to 60 Kiplings.

multijobbing *n.* Elementary moonlighting in which people modestly endeavor to widen their dp experience, in their free time, by assuming additional duties in disparate environments without boasting of their enterprise to their mainstream employer. *Compare* MULTITASKING.

Murphy's law of programming [Formulated by H. Ledgard, 1975.] "The sooner you start coding your program, the longer it is going to take."

my program *n.* A gem of algoristic precision, offering the most sublime balance between compact, efficient coding on the one hand and fully commented legibility for posterity on the other. *Compare* YOUR PROGRAM.

Nobel Prize winners in computer science *n. See* NULL. The nearest candidate for this honor was Sir Henry Ninebit-Byte (1912-1978), inventor of very wide paper tape, who was knighted in 1974 for his invaluable services to the punch card industry. His computerized Nobel Prize selection package was much admired until his own name occurred in five different categories during the 1977 dry run. Although he received the 1978 British Computer Society

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"Reload: A button that is pressed to warn the system that the operator has returned from coffee break."

Silicon Medal for devious software, the Nobel scandal proved fatal, and he succumbed to a massive attack of disgrace.

OCR *n.* [Optical Character Recognition.] A method for misreading source documents directly into a system without having to mispunch cards first.

Operating system *n.* That part of the system that inhibits operating. *Also called* OS (from the clothing industry's abbreviation for *outsize*).

In metacomputer science great care is needed to distinguish 1) the OS qua OS, 2) the name of the OS viz., <OS> 3) what we call the name of the OS viz., "<OS>" 4) what the OS calls itself, viz. {"<OS>"}, OS and, 5) what the OS calls itself, viz.," "<{"<OS>"}>."

parity *n. & adj.* [From *parrot* "to repeat without understanding] 1. *n.* A state of bandruptcy achieved by installing the same computer system used by your nearest competitior 2. *adj.* (Of a check) able to detect an odd number of bit mutilations but oblivious to the equally probable situation in which an even number of bits gets played.

Pascal manual *n.* Any book with an introduction by Prof. N. Wirth.

query program *n.* A program that for all input strings *X* responds with the message *?X?*

reload *n & v.* 1. A button that is pressed to warn the system that the operator has returned from coffee break. 2. *v. trans.* To attempt an interruption of the DOWN TIME status.

SNA *n.* [Abbreviation for the Scapegoat Network Architecture.] A protocol in the OEM environment diluting the suppliers' obligations, but offering end users and their attorneys all the attractions of MSR (Multi-Source Responsibilities).

subroutine *n.* [Latin *sub* "less than, inferior to" + *routine* "mundane, lackluster, boringly repetitive."] Any trivial, overdocumented program written by your immediate supervisor.

systems analyst *n.* An unsuccessful programmer who, to maintain the system's integrity, has been disbarred (removed from all keyboards) and assigned to an offline template.

timesharing *n.* A system in which several users can corrupt the same database simultaneously.

TTY *n.* [Acronym for TeleTYpe.] Any terminal of the Teletype vintage in which the restricted character set is more than offset by the unique busy signal, viz., printer noise.

uptime *n.* Some future (unspecified) time when the system will be up and running. *Compare* DOWNTIME. *See also* CRASH.

Version, latest. *n.* That VERSION which most exceeds the DEADLINE for completion.

virtual *adj.* Being or pertaining to a tangible, nonexistent object, "I can see it, but it's not there"—Lady Macbeth. *Compare* TRANSPARENT.

Voltaire-Candide, law of "All is for the best in the best of all possible environments." (Originally "Tout est pour le mieux dans le meilleur des mondes possibles."—*Candide,* Voltaire). A cynical 18th-century acceptance of the status quo adopted by compter users in the 20th century, but not without some envy of the relatively troublefree adventures enjoyed by Candide and Pangloss. Among the many familiar observations supporting the law, we offer:

"God sent us this 360 and lo, our 1400 payroll programs run no slower than before."

"The six-month delivery setback will allow us to refine our flowcharts and build a computer room."

"The file I have just accidentally erased was due for purging sooner or later."

"The more data I punch in this card, the lighter it becomes, and the lower the mailing cost."

"Our system has broken down. We can all retire to the canteen, where the on-site engineer is watching the big fight on tv."

"This flowchart, although rejected in toto by the DPM will nicely cover the crack in the wall above my desk":

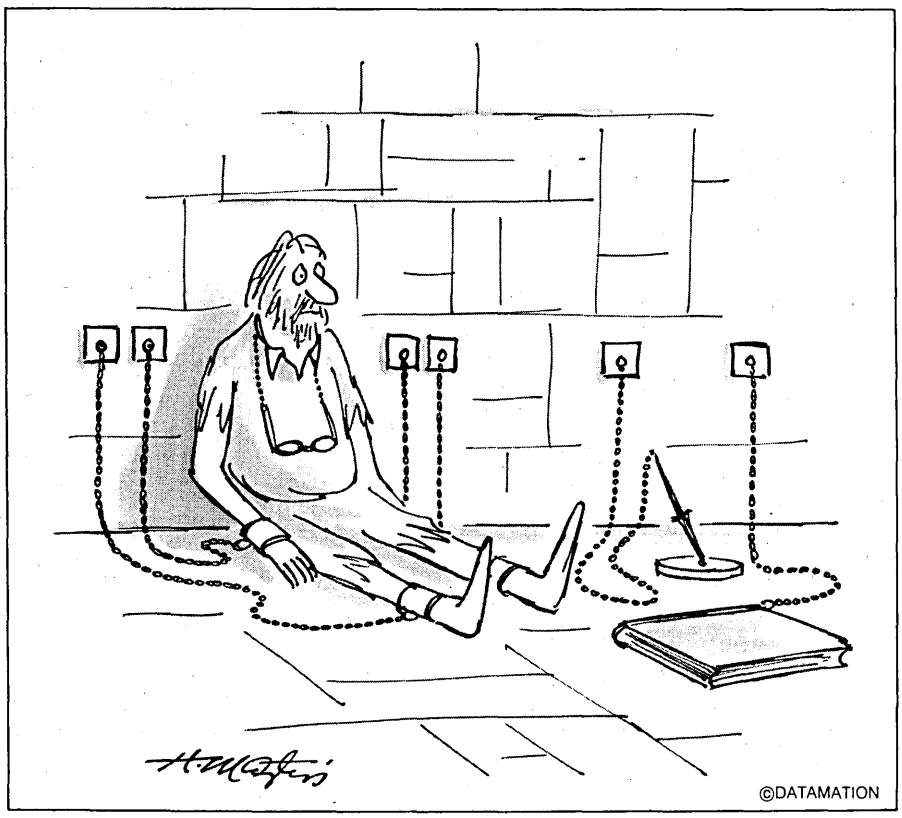
"The system has crashed just as I was beginning to suspect an endless loop situation."

"We were freezing during the power shortage, until the standby generator caught fire."

Watergate *n.* A fluid logic switching device.

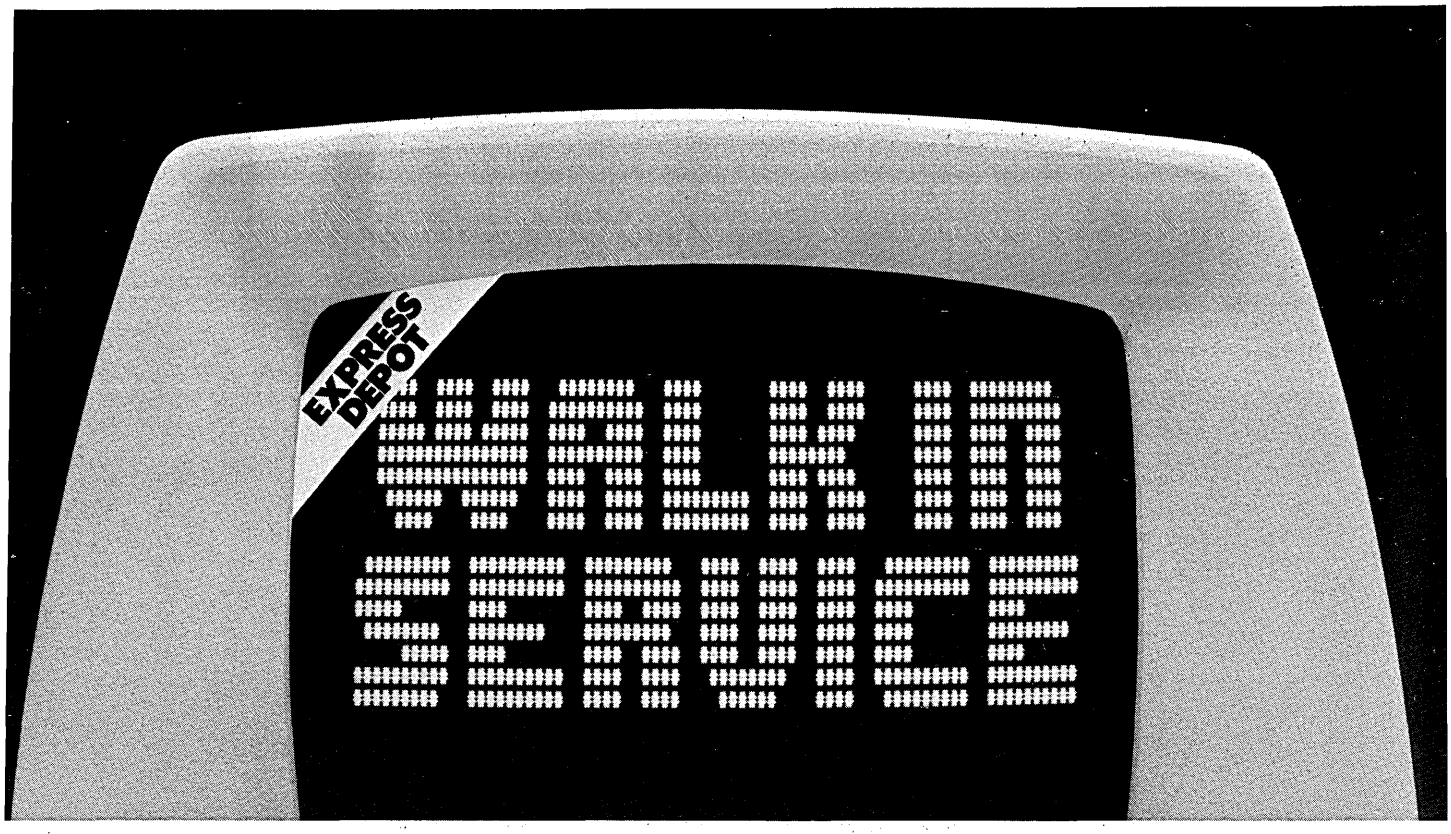
word processing *n.* Any system equipped with a slow, double-case printer.

XDS *n.* [Xerox Data Systems.] Abbreviation in use until 1976, when Xerox Corp. decided to concentrate on the traditional, more reliable aspects of reprography. XDS is now used as an abbreviation for eXoDuS, a warning that mortality in the dp arena is not confined to the midgets. ❋



CARTOON BY HENRY R. MARTIN

Stan Kelly-Bootle is a San Francisco-based consultant on minis and micros in commercial applications. He was born in Liverpool, England, and received one of the world's first postgraduate computer science degrees from Cambridge Univ. in 1954. Mr. Kelly-Bootle also sings, writes songs, plays the banjo, and is destined to become the "Monty Python of computer humor."



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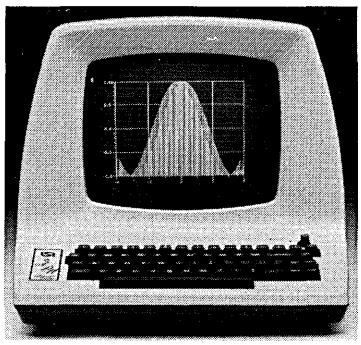

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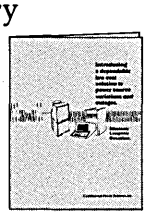

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CIRCLE 136 ON READER CARD

PEOPLE

WHAT'S A PROF TO DO?

It pains the pioneer of computer science education to see what he hath wrought.

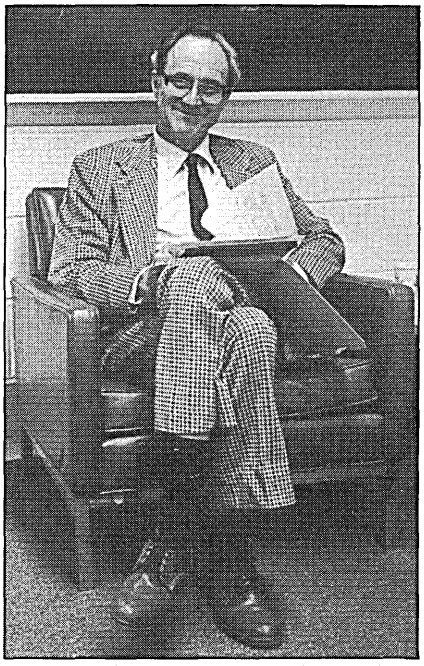
Had William Atchison been able to glean the ramifications of *Curriculum '68,* the foundation of computer science education, he might have wanted it banned in Boston and everywhere else. What was a bold attempt to establish standards for a nascent discipline has metamorphosed into a hydra.

"We are in a crisis situation in the universities," warns Atchison, a professor of computer science at the University of Maryland and the recent recipient of the Association for Computing Machinery's first annual award for outstanding contributions to computer science education.

"Computer science people are being drained off by industry and government. Students are flocking in here and flocking right back out. They know where the jobs are, and they know they can get better salaries outside the universities. $21,000 is not at all uncommon for a bachelor's degree in computer science with no experience. That's about what we pay our assistant professors, and they need a PhD.

"There are so many disciplines where graduates just can't get a job. But they know they can get a computer job without any trouble. We don't have the staff positions we need, our classes are much bigger than they should be, and we can't get people to fill the teaching positions we do have. You can see why students aren't going ahead with their masters and PhDs when guys like Bell Labs and IBM eat 'em up."

Do they ever! No group of Romans had a better feast. According to a recent report by the Computer Science Board, 200 PhDs in computer science were awarded last year, compared to 256 in 1975. More than half of those graduates were absorbed into industry and government, leaving less than 100 for the 600 academic positions known to be available. The board estimated the total demand for computer science PhDs in the U.S. and Canada to be 1,300 per year; it also noted that the doctorate computer science faculty in the country had risen only from 805 to 825 during the period 1975 to 1979.



WILLIAM ATCHISON: "I never really had a plan. I was just following my interest."

"It looks pretty bad right now and I think it's going to have to get worse before people notice," Atchison says. "The students keep coming in [undergraduate enrollment in computer science education has doubled since 1975], but I don't know how much longer that can continue. We're talking about how to limit it here, and I know they're doing that elsewhere as well. We can't continue to let our classes grow and carry the class loads we presently have. But if we limit growth, we're not going to help meet the needs for teaching positions."

Such dilemmas were inconceivable to Atchison when he began his professional journey. He was a math man from bachelor's (Georgetown College in Kentucky) to doctorate (University of Illinois). After being discharged from the Navy in 1946, he became an assistant professor of math at Illinois. He had seen his future, and it was Euclidean.

Five years later, that future was suddenly past. While doing postdoctoral study in algebraic geometry at Harvard, Atchison became acquainted with computer pioneer Howard Aikens and the Mark I computer. When he returned to Illinois in 1951, he was introduced to the ILLIAC I, another ancient machine. It was love at first byte.

"I got into it right away," Atchison recalls with a grin. "I was more interested in that than algebraic geometry, which I had just gotten through studying under the World's leading authorities at Harvard.

"I thought this was something that would really go. I felt it was going to boom. I was very enthusiastic, because the tool is so darn powerful. I'd been using it myself and I saw people around me using it. I saw the possibility of courses being run. I saw the possibility of departments being developed. Some people contested it. I never did."

His baptism came in a study of the movement of rubber molecules as part of his work on restricted random walks. In 1955 Georgia Tech called and wanted to know if he was interested in heading the programming and coding group in its new computer center. Goodbye, Champaign. Hello, Atlanta.

Math had not been totally forsaken. Atchison was research associate professor of that discipline for eight years, then research professor from 1963-66. He also managed to become chief of the computer center in 1957, a position he held until his departure nine years later, as well as acting director of the school of information science for two years and professor of information science for three. Somewhere in that sched-

PHOTOGRAPH BY DR. BEN SCHNEIDERMAN

ule he made space to chair a group which produced "An Undergraduate Program in Computer Science—Preliminary Recommendations," published in the September 1965 issue of *Communications* of the ACM. This soon became shortened to *Curriculum '65,* the predecessor of *Curriculum '68.*

"I never really had a plan," Atchison confesses. "There was no grand scheme. I was just following my interest."

In 1966 he followed it north to the University of Maryland, where he was immediately made professor of computer science. He was director of the computer science center from 1966-73 and acting chairman of the department from 1973-74.

In addition, Atchison has been extremely active and influential in the International Federation of Information Processing Societies (IFIPS) and the American Federation of Information Processing Societies (AFIPS). But his achievements in those arenas pale in comparison to *Curriculum '68,* clearly his most important contribution to date to the information industry.

As chair of the ACM's Curriculum Committee on Computer Science, which was supported by a grant from the National Science Foundation, Atchison had the lion's share of responsibility for producing the 46-page document. Computer science education has never been the same.

The publication contained 22 suggested courses with annotations and bibliographies. Its ancestor, produced without NSF help, had contained only 16 briefer and less developed syllabi.

"The subject was pretty haphazard in those early days," Atchison remembers. "Most teachers were like myself—they came from other disciplines and learned how to program computers by actually doing it. A lot were PhDs in mathematics. It wasn't a terribly difficult transition."

Surely it was easier than the one with which Atchison and colleagues have had to cope in the last few years. When Maryland started a computer science program in 1974, there were 30 students in it. There are now 1,100. They are short on teachers, equipment, and lab space.

"I really have felt sorry for the students," Atchison says, "especially the last two semesters. I sit in my office and they stream in all day. I've had seniors say they can't get anything they need to graduate because the courses are all closed. So they have to beg their way in."

The university is also not above falling to its corporate knees. According to figures circulated at the ACM convention where Atchison received his award, there are about 30 openings for every graduating PhD. It is clearly a bullish employees' market, one ruled by *caveat employer.*

"One of our problems [in the university] is this whole business of promotion and tenure," Atchison complains, "which puts severe strains on all of us. Unless you publish an awful lot of stuff, you don't get promoted. The old 'publish or perish' adage. If professors haven't published a certain number of papers, out they go."

Atchison, of course, has no such worries. The publications part of his curriculum vitae (academic parlance for resume, literally "course of life") consumes three pages and has 45 entries.

"Naturally, those professors go to industry, where they double their salaries. I know people who have done that because they didn't get tenure. It takes the systems people longer to get cranked up and therefore they're going to be slower in putting out publications. But, if they don't do it in five years, they're gone. In my opinion it's too severe."

Odds are it won't moderate despite the intense competition for PhDs. Nor, Atchison fears, will the overall situation. The new Administration's budget ax is expected to fall heavily on the NSF, and state governments are equally callous to the universities' pleas. Eventually, research and technological advancement may slow to a crawl.

