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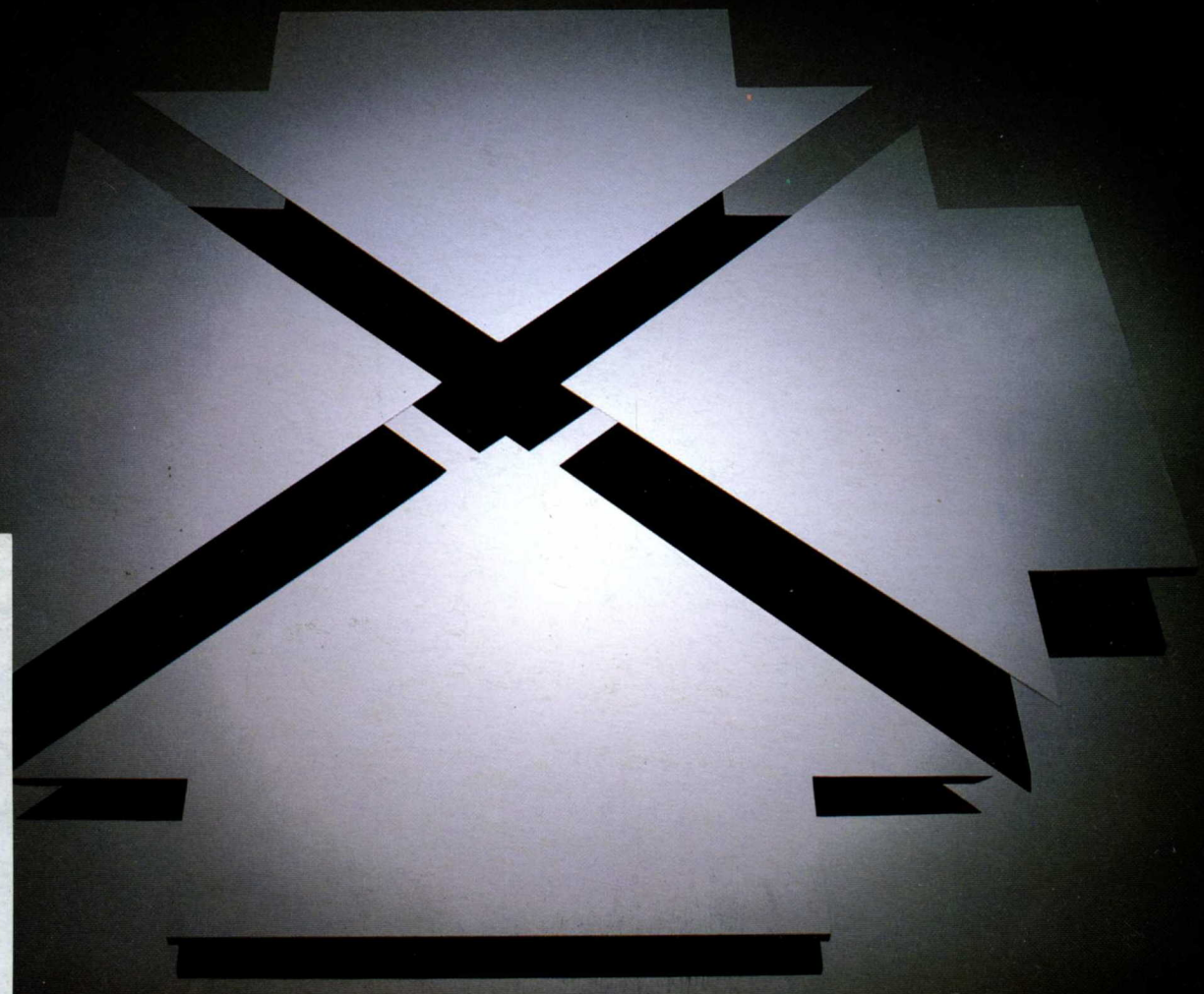

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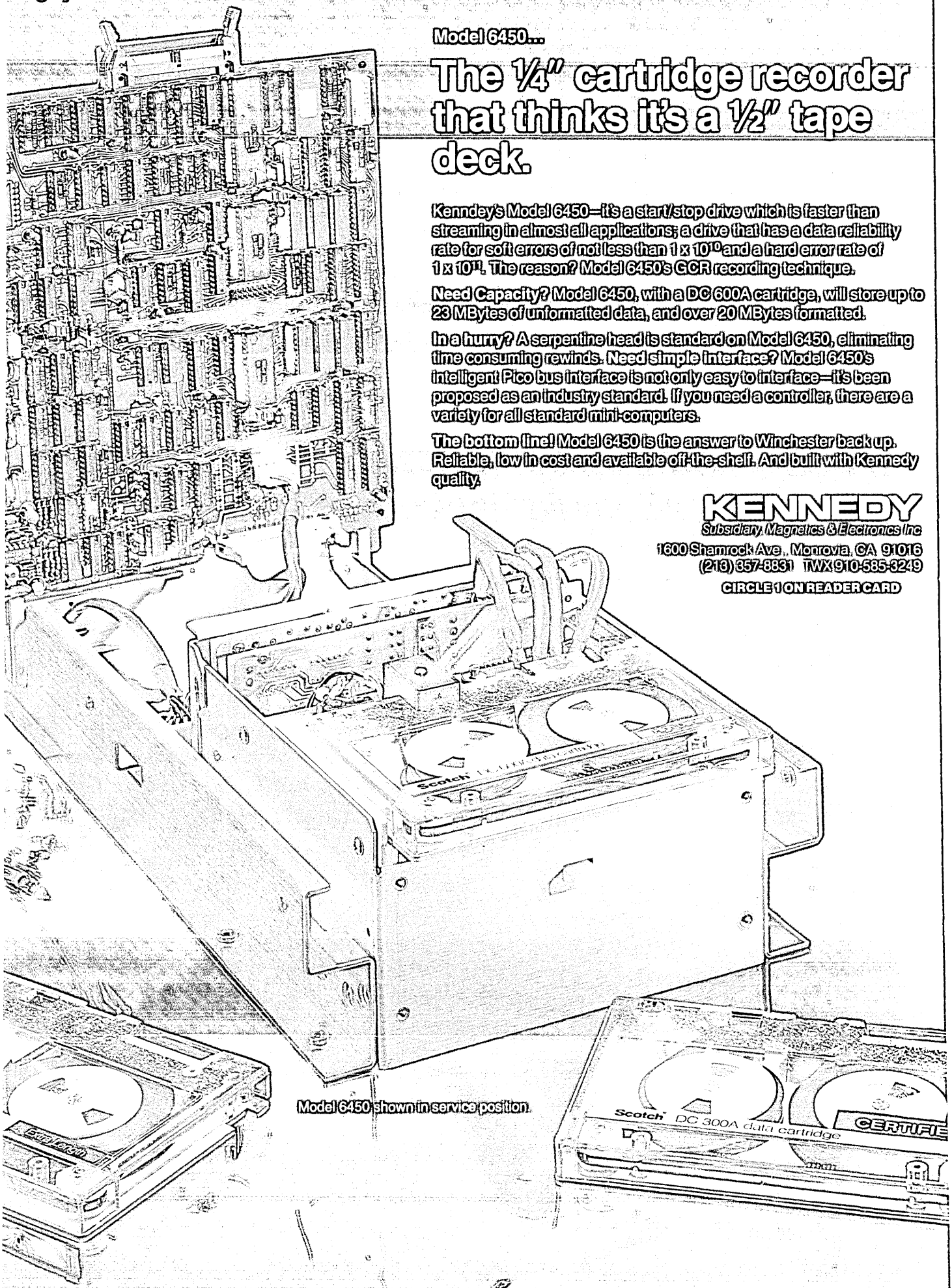

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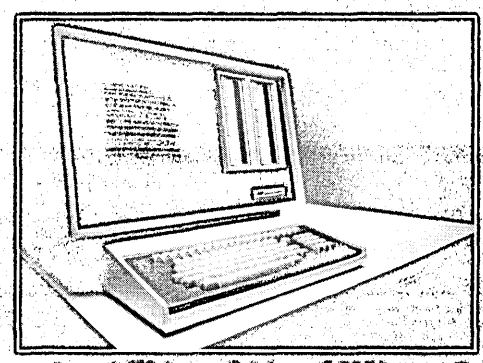

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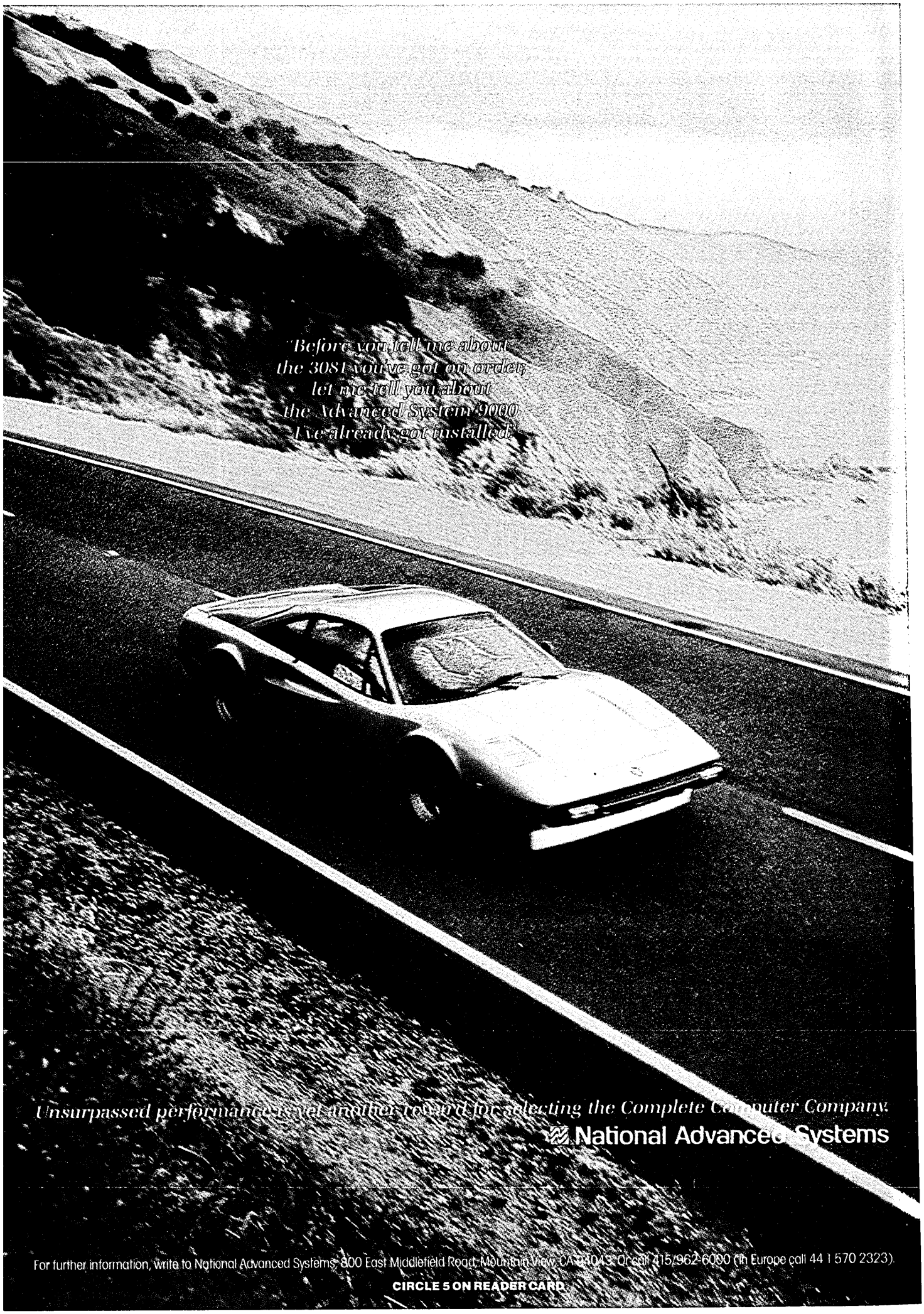

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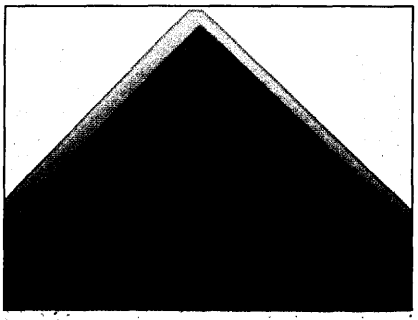

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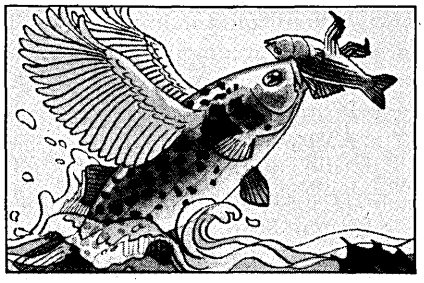

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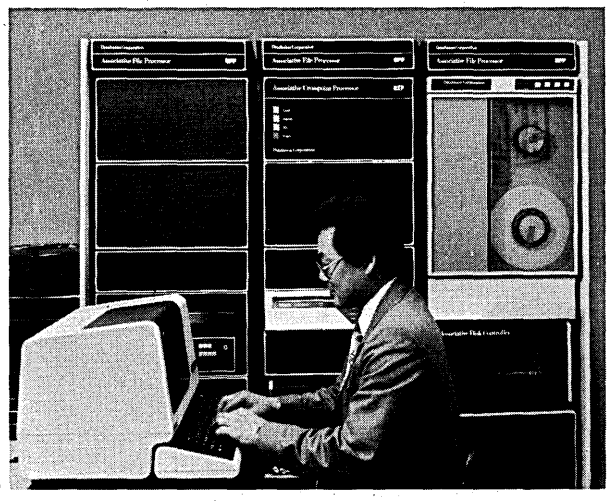
COVER PHOTOGRAPH BY ROBERTO BROSAN

The Associative File Processor. AFP.