"It hasn't happened yet, at least at Maryland," Atchison says. "But it's almost sure to. Right now the supply of jobs far exceeds the demand for them. But at some point the demand will be met, if by nothing else than pure glut. Then there will be no place for these people to go and, because they have not had the training in universities, they won't be able to train the next generation.

"Someone better take a look at it. I think the federal support has to continue. I think state legislatures have to realize they can't cut us off at the source. I think a lot of people feel industry should pitch in and help. We do have some people who get research grants and there are cooperative work/study programs with universities, but those are limited."

Then too, those work/study programs, as the professor acknowledges, often make it more difficult for universities to entice prospective teachers. Once in industry, even for a semester, the students realize the outside world is not so big and bad after all and may not be a poor way in which to spend some time after graduation.

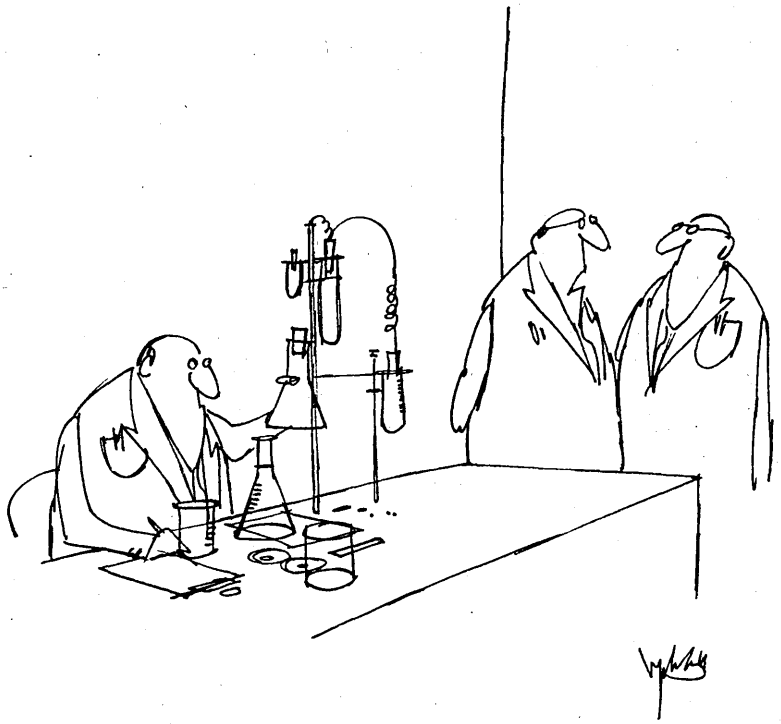
"It's the teaching profession in general that's not getting paid enough," Atchison contends. "The world looks at the profession as 'well, you're not teaching very much, so why should you be paid very much?' They don't recognize that you spend hours at night grading papers, preparing exams, and developing courses."

So what's a professor to do?

"Sorry," Atchison responds when asked for a solution. "I'm no genius. But until such time as we get more money to pay our teachers, more positions to get our teachers into universities, and additional money to give us more equipment, the situation's going to be extremely serious. I hope that sooner or later somebody catches on."

He'll be happy to write a paper on the subject.

—Willie Schatz



"Morley's the only one on staff who never won a science fair . . ."

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CARTOON BY DAVID W. HARBAUGH

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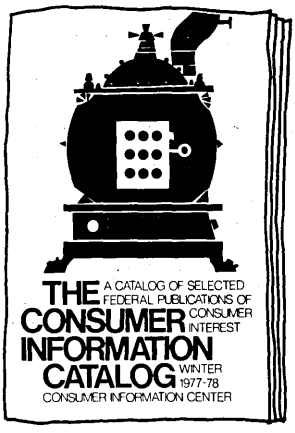

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HARDWARE

OFF-LINE

Tektronix, probably best known to the average user for its line of graphics terminals, will introduce a new line of modular terminals. Dubbed the 4110 series, the line will feature compatibility with existing 4010 series products. At initial introduction, the Beaverton, Ore., firm should be unveiling three display options: a 15-inch high-resolution raster scan display, DVST (Direct View Storage Tube) --the firm's unique bipolar phosphor technology--and DVST with color (you read right, color) write-through.

Nestar Systems, Palo Alto, Calif., received a patent on the Self-Assigning System developed for its Cluster/One system which forms the hub of a local network of as many as 30 microcomputers. The addressing technique allows devices daisychained on a parallel bus to determine their own unique addresses. Each unit uses an identical interface; no dip-switches, jumpers, or special cables are required. The technique separates the control bus into two or more groups of lines, with each group consisting of different, mutually prime numbers of lines. The number of unique addresses possible is the product of the number of lines in each group; i.e., 12 control lines grouped into subsets of three, four, and five lines can address 60 devices. The concept is adaptable to nonelectronic devices, such as those using optical, mechanical, or hydraulic signaling.

A proposed revision to ANSI X3.55-1977, the standard for blank 1/4-inch cartridge tape is available for public comment. Order copies by sending $6 and a mailing label to X3 Secretariat, CBEMA, 1828 L St., Washington, D.C. 20036.

DESKTOP TELEPRINTERS

It seems like just about everybody wants to put a terminal on executives' desks, and Trendcom is no exception. The firm has come up with a pair of desktop teleprinters with integral auto answer modems; an additional intelligent keyboard can be added, turning the RO teleprinters into ASR terminals. The Trendcom 400 sells for $595 and prints lines of up to 40 upper and lower case characters, while the Trendcom 800, priced at $695, can print 80 character lines. Both units can communicate at 110bps, 200bps, or 300bps, and both feature direct connection—via a modular phone jack—to the direct dial or TWX networks. The Trendcom

600 Intelligent Keyboard ($295) features 4KB of storage, and character insert/delete editing. Plugging the keyboard into either printer yields an ASR terminal that can communicate with computers, other Trendcom 400s and 800s, TWX terminals, or, using a value-added network, Telex machines. Quantity discounts are offered to oems. TRENDCOM, Sunnyvale, Calif,.

FOR DATA CIRCLE 301 ON READER CARD

DISTRIBUTED PROCESSING

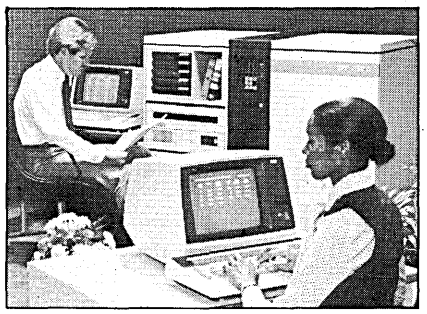
Harris Corp.'s Data Communications Div. has enhanced its 1670 distributed data processing system to operate with Honeywell hosts supporting the VIP 7760 communications protocol. Dubbed the 1670/Honeywell, the system allows an operator to access data in either the 1670 or remote Honeywell mainframe from the same display station. The 1670/Honeywell supports up to 32 display stations operating in interactive VIP 7760 mode; 16 of these terminals can be switched from on-line host inquiry to local 1670 inquiry. Concurrent batch communications in Honeywell's G115/355 protocol are also available to 1670 users. The Harris system includes support for formatted or source data entry, local inquiry and response, and system utilities. Harris says that the 1670/Honeywell system will allow users to distribute mainframe applications while speeding the implementation of new applications and reducing communications costs. With additional hardware and software modules, current users of Harris 8760 interactive terminal systems, 1600 batch terminals, or 1650 or 1660 ddp systems can upgrade to 1670/Honeywell ddp systems. Configured with four displays, a 300 lpm printer, 12MB disk, tape drive, card reader, job entry and interactive communications lines, emulators and Format/10 data entry application software, the 1670/Honeywell leases for $2,135 per month (including maintenance) for 60 months. The same system sells for $97,496, with maintenance priced at $499 per month. HARRIS CORP., Data Communications Div., Dallas, Texas.

FOR DATA CIRCLE 302 ON READER CARD

SMALL COMPUTER

The TRW-Fujitsu Co. (TFC) has introduced its first computer system since the joint American-Japanese venture was formed a year ago. The TFC 8500 is a family of small general purpose machines ranging from a single workstation system in the $25,000 price range up to $200,000 or so for a multistation system that can support up to 80 workstations (in some applications, however, the practical limit on workstations may be lower).

The system can operate as a standalone unit, in a network with other 8500s, or



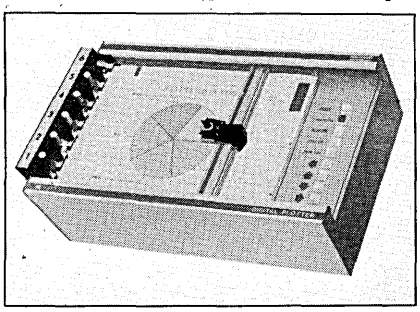
on-line to a central computer. TFC expects to find customers ranging from first-time users up through large companies seeking to build distributed processing networks. Batch, on-line, and distributed processing applications are all supported by the 8500. While the machine is said to be unique (i.e., not 370-compatible at the code or plug level), it is channel-oriented, with channel control programs handling the transfer of data to and from main memory and peripherals. Its bundled operating system is said to be DOS/VS-like, with a CICS-like on-line monitor, and JES-like batch. For an added charge, users can acquire language processors for FORTRAN, ANSI COBOL, and RPG. RJE communications are supported using 2770 or HASP protocols, with 3780 and 3270 bi-sync coming next quarter. SNA 3270 support is planned for the end of next year.

The basic hardware consists of 256KB of main memory, expandable to 2MB memory cycles at 400nsec per two bytes. The cpu is a single chip, 10,000 gate microprocessor. Peripherals include up to 800MB of disk, mag tape, line printers, and display/printer workstations. Initial deliveries are planned for July. THE TRW-FUJITSU CO., Los Angeles, Calif.

FOR DATA CIRCLE 311 ON READER CARD

SIX-PEN PLOTTER

For an additional $395, the HI Plot series of low-cost plotters models DMP-2 through DMP-7, can be outfitted with a six-pen option, allowing users, such as personal computer owners, to get into multicolor plotting for less than $1,500. The six-pen option is a holder for six pens; it attaches at the left of a DMP-series flatbed plotter. The six-pen

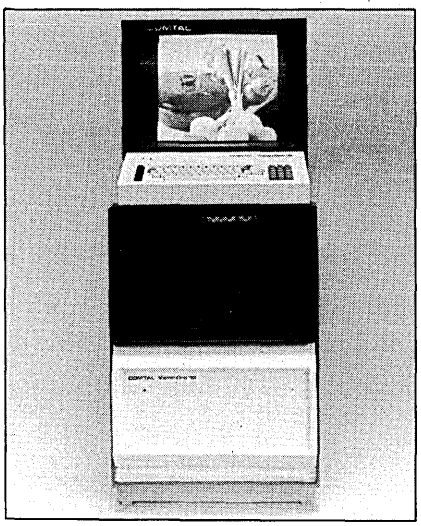


changer can be user-installed by owners of the DMP-2, 3, or 4; DMP-5s, 6s, and 7s must be returned to the factory for updating, at a charge of $100 plus shipping. A sample BASIC routine is provided to demonstrate automatic selection of each of the six colors. HOUSTON INSTRUMENT, Austin, Texas.

FOR DATA CIRCLE 303 ON READER CARD

IMAGE PROCESSING

Comtal, now a subsidiary of 3M, has been involved with digital image processing for better than 10 years. The firm has now come up with a new entry-level system, complementing its Vision One/20. The new Vision One/10, priced under the $55,000 mark for a complete system, is intended for standalone, interactive processing in real time (1/30th second). It has a memory capable of containing up to four 512 x 512 x 8 bit images, and an additional four 512 x 512 x 1 bit graphic planes. A Digital Equipment



Corp. LSI-11/02 microcomputer controls the system from a PROM-based operating system. Additional RAM holds user code. Brightness enhancement and color processing are handled by an in-line, real-time pipeline processor. A pseudo-color processor accepts eight bits as input, and outputs eight bits each for the red, green, and blue color guns of a monitor. A zoom feature, based on pixel replication, allows image magnification by factors of one, two, or four. Software controlled histogram and bilinear zoom features are also available to users. Options to the Vision One/10 include a high resolution monochrome vidicon camera, real-time 10MHz analog-to-digital converter, small-area brightness or color control, and hardware to add, subtract, multiply, or divide two 512 x 512 images in real time. Vision One/10 can operate as a loosely coupled image processing system with a host computer, in addition to functioning standalone. COMTAL/3M, Altadena, Calif.

FOR DATA CIRCLE 309 ON READER CARD

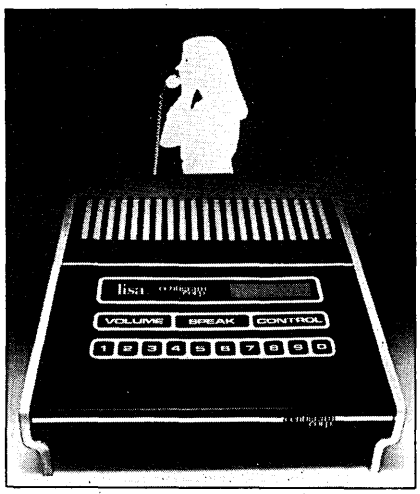
FLOATING POINT PROCESSOR

Data General's addition of a Floating Point Processor for its 32-bit Eclipse MV/8000 computer can speed double precision floating point arithmetic by a factor by a factor ranging from three to six. The single-board processor option accepts floating point arithmetic instructions identical to those used in the standard MV/8000 microcoded instruction set, allowing existing programs to run without modification. And, since the FPP is transparent to the user, it can be taken off-line in the event of a hardware failure or for preventive maintenance, with no effect on the user's programs, except for a slow-down in double precision arithmetic. The

HARDWARE SPOTLIGHT

VOICE OUTPUT

The company that brought you MIKE (a speech recognition system) has come out with a complementary sister product: LISA (Logically Integrated Speech Annunciator). LISA offers a virtually unlimited vocabulary, using digitized speech. The technique used

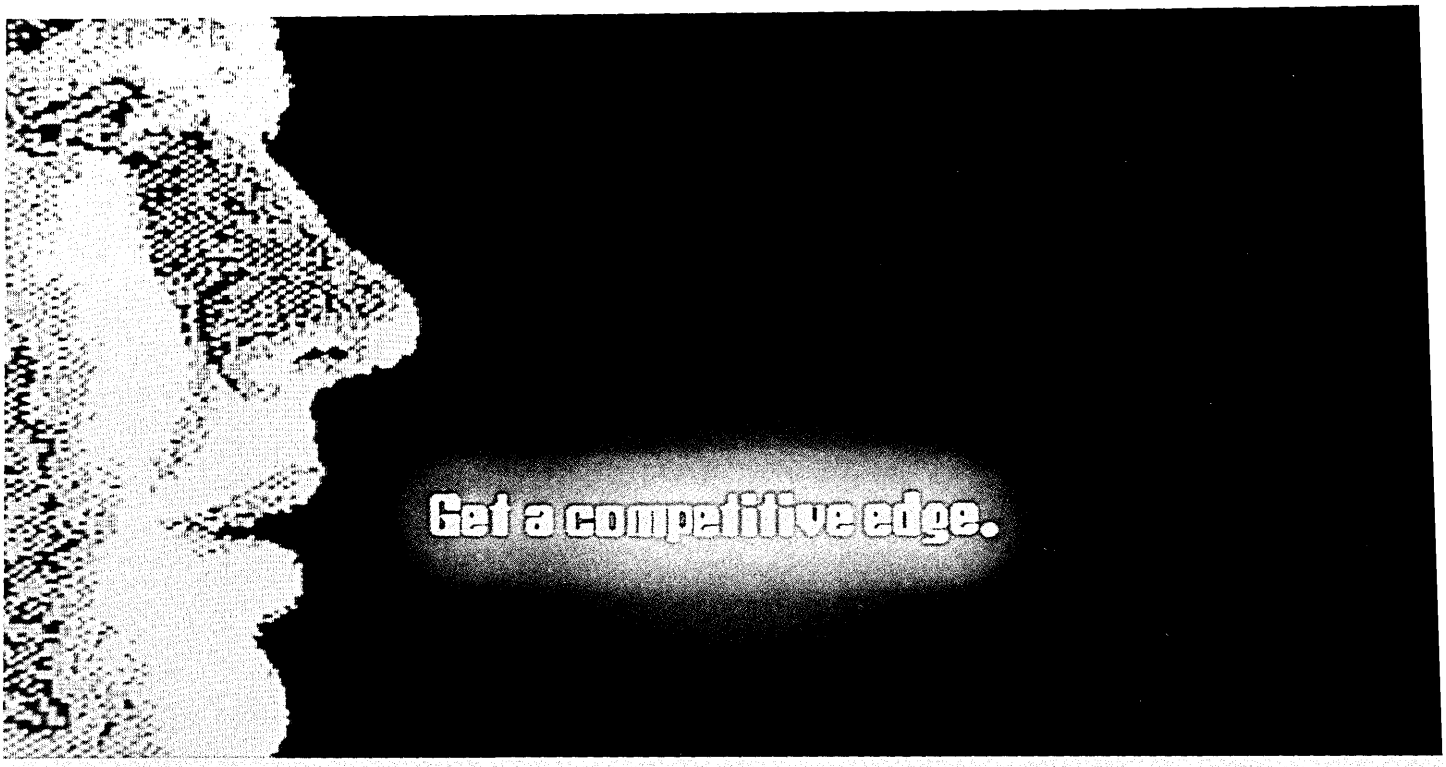


is an outgrowth of two earlier technologies, Linear Predictive Coding (LPC is used by Texas Instruments) and waveform analysis. Dubbed Parametric Waveform Coding (PWC), the digitizing method produces sufficient fidelity at 480bps to not only sound human, but make the speaker identifiable.

LISA can operate standalone as a terminal connected to a computer via its RS232 port, or it can operate in pass-through mode with a terminal, generating speech only when addressed with the proper escape-code sequence. With its vocabulary stored in digital form, 1MB of disk space can contain better than half an hour of continuous speech. The vocabulary can be stored in whatever form appropriate to the user—single words, phrases, sentences, or lengthy statements. Centigram Corp., LISA's manufacturer, offers a Standard Voice Library on disk; the library contains often-used words and phrases that can be threaded together into longer statements (although cadence may be lost at the joints). A Custom Library Service offers the user the opportunity to prepare a script or a tape, which Centigram will digitize (at $25 per word, $500 minimum purchase). Later this year the firm plans to release the hardware it uses, known as the Voice Library Generator.

LISA terminals sell for $3,450 (five or fewer) or $2,760 (in the 20 to 50 unit quantity). LISA boards sell for $1,800 or $1,600 in similar quantities. The Standard Voice Library is $1,000. An evaluation package, consisting of LISA terminal, Standard Vocabulary, and 40 custom words, is offered for $4,200. CENTIGRAM CORP., Sunnyvale, Calif.

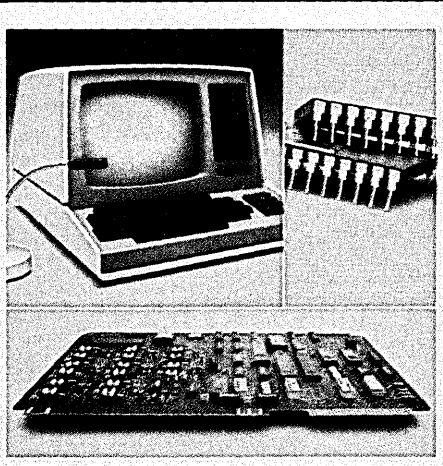
FOR DATA CIRCLE 300 ON READER CARD



It's easy to add the competitive power of Voice Recognition to your product line. The cost is low and the return on the investment is very attractive. Whether you are an OEM or an end user, Interstate has a Voice Recognition product to suit your needs; terminals and boards for system integration and chips to create your own sub-systems.

Terminals. Interstate standalone Voice Recognition terminals perform voice controlled data and word processing with a vocabulary up to 100 words and 99%+ accuracy. You unpack them, power them, and immediately begin talking to your system. You can develop and execute resident application software using voice data input without going through expensive, time consuming integration.

Boards. Interstate Voice Recognition Q-Bus,™ Multibus,™ and Lear Siegler Dumb Terminal® compatible boards are capable of recognizing up to 100 words or short phrases in any language. They perform all training, updating, word recognition and communication for your selected vocabulary. Accuracy is 99%+.



And if you need voice response we also offer a Multibus board with a 1500 word vocabulary.

Chips. Three separate chip products from Interstate provide Voice Recognition capabilities with 100, 25, and 8 word vocabularies and accuracies up to 99%+ for your commercial, industrial and consumer applications.

Discover the world of voice. Data entry via direct human to computer communication makes voice recognition ideal for a broad range of application areas *including office and factory automation, word processing, small business data processing, computer-aided design, building security and many more.* Whatever your application, the benefits of voice are virtually unlimited.

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CIRCLE 139 ON READER CARD

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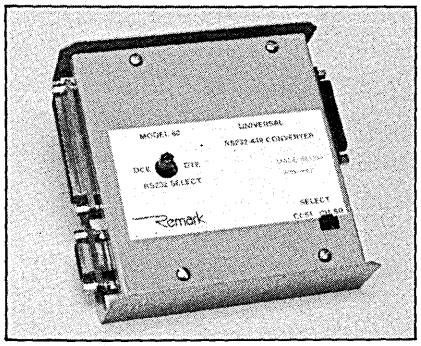
HARDWARE

FPP handles both single and double precision calculations, with six- to seven-digit accuracy (single precision) and 14- to 15-digit accuracy (double precision). Single precision arithmetic runs at virtually the same speed with or without the FPP, but users get significant time savings in double precision. A double precision add or subtract that would take 5.17 usec without the FPP takes but .88usec, compared to 11usec, while a double precision divide takes 6.93usec, compared to 40.7usec. Calculations can involve numbers in the decimal range of 5.4E-79 to 7.2E75. The FPP sells for $8,800, with deliveries quoted at 120 days ARO. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 307 ON READER CARD

INTERFACE CONVERTER

As of last June, the federal government has mandated that communications hardware should conform to a new interface standard, EIA RS-449. Still, most of the products we've seen in the past year offer RS232C, without even mentioning RS-449. With all the existing RS232 devices, and others appearing almost daily, Remark International may have its thumb in a potentially huge slice of the communications market pie. That firm's Model 60 interface adaptor handles the necessary conversion between RS232 and RS-449. RS-449 treats Data Terminal Equipment (DTE) and Data Communications Equipment (DCE) differently, so there's a switch within the Model 60 to select DTE or DCE operation. RS-449 also has a reverse channel, accommodated by a separate 9-pin male connector (in addition to the 25-pin RS232 female connector); the RS-449 port has a 37-pin male connector. Compatible with Dataphone II Modems from Western Electric, the Model 60 is said to be fully compliant with EIA specs outlining the interfacing of RS-449 and RS-232-C. Model 60 pricing starts at $115 in singles, with oem and distributor discounts offered. REMARKS INTERNATIONAL, Woodbury, N.Y.



FOR DATA CIRCLE 305 ON READER CARD

DISK CACHE

For users of its 1100/60 and 1100/80 mainframes, Sperry Univac has developed the 5057 Cache/Disk Processor and 7053 Storage Unit. Built of 16Kb RAMs, the 7053 is a solid state backing store with a maximum capacity in excess of 900K words. Configured with the 5057 controller, the combination of 7053 storage and 5057 can sit between the processor and Univac's 8450 or 8470 disk, functioning as a cache between cpu and disk. The semiconductor mass memory also can be used as a Solid State

Disk, providing a response time of roughly 0.2msec. Multiple 7053 cabinets can be used, intermixed as both cache and solid state disk.

The Cache/Disk System holds frequently accessed data, eliminating the relative lengthy seek and latency times of the rotating disks. At a 75% hit ration, the

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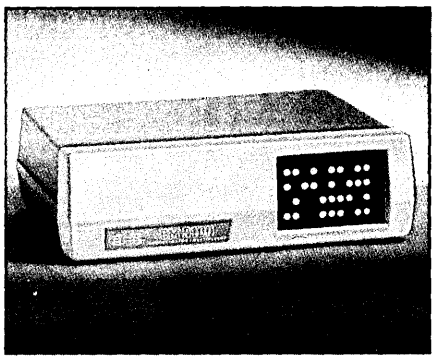

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- Tulsa, OK (918)-252-9646
- Wash. DC (301)-428-5600

CIRCLE 141 ON READER CARD

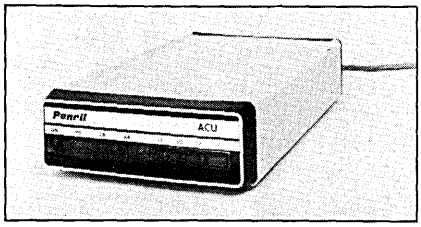
Cache/Disk System is said to be at least two or three times faster than disk, when measuring the elapsed time from requesting a record to the time it actually arrives in the cpu's main memory. This should improve overall system performance, says Univac, adding that the Cache/Disk System "will be a key component in future database computer designs."

Connecting to a word channel on an 1100 series mainframe, the 5057 Cache/Disk Processor acts as a controller over an I/O peripheral system. It handles indexing, searching, buffering, storage management, staging and destaging data between disk and solid state cache. Since data accesses occur with the 7053 as an intermediary, much larger record sizes can be used, allowing maximal use of available disks, Univac says, potentially letting fewer disk drives satisfy an installation's mass storage requirements. At the user level, the Cache/Disk System is transparent to applications software. The 5057 Processor sells for $104,700, and the 7053 Storage Unit is $137,534. On a five-year lease, the rates are respectively $2,460 and $3,266 per month, including maintenance. Initial deliveries are planned for December (for systems configured as Solid State Disks) and March 1982 (for systems supporting caching in addition to SSD). SPERRY UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 304 ON READER CARD

AUTO DIALER

Penril's FCC-registered, Bell 801-compatible Automatic Calling Unit (ACU) provides standard tone signaling or pulse dialing for initiating connections for 300bps/1200bps two-wire full-duplex Bell 212A compatible modems. Selling for less than $700 in single units, the Penril ACU dials numbers stored in

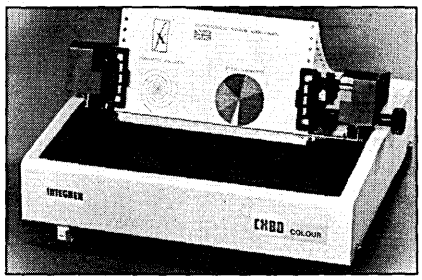


the terminal, allowing the dialing of numbers with any number of digits, including PBX access codes, international access code, international country codes, area codes, and phone numbers. The ACU detects dial tones and can pause for additional dial tones, as when calling through a PBX into the local DDD network. If an answering tone is not received, the ACU alerts the terminal to abort the call. PENRIL CORP., Data Communications Div., Rockville, Md.

FOR DATA CIRCLE 308 ON READER CARD

COLOR PRINTER

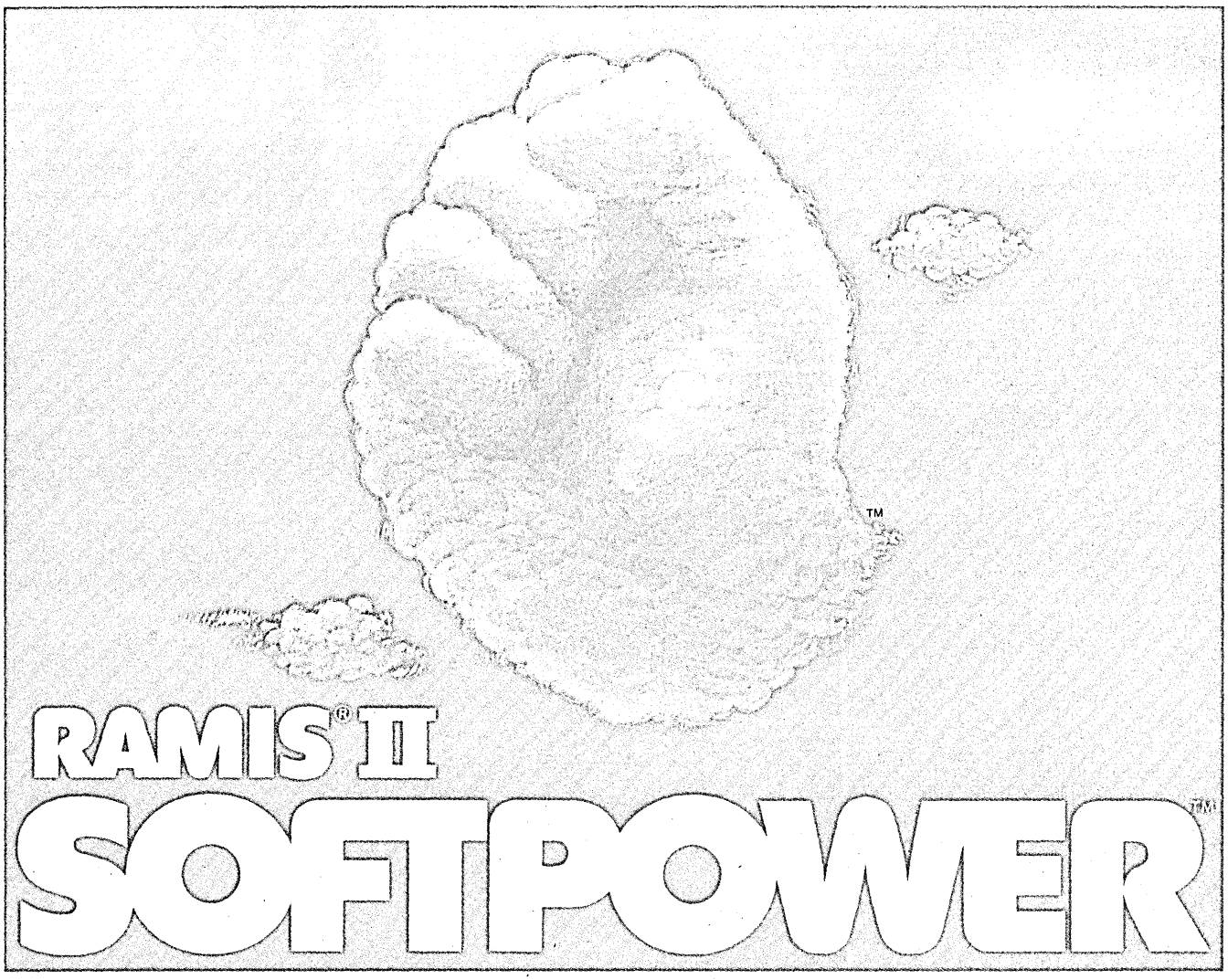
Using a tricolor ribbon and dot matrix print head, the English-made Integrex CX 80 provides low-cost color hardcopy of text and graphics in up to seven colors; the unit's U.S. price is expected to be roughly $2,000. The printer's character generator ROM contains 96 ASCII characters and 64 graphics characters. Colors are selected by seven color control codes, with the printer controlling the tricolor ribbon to produce the desired color. Gaphics and text may be intermixed on the same line, and all characters may be printed double-length or reverse. There are



also 15 user-programmable characters. The seven-wire print head forms alphanumerics on a 5 × 7 dot cell, and graphics characters on a 6 × 7 cell. The printer is fully dot addressable, with a resolution of one-sixtieth inch. In single color printing, the CX 80 is rated at 125 cps. The printer's standard interface is Centronics-compatible, with RS232 and IEEE-488 available as an option. INTEGREX INC., Philadelphia, Pa.

FOR DATA CIRCLE 306 ON READER CARD

Most installations have a 2-3 year backlog of unimplemented applications



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Eliminating programming also eliminates the need to talk about programming. This frees the user and dp staff to concentrate on the problem rather than the code–which results in both better communications and a better system.

In business, to stand still is to fall behind. More cost effective hardware, an increasing demand for computerized applications, and the decreasing availability of applications programmers means even bigger backlogs unless more powerful, more productive software is used.

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CIRCLE 143 ON READER CARD

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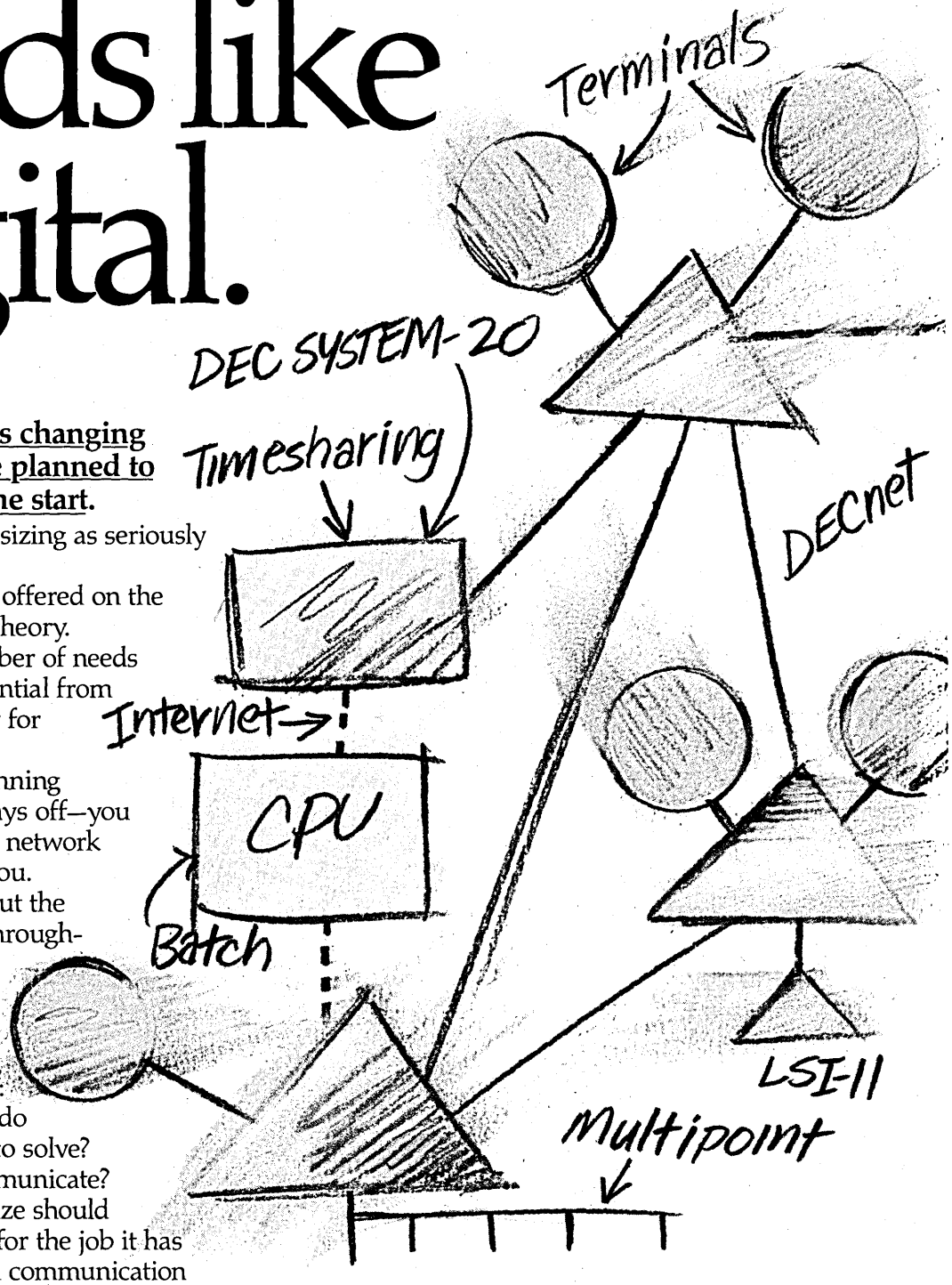

Digital's know-how is changing the way networks are planned to perform right from the start.

Not everyone takes sizing as seriously as Digital.

You'll see networks offered on the "one technology fits all" theory. Networks that fill a number of needs but may not get top potential from your investment or allow for future growth.

At your earliest planning stages—where it really pays off—you can put Digital's years of network experience to work for you.

Experience works out the ideal balance of speed, throughput, cost, data integrity, flexibility, control.

Experience asks the right questions to start with. Basics such as: What business problem do you want your network to solve? What systems must communicate?

To specifics: What size should each individual node be for the job it has to do locally? How much communication

redundancy should be planned to avoid downtime? What options are possible later for future growth?

And how do you meet your requirements most economically?

Digital's range of options.

No other vendor can match Digital's broad range of flexible, cost-effective communications and processor options which allow networks to be sized to your organization's particular needs.

A few examples. Some manufacturers support only BISYNC or X.25. Digital supports Batch BISYNC, Interactive BISYNC, and other standard mainframe communications protocols.

An advanced SNA protocol emulator allows Digital systems to participate in IBM/SNA networks.

And Digital offers X.25 Packetnet™ System Interfaces so Digital systems can communicate to public packet-switched networks.

DECnet,™ Digital's highly functional networking software, provides features not available with mainframe protocols. With DECnet, you have point-to-point, multipoint, and parallel communications.

You can automatically reroute information around problem areas so network operations can continue even when communication links or nodes fail.

Even add new nodes without shutting down operations. With DECnet, you can have complete control.

Your Digital Network Profile.

A Digital team of networking experts will work closely with you, from concept through installation through support.

First, a written Profile details your network requirements. The number and location of each proposed node, each terminal. Types of network applications. Volume of data to be transferred between individual nodes. Data urgency and importance. Line and system reliability, availability, and maintainability. Costs. Network operations and security. Future growth.

Digital's Customer Support Plan.

Based on your Network Profile, our experts, working with you, document how Digital will help satisfy your needs. Installation, start-up, training, network maintenance, troubleshooting. This plan clearly spells out what Digital will do, when it will be done, and how it will be accomplished. Following this thorough preplanning, Digital field service and software support experts will install and verify the hardware and software needed at each node, and demonstrate working network connections.

Digital planning leads to Digital performance.

A working network, ready to go. Ready to perform to the maximum now. Capable of expanding later as your business grows. To date, Digital has implemented over 5,000 network nodes around the world. And we don't just install them. We support them, too, with an international team of over 14,000 service people. At Digital, we're changing the way technology works for your needs.

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SOFTWARE AND SERVICES

UPDATES

Vista-United Telecommunications has let a contract to Digital Communications Corp. for a fiber optic transmission system installation at the Experimental Prototype Community of Tomorrow (EPCOT), a multi-megabuck project expansion at the Walt Disney World Resort Complex in Florida. Named VISTANET, the system will connect EPCOT center pavilions in Future World and World Showcase. The fiber optic system will carry telephone, data, alarm monitor and control, and energy management traffic.