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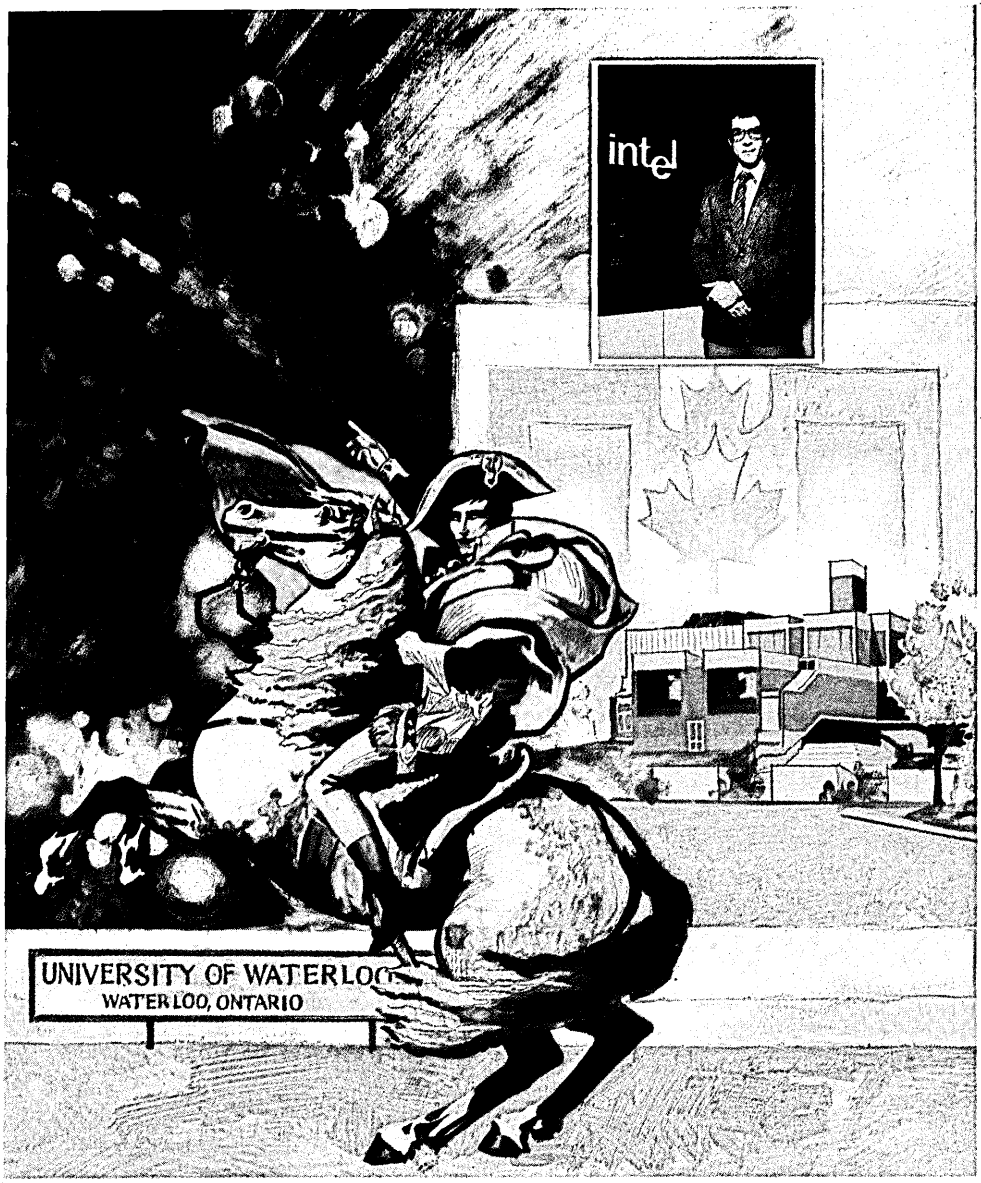

At Waterloo, Intel's FAST-3805 won.

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"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."

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"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."

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LOOKING BACK

VOORHOEVE'S REBUTTAL

March 1961: The January 1961 issue of DATAMATION included an article by Daniel D. McCracken, "The Human Side of Computing," to which reader H.C. Voorhoeve responded in the March '61 "Letters to the Editor." The reference Voorhoeve objected to was McCracken's statement that professional status for dp people would be impossible to obtain "as long as anyone with ten dollars can join the ACM and proclaim himself a professional computer expert." Voorhoeve signed his letter of complaint, "Proud Member of the ACM," and defended his position by saying his membership represented a form of dp education, not instant professionalism. Nearly 18 years later, McCracken was elected president of the ACM; he completed his two-year term in 1980. And now, it costs you $40 per year to proclaim your professionalism.

FILLING THE GAPS WITH S/3

March 1971: Early 1971 brought rumors centered around IBM and its impending introduction of a 64K version of the S/3, followed by another version with even more memory. The predictions said the 125 would be scrapped, and the new S/3 versions "would bridge the gap all the way to the 370/135." IBM could then push users to the 370/135 line from 360/25s and 30s, thereby collecting more revenue. This push, along with some other changes, gave IBM the appearance of breaking its products into two "more manageable" families. But then, as DATAMATION noted, "How and when can you grow from an S/3 to a 370? Or do you just slap on communications gear and become part of a 'computer utility'?"

"1971—The Year EDP Goes Multinational," by Dr. Mirek J. Stevenson, president and founder of Quantum Science Corp., discussed the reasons for going multinational and why 1971 was a turning point for U.S. computer companies planning on entering foreign markets.

"The computer industry will be forced into the worldwide multinational direction partly because use of computers is all-pervasive," wrote Stevenson. To gain and maintain a fair share of the hardware and services market, companies would inevitably have to go multinational. Global operations and manufacturing—not just increased exportation—would soon be necessary. Stevenson claimed the '70s would be characterized by the multinational competition of large and middle-sized computer companies. He said, "By 1975 the non-U.S. free-world market will have increased in size to 90% of the U.S. market and will still have a faster growth rate than the U.S. market."

Also, the Honeywell-GE merger had a great effect upon world computer markets. Together, these two companies created a European marketing strength second only to IBM, forcing other large companies to take a more competitive stand in foreign markets in order to survive.

Stevenson also noted that European and Japanese firms were becoming more important in world markets, and predicted that major European and Japanese companies would soon be moving at full force onto American turf via acquisitions, mergers, and consolidations. Conversely, once U.S. companies recovered from the necessary learning curve, they would settle more in foreign countries to manufacture the same goods at lower costs.

Stevenson ended his article with an insightful paragraph on the new decade: "It was not long ago that 'Made in Japan' was a slur. Soon it may be closer to a compliment. Consumer companies have found that if you can't beat them, you may as well join them. Even U.S. automakers are doing so. The computer industry is facing its worldwide challenge today and aggressive multinational posture is the road ahead."

—Deborah Sojka

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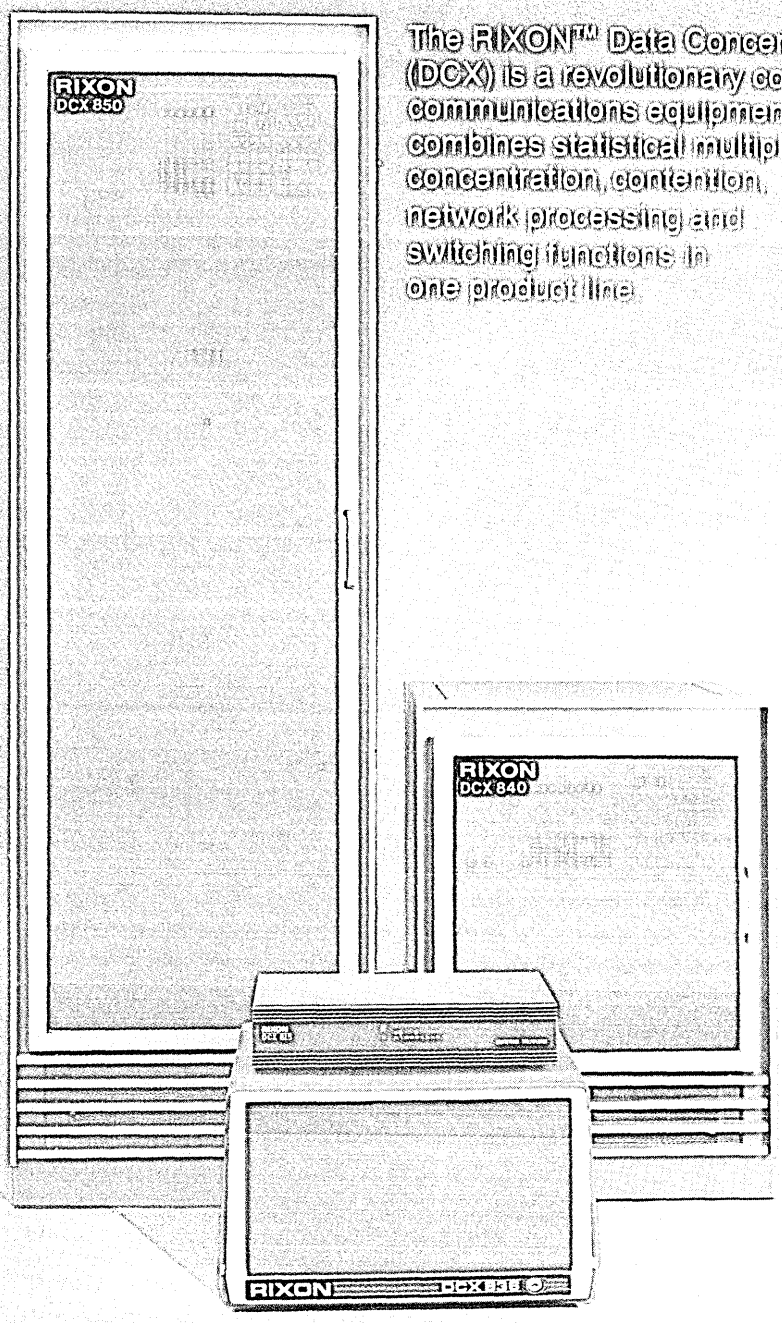

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Channel Loopback	✓	✓	✓	✓
Unbalanced Channel Speeds	✓	✓	✓	✓
EIA Controls (4 FDX/Channel)	✓	✓	✓	✓
Automatic Baud Rate Detection	✓	✓	✓	✓
Down Line Loading	✓	✓	✓	✓
Flow Control	✓	✓	✓	✓
Fly-Back Buffering	✓	✓	✓	✓
Channel Reconfiguration	✓	✓	✓	✓
Line Utilization Indicator	✓	✓	✓	✓
Buffer Overflow Control	✓	✓	✓	✓
Data Lost Message	✓	✓	✓	✓
Link Down Message	✓	✓	✓	✓
Link Up Message	✓	✓	✓	✓
Channel Test — Non-Interferring Validation	✓	✓	✓	✓
Buffer Size (BYTES)	5.5 K	16 K	64 K	64 K
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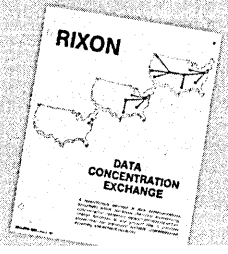

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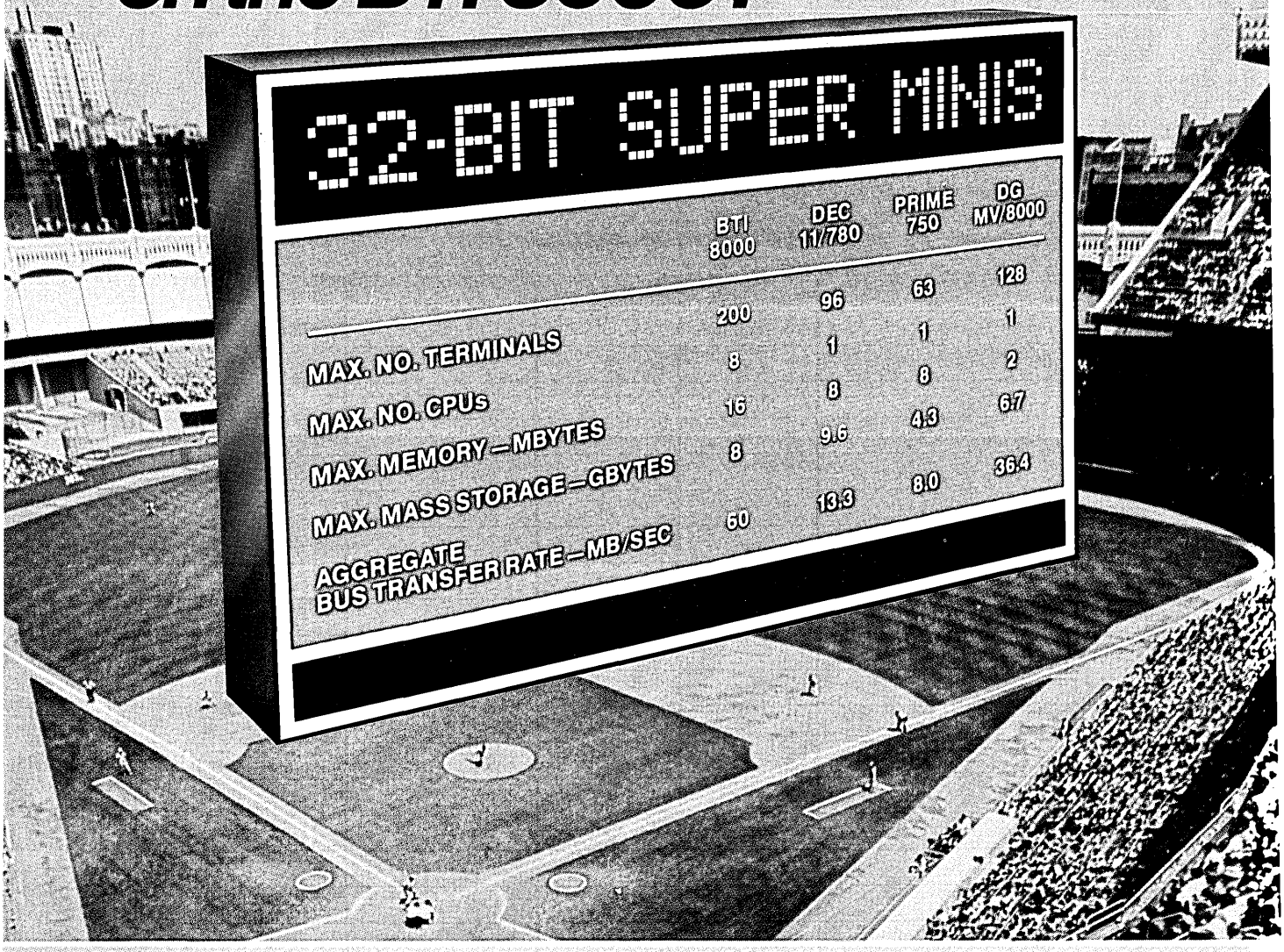
What's the score on the BTI 8000?



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

BTI is a registered trademark of BTI Computer Systems

CIRCLE 23 ON READER CARD

LOOK AHEAD

KEEP AN EYE ON THE PBX SCENE

Watch for stocks in North America's PBX builders to go through the roof. Suddenly these three little letters are all you hear. It seems that both Amdahl and Olivetti are currently scouring North America to buy a PBX company. (Olivetti is part of cash-flushed French industrialist Saint-Gobain's attempts to diversify into the area.) In addition, the Swedish telecommunications giant, L. M. Ericsson, and its recently acquired subsidiary, Datasaab, have joined forces with the U.S. Atlantic Richfield oil giant to mount a PBX/office automation thrust in America.

Also, IBM is shortly expected to capitalize on its 3750 PBX development in Europe by offering a modern American version as a gateway into U.S. offices and into its "Enterprise" systems and a "resculpted" SNA. The mighty mainframer has already applied to the FCC for authorization to connect its 1750 PBX switching system, previously offered only in Europe, to the U.S. telephone network.

And even a big bank is getting into the act: Citibank is expected to announce an advanced PBX through an internal development operation that we hear will be spun off at year-end.

THE MARCH IS ON AT CITIBANK

Citibank's march into computer services (see related story p. 46) has led it into a major development effort with the same federal body that is currently investigating the legalities of other moves outside its traditional turf of banking. The talk is of a major federal funds transfer network being put together by a 200-man Citibank team down on Wall Street. The transaction network, believed to be based on Tandem hardware, would link the Federal Reserve and the big banks in a major funds transfer network, insiders claim. It is not known at this time whether the network will be on a national scale, or indeed whether it will be greeted by objections that Citibank is adding common carrier status to its other ambitions.

NEW LEASING COMPANY SURFACES

A new company has been formed in San Jose that touts its niche as "the first high technology-based financial support services company specializing in leasing programs for relatively new manufacturers in advanced markets." Western Technology Investment, Inc., headed by former Magnuson executive Ronald Swenson, hopes to have an edge over the traditional non-technology-based leasing companies by boasting an industry-trained

LOOK AHEAD

staff and an industry-respected board of directors. Initial investors are said to include the likes of Dr. Gene Amdahl, founder of Amdahl Corp; his son Carl Amdahl, a founder of Magnuson; and Ray Williams, a founder of both Amdahl and Magnuson.

WTI plans to support "selected" manufacturers with complete lease programs, as well as advise them on the financial aspects of marketing. Its emphasis will be on newer manufacturers in state-of-the-art markets such as robotics, office automation, and computers used for energy and health care applications.

MORE ON X.25

Sources tell us that Ma Bell may have already submitted its version of the X.25 networking standard to the International Standards Organization (ISO) for ratification. And if IBM is indeed preparing to offer the X.25 interface in its new Mirage/Mistral front-end processor development (support is already offered for Series/1), as sources say, it shouldn't be too long before a market for X.25 begins to materialize in the United States.

ONE FIRM'S PLANS FOR HIGH FLYING

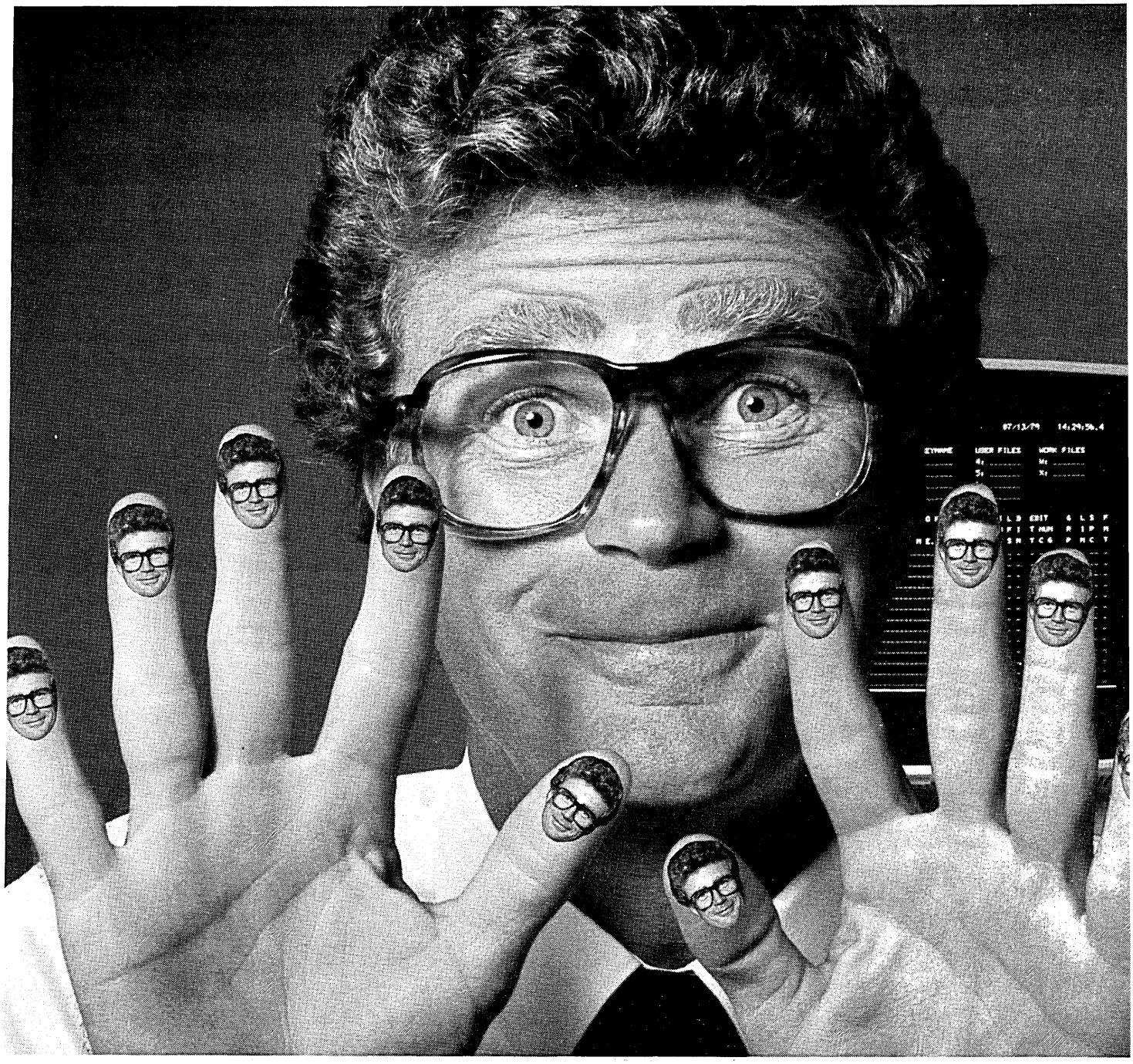
PolyMorphic Systems, Santa Barbara, Calif., one of the early-on suppliers of microprocessor-based systems, has been on something of a roller coaster ride in terms of profitability lately. But it may now have the opportunity to take a motorcycle ride out of its troubles. New president Walter J. Kosinski is attempting to merge the firm with another of which he is president -- AMS (American Minisystems of California's Orange County). AMS offers a turnkey system for motorcycle dealers. The merger is viewed by Kosinski as the initial effort in positioning PolyMorphic in a variety of highly specialized vertical markets.

And if motorcycles don't do the trick, maybe airplanes will. AMS is part of ITX, a mini-conglomerate which, among other things, is into timesharing of airplanes (much like the condo timesharing plans). "We already have two airplanes available to us," said Kosinski, himself a one-time private pilot who is now brushing up on his flying skills.

NEW STRATEGY FOR JAPANESE BANKS?

Japanese banks, which have long had the automation know-how along with experience in electronic corporate cash management, may be on the verge of doing something with it. Observers see it coming in the mid-1980s due to changes in the

(continued on page 45)



It's like multiplying your CICS programming staff by ten.

TRANS IV lets you increase programming productivity ten times or more – without adding CICS programmers.

This solution-oriented application development system performs CICS/VS functions automatically.

With it, programmers can write on-line application programs interactively, without referring to CICS macros or internals.

Features For Productivity. With TRANS IV, you can define files and display formats in real time – also procedures unique to your applications (like edit and range checks).

TRANS IV gives you on-line error correction and test/debug capabilities – without cards, batch processing, or programming.

TRANS IV operates under all releases of CICS/VS.

With our Informatics classes and learning aids, programmers are fully productive with TRANS IV within a week.

The Problem Solver. If you've got a scarcity of CICS expertise and a growing demand for on-line applications, find out the details of TRANS IV.

It's an impressive system that can help you go a long way toward maximizing your CICS investment. In a very short time.

TRANS IV is one more way Implementation Systems from Informatics help you manage human energy problems.

Call or fill out the coupon for more information. Or attach your business card to the coupon.

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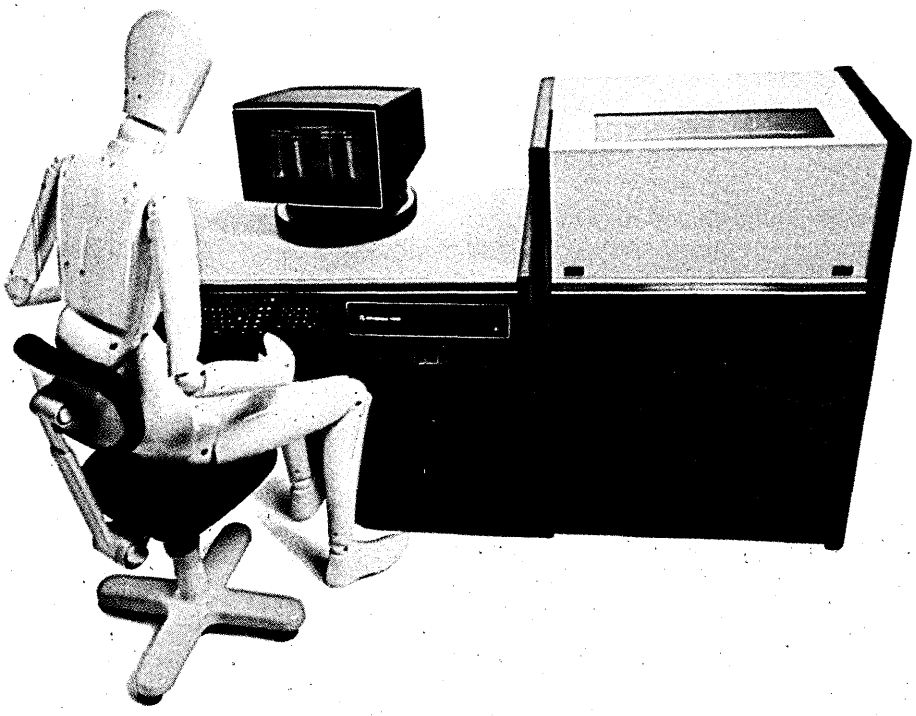
CIRCLE 24 ON READER CARD



A solution to a human problem in information management.