Our apologies to Manual Madness entrant Charles E. Aylworth, whose entry from Apple's DOS manual was misquoted. It should have read "On a clear disk you can seek forever," not "On a clear disk you can see forever."

We also apologize to those entrants who received their calculators with unplanned engineering modifications courtesy of the U.S. Postal Service and its counterparts in other countries. At least two entrants reported smashed LCD faceplates. We do suggest that you check the batteries first, if you have received a dead calculator with no obvious physical damage.

Emulog, manufacturers of the 'Log 53 Data General 6053 crt look-alike, has signed a maintenance agreement with General Electric. GE will provide field service through its nationwide network of response centers.

The Forth Interest Group (FIG) keeps in the spirit of the language by holding chapter meetings on the fourth Saturday of each month, and by printing a bimonthly newsletter called Forth Dimensions. Membership costs $12 a year; those so inclined can write FIG at P.O. Box 1105, San Carlos, Calif.

REPORT WRITER

Dylakor, which has been successfully marketing Dy1-260 (the report writer and utility) for nine years, announced its latest offering: Dy1-280, a free-form English language report writer that also allows the use of fixed-form parameters. Featuring most of the capabilities of Dy1-260, the new dual command mode report writer/extended utility/programmer aid Dy1-280 will be available for the OS environment this summer, and for DOS in the fall. Current Dy1-260 users can get Dy1-280 for a one-time handling charge, while new customers can get Dy1-280 for the same price as Dy1-260: $127.27 per month on a three-year lease. Dy1-280 will support Dy1-260 and as an option its companion product, Dy1-Audit.

Dy1-280 gives the user complete control over report formatting, with automatic composition, control breaking, editing, totaling, titling, and formula calculations. Compiled Dy1-280 programs can be saved in, and invoked from, a library. Up to eight input and eight output files may be specified; Dy1-280 can handle most organizations, including sequential, ISAM, and VSAM. It can also accommodate fixed, variable, variable spanned (OS) and undefined record types. Conditional statements and branching, sorting, and a user exit facility (allowing use of programs written in COBOL, FORTRAN, or assembler) are also package features. DYLAKOR, Granada Hills, Calif.

FOR DATA CIRCLE 326 ON READER CARD

CROSS-ASSEMBLER

The ZAS Z-8000 Software Development Package runs under CP/M or ISIS-II+ on eight-bit 8080 (and derivatives) based microcomputers, providing users with the tools for creating assembly language programs for the 16-bit Z-8000 micro. Support is provided for both the Z-8001 segmented chip and the Z-8002 nonsegmented addressing version. ZAS uses standard Zilog instruction syntax. The cross-assembler includes 26 directives, providing such features as "include files" and nested conditional assembly. Programs are broken into named program, data, and absolute sections, which can be combined and renamed using the ZLK task builder (included). ZLK can be driven from a command file or terminal and can convert any or all program sections into absolute form. ZLK outputs a section map file and an object file. Complicated overlay systems can be created using multiple ZLK operations. Absolute object files are processed by the ZLD Object Loader (also included), which generates an object file that can be loaded and executed by the host operating system if a Z-8000 cpu is on the bus (as an alternate bus master). The ZAS package requires at least 40KB of memory, with at least 48KB recommended for larger programs. ZAS sells for $395. WESTERN-WARES, Placerville, Colo.

FOR DATA CIRCLE 327 ON READER CARD

OFFICE AUTOMATION

IBM has announced enhancements to its Distributed Office Support Facility (DOSF) for the 8100 Information System running under DPCX. Originally announced last June, DOSF provides word and text processing, storage and retrieval, and host transfer functions; newly added capabilities include spelling verification, automatic hyphenation, records processing, text arithmetic, mass mailing, and user conveniences.

DOSF Release 2 comes with a user-expandable vocabulary of roughly 170,000 medical, legal, and general English words. This vocabulary is used for spelling verification and assistance and automatic hyphenation. The user can ask for verification of a single word, all words on a page, or an entire document; when a suspected spelling error is detected, the word is highlighted, and the user is presented with a list of possible correct spellings. Even phonetic errors are handled. The user can then move the cursor to the correct spelling, or tell DOSF to accept the word as typed—in which case all such subsequent spellings will be accepted. DOSF keeps track of these operator-accepted words for possible inclusion in the dictionary. This same dictionary contains standard hyphenations, allowing DOSF to automatically break words over the right margin. The user can alter IBM's supplied hyphenations, as well as specify hyphenation points for user-added dictionary entries.

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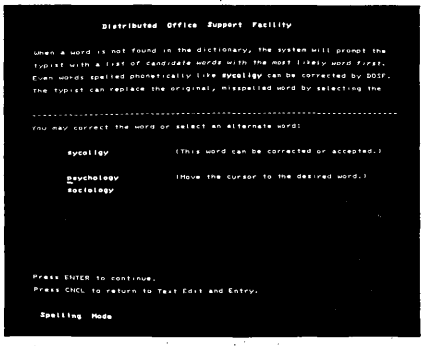
CIRCLE 145 ON READER CARD

SOFTWARE AND SERVICES

Records processing allows sorting and selecting structured text-created files. Sorting may be over multiple fields (maximum combined length of 60 characters) in ascending or descending sequence. Selection criteria, such "equal to" or "more than," may be combined with the logical operators "and" and "or" to produce complex selection requests. DOSF prompts for record processing selection and sort criteria,



and can save the users' responses for subsequent automatic document processing.

Text arithmetic provides the four basic functions. Operations may be performed on numbers in normal text as well as across rows or down columns of tabular data. The facility also can validate that numeric fields indeed contain numeric values.

Automated text facilities can now generate formatted reports from text files, use text files for embedding text and tables in documents, and copy a field from a file directly into the working document. Mass mail merges master and control documents, allowing generation of "customized" letters over a mailing list. For operator convenience, an alternate working store feature allows interruption of work on one document, saving contents and status of the working store. The operator can then work on another document, returning to the original work at the point of interruption.

DOSF Release 1 only became available this month; you'll have to wait until November for Release 2, which includes spelling, hyphenation, text arithmetic, and additional printer support. It won't be until May of next year that Release 2.1 will be out with records processing, automated text, mass mail, and alternate working store enhancements. The basic license for DOSF is $496 per month, or $372 per month under DSLO. INTERNATIONAL BUSINESS MACHINES CORP., Data Processing Div., White Plains, N.Y.

FOR DATA CIRCLE 328 ON READER CARD

SOFTWARE SPOTLIGHT

PROGRAM LIBRARY DATABASE

The CP/M users group (CP/MUG) has more than 40 diskettes containing better than 1,000 contributed programs. These contributed programs are available through computer clubs and stores for a small charge. Addressing the problem of actually locating the diskette(s) containing the programs you want, Elliam Associates has created a CP/MUG.DB database referencing all the CP/MUG programs by a number of descriptive keywords. The diskette comes set up and ready to use with Island Cybernetics' Information Master database program. With the database and Information Master, users should have an easier task of locating the program or set of programs needed: the database contains disk number, program name, size, language, and comments from the disk catalog and abstract. Among the entries in the database are 22 assemblers and disassemblers, 138 games, 14 versions of Startrek, 35 file maintenance programs, and 22 languages. Search results may be displayed on the console, a printer, or written to a disk file. CP/MUG.DB sells for $20, or $15 when ordered with Information Master ($37.50), plus $1.50 for shipping and handling. ELLIAM ASSOCIATES, Woodland Hills, Calif.

FOR DATA CIRCLE 325 ON READER CARD

WORD PROCESSING

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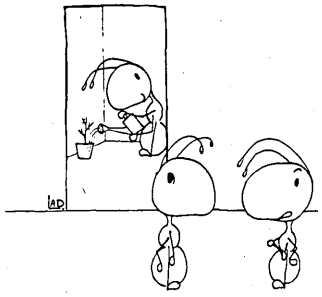
ers of Hewlett-Packard's 250 small business computer. CP 250 offers the usual functions for adding, modifying, and storing text. Centering, right and left justification, text relocation, formatting, document directory, duplication, search and replace, indentation, table generation and other features are controlled by the HP 250's "soft keys." The package can drive HP printers, as well as Diablo daisywheels.

Additionally, CP 250 can assess data in databases maintained by IMAGE. The information may be included in a document, e.g., using accounts payable data to generate dunning notices to those owing more than a given amount for 60 days or more.



"I've been waiting three months for his decision tree."

©DATAMATION

When storing a document, the user is presented with a fill-in-the-blanks dialog for defining the format. Text width, page margins, single- or double-spacing, and other formatting information are set at this stage. Formats may be altered at a later time. CP 250 sells for $2,500; oem arrangements are available. MARYLAND COMPUTER SERVICES INC., Bel Air, Md.

FOR DATA CIRCLE 329 ON READER CARD

APPLE UTILITY

If you're using Pascal on an Apple computer, there probably have been times when you would have liked to move files between Apple's DOS 3.3 and the Pascal operating environments. The Bridge is a program to move files between the two formats. It can allow your Pascal programs access to DOS 3.3 files, or you might want to use the UCSD/Apple full screen editor to clean up a BASIC program. The Bridge can work with single drive systems, with a "dual-format" diskette to which both DOS and Pascal files may be copied using Apple utilities; the Bridge can perform the necessary file conversions on that disk. The dual-format diskette looks like a "normal" diskette to both operating systems. The Bridge is supplied as a compiled and linked object code file for $90. ANALYTIC SOLUTIONS INC., Research Triangle Park, N.C.

FOR DATA CIRCLE 330 ON READER CARD

DATABASE QUERY

Current users of Cullinane Database Systems' OLQ OnLine Query language should be receiving Release 3.0 soon (as a no-charge update), while new users can license the package for $20,000. OLQ 3.0 is said to contain major enhancements making data access easier and programming more efficient. The query language retrieves data from Cullinane's IDMS database management system, allowing the production of ad hoc reports without resorting to involved programming.

Release 3.0 uses English commands and Boolean expressions to allow programmers and end users to view database records before specifying terminal screen formats (with DISPLAY commands), to retrieve multiple records with a single command, and to use the Integrated Data Dictionary (IDD). Computational functions are included for calculating totals, subtotals, averages, item counts, and minimum and maximum values. New users can be guided through a session with OLQ 3.0's step-by-step HELP facility. Additionally, arithmetic computations can be used during record selection and display, and there are provisions for sorting and summary reporting. The package will be available for general release this quarter. CULLINANE DATABASE SYSTEMS, INC., Westwood, Mass.

FOR DATA CIRCLE 331 ON READER CARD

CARTOON BY TOPOLSKY

Raster brilliance, contrast and erasability. Z-8001 intelligence plus programmability. All in a desk top, high resolution (1024 x 792), monochrome, graphics terminal ticketed at a low $10,000.*

Genisco's G-1000 is the low cost graphics terminal you've been holding your purchase order for. It is the first direct raster replacement for the Tektronix 4014-1** terminal—plug to plug and software compatible. But, at the same time, the on-board Z-8001 microprocessor plus 16K words each of RAM and PROM let you develop your own programs at your pace while your system is up and running on existing software (like PLOT-10).

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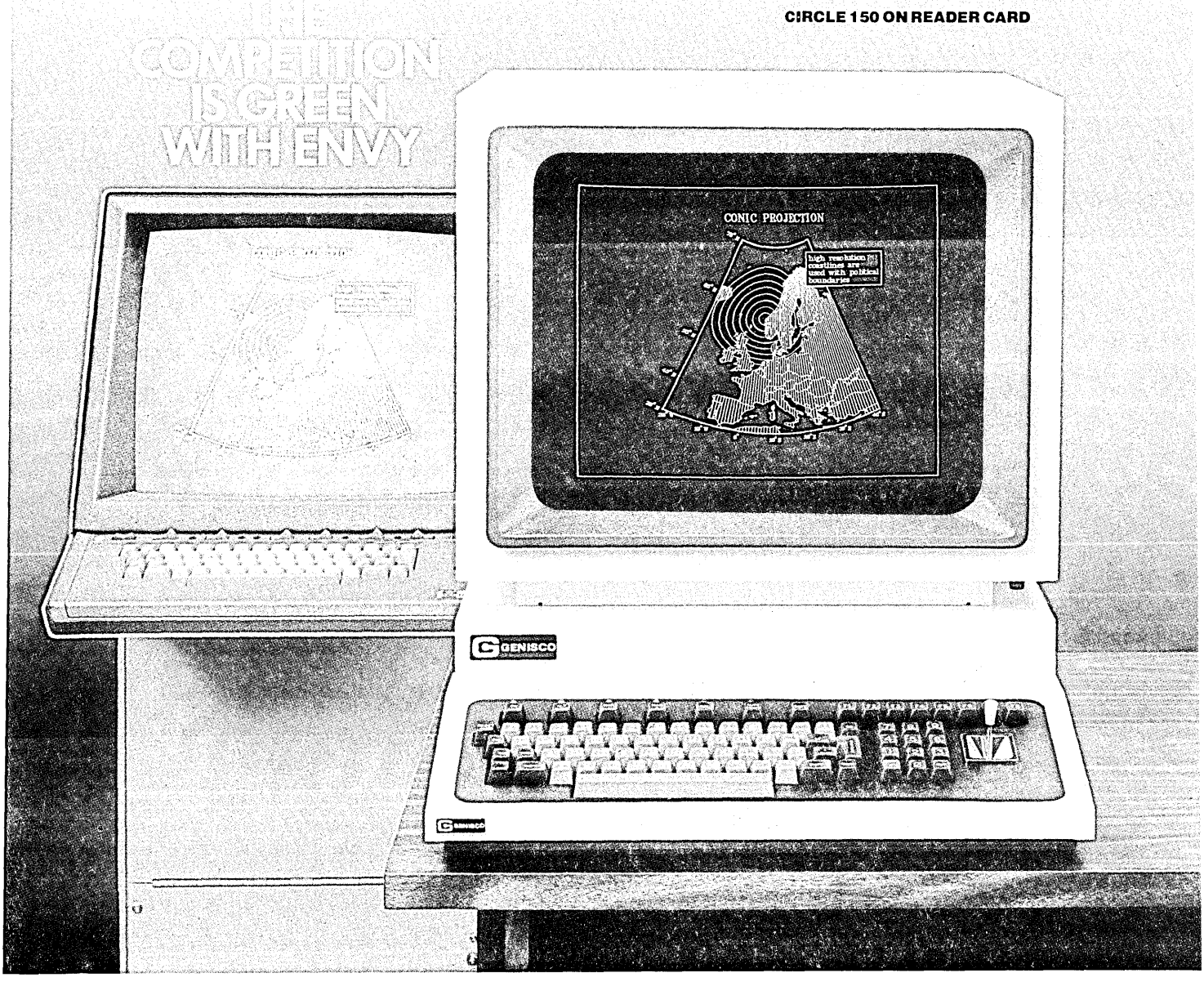
Take a look at Genisco's new G-1000—the 4014-1 replacement and a whole lot more.

Call or write for more information to Genisco Computers Corporation, 3545 Cadillac Avenue, Costa Mesa, California 92626. (714) 556-4916.

*Price varies according to quantity.
**Trademark of Tektronix
Graphics software from ISSCO Graphics.

Genisco

CIRCLE 150 ON READER CARD



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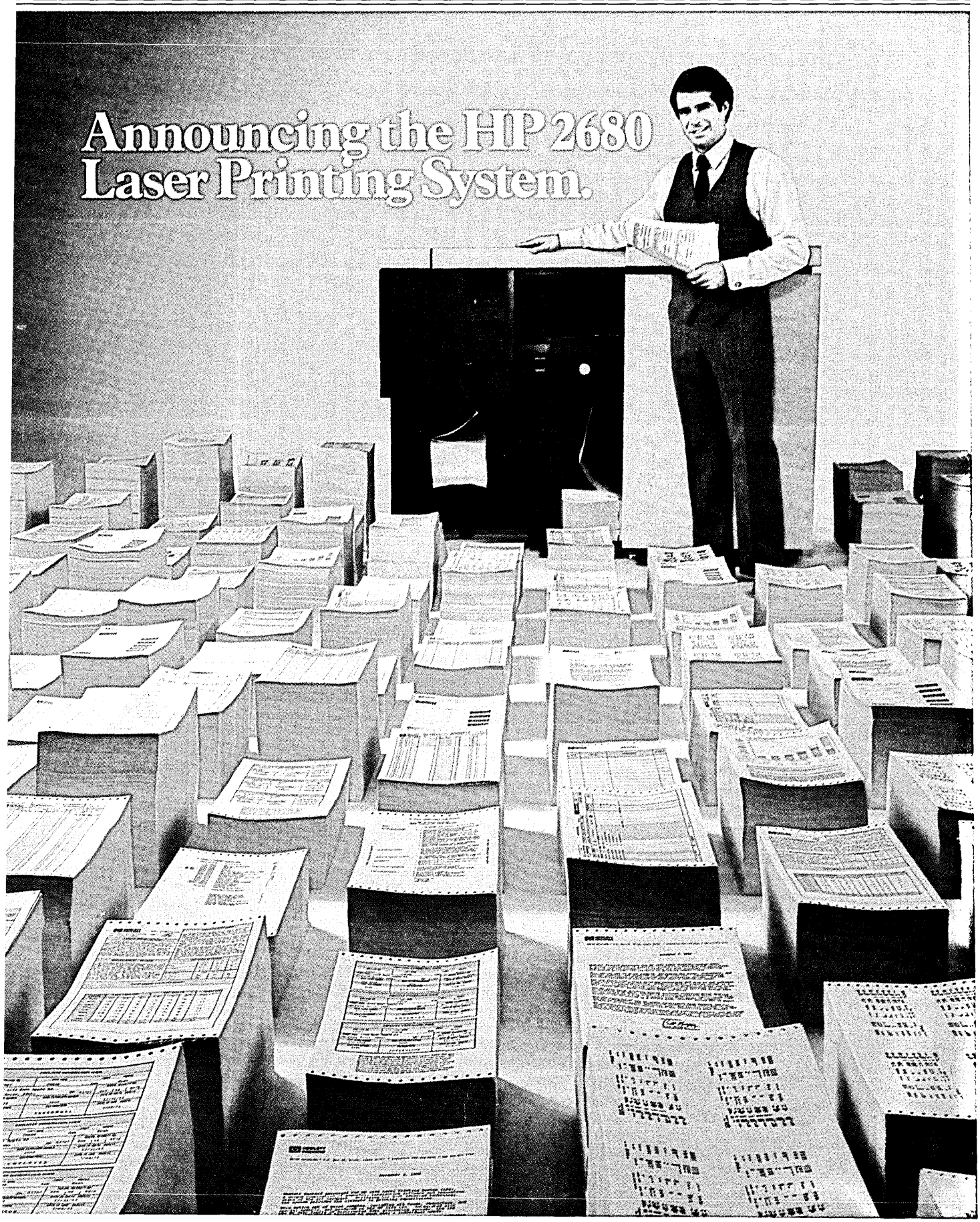

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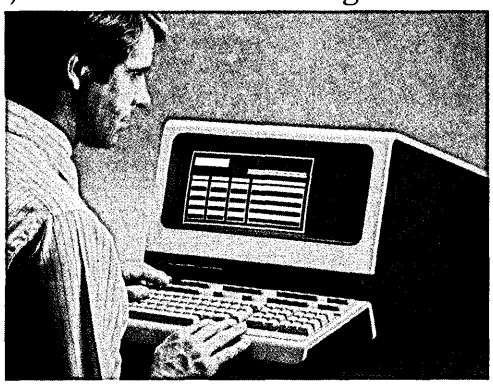

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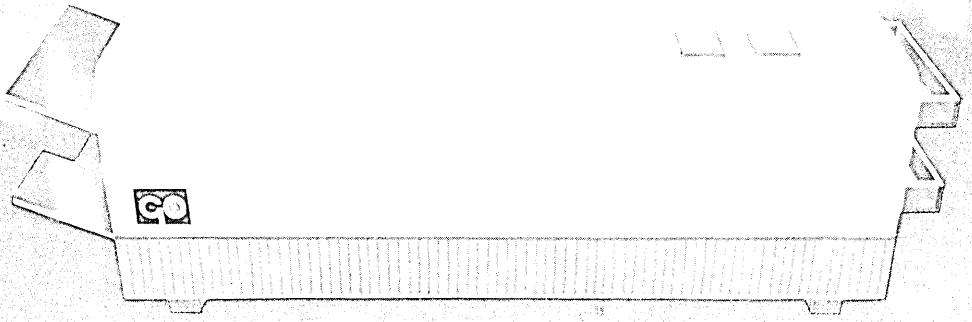

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BOOKS

SOFTWARE PSYCHOLOGY by Ben Shneiderman

The introduction to *Software Psychology*, subtitled *Human Factors in Computer and Information Systems*, shows the author is quite obviously in love with certain aspects of dp:

"Programming has all the excitement and agony of making scientific discoveries, composing symphonies, designing buildings, and writing novels. Programming is an intensely human experience whose esthetics cannot be imitated or appreciated by mere machines." Having known programmers in both academic and business environments, I can say that while the academicians may be at least more familiar with such subjectivity, anyone in the business world is likely to write Dr. Shneiderman off before he gets started.