The Bell System knows that information management works best when it's people oriented. After all, that's been the basis of our business for years.

So our Dataspeed® 4540 data communications terminal is human engineered.

It has a display unit with a tilting screen to eliminate glare and eye fatigue. Plus simplified controls on the console. And you get a choice of keyboards with numeric cluster arrangement.

Of course, the terminal is every inch an information management problem-solver. It transmits at speeds from 2400 to 9600 bps efficiently, has built-in diagnostics, greater hardware flexibility and 3270 compatibility.

Its microprocessor-based controller interconnects with up to 32 devices. Eight of them can be printers which can be located up to 2000 feet away from the controller. Keyboard displays can be up to a mile away.

The Dataspeed 4540 data communications terminal. You can expect it to add efficiency and economy to business applications involving inquiry response, data entry and retrieval.

With our knowledge, our advanced communications technology, our thousands of experienced information management specialists, we can help your business. A call to your Bell Account Executive will put our knowledge to work for you.

The knowledge business

CALENDAR

MARCH

Fourteenth Annual Simulation Symposium, March 18-20, Tampa, Florida.

Part of Simulation Week, March 16-20, the symposium is sponsored by the IEEE, ACM, SCS, and IMAC. Contact Alexander Kran, IBM, B/300-40E, East Fishkill Facility, Hopewell Junction, NY 12533, (914) 897-2121 X 7142.

Office Automation Conference, March 23-25, Houston.

The major conference for users and designers of electronic office equipment, the OAC is produced yearly by AFIPS. Contact AFIPS, 1815 North Lynn St., Arlington, VA 22209, (703) 558-3617.

Printemps Informatique, March 24-27, Paris.

An international edp exhibit for computer oems. Contact Kallman Associates, 30 Journal Sq., Jersey City, NJ, 07306, (201) 653-3304.

Interface '81, March 30-April 2, Las Vegas.

This is the largest U.S. computer show and exposition. It is devoted to data communications, distributed data processing, and networking. Contact The Interface Group, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Exposium '81, March 31-April 3, Milwaukee, Wisconsin.

State-of-the-art word processing and information processing systems, from the beginner level through the advanced, will be featured at this four-day conference and exhibition presented by the Word Processing Society, Inc. Contact Word Processing Society, Inc., P.O. Box 92553, Milwaukee, WI 53202, (414) 226-5215.

APRIL

DPMA Quality Assurance Conference, April 1-3, Chicago.

The objective of this conference, sponsored by the DPMA Education Foundation, is to explain methods tools, and techniques for improving computerized applications. Contact DPMA, 12611 Davan Dr., Silver Spring, MD 20904, (301) 622-0066.

Hanover Fair, April 1-8, Germany.

One of the world's largest technology exhibitions, it combines dp and office products as well as a variety of noncomputer-related pavilions. Contact Deutsche Messe- und Ausstellungs-AG, Messegelande, D-3000, Hanover 82, Germany.

6th West Coast Computer Faire April 3-5, San Francisco.

Since 1977, this annual small business and personal computing conference and exposition—with a strong focus on micros—has been held regularly. Contact Computer Faire, 333 Swett Rd., Woodside, CA 94062, (415) 851-7075.

1981 AECT National Convention, April 6-10, Philadelphia.

The Association for Educational Communications and Technology produces this show, the largest gathering of instructional media/AV professionals in the U.S. Contact AECT, 1126 16th St., N.W., Washington, DC 20036, (202) 833-4179.

Computers In Manufacturing, April 6-8, New York City.

Computers and dp as tools in manufacturing. Contact NIMR Seminars, P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

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

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

MAY

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

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

Thirteenth ACM Symposium on Theory of Computing, May 11-13, Milwaukee, Wisconsin.

STOC is sponsored by the ACM's Special Interest Group for Automata and Computability Theory. Contact George Davida, School of Information & Computer Science, Georgia Institute of Technology, Atlanta, GA 30332, (404) 894-3152.

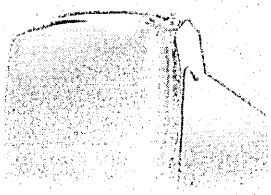
CompuFest '81, May 11-13, Louisville, Kentucky.

The exhibition will feature vendors of computer hardware, software, service bureau services, and other related computer products. Contact Kathy Schoen, Kentucky Society of CPAs, 310 W. Liberty St., Louisville, KY 40202, (502) 589-9239.

A video bandwidth of 30 MHz and a 1200-line resolution make this new CRT monitor the brightest and sharpest you can get.

C. Itoh's new model 1201HB in our QDM series is capable of receiving separate horizontal drive pulse, vertical drive pulse and video input at the TTL level. This separate signal mode eliminates composite sync and video signal processing. The CRT is equipped with its own power supply unit. P4 phosphor is standard, but optional P31 or P39 phosphors can be provided. Available options: Dynamic Focus, Skip Scan, anti-glare etched face and a 15.5 KHz horizontal frequency.

The high performance and low price offered with this new CRT monitor give you all you need to really enhance your system's capabilities. For complete information contact your nearest C. Itoh representative or C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066. Tel. (213) 390-7778; Telex (WUI) 65-2451, or 6565 Third Avenue, New York, NY 10017. Tel. (212) 682-0420; Telex (WUI) 12-5059.

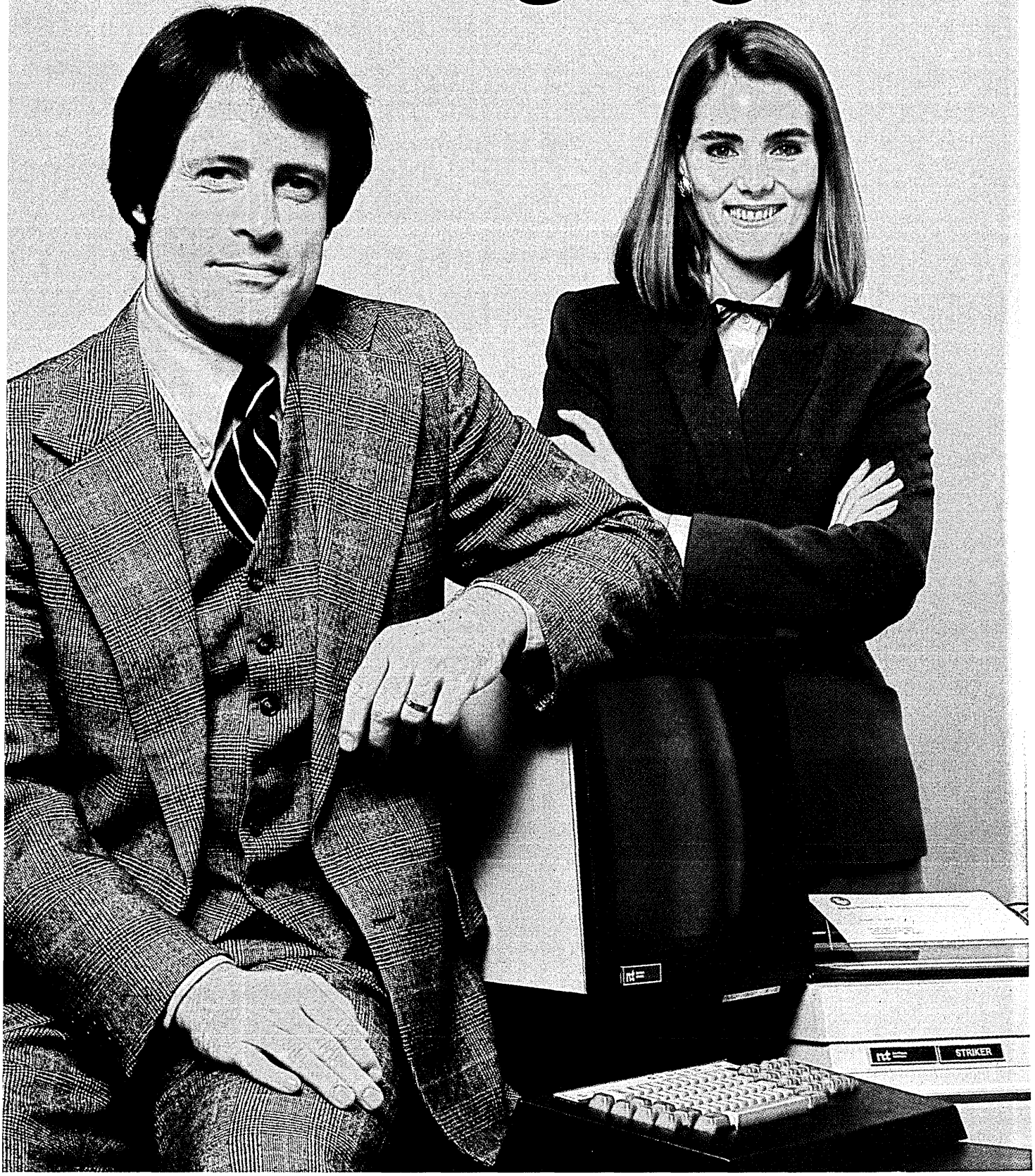


C. ITOH ELECTRONICS, INC.

Introducing the 12" CRT monitor for the systems designer with bright ideas.

CIRCLE 250 ON READER CARD

"It speaks our language."



Introducing Omniword.™

The DDP word processor that speaks plain English.

Early DDP word processors were designed for DP professionals. But here's one that's made for secretaries—and their bosses. Where others use a lot of code, Omniword uses plain English.

Jobs that take complicated keystrokes on other machines, Omniword handles with a single "function" key.

And Omniword makes it easy to merge information from several sources into a single document.

In short, we've designed Omniword so that the average secretary, (and, in a pinch, the average boss), can generate letters and edit documents with less than a day's instruction.

Simpler than most DDP word processors. More versatile than stand-alone word processors.

Omniword's Striker™ printer makes personal-looking letters fast.

But it also has a wide range of type styles which you can use for manuals, contracts, proposals—all kinds of short-run printing jobs.

Omniword has plenty of storage room for long name-and-address files too.

And at the flick of a switch, Omniword becomes a DDP terminal.

We make service simple too.

With an entire network of sales and support offices around the world.

Let us show you Omniword—the simple DDP word processor. Call your local Northern Telecom sales office or write Northern Telecom Inc., Box 1222, Minneapolis, Minnesota 55440.

northern telecom

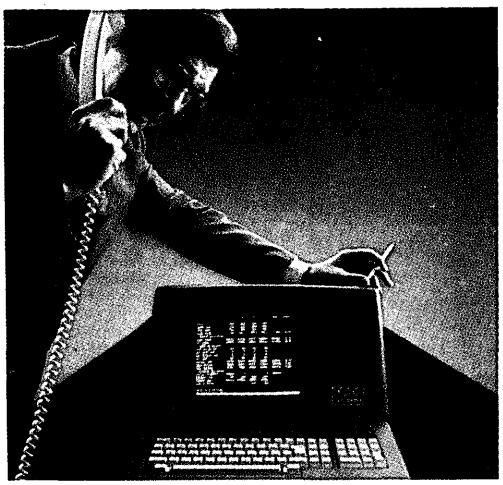
Today's leader in tomorrow's technologies.

CIRCLE 26 ON READER CARD

YESTERDAY'S AUTOMATED OFFICE.

Word Processing, which many people used to equate with office automation, actually accounts for only 10 to 15% of the costs in an office. It's very helpful to clerical people. But it's only a small part of the potential of office automation.

TODAY'S AUTOMATED OFFICE.



The Prime Office Automation System is the only totally integrated system available today. It's designed for use by major corporations. And unlike word processing systems, it provides tremendous support to managers, who account for about 75% of office labor costs. As a result, our Office Automation System can make a substantial improvement in productivity. Briefly, here's what it consists of:

Word Processing and Text Management. Text creation, editing, filing, list processing, and boilerplate library. Automatic spelling check and hyphenation, plus multilingual dictionaries to assist translation.

Electronic Mail. Receives messages and forwards documents to an individual down the hall or around the world.

Activity Management. Confidential personal calendar, meeting scheduler, tickler file, telephone log, and personal diary.

Personal Computing. Financial modeling, data base inquiry and reports, programming, and other user-defined applications.

Information Access. Direct access to central corporate data files, external data services and international networks.

Data Processing. Business D.P., engineering and scientific D.P., and program development.

Productivity. If you want to make your clerical staff more efficient, a word processor can help. But if you're serious about improving office productivity, you can automate your entire office with a totally integrated system from Prime. Today. Write to us at Prime Park, MS 15-60, Natick, Massachusetts 01760.

PRIME Computer

CIRCLE 27 ON READER CARD

LETTERS

COPING WITH KOPS

Re: "Tracking the Elusive KOPS" (Nov., p.99), our organization recently upgraded from a Burroughs B6807 to a B6811, so I was particularly interested in the KOPS ratings for those mainframes. While examining the figures, I came up with some questions and would be interested in Dr. Lias's comments on them:

1. In the "Composite Hardware List" on p. 100, the Burroughs B6807 is listed twice (#74 and #101). Why are there two ratings for one mainframe?