But, what is "software psychology?" "The study of human performance in using computer and information systems. Understanding of human skills and capacity to design effective computer systems can be improved by application of the techniques of experimental psychology; the analysis of cognitive and perceptual processes; the methods of social, personnel, and industrial psychology; and the theories of psycholinguistics." The author states, "The audience for this book includes professional system designers, managers, and programmers," as well as graduate students, industrial and academic researchers. I won't hazard a guess at how many of the above know what "psycholinguistics" is, but the author is genuinely intent on improving the lot of all of us who deal with computers.

However, sincerity aside, the author addresses his large audience and introduces his research methods: "The simplest form of research in software psychology is *introspection*, in which the experimenters or the subjects simply reflect on how they write, study, debug programs, or use terminals." From this admittedly modest beginning, Dr. Shneiderman takes a sudden leap into interpreting statistical differences, variances, and the like, and within a few paragraphs of the above sentence, the reader is confronted with formulas like

$$t = \frac{M1 - M2}{\sqrt{\frac{s^2}{N1} + \frac{s^2}{N2}}}$$

$$\text{where } s^2 = \frac{\Sigma\ (x - M1)^2 + \Sigma\ (x - M2)^2}{N1 + N2 - 2}$$

The point is that research requires experimental testing, and analysis of test results must surely follow in the form of interpreting statistics. We are only on page 18 and the dp manager or programmer without a background in statistics must already be tempted to give up.

This is typical of what is wrong with his book; more than businessmen, academicians tend to take prior knowledge for granted. Dr. Shneiderman does this often, but also manages to touch on scores of themes very superficially. He skips from "team organization" to "database systems" to "natural languages" with no clue as to what these fields are supposed to have in common or why they are supposed to relate to each other. These are no longer the faults of an academician vs. a businessman, but rather a writer desperately in need of an editor.

"Software psychology" appears to be a new term for a newly created field. Even when following the author's own definition, however, the search for an "application of the techniques of experimental psychology" in this book invariably leads to several paragraphs with a conclusion like the following: "If high-level managers can produce stable egoless [programming]

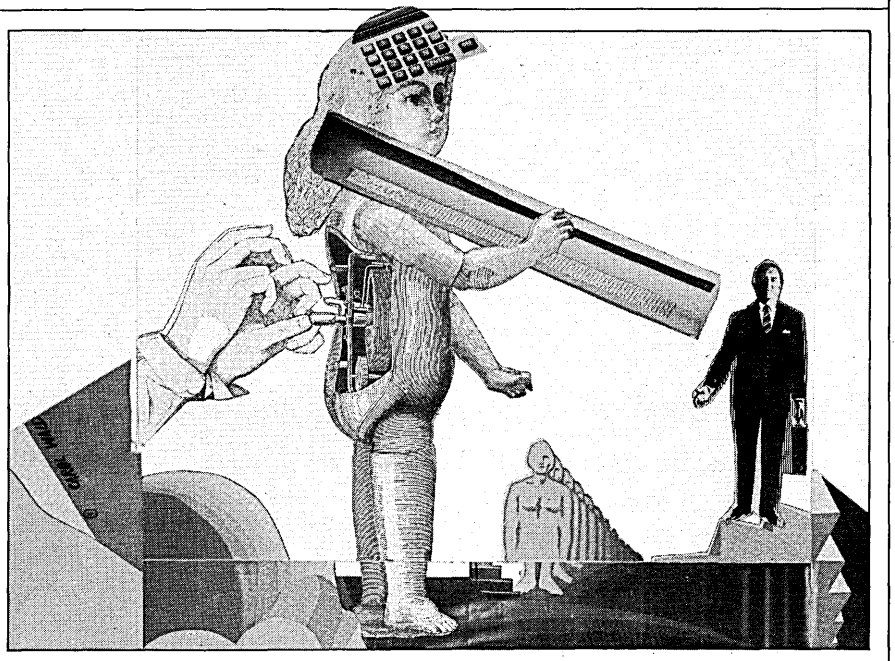

ILLUSTRATION BY CAROL WALD

teams, they will be rewarded with quality work, low turnover, high morale, and loyal employees." With such empty idealism, the author can easily infuriate the average dp businessman, alienate his fellow academicians at Stony Brook, where he teaches, and put his whole "software psychology" concept into jeopardy.

A mass of examples do not a concept make, and in addition to an editor and an audience, the author needs to present us with a well-defined method for using "human factors in computer and information systems." A wealth of interesting material is suggested here, but it is all dragged down by the uneven writing style, which ping-pongs between an elementary level and an in-circle of researchers.

In the end, we are buried under a heap of quotes from *Zen and the Art of Motorcycle Maintenance*, admonitions on ethics (which ring hollow in a book that refers to case studies which "were conducted by capturing samples of programs from program libraries"), a dreadful discussion on Gilb and software metrics (how does this fit into anything?), and chapters on subjects like computers and natural language which go nowhere.

Carol Wald's delightful collages, familiar to DATAMATION readers, illustrate the book, but suffer from the mediocre quality of the layout. Both the subject and the author deserve another chance. Winthrop Publishers, Inc. Cambridge, Mass. (1980, 320 pp., $24.95).

Sally Williams-Haik

BOOK BRIEFS

THE EFFECTIVE EDP MANAGER by Michael R. Frank

Mr. Frank claims his book is basically solution-oriented, and provides "real world insight" into approaches that can help edp organizations reach the potential that technology provides. He starts with an explanation of the "edp mission," and goes on to cover the edp organization, tools of systems management, managing human and hardware resources, edp planning, and several related topics. The book is easy to read and would be helpful to the student as well as the edp manager. Published by AMACOM, a division of American Management Associations, New York (1980, 197 pp. $17.95).

MOTIVATING AND MANAGING COMPUTER PERSONNEL by J. Daniel Couger and Robert A. Zawacki

At a time when personnel costs constitute over half the computer department's budget, people in dp cannot be overlooked. The two authors compiled data from over 3,000 dp personnel and found out what employees want from their jobs. There are chapters on motivating people at work, joint goal-setting and feedback, enhancing motivation and productivity, the supervisor as counselor, procedure for work redesign, and sets of national norms established by the survey Couger and Zawacki conducted and compiled into this book. Information is meaningful as an aid for managers. John Wiley & Sons, a Wiley-Interscience Publication, New York (1980, 213 pp., $19.95).

WITHOUT ME YOU'RE NOTHING by Frank Herbert, with Max Barnard

Mr. Herbert is a novelist, famous for *Dune* and other desert-world classics, and Mr. Barnard is a computer professional, presently working on Herbert's home computer system. The two men have put together a useful book, geared toward the "average Joe" with no computer experience. It seems ideal for someone who would like to install a home computer, and would also like to instruct his or her family in how the machine operates. The book also contains a general buyer's guide and some applications. There is a buzzword glossary, and a promise to the reader in the first chapter: "In this book you will find the essential things you need to know to run your own computer." That is a fairly accurate description—not much more than the essentials are given. Simon and Schuster, New York (1980, 304 pp., $14.95).

AIAD edited by Ellen T. Crowley

The seventh edition of the AIAD (*Acronyms, Initialisms and Abbreviations Dictionary*) contains 211, 323 entries, costs $70, and weighs nearly seven pounds. AIAD editors have concentrated on U.S. usage, and AGOs (Acronym Generating Organizations) represented range from religious orders to publications to scientific societies. The volume also contains orthographic tomfoolery in French, German, Russian, Italian, and other major languages.

Dp alone seems to have contributed nearly a pound of acronyms. The popular DBSC (Digital Block Slave Clock) is listed, as is the handy PTF (Program Temporary Fix). The other big AGO is, of course, the Pentagon. Computer people are justifiably proud of their acronymic achievements, but when it comes to length, nobody—except maybe some Polish journals—can touch the colonels. How would you like to work for USAET & DL (ECOM)? If you did, you might find yourself interfacing with USAFESA-RTD, designing something important for use in, say, Zaire. If you didn't have it ready on time you'd have to answer to the USCINCEMEAFSA, a very important man, and it wouldn't avail you much to blame it on the USAEMAFMPO, which failed to procure your parts on time.

Slang and humor are listed, too: AAAAAA is the Association for the Alleviation of Asinine Abbreviations and Absurd Acronyms. Absent, though, is the title recently suggested for Secretary of State Haig: CINCWORLD (Commander in Chief of the World). Maybe it'll make the next edition. Gale Research Co., Detroit (1980, 1,330 pp., $70).

REPORTS & REFERENCES

LOOKING AHEAD

The Committee for Economic Development (CED) published a report earlier this year entitled "Looking Ahead: Identifying Key Economic Issues for Business and Society in the 1980s." The report offers no hard solutions, but outlines economic issues and forces that will confront U.S. business and society during this decade. According to the CED, there are "fundamental forces" with which we must come to grips. Some of these forces are domestic population changes, increased global economic interdependence, public questioning of economic decisions, and the increased importance of Third World nations. The CED report also discusses key problem areas—inflation, taxes, inadequate capital investment, unemployment—which, it says, can be alleviated in part if stronger cooperation between business and government is established.

The report is the result of two years of discussions with corporate executives and economists, and while it does not rank the issues or propose solutions, it "identifies those economic problems that a group of knowledgeable business leaders regard as most worthy of attention and consideration." The CED, formed in 1942, is a nonprofit research and education organization that studies public policy. Copies of the report go for $5. Contact CED at 477 Madison Ave., New York, NY 10022, (212) 688-

INTERNAL CONTROLS

Martin B. Roberts of Georgia State University looked for a checklist he could use to review internal controls in modern computerized auditing systems, but he couldn't find one. So he proceeded to study control problems in both larger DBMS systems and smaller mini-based systems, and to review existing questionnaires from five major accounting firms. Finally, he devised his own checklist. The results of his work are available in a 163-page monograph for $47.50. Contact Mr. Roberts at Administrative Systems. Design, 2423 Burnt Creek Rd., Decatur, GA 30033 for a copy of "Internal Controls in Edp Systems."

SWEDISH TRADE

The Swedish Trade Office has compiled a report, "The U.S. Market for Industrial Electronics and Data Processing Equipment and Systems," intended as a handbook for foreign suppliers looking to export to the U.S. Four case studies of Swedish electronic sales in the U.S. are included, as are general surveys of the U.S. marketplace in

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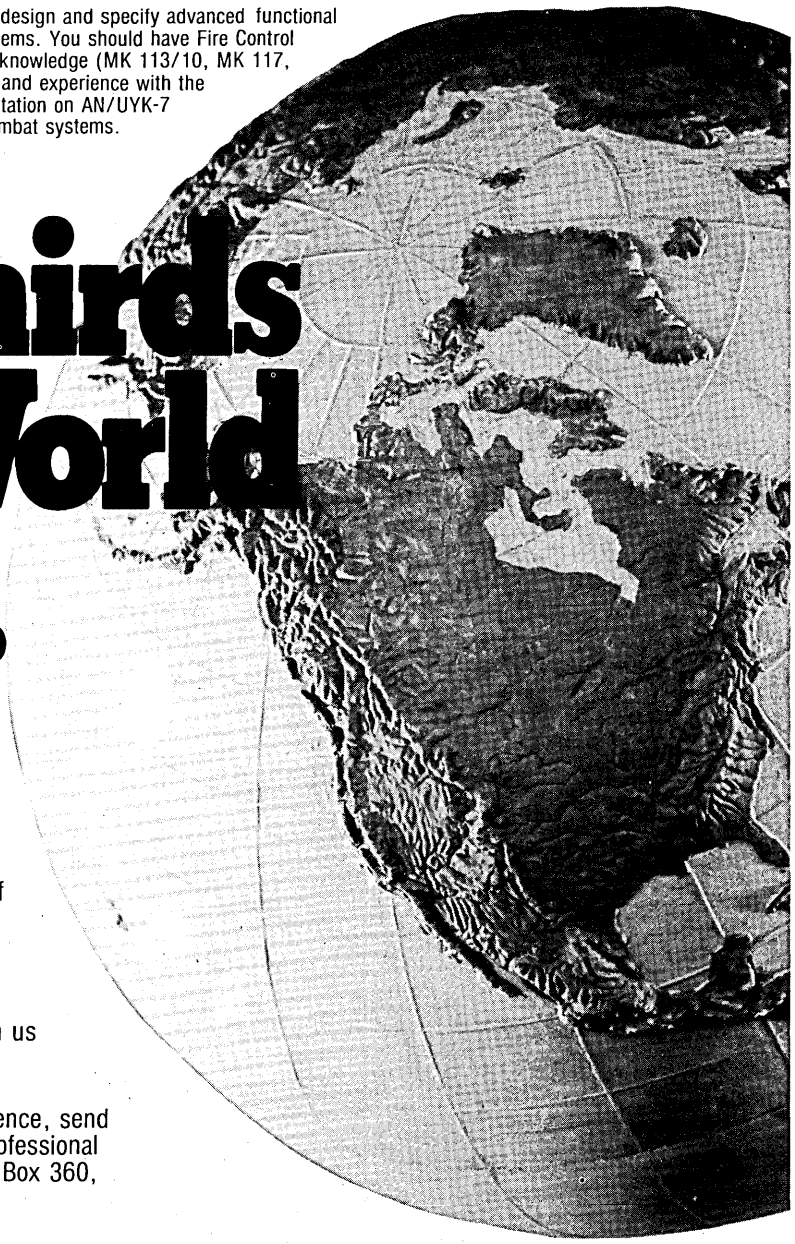

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various specific categories, 16 pages on establishing sales in the U.S., a chapter on suggested joint Swedish export activities on the U.S. market, a listing of several major American consulting firms (including their current market reports and other services, and names of major trade publications and trade shows.) The Swedish Trade Office is part of the Swedish Trade Council, a nonprofit organization sponsored 50/50 by the Swedish Government and Swedish private industry. The report can be ordered ($250, airfreight included) from the Swedish Trade Council, Box 5513, S-114, 85 Stockholm, Sweden.

BIBLIOGRAPHY

"The Annual Bibliography of Computer-Oriented Books" is now in its 14th edition —over 1,000 books from more than 150 publishers appear in this year's version. All introductory books published prior to 1978 have been deleted, and over 270 new books have been added. The bibliography separates the books into 55 categories and then catalogs them according to type (reference, textbook, handbook), and style of presentation (programmed instruction, case study, narrative). The section "Introduction to Edp" is broken down into three categories, for students, managers, and laypeople. Computer programming lists an introductory section and further sections on ALGOL, APL, BASIC, COBOL, FORTRAN, Pascal, PL/I, RPG, as well as special languages, special machines, advanced programming, data structures, and structured programming. Some of the other major categories are systems analysis, systems design, computer applications, management of dp, hardware, and computer references. Whatever your computer book needs are, this listing will prove useful because of its wide subject range and specific headings. The bibliography is available for $4 from *Computing Newsletter*, Box 7345, Colorado Springs, CO 80933. (The cost is $6 if an invoice is required).

FOR SOFTWARE WRITERS ONLY

"The 1981 Software Writer's Market," subtitled "1,800 Places to Sell Your Software," is a market report for independent software vendors and small software businesses. The report names 1,800 firms that will market and distribute programs for independents. Service bureaus, hardware manufacturers, book publishers, computer magazines, consulting firms, and retail computer stores are among the buyers listed; Wang, Atari, Control Data, Osborne/McGraw Hill, Apple, and A. D. Little are a few of the names that appear. "The advantage of dealing with companies like these is that the independent author is able to leverage his marketing efforts through these larger firms, many of which have international sales forces and distribution channels already in place," according to the publisher. The report explains each company's marketing techniques, and fills writers in on what kinds of software they look for, how they deal with independent vendors, royalty rates, and contract details. Also included is the name of the key decision maker at each company. The price is $45. Order from Kern Publications, 190 Duck Hill Rd., P.O. Box 1029, Duxbury, MA 02332, (617) 934-0445.

COURSES

WORKSHOP

The New York Chapter of the EDP Auditors Association, Inc., holds chapter meetings on the second Monday of each month (September through June) in New York City. On May 11, the topic is "Systems Evaluation Approach: Documentation of Controls (SEADOC)," and on June 15, "Auditing RACF Controls" will be discussed. The workshops take place at the Summit Hotel and are followed by a dinner. Contact Angelo Telesca, G.P.O. Box 1279, New York, NY 10116, (212) 248-5401.

CONTINUING ED

The University of Michigan College of Engineering continues its summer engineering

SCIENCE/SCOPE

By producing a coldness almost to where molecular motion freezes, a refrigeration unit cools the detector "eyes" of a U.S. Navy infrared sensor so they are sensitive enough to see infrared radiation emitted by warm objects. The cryogenic dewar base is built by Hughes for the A-6E TRAM/DRS (Target Recognition and Attack Multisensor Detecting and Ranging Set). The TRAM/DRS, also built by Hughes, is a combination laser and infrared device that lets crewmen of the A-6E Intruder aircraft locate and attack ground targets day or night.

For the first time, the F-15 Eagle has made detailed radar maps using real-time SAR (synthetic aperture radar) techniques. The maps, made at ranges up to 160 nautical miles and with resolution down to 10 feet, were part of a demonstration of the multimission capabilities of the new F-15 Strike Eagle. The tests were conducted by an F-15 whose AN/APG-63 radar had been modified by increasing its bandwidth and reprogramming its programmable signal processor. All flights were realistic profiles so that new navigation penetration and all-weather weapon delivery modes could be evaluated. Sponsoring the tests were McDonnell Douglas Corp., builder of the U.S. Air Force fighter, and Hughes, the radar supplier.

A resilient plastic coating could lengthen the lives of infrared domes on Maverick air-to-ground missiles. Using a process called plasma polymerization, Hughes researchers placed a plastic film 5.1 micrometers thick on a curved section of an anti-reflection zinc-sulfide dome. The section, when subjected to fine-grain sandblasting, suffered a transmission loss of only 1.7 percent, compared with 18.5 percent for a noncoated sample. The film reduced the infrared transmission qualities by only 3 percent. Not only did the tests indicate the feasibility of extending dome life, but also that the frangible dome covers that are blown off in flight might even be eliminated.

Hughes Missile Systems Group, located in Canoga Park, California, an attractive suburb of Los Angeles, is seeking engineers and scientists for a growing list of development and engineering programs. The list includes AMRAAM, Wasp, multimode guidance, TOW 2, Phoenix, and IR-Maverick. Typical openings are in LSI design, radar and millimeter-wave seekers, IR seekers, signal and data processing, pattern recognition, computer software, and advanced electronic packaging. Please send your resume to Gary Jong, Hughes Engineering Employment, Dept. SE, Fallbrook at Roscoe, Canoga Park, CA 91304. Equal opportunity employer.

Passengers flying on a number of airlines between Miami, the Caribbean, and South America are enjoying smoother flights because of a weather satellite. Although tropical thunderstorms develop and die quickly through much of the area, airlines can avoid them and take advantage of beneficial winds by studying pictures from a GOES (Geostationary Operational Environmental Satellite) spacecraft. The airlines can even determine when turbulence will be at a minimum and then advise cabin attendants to serve in-flight meals. GOES was built by Hughes and is operated by the National Oceanic and Atmospheric Administration.

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conferences. On July 13-15, the "Data Communications, Fiber Optics, and Spread Spectrum Techniques" conference will be held. Topics include signal alternatives, error-probabilities, error-control, channel capacity, modems, line control, common-carrier digital services and facilities, fiberguides, LEDs and injection lasers, PIN and avalanche diodes, etc. The fee for the conference is $475; contact the University of Michigan, College of Engineering, Continuing Engineering Education, 300 Chrysler Center, North Campus, Ann Arbor, MI 48109, (313) 764-8490.

NOT NECESSARILY IBM

"SNA But Not All IBM" is the title of a symposium that will show you how to use non-IBM products with IBM's SNA. The five-day symposium, presented by Telecom Computer Technology International, Inc., will feature Saroj K. Kar, founder and president of TCT. According to Kar, the users and manufacturers have two options in dealing with SNA: "They can either adapt it to their advantage, or risk substantial financial losses through inexperience or misinformation. In any case, the impact of SNA on both users and manufacturers cannot be avoided." The symposium on SNA's technical structure, its implications, alternatives, and the pitfalls of designing and choosing SNA-compatible systems. The three segments of the symposium are as follows: 1. A one-day review of SNA terms, techniques, and concepts, including networking components in SNA, SDLC-HDLC comparison, 3705/NCP configurations, VTAM functions and ACF techniques. 2. Three days of seminars and workshops addressing usage requirements of non-IBM products in SNA, the aspects of support and the alternatives to SNA. 3. A one-day EDP/MIS executive seminar to "equip decision makers with an understanding of the crucial issues and implications of SNA." The symposium will take place in New York June 1-5. Fees are $650 for the three-day seminar-workshop, $850 for the review-seminar-workshop, and $350 for the executive session. Contact TCT International, 599 North Mathilda Ave., Sunnyvale, CA 94086, (408) 735-9990.

PASCAL

Colorado State University is offering videotaped short courses on Pascal. The first of the three courses is "Beginning Pascal," which covers structured control aspects and primitive data types in 10 half-hour lectures. "Intermediate Pascal" discusses the structured data type facilities in eight half-hour lectures, and "Advanced Pascal" includes advanced uses of Pascal in six half-hour lectures. For a folder describing these courses, contact W. L. Somervell, Jr., Director, Engineering Renewal & Growth Program, Colorado State University, Christman Field, Bldg. 1000, Ft. Collins, CO 80523, (303) 491-8417.

SOFTWARE REBATE

Software International Corp. is holding free one-day seminars to "demonstrate how any company can close the books on time, provide on-line financial information instantly, and control cash flow for maximum profitability." Software International will present attendees with a certificate worth $1,000 toward the lease price of any or all of the following packages: General Ledger and Financial Reporting, Accounts Payable, Accounts Receivable, Fixed Asset Accounting, and Payroll/Personnel systems. The seminars will take place in 48 cities in the U.S. and Canada through June 11. Contact Software International, Elm Square, Andover, MA 01810, (617) 475-5040.

VENDOR LITERATURE

THE NEW MANTIS

A new application development system, the Series 80 MANTIS, is described in this vendor's brochure. User case histories, charts, photos, and a sampling of the Series 80 MANTIS in use highlight this system's capabilities. CINCOM SYSTEMS, INC., Cincinnati, Ohio.

FOR DATA CIRCLE 350 ON READER CARD

PROCESS COMPUTER SPECIALIST

Aramco needs outstanding process computer specialists on the energy frontier in Saudi Arabia. We're offering outstanding incentives to get them, including up to 40 percent pay premium.

The application of process computers to Aramco projects has accelerated the need for experienced computer system specialists in systems engineering, systems software, real-time application of programming, computer hardware, instrumentation, and NGL process engineering.

Need best people for challenging jobs

Aramco has challenging job opportunities on oil, gas and NGL control systems, offshore and onshore SCADA, metering, chromatographic systems, terminal systems, and many more.

Aramco, the principal oil company helping the Saudi Arabian government develop its energy resources, is involved in projects that are overwhelming in scope, complexity and inventiveness.

The Company is dedicated to applying process computer systems to all areas. That's why we need some very talented process computer specialists. Openings are available immediately for direct foreign assignment, temporary USA project teams, or permanent domestic assignments, depending on your particular qualifications.

Process Computer Software Engineers

We require Process Computer Software Engineers with a B.S. degree in engineering, math or computer sciences, and 3 or more years' experience in various real-time processes, SCADA, projects, or process systems.

- **Software Systems Engineers**
- **Process Computer Control Specialists**
- **Hardware Systems Engineers**

Process Computer Control Specialists

We also need Process Engineers with a B.S. in chemical engineering, and 3 or more years' plant experience and process computer control application experience.

Process Computer Hardware Systems Engineers

Process Computer Hardware Systems Engineers are needed with a degree in electrical engineering, computer science or engineering, computer science or engineering technology, plus 3 or more years' experience in designing and maintaining process computer and instrumentation systems.

Unsurpassed compensation and benefits

The Aramco salary is competitive and a cost-of-living differential increases it even further. In addition, Aramco pays employees in Saudi Arabia an after-tax expatriate premium of 40 percent on the first $30,000 of base salary and a 20 percent premium on the next $20,000. And there is an outstanding combination of benefits: long vacations, comfortable housing, abundant recreation, and an excellent school system.

Extra overseas bonus and new voluntary "bachelor" status for married employees

Newly hired employees for Saudi Arabia also receive a one-time, lump-sum, after-tax Overseas Employment Bonus of up to $5,000.

All of the attractive compensation and benefits are available for married employees who may want to work overseas on a temporary "bachelor" status for the first year. This program includes three free repatriation trips by air during this one-year period, and the option to request family status at three conversion dates during that same year.

Interested? Call our 24-hour line any day: (713) 750-6965. If you wish, call toll-free: (800) 231-7577, ext. 6965 between 7 A.M. and 5 P.M., Monday-Friday, Central Time.

If you prefer, send your résumé in full confidence, or write for more information to: Aramco Services Company, Department DM0501-DR04A, 1100 Milam Building, Houston, Texas 77002.

CHALLENGE BY CHOICE

ARAMCO

SERVICES COMPANY

SOURCE DATA

VENDOR NEWSLETTER

Network is the name of this bimonthly telecommunications newsletter specifically aimed at the MIS and telecom professional. The vendor's name is liberally sprinkled throughout the newsletter, but they do find room for some interesting stories. ROLM TELECOMMUNICATIONS, Santa Clara, Calif.

FOR DATA CIRCLE 352 ON READER CARD

PRIVATE CONVERSATION

This brochure traces the history of voice security from the first scrambler patent application in 1881 to a modern algorithm meeting the National Bureau of Standards data encryption standards. It also supplies data on the vendor's own voice security systems with charts and spec sheet. SYLVANIA SYSTEMS GROUP, Needham, Mass.

FOR DATA CIRCLE 354 ON READER CARD

TRAINING AND SOFTWARE

An eight-page color brochure that lists course offerings for IBM users describes "The Debugging Controller," a software package. There are three pages of tables illustrating which dp job functions benefit from use of the vendor's education modules. (The education modules available are MVS Internal Logic System Design and Performance, 303X System Operation and Problem Resolution, and JES3 System Design Operation and Problem Resolution.) COMPUTER SYSTEMS RESEARCH, INC., Avon, Conn.

FOR DATA CIRCLE 355 ON READER CARD

DATAMATION SUBJECT INDEX

The 1980 index contains topic, author's name, month of publication, and page number of every article and news feature appearing in DATAMATION during 1980. TECHNICAL PUBLISHING CO., New York, N.Y.

FOR DATA CIRCLE 351 ON READER CARD

PRODUCT GUIDE

This vendor's complete line of terminals and hardcopy peripheral devices is illustrated in a four-color, 16-page brochure. Product groups include alphanumeric, graphics, and data capture terminals; alphanumeric and graphics printers; graphics plotters; and graphics input devices. HEWLETT-PACKARD, Palo Alto, Calif.

FOR DATA CIRCLE 353 ON READER CARD

MEMORY SYSTEM

A spec sheet describes this vendor's MSC 3610 VAX memory system, said to be a plug-compatible replacement for DEC's M8210. Storage capacity, access and cycle times, AC power requirements, and operating requirements are listed for the MSC 3610, in addition to details on the warranty and systems reliability. MONOLITHIC SYSTEMS CORP., Englewood, Colo.

FOR DATA CIRCLE 356 ON READER CARD

MICROTERMINAL

The TM71 alphanumeric microterminal is described in this four-page brochure and spec sheet. A message summary, examples of communications protocol, and a list of performance features are included in the material. BURR-BROWN, Tucson, Ariz.

FOR DATA CIRCLE 357 ON READER CARD

SUPPLY SIDERS

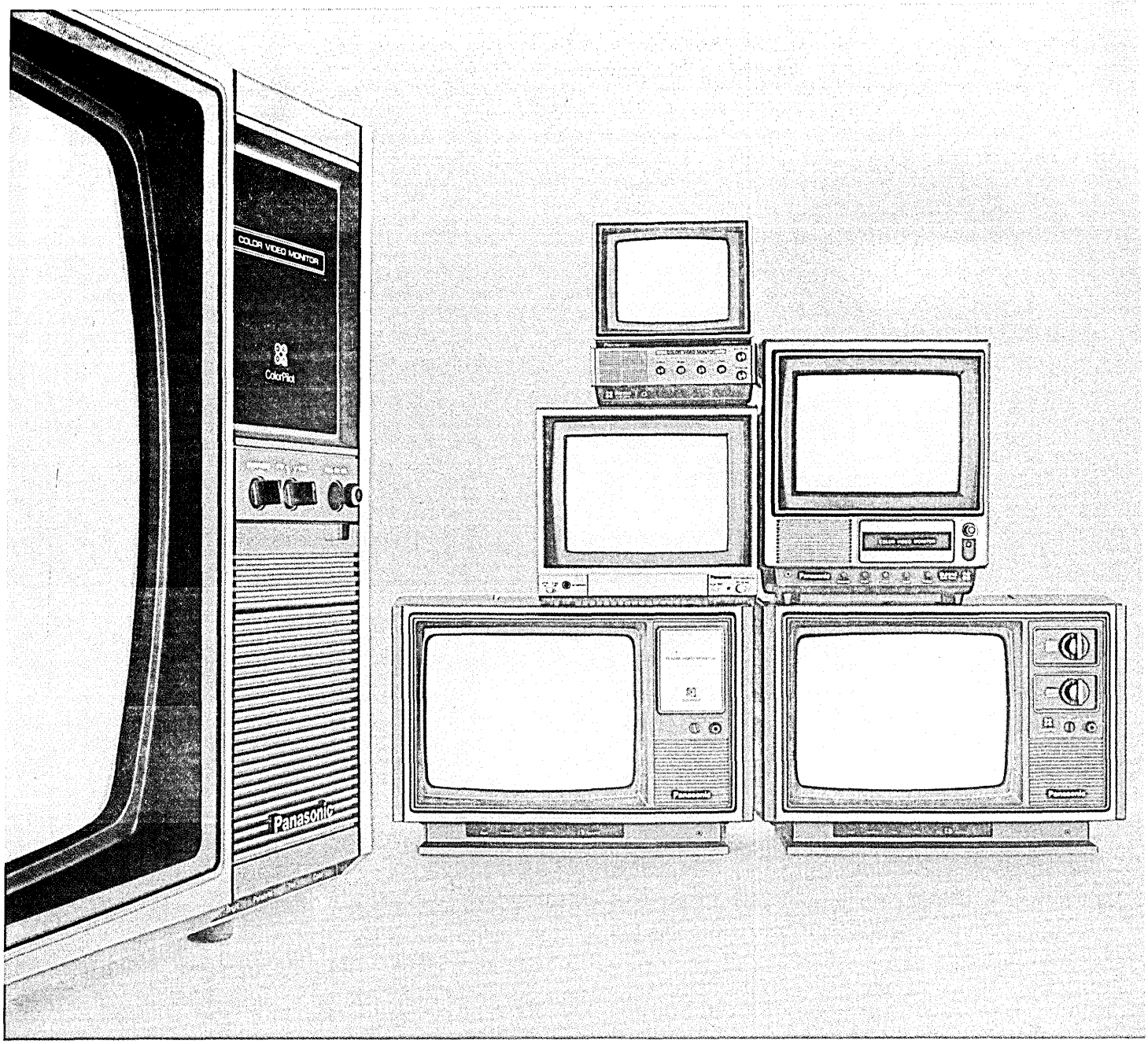
This 64-page catalog describes dp supplies ranging from interface cables to computer room furniture and DEC terminals. The vendor states that most items are in stock to ensure immediate delivery. SOURCE SYSTEM, INC., Chicago, Ill.

FOR DATA CIRCLE 358 ON READER CARD

SERIES/1 OPERATING SYSTEM

An 11-page booklet introduces and outlines the capabilities of PXS (Program Executive System), a logical operating system for IBM Series/1 computers. There are charts, examples of program logic, and a sample PXS program in the booklet, along with a paragraph on the development of PXS. ALAN HOCHSCHILD, INC., San Francisco, Calif.

FOR DATA CIRCLE 359 ON READER CARD



Panasonic color monitors. A great price is just part of the picture.

But perhaps the best part of the picture is our picture. And you can see this beautiful picture in six different models ranging from 7" to 19" (all screen sizes measured diagonally) at prices starting as low as $450.*

Beautiful pictures come naturally to Panasonic color monitors because they all have our Quintrix II™ in-line black matrix picture tube. And that means a picture so life-like you'll feel like you're part of it, whether you're watching production tapes or the latest computerized color graphics display.

Some monitors like the 19" CT-1910M, the 13" CT-1310M and the CT-1310V monitor/receiver include ColorPilot™ which automatically adjusts color intensity and hue to preselected levels.

Our 10" CT-110M monitor is small enough to fit on a desk and economical enough to be used in multi-monitor configurations. While our 7" portable, the CT-700M, works on both AC and DC power and comes with a 12-volt car battery adapter.

Best of all, Panasonic color monitors are just one part of a complete line of Panasonic video components. Including portable and studio color cameras, ¾" VCR's, editing systems, professional VHS™ recorders and cameras.

Want to get the complete picture on color monitors? Feast your eyes on Panasonic.

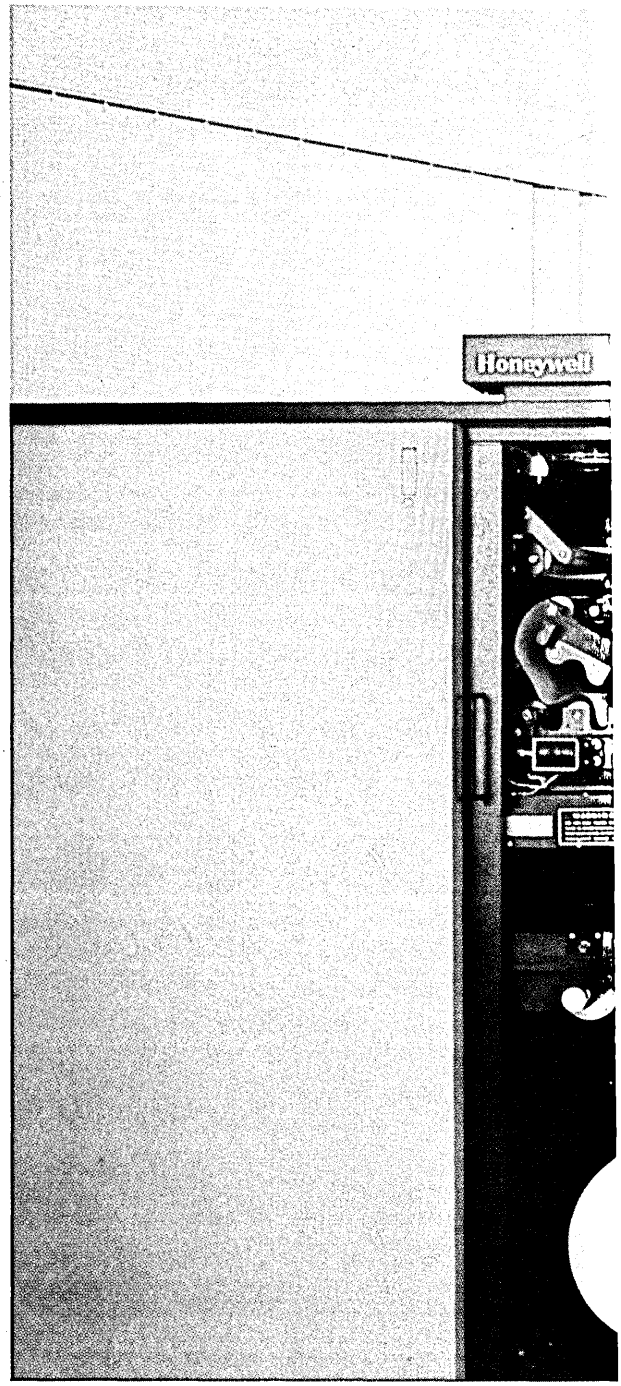
*Manufacturer's suggested price.

Panasonic
VIDEO SYSTEMS DIVISION

CIRCLE 163 ON READER CARD

"18,000 lines a minute and all the processing power of a Level 6. Our new PPS II/E does everything but feed the dog."

Ron Borelli
Director, Page Processing Systems
Honeywell Information Systems



PPS II was a productive printing system to begin with. But now, by giving users access to the power of the Level 6 computer, we have created a system that is a data collector, processor, and printer all in one. So users can customize an output system to fit their particular printing needs.