2. I assumed that our B6807 was equivalent to #101 with a KOPS rating of 544. Since the B6811 (#129) has a KOPS rating of 765, our processor speed benchmarks performed after our upgrade should have shown an increase of approximately 40% (765/544 = 140.6%). Instead our figures showed only a 25% to 26% processor speed increase, which seems to be the average for other B6807-B6811 upgrades we are familiar with. What could be the reason for this difference?

CHARLES A. BERG
DP Manager
ESV Region V Computer Services Coop.
North Mankato, Minnesota

Dr. Lias replies: Charles Berg spotted one of two errors which were carried in the original KOPS list. On p. 100 two lines should be changed to read:

74 Burroughs 6807 (before July 1977) 340 KOPS

101 Burroughs 6807 (after July 1977) 544 KOPS

Another omission should be corrected on p. 100:

215 Honeywell DPS 8/70 (2X) 3,576 KOPS

Charles Berg's question regarding his machine's performance illustrates the weakness in the KOPS standard. Several inconsistencies can be the source of the differences in measurement.

1) The benchmarking process by which the "real" increase of 25% to 26% was calculated probably used actual production-like programs which contain lists of instructions quite different from those presented in IBM job mix number 5.

2) Actual execution timings always include the time delays associated with disk I/O, paging I/O, mux channel bandwith, and other operating system efficiencies or inefficiencies. KOPS measurements ignore all of these factors.

3) A call to Burroughs revealed that the new machine allows a greater "connectivity" within the system, meaning that processing events in any part of the system are more intelligently coordinated with events in other areas of the system than was allowed in the earlier machine.

This tradeoff is quite normal. As we purchase machines which are larger and faster, we also demand more sophisticated handling of security, paging, file handling routines, terminal handling routines and system accounting. KOPS, being a theoretical measurement, does not account for any of these things and therefore, as the article suggested, they are not appropriate for systems of the '80s. Unfortunately there are no other standards. KOPS and MIPS are all we have as of February 1981.

We are concerned about the misrepresentation of the product line marketed by National Advanced Systems.

None of the products listed under our name are marketed today as listed and several have not been marketed under these or any other designation for several years, either by National Advanced Systems or the former marketer, Itel Corp.

In January 1980 National Advanced Systems introduced its line of products and added to the product family through September of 1980.

We apparently were not one of the companies you contacted to source your article. Other reference sources used for cross-checking quite possibly did not have the current information on National Advanced Systems either.

You can understand that, as presented, the product profile on National Advanced Systems is misleading to readers positioning PCMs in their own minds with purchase intentions.

MICHAEL L. AYERS
Public Relations Manager
National Semiconductor
Santa Clara, California

The article was inaccurate with regard to Control Data systems performance.

Like many vendors, Control Data discourages its sales representatives from using kilo- or mega-operations per second ratings. Such ratings are heavily dependent upon cpu architecture and can only be useful in comparing computers with like instruction sets—such as IBM vs. plug-compatibles.

Since, however, many will read and use the DATAMATION KOPS ratings, we would like to go on record in two ways:

1) We do not endorse the ratings shown for our machines;

2) The ratings cited do not conform with results from benchmarks comparing our computers with each other and with other vendor models. In particular, the KOPS ratings for the CDC 76, 7600, and 176 should and, experience has shown, are nearly identical.

I would urge your staff to use price/throughput rather than KOPS in future evaluations. In automotive parlance, it isn't the RPM, it's the MPG that count.

W. M. SHAFFER
Control Data Corp.
Minneapolis, Minnesota

PACNET SPEAKS UP

Re: "Data Communication Carriers" (Aug., p. 107), Pacnet was not included.

Pacific Network Communications Corp. is an FCC-approved resale common carrier offering data transmission services in speeds ranging from 50 baud to 4800 bps. We presently serve 28 cities including Honolulu, Hawaii.

The Pacnet FCC Tariff No. 1 became effective in December 1979. We serve approximately 60 customers consisting of

about 400 circuit terminations. Revenues for 1980 were approximately $1.8 million.

Our company revenue is derived 100% from data transmission services, and our fiscal year ends Dec. 31.

GIL WILLIAMS
General Sales Manager
Pacnet Corp.
Dallas, Texas

JARGON GRIPE

Re: "Japan Rediscovers DBMS" (Dec., p. 155), you use the buzz letters DBMS 15 times on the first page of this article, including the title and label of an illustration, and not once do you write out the words these letters stand for—let alone explain the idea.

I think good technical writing should include at least a short lead-in to explain what the article is about, including the full wording of any important contraction or acronym.

The reading public includes more than jargon-oriented engineers, and even engineers frequently must cross disciplines. It is irritating to constantly run into a wall of special jargon without any explanation.

GERALD WAXLER
Engineer
Spinnerstown, Pennsylvania

WANTED TO BUY

Re: "Evaluating Off-the-Shelf Packages" (Dec., p. 122), I am presently installing IBM's IPICS Programs on a System 34. I was interested in the fact that there are at least 23 other companies that have installed or are installing programs on a System 3 or a System 34.

I am writing because the IPICS package lacks two important feeder-type programs, Production Planning and Master Production Scheduling, which feed and interface with the Material Requirements Planning Package.

We need these two packages and I do not want to reinvent the wheel. If any of these 23 companies has written these two programs, I would like to talk to them for the possible purchase of same.

KENNETH E. ZOELLER
Zoeller Co.
3280 Old Millers Lane
Louisville, KY 40216
(502) 772-2584

OUT OF THE MONEY

Re: People (Sept., p. 224), in the interview with Ivan Socher, the claim that Socher's company Computer Advances was in 1974 second to IBM in dp revenues in South Africa is grossly inaccurate. There were (and still are) computer companies such as ICL and NCR whose revenues in 1974 were certainly much larger.

J.P. BLAKEY
Pinelands, South Africa

IGNOTUM PER IGNOTIUS

Re: Letters (Dec., p. 24), I propose that Mr. Burke and Mr. Lambropoulos should remain with their native languages (COBOL, FORTRAN, RPG, etc.) and leave the classics alone.

Please note that "erat" (one "r") is a proper Latin form. It is the third person singular imperfect indicative active of the verb "to be." That is first year Latin.

Can we state that this is just "Basic"? (Ouch!)

J. RICHARD LUTZ
Bronx, New York

MEUM ET TUUM

Re: "A Home for a Floppy Disk" (Oct., p. 88), in which it is related that Shugart has presented its first IBM-compatible floppy disk drive to the Smithsonian.

In 1963-64 Jack Potter and I experimented with a floppy disk, but the venture was not actively pursued until 1971, when it was decided to build, at Potter, a floppy to be compatible with the IBM 23 FD 11. Pilot production was started and advertising literature, dated 1972, was printed.

Just about this time, knowledge of the IBM 3740 system became available, and Potter Instrument Co. demonstrated publicly a fully IBM-compatible floppy at the New York Coliseum in 1973. According to my notes, life testing on one of the first production units was started in May 1973.

The electrical designs were Fred Reisfeld's, the heads, which by 1974 were ferrite, were by Charlie Pear, and I did the mechanical design and managed both floppy disk projects at Potter.

IVAN O. FIELDGATE
Milford, Massachusetts

"Ever have one of those days when you don't have anything to say?"

©DATAMATION

CARTOON BY JOSEPH A. DAWES

If your company asks you to recommend a financial planning and modeling system, tear out this page.

With more than 50 financial modeling systems on the market today, having to choose one can be confusing, at best. On the surface, many of the systems look alike. Looking deeper, only one stands out.

FCS-EPS: More Than A Modeling System
As a comprehensive planning, modeling and information management software package; FCS-EPS brings the power of the computer into the hands of the financial planner. Over 100 pre-coded functions, with modules for forecasting and econometrics, sensitivity and risk analysis, color graphics; hierarchical consolidation automates currency conversion, inflation scenarios, cost allocation and cross-sectional reporting. It all adds up to a three-dimensional system which provides views of your financial future more detailed than any mere modeling tool ever could.

A System That Grows With You
FCS-EPS is a system limited only by your imagination. Beyond the pre-programmed functions is an entire financial programing language to take you as far as you want to go. You can begin to use the system after only two hours training.

But don't take our word for it. Get the facts. Send for our free publication, "Selecting and Evaluating Financial Modeling Systems," which includes a checklist of features you should look for in a state-of-the-art system. Use it to compare FCS-EPS with your company's requirements. We think the facts will speak for themselves.

Offices in New York, Detroit, Houston, Boston,
Los Angeles, San Francisco, Toronto, Montreal

EPS, Inc.
8600 W. Bryn Mawr Avenue
Chicago, IL 60631
312/693-2470

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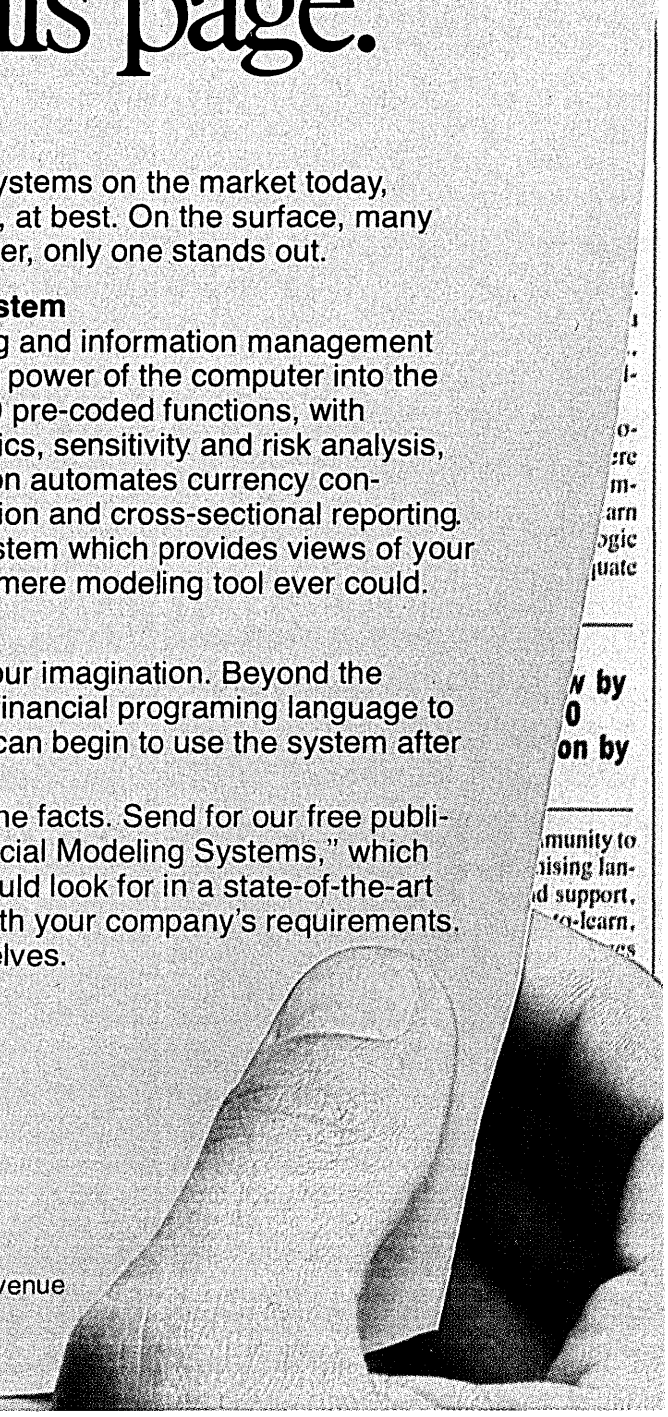
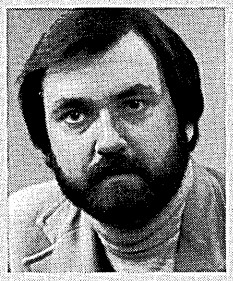


IN JUST A FEW SI
SPERRY UNIVAC'
HAS DECISION M

Overwhelming acceptance and praise from people who are not computer experts for an interactive system that's easy to use and easy to program for a wide range of computer applications. Just listen.

Precision Tube Company, Inc.
Mr. John Thompson, Vice President

"Compared to a computer of equivalent capacity five years ago, System 80 is one-fifth the size, consumes less than half of the power, is almost twice as fast and costs about 50 percent less."



Magnode Corp.
Mr. John M. Bidwell, DP Manager

"In an intensive 17 month search for hardware, the SPERRY UNIVAC SYSTEM 80 best met our three major criteria—cost effectiveness, growth compatibility and ease of use."

GENUARDI Supermarket Chain
Arden Stover, Director of Operations

"One of the major features we like about the System 80 is that it offers capabilities normally found only in large processors. And it can be used as a stand-alone system or as a part of a distributed processing network."

Skidmore College
Mr. John Butler, Comptroller

"A major factor in our decision was the high priority we gave to service. We were advised to be sure to make this a prime consideration. Every one of your customers confirmed his satisfaction with your equipment."

SPERRY UNIVAC is a division and registered trademark of Sperry Corporation.

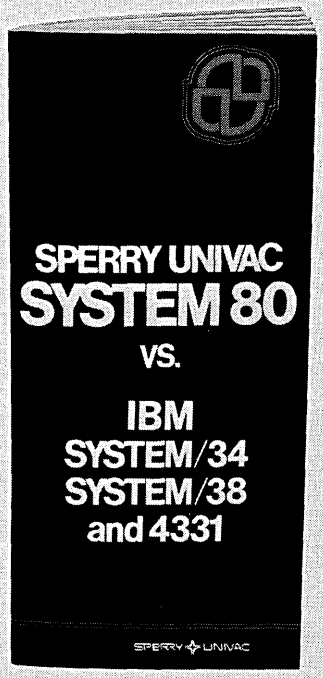
IORT MONTHS, S SYSTEM 80 IAKERS TALKING.

Innovative Systems
Mr. Roland Short,
President

"After looking at over 40 different potential systems over a seven-month period, we gained complete confidence in the System 80. It's the ideal system which enables us to provide complete hospital information systems for our customers."

Olde Worlde
Products Inc.
Kenneth Mackovic,
Chairman of the Board

"The acquisition of System 80 is an important element in our long-term strategy of continually seeking new ways to enhance the support of our thousands of representatives who sell Olde Worlde products throughout North America.



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CIRCLE 29 ON READER CARD

SCIENCE/SCOPE

Listeners of National Public Radio can now hear concerts live and in stereo, thanks to Western Union's Westar communications satellites. Before using the satellite network, NPR broadcast programs throughout the continental United States over telephone lines and land-based microwave links. The system was limited only to monaural signals, so programs that depended on good audio fidelity were duplicated on tape and distributed by mail to member stations. With the Hughes-built Westars, however, the radio network can broadcast with better sound quality and also transmit programs to some 220 stations at once.

Digital modifications to the weapon control system of the U.S. Navy F-14 Tomcat will enable the fighter to meet evolving threats through the 1990s. Enhanced tactical capabilities include electronic countermeasures, improved missile launch zones, coherent air combat maneuvering modes, and a digital display system. The key changes to the Hughes AN/AWG-9 system are the addition of a programmable signal processor and its companion radar data processor. These units can perform up to 7.2 million operations per second. The modifications will allow the F-14 to fully incorporate the improved AIM-54C Phoenix missile.

For the first time, a new battlefield data distribution system will provide an integrated capability for data communications, position location reporting, and identification for ground and air units. The secure, jam-resistant system, being developed for the U.S. Army, is called PLRS/JTIDS Hybrid. It combines and expands the proven capabilities of two high-technology systems -- PLRS, the Army/Marine Corps Position Location and Reporting System, and JTIDS, the Joint Tactical Information Distribution System. Hughes has entered the second phase of a five-phase accelerated development plan designed to meet the Army's critical need for reliable battlefield data communication by the mid-1980s.

Hughes Research Laboratories needs scientists for a whole spectrum of long-term sophisticated programs. Major areas of investigation include: microwave devices, submicron microelectronics, GaAs integrated circuits, ion propulsion, lasers and electro-optical components, fiber and integrated optics, pattern recognition, and new electronic materials. For immediate consideration, please send your resume to Professional Staffing, Dept. SE, Hughes Research Laboratories, 3011 Malibu Canyon Road, Malibu, CA 90265. Equal opportunity employer.

Three communications satellites ordered by AT&T (American Telephone and Telegraph Company) will live longer and handle more long-distance calls than earlier models. The new Telstar 3 satellites will serve 10 years instead of seven and have the capacity for 21,600 simultaneous calls instead of 18,000. These improvements are due chiefly to such technical innovations as solid-state amplifiers, better batteries, and a greater capacity for fuel to keep the satellites on station while in orbit. The new satellites will be based on the model Hughes is building for Indonesia, Telesat Canada, Western Union, and Satellite Business Systems. The first Telstar 3 is set for launch in 1983.

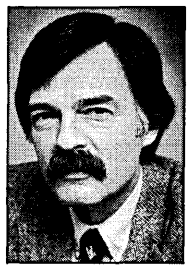
Creating a new world with electronics

HUGHES

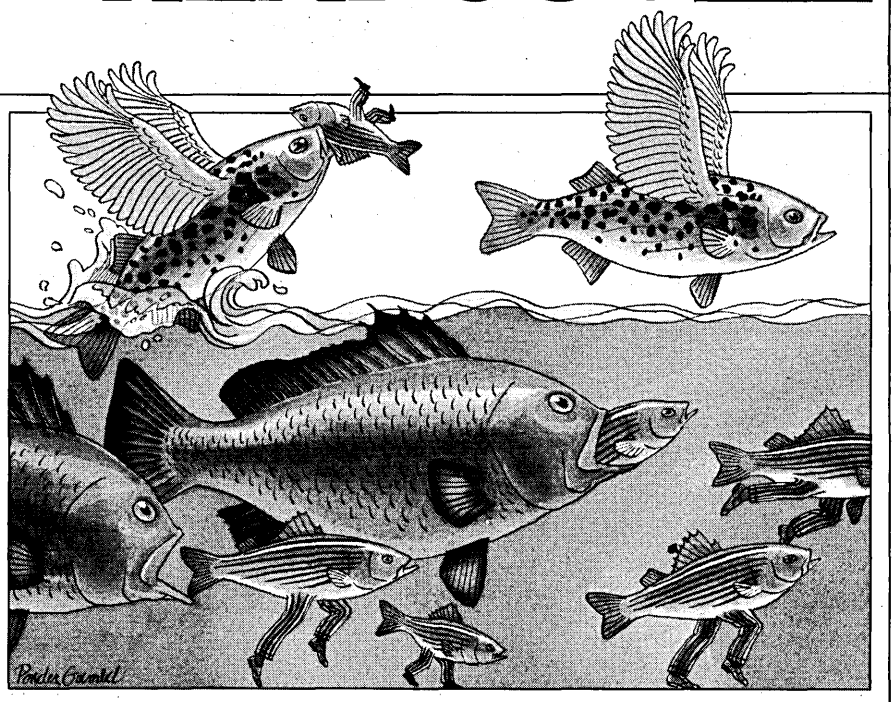
HUGHES AIRCRAFT COMPANY
CULVER CITY, CALIFORNIA 90230

John L. Kirkley, Editor

EDITOR'S READOUT



A MATTER OF SURVIVAL



We're at an interesting point in the short but lively life of the computer industry. There are signs and portents that we are on the verge of new growth, new directions, a major shift in the rhythm and development of this complex high-technology industry that is reshaping the world.

One very clear indicator is a sudden profusion of industry gurus. There's so much going on, at such a fast pace, on so many fronts, that anyone who can decipher a bit of the confusion is in great demand. The most successful oracles are those who remember the great truth in industry guruing—being wrong is pardonable; being unclear is unforgivable.

At the present time a number of future scenarios are being circulated by the pundits. We'll look at two of them. We'll call them the big fish/little fish and the flying fish theories just for the purposes of identification.

In scenario number one—the world of the big and little fishes—the small entrepreneurial companies are at the bottom of the food chain. Off to a fast start, they eventually find that the market demand for their successful product has put them in a capital squeeze. So their money man puts on his best pin-striped suit, shines up his wing tips, and sallies forth. His choices are limited: bank lines of credit (if you can find them), private investors such as the venture capital mavins, merging or being acquired, or going public. All offer a Hobson's choice: they mean loss of control to one degree or another.

Often the little company is a one product company, or it may contain the seeds of its own destruction in a top management that is technical but not business oriented. Or it may have reached that delicious $20 million to $25 million mark in annual sales and is just plump and juicy enough for consumption by a larger predator.

Given all this Darwinian activity, goes scenario one, there will be no independent computer industry in 10 years. We're on a track very similar to the one the movie industry followed: the Exxons, IBMs, General Motors, St. Gobains and the like will be the sole survivors.

The flying fish advocates are a bit more sanguine. They concede that the mergers and acquisitions are likely to occur for some time to come. And, on the user side, they do see stability in the big batch shops and lack of big user migration because of conversion costs.

But they also contend ours is far from being a mature industry and entrepreneurial opportunities are manifold and promising. We are not settling into the oligarchy painted by theory one; rather, those bold companies that are willing to leap into new environments will not only not get munched by the big companies below, but may be able to do a little munching of their own.

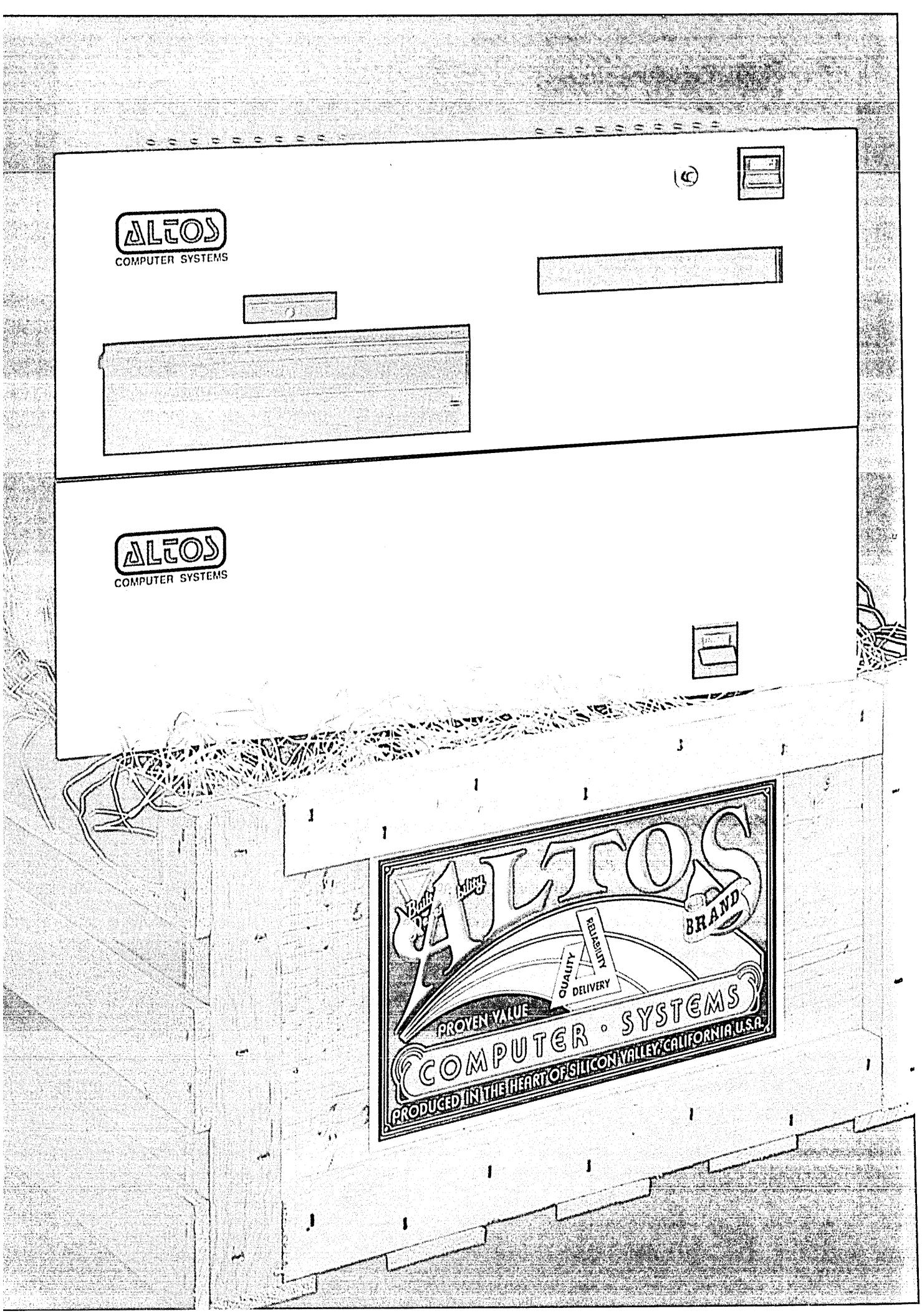
These gurus enthusiastically point to the opportunities just now becoming apparent in office automation, small business systems, distributed data processing, software and services, robotics, personal computers, factory automation, voice and image processing and the wacky world of consumer marketing, to name but a few. There is lots of venture capital available; ask some of the ceos of some of the more successful software package houses: they're being accosted in elevators and parking lots and having millions of dollars in wadded up bills thrust at them by crazed investors.

Actually, the two theories are not mutually exclusive. There will be a great deal of ingestion by the huge corporations. And there will also be a great deal of new activity founding successful entrepreneurial endeavors.

The smart, surviving companies will be those who know how to deal with the high cost of money; who have the sense to plow back significant sums into research and development; and who move beyond a single product line into integrated systems incorporating word processing, communications, computers, facsimile, semiconductor technology, voice and image processing, and other essentials of the new corporate environment.

A good part of this growth will depend upon residing in a country that provides a favorable atmosphere for such growth and activity. The U.S., for example, could well learn from Japan and Germany about how a nation fosters its high technology development rather than hinders it.