The new PPS II/E collects data from word processing diskettes and magnetic tapes, as well as from on-line and remote connections to a variety of mainframes. It can even collect data from multiple sources simultaneously. Then, using Level 6 application programs, it organizes and prints this data at speeds as high as 18,000 lines a minute. PPS II/E will even interface with impact printers for specialized requirements such as check printing.

"This is one of the most cost-effective page processing systems ever designed."

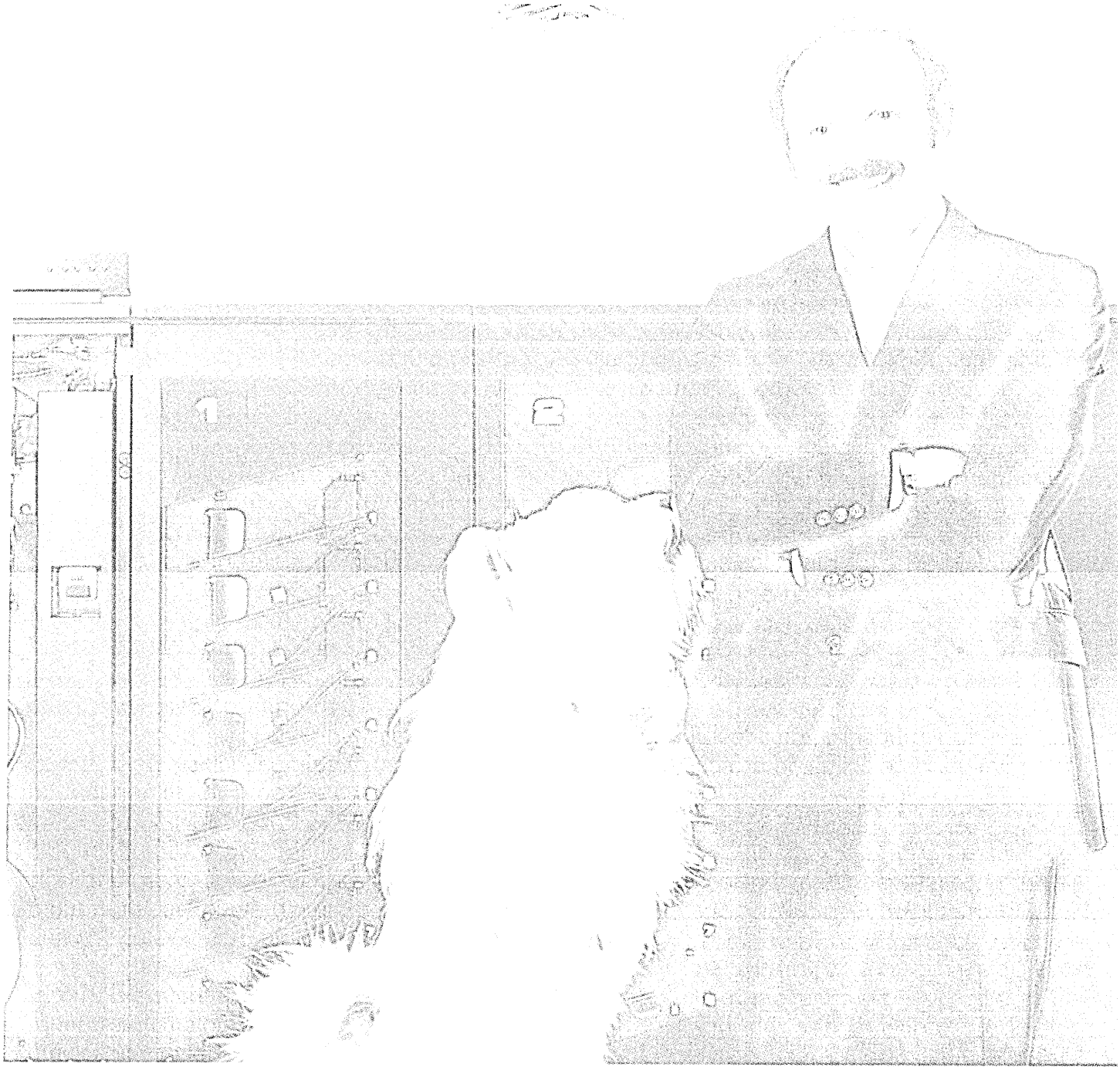
On one hand, PPS II/E is a high-speed non-impact printing system, capable of producing up to 18,000 lines a minute. It also punches, collates, perforates, and addresses.

PPS II/E lets you print your own forms, choose your own colors, and sizes, and design your own character sets.

More important, PPS II/E is growth-oriented. You can add disk storage or stackers. Increase printing speeds. Design new characters or forms as your applications change. Or add more CPU power or memory.

"Built-in processing power gives PPS II/E unbeatable flexibility."

Of course, the new PPS II/E is also a processing system. And it can accept Level 6 software programs. PPS II/E can be used to relieve your computer during peak load times. Or reserved for new applications development. Or custom-designed to perform a certain function. For example,



PPS II/E can change your output processing system into an electronic mailroom—accepting input from data or word processors—organizing, prioritizing, and addressing it before printing for quick and easy distribution.

Efficiency has been enhanced by the addition of a new disk queuing capability that lets you store and merge data coming in from different sources. Now you can organize, process, and print information at your convenience.

In short, PPS II/E is a powerful and versatile system that gives you the flexibility to manage your operation with maximum efficiency. It prints like a demon. It processes like a computer. It does just about everything.

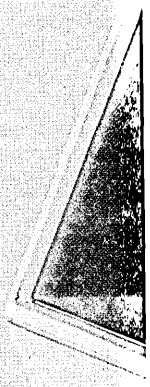
For more information call 800-328-5111. (In Minnesota call collect 612-870-2143.)
Or write Honeywell, 200 Smith Street
(MS 487), Waltham, Massachusetts 02154.

Honeywell

The ingenuity of people, the power of computers.

CIRCLE 167 ON READER CARD

What's the biggest d new 7580A drafting plotte Abou



New HP technology cuts the cost of high performance plotting in half.
Our new 7580A moves paper, vellum or polyester film instead of massive drums or crossarms like other plotters. And that means high performance and reliability at much lower cost.

High quality and fast throughput.
The 7580A offers 4 g's acceleration and 24 ips speed. Numbers that add up to fast throughput.

Addressable resolution is 0.025mm (0.001"), with a mechanical resolution of 0.0032mm (0.00012")—or about 1/50 the width of a human hair. Curves are smooth and lines are straight for superior plot quality.

Our 7580A is probably the easiest to use large plotter ever built.
Paper loading takes only seconds. Pen force and pen velocity are set automatically. And thanks to automatic pen capping, even liquid-ink pens stay ready to write for up to several days.

Eight pens of different colors, line widths and types can be accessed automatically. It even sets plot boundaries automatically.

Use of individual sheets permits plotting on standard company and government forms ranging in size from 20.3cm x 26.7cm (8" x 10.5") to 62.2cm x 119cm (24.5" x 46.85").

Software support is available on HP and other computers.
HP's graphics software supports the 7580A on HP desktop computers and computer systems. And HP's Industry Standard Plotting Package makes the 7580A easy to add to other systems. RS-232-C and HP-IB (conforms to IEEE 488-1978) interfaces are available.

For CAD/CAM, drafting, mapping and a lot of other uses, we think the 7580A is a real plotter breakthrough with exceptional price and performance advantages. Send for complete information and a sample plot today. And draw your own conclusions. Domestic U.S.A. price only $15,450. 11101

Have your 7580A draw me a sample plot so I can draw my own conclusions.

☐ Send me a free sample plot and data sheet.
☐ Send me OEM information on the 7580A.
☐ Have your representative call me, my number is
( ) _____.

My Computer/Model no. is _____

My application is: _____

Name _____

Title _____

Company _____

Address _____

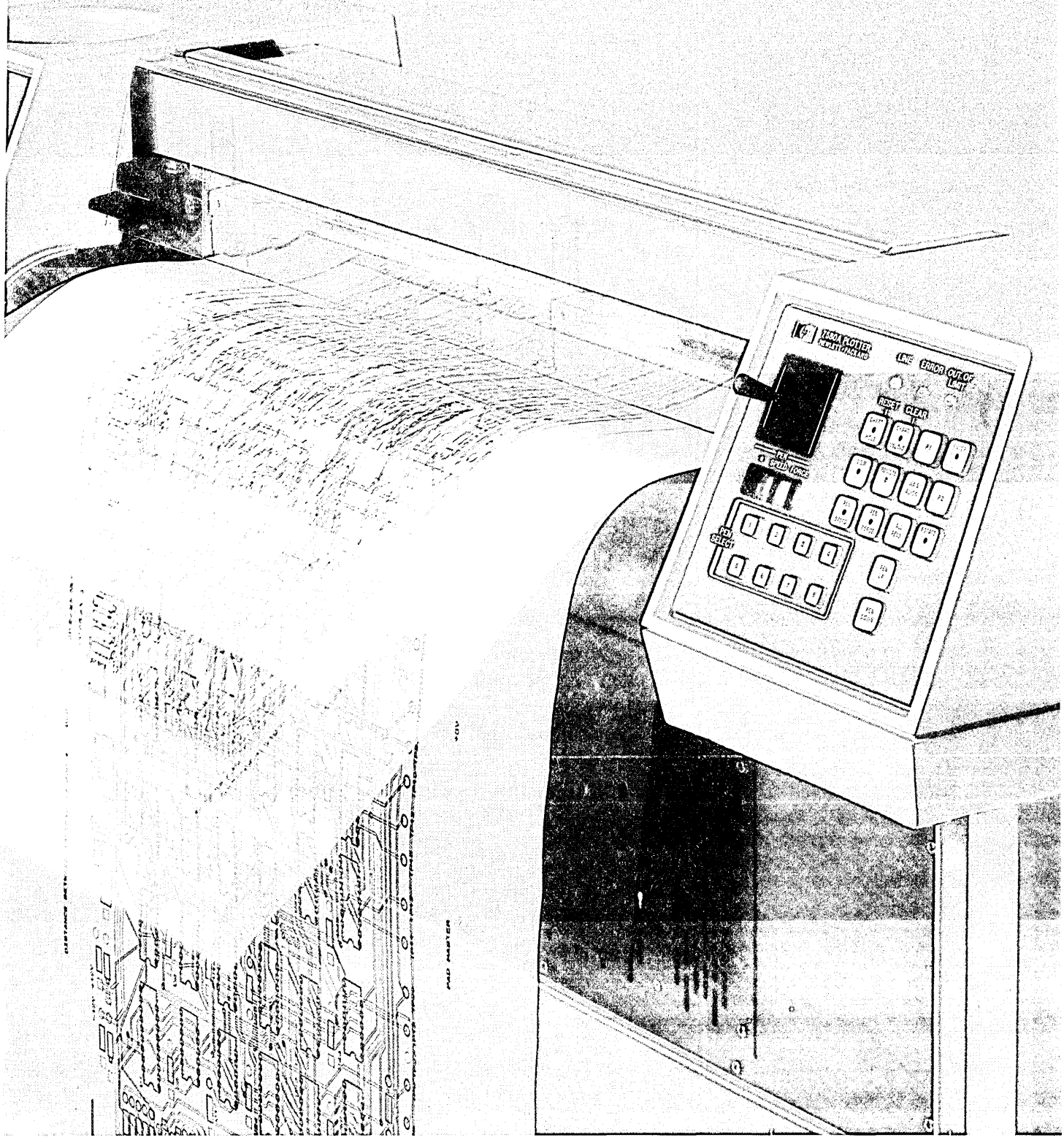
City _____ State _____ Zip _____

Send to Nancy Carter, Hewlett-Packard, 16399 West Bernardo Drive, San Diego, CA 92127, U.S.A.; or call Bill Fuhrer at (714) 487-4100.

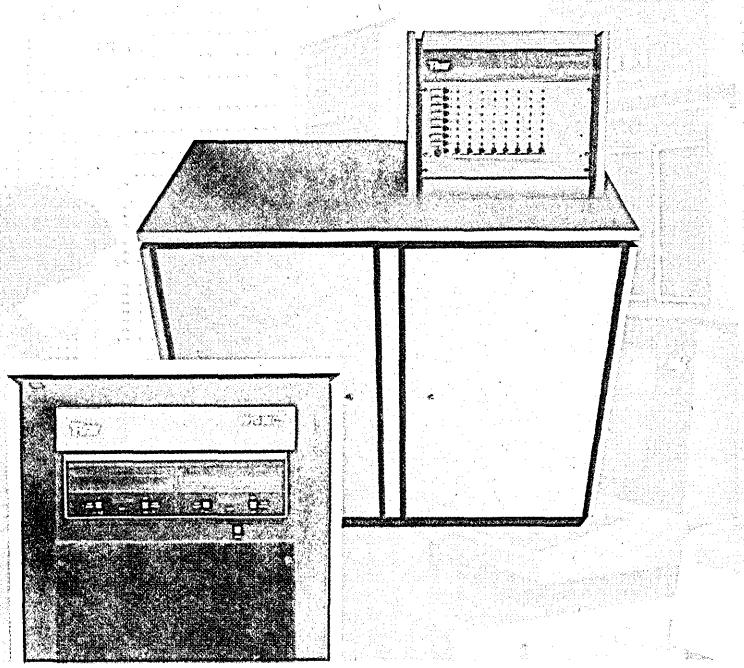
HEWLETT PACKARD

CIRCLE 168 ON READER CARD

rence between HP's
nd other $30,000 plotters?
15,000.



The 3919– Computer Peripheral Switching IMC



Computer Control of Peripheral Switching. Others call it new. We've been selling it for years

The T-Bar 3917 IMC™ is in use at most of the major airlines in the United States—and at other large installations of IBM and IBM—compatible mainframe

Now we have a smaller version of the 3917, the 3919. Intelligent Matrix Control of even a single computer peripheral switch, or as many as eight switches. When you grow past that point, there's the 3917.

Still better—you can buy our 3915 switch now, with manual control. And add the 3919 IMC when you need it, without obsoleting what you have.

The 3915's are available in sizes as small as 2 x 4 and as large as 8 x 16 (and even larger). They can be easily and inexpensively field upgraded for IMC operation at any time.

And many customers who already have 3915's installed can also add the 3919 IMC easily—right now.

For smaller users, the 3919. For larger users, the 3917.

Please call or write. We'd like to show you one of our proven systems today.

T-bar®

T-Bar, Incorporated, 141 Danbury Road, P.O. Box T, Wilton, Connecticut 06897
(203) 762-8351

CIRCLE 171 ON READER CARD

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

REPLY TO PERSONNEL'S TRENDY QUERY

Thoughts upon hearing the young personnel manager's question: where will you be in 15 years?

Where will I be in 15 years?
You sure ask complex questions.
I can't exactly pin it down,
But here's a few suggestions:

I might be chairman of the board,
Some Forbes 500 firm,
I might be on a river bank,
With rod and reel and worm.

I might read nights like Justice Holmes,
And then become a lawyer;
I might study psychiatry,
To treat my paranoia.

I might give politics a whirl,
I think I've got the feel;
I know that I'm too proud to beg,
And shake too much to steal.

I think I've got a book inside,
Of heads unbowed though bloody;
I might coach teenage MBA's,
Am I coming through, good buddy?

I've "synergised" and "MBO'd,"
And "zero based" my share,
Go find someone with fewer stripes
To prove your questionnaire.

My life runs one day at a time,
Tomorrow's dark and murky,
And all I know beyond that is
I won't be here, you turkey.

—Edward C. McManus
Marlborough, Massachusetts

ILLUSTRATION BY STUART LEEDS

WATCH YOUR LANGUAGE

This piece appeared in *The Guardian,* on Jan. 22, 1981:

I want to urge you to stop using the programming language BASIC (or FORTRAN) to write programs that control anything or assist in designing anything.

A few years ago the Americans sent a space vehicle to look at Venus. When it was near to its destination, a computer, trying to alter the trajectory of the space ship, executed the FORTRAN statement: DO 3 I=1.3.

The programmer's intention was one thing, and the statement as written means something. But regrettably the statement should have a comma rather than a full stop. The computer, as an automaton, took the strict interpretation and sent the Venus probe off to oblivion, at a cost of several billion dollars.

Three times in the last year the American nuclear deterrent system was erroneously placed on red alert. For several minutes the

Who offers peripheral switches with higher capacity and more features at lower cost?

Data/Switch...the outperformer.

Simply stated, Data/Switch outperforms every other peripheral switch. Its integrated semi-conductor matrix assures the highest throughput for data transparency. You can even reconfigure off-line control units while the channels remain active.

Start with the industry's single largest matrix: 16x24 or build up to it gradually from a 2x2, because Data/Switch is modular and easily field upgradable.

A unique channel diagnostic display monitors data passing through the switch to isolate hardware problems in the computer room. And with the widest selection of expandable matrices at the industry's lowest cost per crosspoint, Data/Switch provides unrivalled economy.

For higher capacity and more features at lower cost, Data/Switch is the outperformer.

For more details, write or call Data/Switch at (203) 853-3330.

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CIRCLE 169 ON READER CARD

procedures designed to take the ultimate retaliatory action were carried out. Then someone realized it was a computer fault. Rumor has it that one of these failures was due to a program bug.

In 1979 five nuclear reactors in the U.S. were closed down. A bug had been found in a program used to perform calculations to aid the design of the cooling systems. Many heart pacemakers are today controlled by microcomputer (some are programmable after implantation). But would you be willing to write the program for your own? I wouldn't.

I do not suggest that all problems would be solved simply by the use of better programming languages. But human life is increasingly dependent on programs that work properly. We should therefore take every care to use the best techniques we can in order to avoid failures.

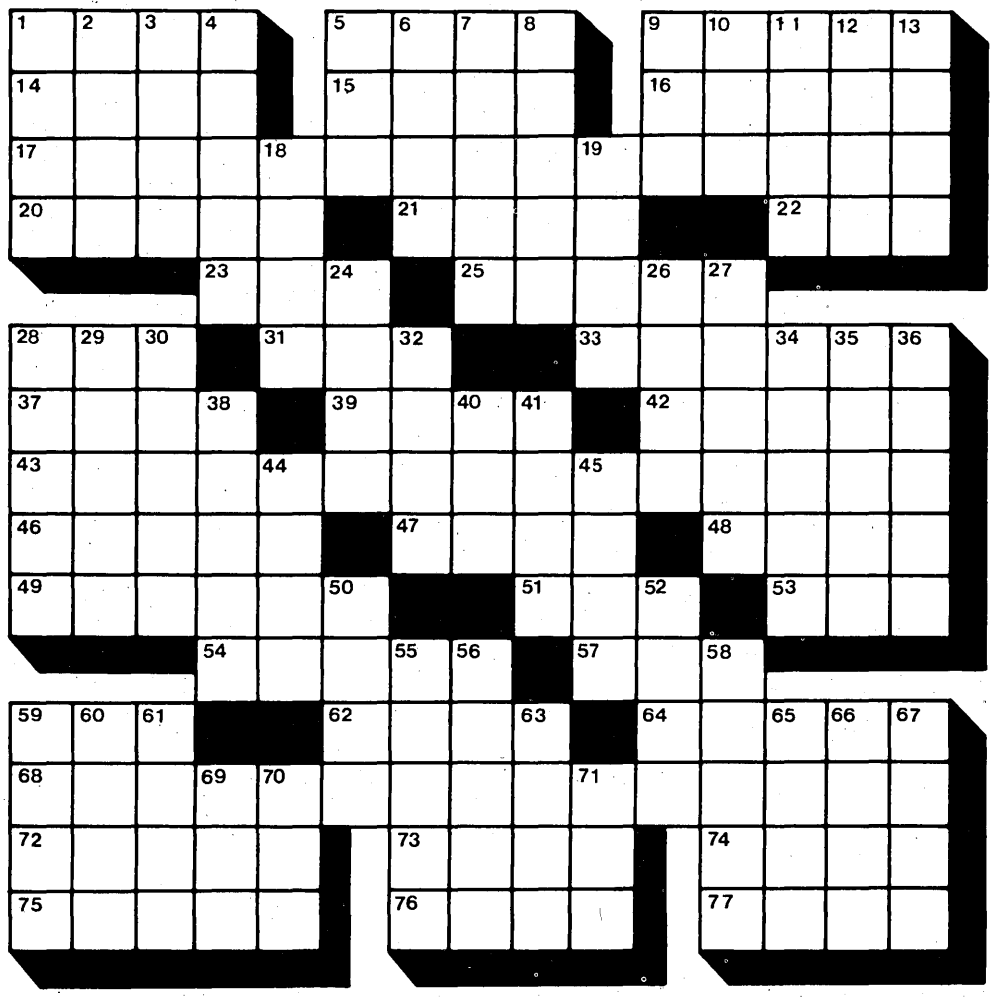
Expressiveness is the ability of the language to describe exactly what we want to do in a precise, clear way. The evidence suggests that we can test a program until we are blue in the face; it will still have bugs in it. So it's better to try to ensure that in constructing the program we have got a program to work at the first attempt. Nowadays this must always be our aim.

Consider the common situation on which we want a program to do something repetitively, but the number of repetitions is not fixed. Examples are: 1. input and process a set of numbers until some special number indicates the end; 2. perform a numerical computation iteratively until the error is less than a set amount; 3. search a table such as a telephone directory until a required item is found. Although this sort of processing is extremely common,

(continued on pg. 220)

DATAMATION CROSSWORD

OUT OF PHRASE
by Brian Burke



ACROSS

1. *The world according to* ____
5. M-16s, e.g.
9. Mist
14. Zone
15. Vile persons
16. Mrs. Petrie
17. Self-elevation, with 68 across: phrase
20. Pillar: comb. form
21. Fur
22. Draft initials
23. Aral, for one
25. Gave information
28. Scottish negative
31. Insecticide
33. Knocks out: slang
37. This, to Theotocopoulos
39. Venetian ruler
42. Black tea
43. Appetizers?: phrase
46. Warm
47. Red Devil, e.g.
48. Dispatched
49. Fishhook attachers
51. Word with wig or wax
53. What a body comes through
54. One Wyoming mountain
57. Group of walruses
59. Gov't. agency
62. Seed covering
64. Befits
68. See 17 across
72. Charles Lutwidge Dodgson wrote for her
73. Footnote abbreviation
74. Easy: slang
75. Chops, e.g.
76. Hardy heroine
77. Attend

DOWN

1. Lacunas
2. In ____
3. Depend
4. Coffin coverings
5. Start of a Faulkner title
6. Dudley Dooright's employer: abbr.
7. Songwriter, according to Manilow
8. Detect, with out
9. Type of radio wave: abbr.
10. Track meet sponsor: abbr.
11. Young seals
12. Spheres
13. Coniff and Milland
18. Did a garden job
19. White: comb. form
24. Totals
26. River to North Sea
27. Fates
28. Salamanders
29. Pale
30. One day's march
32. Die's partner
34. Mirth
35. Rogers of First Edition fame
36. Fried quickly
38. Like a knight jousting
40. South African antelope
41. To be, in Brest
44. Disengaged
45. Mound
50. Laurel
52. Herbert or Katherine
55. Former Glenn locale
56. Woman turned to stone by Zeus
58. Stuyvesant, for one
59. Illusory
60. One of the four humors
61. Largest of seven
63. Lane of Metropolis
65. Of wrath
66. Filming
67. Raced
69. Mo.
70. Basketball's Unseld
71. Scores: abbr.

Solution on page 224

PUZZLE GRAPHICS BY GLEN BOCK

The Marketplace...

ADVERTISERS' INDEX

SOFTWARE SERVICES

COBOL

FOR DEC RSX-11M VER. 3.2 USERS

Compile and execute large COBOL programs

- Compilation capacity exceeds 5000 lines
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ADVANCED SET OF ANSI-74 FEATURES

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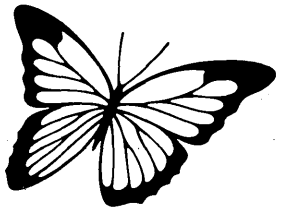
CIRCLE 204 ON READER CARD

NEW LIFE FOR *1401* PROGRAMS



CS-TRAN converts your 1401 *object* programs to COBOL for the mainframe or mini of your choice.

CS-TRAN is the *only* translator that accepts your object programs, patches and all, yet allows you to include actual COBOL paragraph names and record definitions.

If you'd like more details about new life for your 1401 programs just call or write Russ Sandberg.

C·S Computer Systems Inc.

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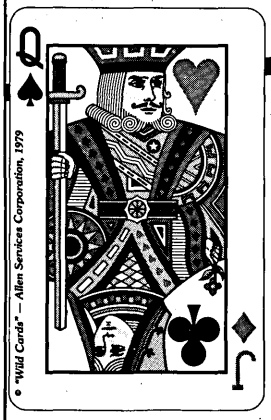
CIRCLE 205 ON READER CARD

PREVENT "*Wild Cards*" IN YOUR DATA



"Wild Cards" — Allen Services Corporation, 1979

with... SUPER-MSI™

Multiple Systems Integrity Facility™

Consider - SUPER-MSI... **SHARED DASD USERS:**

- **PROTECTS YOUR DATA INTEGRITY** by preventing simultaneous destructive updates by jobs in different systems.
- **Eliminates RESERVE Lock-outs** (both performance Lock-Outs and "deadly embrace").
- **DOES NOT SACRIFICE RELIABILITY** as do other approaches to the problem.
- **Now has extended VSAM Dataset Integrity** to specifically handle the internal VSAM Dataset SHR options.
- Informs Operators and/or TSO users (as appropriate) about the precise task (job, TSO user, etc.) causing dataset conflicts.
- **Provides powerful operator commands** to Control and Monitor performance and activity.
- Is **TRANSPARENT** to users, and almost transparent to operators.
- **Is Independent of system environment** — for example, it works equally well with MVS, MVS-SE, SVS, MVT, VS1, MFT, HASP, ASP, JES2, JES3, etc.
- Can be installed in **10 minutes** without an IPL and with **NO SYSTEM CHANGES** whatsoever.
- MSI is already being used in well over 400 installations throughout the world.

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READERS' FORUM

neither BASIC nor FORTRAN provides language features designed specifically to express it. What we have to do is use IF and GOTO statements to express what we want. In my telephone directory I am advised to start finding the telephone number I want by following the instruction: find the surname (surnames are in alphabetical order). Few programming languages have this sort of expressive power. But FORTRAN and BASIC both make a meal of it. The sort of thing we have to do is like this: Step 1: if this surname is the one we seek then go to the next step, otherwise look at the next entry—go to step 1.

Next step:

It is not easy to see that what we desire here is a repetitive activity. We have had to express ourselves in terms of more primitive actions like comparisons and go to statements. (It gets worse if we have to make the program deal with the possibility that the name is not in the directory). This is satisfactory in terms of being able to accomplish what we want, but unsatisfactory from the point of view of being able to clearly express it. The available features of BASIC and FORTRAN completely distort the programmer's intent, in this situation as in others. What we would like to do is to express our intention in directly meaningful terms, something like: repeat: look at the next entry until the surname is the one we seek.

Humans like using names, and it is more meaningful and accurate than a National Insurance number. A particularly dismal feature of BASIC is its limited facility to let us give things names.

What does this mean:

10 GOSUB 1000,
20 GOSUB 2000,
30 GOSUB 3000,

"I had expected a playground for the rich to be a little classier."

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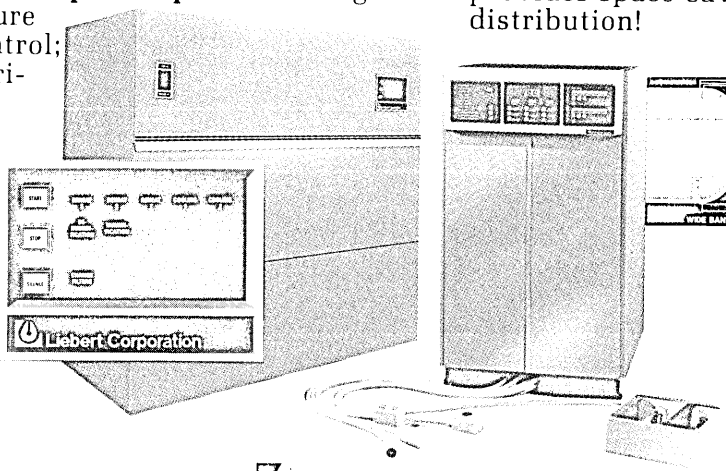

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READERS' FORUM

By comparison, what does this mean: input the information, process it, print results?

Which is easier to check? The former is written in BASIC; the latter in a less mystifying language.

After a program has been written on paper it is entered into a computer via some suitable device like a typewriter. Then, before the program is obeyed, a sophisticated program called a compiler translates it from whatever language it is written in into the instructions that the computer can obey. As the translation takes place, the compiler checks the program for errors. It would be highly desirable if the compiler, when translating our program could (politely) inform us of the bugs—not just the grammatical errors. Language design is moving firmly in this direction.

In a program, if the language requires us to name all the items we need at the start, then the compiler can check that we haven't inadvertantly misspelled a name later on. Unfortunately FORTRAN and BASIC don't carry out this sort of checking. They allow us to introduce ingredients as we go along. If such checking was carried out, the Venus probe might not have been lost, since the particular error mentioned above would have been easily detected.

Another way in which a compiler can be provided with adequate information to enable it to check a program is if we distinguish carefully between different types of data. For example, a bus number, my annual salary, and the distance from Sheffield to London are all numbers. But we are not likely to want to add a bus number to a salary or compare a distance with the value of pi. However FORTRAN and BASIC both allow this to go on freely.

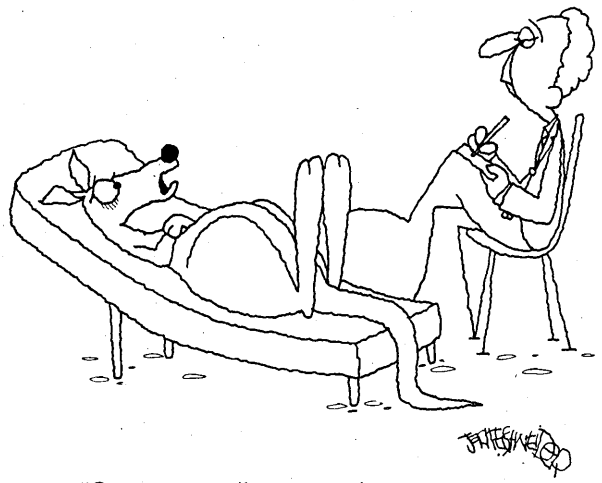
Such faults could be exposed automatically by the compiler if the language did not allow us to freely "mix" data of different "types," but instead forced us to spell out exactly what we want to do.

This feature of insisting that different kinds of data are kept separate is known as "strong typing." It isn't always desirable, but if you want reliability, it is.

Writing programs is a delight; it is creative and interesting. By using real examples, I have tried to convey my fears of disasters that may in the future be caused by computer system failures. I do not allege that BASIC and FORTRAN has been or will be the villain. But there are weaknesses in these languages.

I don't believe that the ultimate language is available. Nor do I claim that, by itself, good language design can lead to reliable programs. But I do assert that there are "better" languages than BASIC and FORTRAN. I recognize that there are many other factors that affect the reliability of a computer system. But we should seize on every technique we can to improve reliability, and that includes good programming languages.

—Douglas Bell
Sheffield, England



"One moment I'm up . . . the next moment I'm down . . ."

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Client Request
With scanty justification
We develop his creation
In a system conflagration.
Then we charge out
To the fore.

Initiation
Not so detailed explanation
Of the client's operation
Pre-lim specifications.
Really
Quite a bore.

Analysis
Detailed procrastination
Giving functional specifications
With a suspect organization
Now this
Is just a chore.

Systems Design
Nitty gritty explanation
Midst a witty presentation
Yield system specifications
A task we
All abhor.

Construction
An enforced perambulation
Through the COBOL incantation
Leads to absolute frustration
Still we don't know
What's in store.

Implementation
There are no congratulations
Only stiff interpretations
Of original specifications
Which we probably
Ignore.

Defacto Analysis
Post mortem accusations
Melt with system aberrations
And the ultimate prostration
As they lead us
To the door.

Epilogue
Would that,
In a burst of revelation,
We'd realize that automation
Is a damned abomination
And all should be
As before.
But instead,
each application
Tends to lengthen the duration
Of the systems occupation
And we press on
Ever more.

—Anthony Martins
New York, New York

Answers to puzzle on page 214

G	A	R	P		A	R	M	S		V	A	P	O	R
A	R	E	A		S	C	U	M		L	A	U	R	A
P	U	L	L	H	I	M	S	E	L	F	U	P	B	Y
S	T	Y	L	O		P	I	L	E			S	S	S
			S	E	A		C	L	U	E	D			
N	A	E		D	D	T			C	L	O	C	K	S
E	S	T	A		D	O	G	E		B	O	H	E	A
W	H	A	T	I	S	O	N	T	H	E	M	E	N	U
T	E	P	I	D		L	U	R	E		S	E	N	T
S	N	E	L	L	S			E	A	R		R	Y	E
			T	E	T	O	N		P	O	D			
S	B	A			A	R	I	L		S	U	I	T	S
H	I	S	O	W	N	B	O	O	T	S	T	R	A	P
A	L	I	C	E		I	B	I	D		C	A	K	E
M	E	A	T	S		T	E	S	S		H	E	E	D

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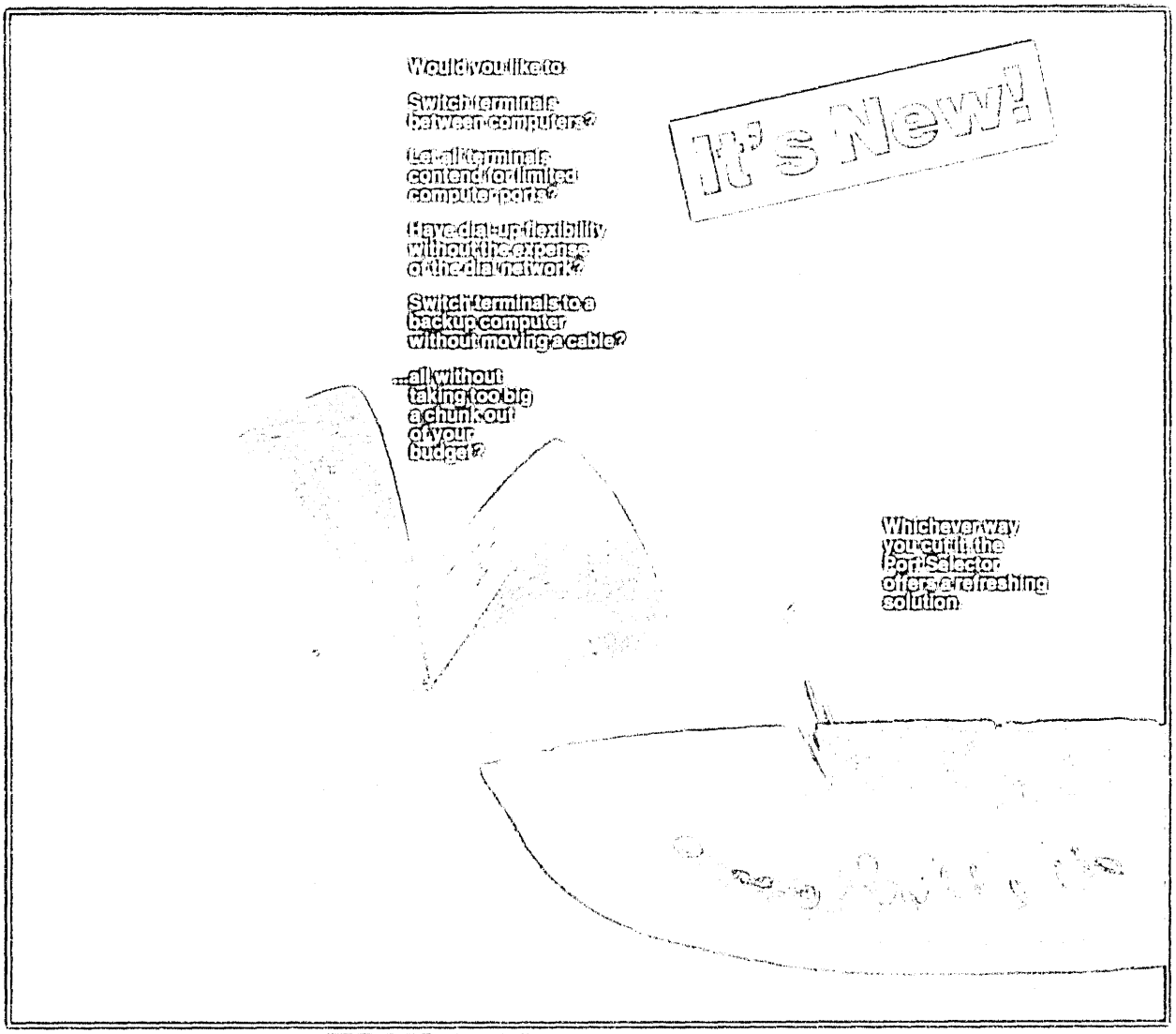

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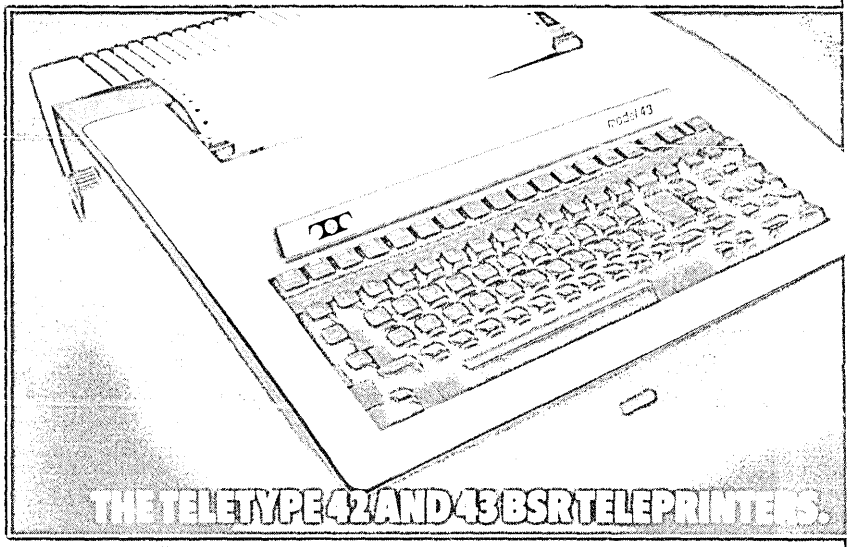

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