In the world of computers and communications, Japan and Germany have become very big fish indeed. And, lest we forget, big fish have big appetites. ✲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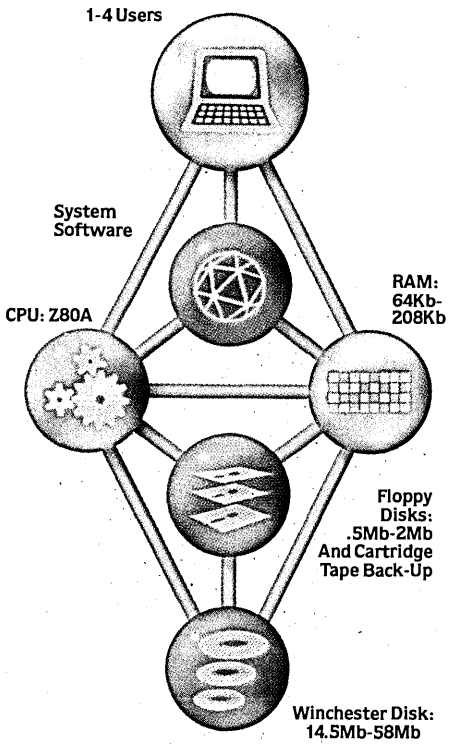
FRESH IDEAS ARE GROWING AT ALTOS

Silicon Valley, California. At one time few places in the world were as abundant with orchards. Today, no other area is as technologically fertile. And nowhere on earth is the business climate as prolific with computer innovation.

Yet within this competitive environment, one microcomputer firm continues to grow above the rest. Altos Computer Systems. Recognized as a world leader in single board microcomputer technology, Altos flourishes on its ability to produce ideas and deliver them to the market while they're still fresh and packed with price performance value.



Fresh ideas like Altos' new ACS8000-6/MTU single board microcomputer system with a DEI ¼-inch cartridge tape back-up drive, and Shugart's 8-inch floppy and 14-inch Winchester hard disk drives, with total on-line capacities from 14.5 MBytes to 58 MBytes.

The ACS8000-6/MTU joins Altos' growing family of products that branch out to a multitude of single board system configurations to serve the OEM, the business sector, and many other end users. These systems range from the ACS8000-2 with its dual 8-inch floppy disk drives, to the powerful ACS8000-5, which is upgradable to any of Altos' hard disk and multi-user systems.

Altos supports three industry standard operating systems: single/multi-user CP/M*, OASIS,† and Altos' proprietary AMEX.™ Seven high level programming languages are offered which are CP/M or AMEX compatible.

Ideas aren't the only things growing at Altos. In three years over 4,000 field-proven microcomputer systems have been shipped worldwide to an ever-increasing customer base of over 300 companies. And recently a new facility has been acquired, expanding Altos' plot to over one-and-a-half acres of production facilities.

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Packed with Fresh Ideas

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CIRCLE 30 ON READER CARD

IN FOCUS

THE IBM MARKET IN JAPAN

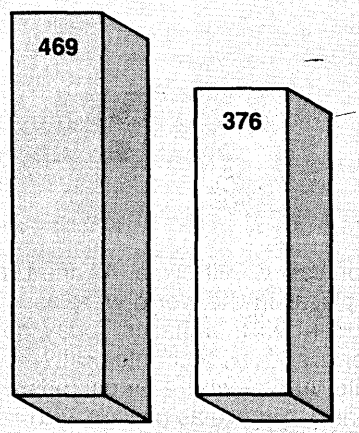
A survey by G.S. Grumman/Cowen and DATAMATION looks at the IBM and IBM-compatible mainframe systems market in Japan.

Early last year, G.S. Grumman/Cowen, in conjunction with DATAMATION, conducted its third annual nationwide survey of U.S. mainframe systems users. Approximately 29,000 users at IBM installations were sent a questionnaire, and unduplicated returns from nearly 4,000 sites were included in the results. Along with the findings of the Burroughs, NCR, Honeywell, and Univac surveys, these results were summarized in the June 1980 issue of DATAMATION.

Concurrently, the questionnaire em-

FIG. 1

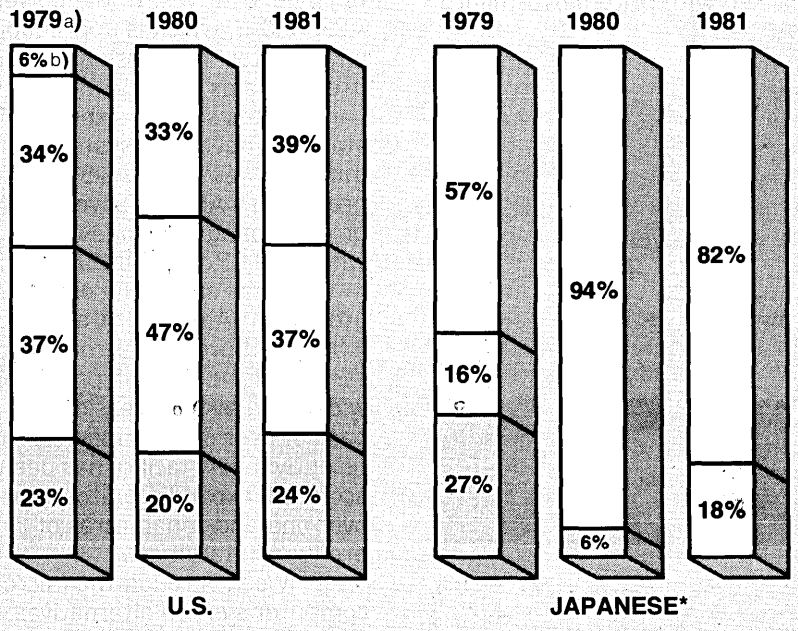
MONTHLY SYSTEM UTILIZATION—HOURS
(370, 303x, and 4300 ONLY)



*IBM respondents only

FIG. 2

303X SALES/LEASE MIX IN DOLLARS
(PERCENT OF SYSTEMS INSTALLED OR TO BE INSTALLED)



a)Includes lease-to-purchase conversions
b)Monthly rental installations

*IBM respondents only

CHARTS BY BARBARA KRAUS

FIG. 3

CONVERSION POTENTIAL
(PERCENT OF INSTALLED BASE ON IBM RENT/LEASE)

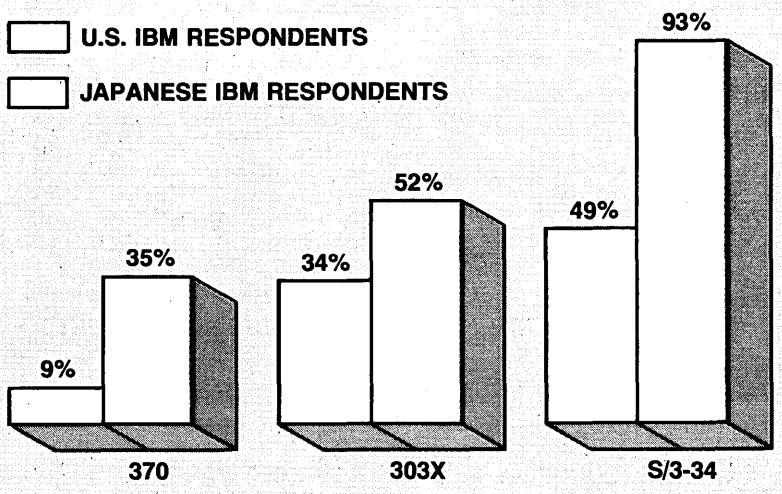
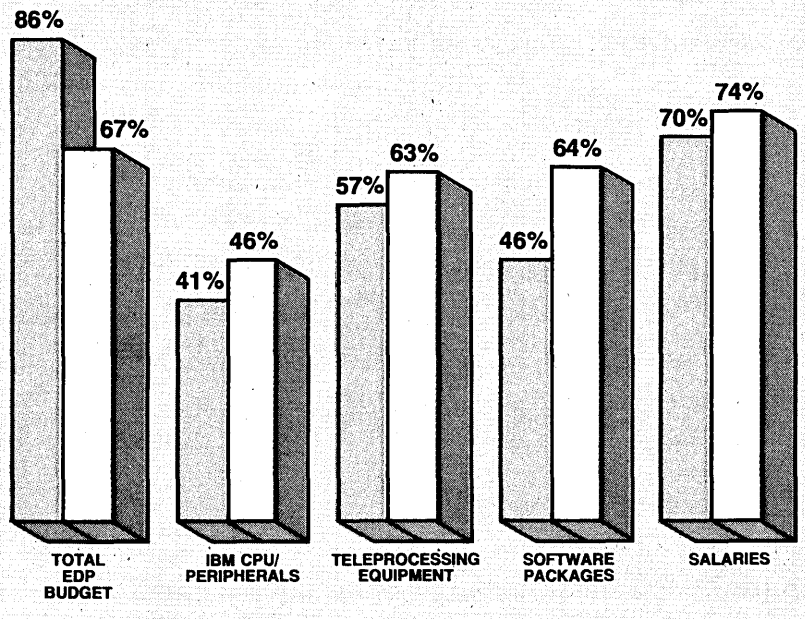


FIG. 4

PERCENT OF SITES PLANNING HIGHER SPENDING FOR:



Average per site increases foreseen by:	U.S. IBM RESPONDENTS	JAPANESE RESPONDENTS
• Total EDP Budget	13.0%	7.2%
• IBM CPU/Peripherals	5.5%	5.9%
• Teleprocessing Equip.	15.7%	12.4%
• Software Packages	11.6%	16.0%
• Salaries	11.4%	6.7%

ployed in the U.S. IBM user survey was provided to an affiliate organization in Tokyo, whose headquarters staff translated it into Japanese. Their sales staff then used it as the basis for face-to-face interviews with 194 customer organizations that are users of large-scale IBM systems and/or Japanese-manufactured IBM software-compatible (e.g., Fujitsu, Hitachi) cpus.

After the data were collected, they were retranscribed into English language questionnaires, which were returned to the U.S. for processing and analysis. The main focus of the analysis in this initial effort was to contrast the Japanese survey response with that garnered from the IBM users domestically so as to discern any noteworthy similarities and differences in the workings of that highly important marketplace—indeed, one that is second only to the U.S.

A second survey of Japanese users is presently under way. This and future research will provide the additional perspective of trends (e.g., in market share, sales/lease mix, software usage, etc.) as they develop from survey to survey.

What follows is an extract from this first survey, which looks mainly at the questions of software and telecommunications spending and usage among IBM users in Japan, although a number of other areas are touched on as well.

In total, 194 user sites located in and around Tokyo and Osaka, Japan's largest and second largest cities respectively, were included in the survey. Of these, 160 had one or more IBM mainframe systems in

Japanese users employ their installed systems less intensively than do their U.S. counterparts.

place. The remaining 34 sites were users of IBM 370-compatible hardware, but had no IBM systems per se installed.

In terms of units, the respondents reported an aggregate of 250 IBM cpus in use at the time of the survey and 120 cpus of Japanese origin. Included among these specifically were 66 IBM 303X systems, four 4331s, 161 System 370s, five System 360s, and 14 in the IBM System/3-38 family. Fujitsu figured most prominantly among the respondents using Japanese-made cpus with 36 mainframe-class systems in place. Ten additional mainframes were from other Japanese cpu makers, and the remainder of the Japanese cpus in the survey installed base were mainly of the small business systems variety.

As for planned installations, for the 24-month period subsequent to the survey, the Japanese respondents stated their intentions to take delivery of 28 303Xs, 55 4300s, and three 370s from IBM, as well as of 110 8100s and 12 System/3-38 processors. During that same timeframe, they also planned to install 14 Fujitsu cpus, 15 from

Hitachi (roughly half of these are relatively small-scale L340 systems), and a dozen systems from Nippon Electric Corp. (NEC).

According to survey results, Japanese users employ their installed systems less intensively than do their U.S. counterparts (see Fig. 1). The U.S. survey respondents reported that, on average, their installed 303X, 4300, and 370 systems were kept in operation for some 469 hours per month (out of a theoretically available maximum of 720 hours). The Japanese respondents who had these same models in use, on the other hand, indicated average monthly utilization of 376 hours, a level fully 20% below the U.S. figure. This possibly reflects the fact that IBM systems are much more heavily rented or leased in Japan than purchased (and thus, presumably because they can be more readily upgraded to a larger system, there is less incentive to utilize them to the hilt).

Even IBM's largest systems (the 303X at the time the survey was taken) are predominantly rented or leased from IBM rather than purchased (see Fig. 2). But in large part this is because of the relative absence of third-party financing activity in Japan. (Systems acquired via third-party lease are purchased systems from IBM's standpoint.) Whereas fully 67% of the 303Xs being installed by the U.S. survey respondents during 1981 were to be purchased directly or by third parties (for subsequent lease to the user), the comparable figure in the Japanese survey was a meager 6%.

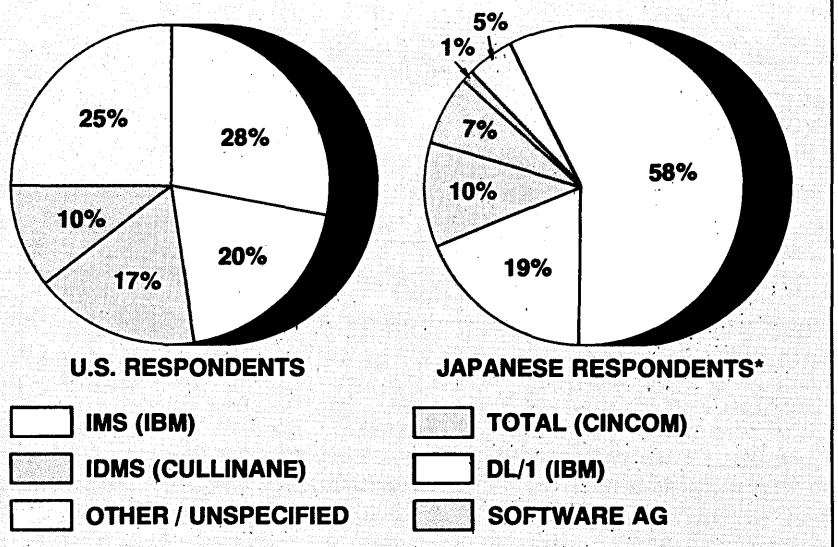
On the other hand, the direct purchase and third-party percentage for the 303Xs already installed by the Japanese respondents during 1979 (43%) was much closer to the percentage indicated by the U.S. survey sites (50%). This suggests that post-installation from lease to purchase conversions, which are familiar phenomena domestically, are not uncommon in Japan either.

In Japan, Memorex is the PCM market leader in disks.

The potential for conversions in terms of percentage of systems installed on IBM rent or lease (and thus susceptible toward being purchased if, say, IBM cuts purchase prices and/or raises rental prices as it has on two occasions since the survey was taken) is much higher in Japan than in the U.S. (see Fig. 3). For example, only 34% of installed 303Xs in the U.S. sample were on IBM rent/lease plans, compared with a much more sizable 52% for the Japanese.

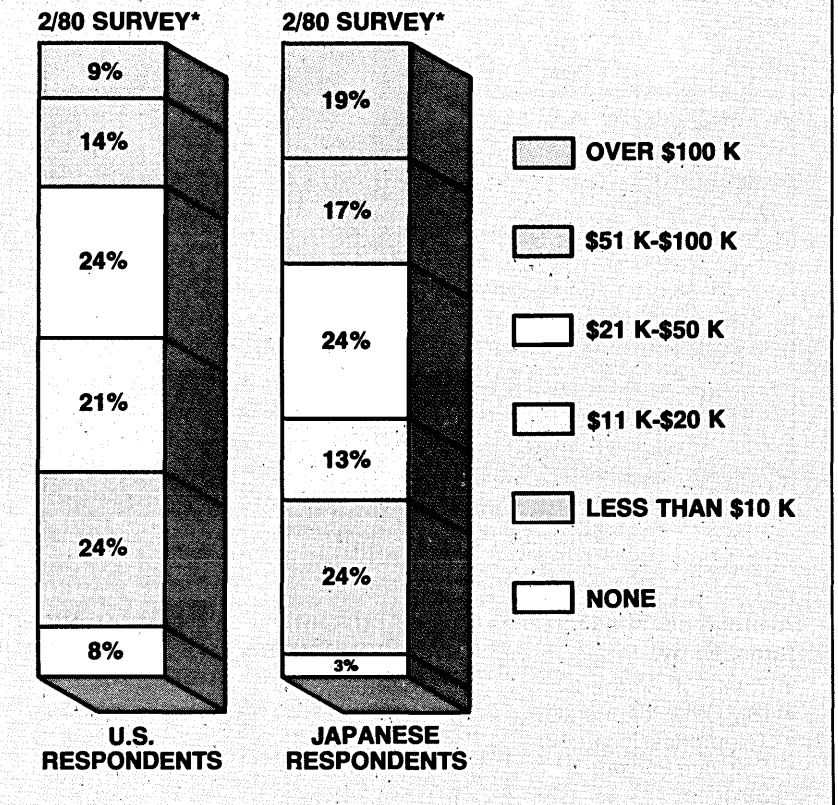
While IBM has no totally plug-compatible cpu competition in Japan (the Fujitsu and Hitachi operating system software is close but still somewhat differentiated, unlike the Amdahl and National Advanced Systems versions), there are U.S.-based peripherals vendors with a presence in that

FIG. 5



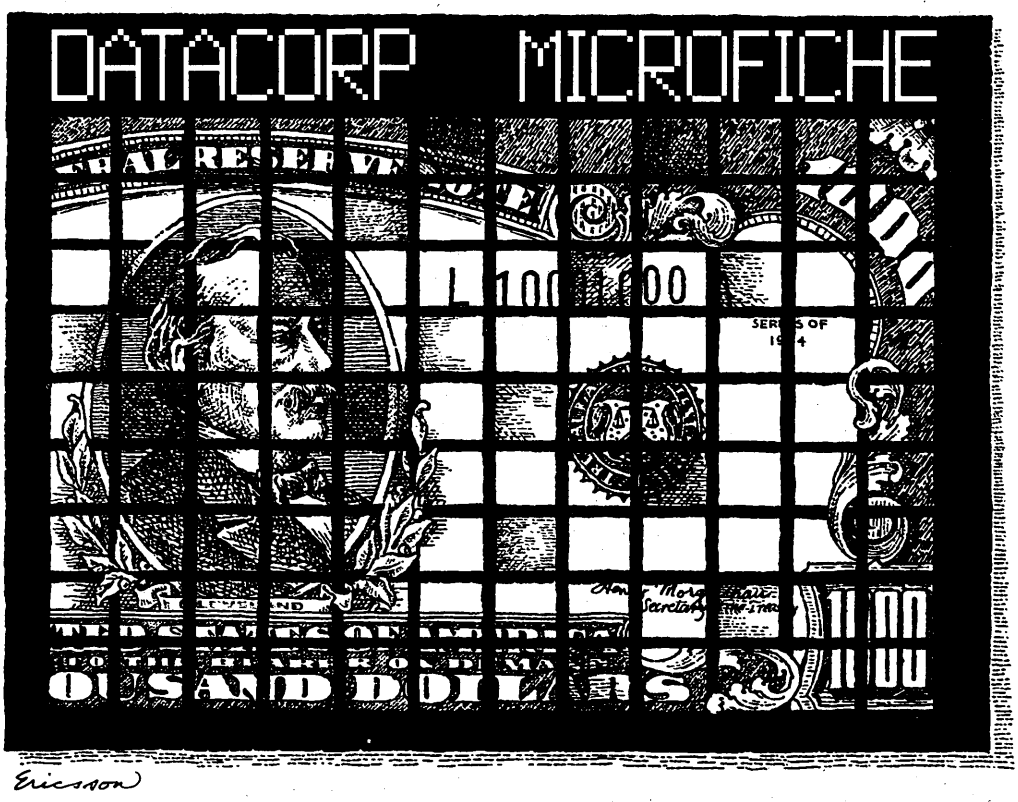
* For Japanese respondents, DBMS installed on both IBM and PCM mainframes

FIG. 6



* Excludes S/3-34 sites

PROFIT PICTURES



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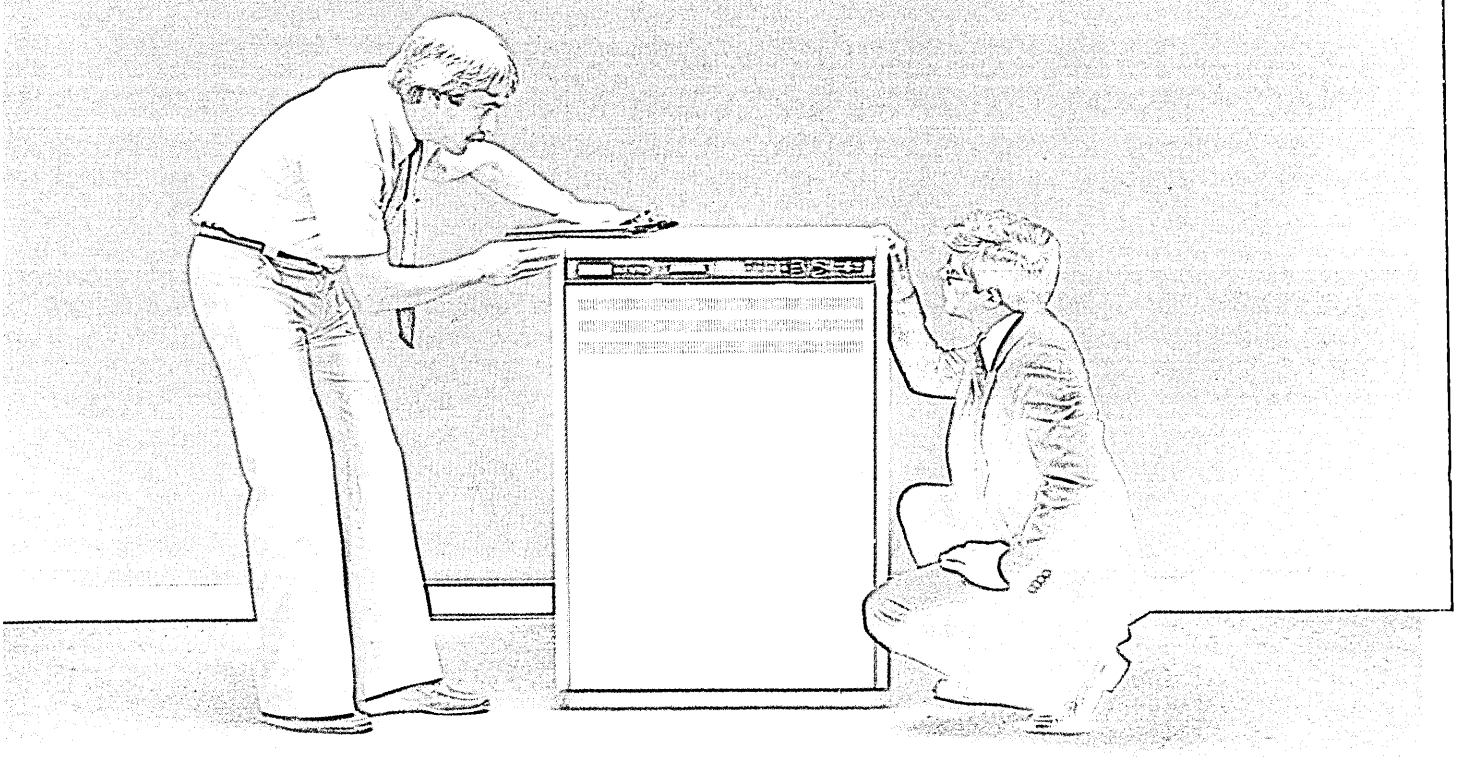
Digital's new



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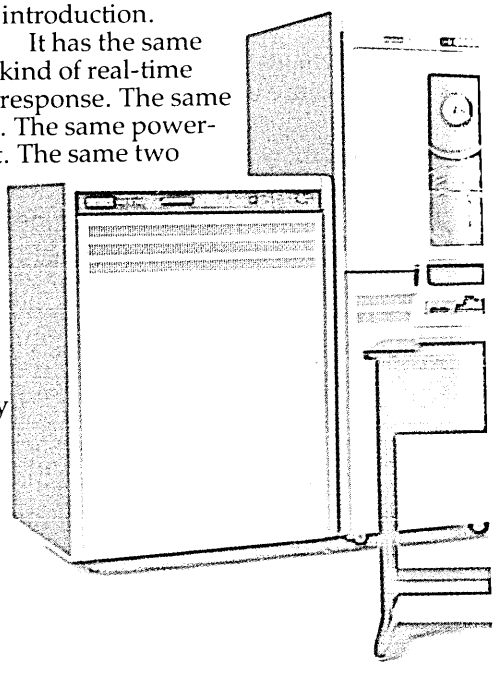

VAX-11/750.

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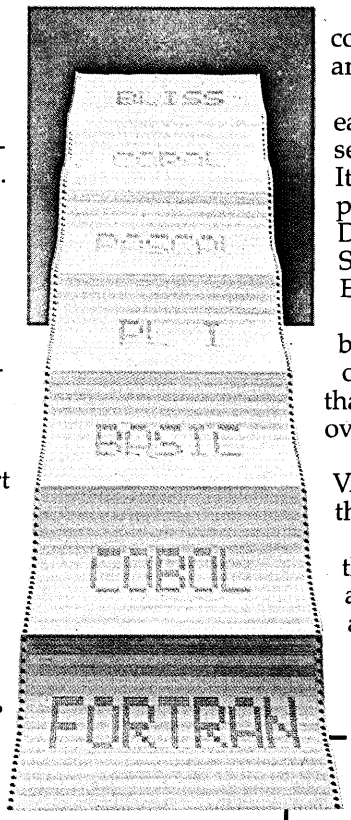

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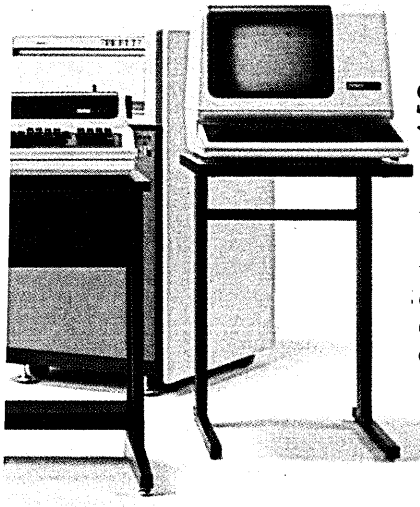

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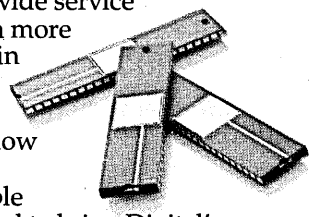
And VAX computers are supported by Digital's worldwide service organization, with more than 14,000 people in over 400 offices.



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The program's emphasis is upon evaluating, managing, and planning the development and growth of the data processing activity.

The orientation of the program is toward management, not technology. Participants will include managers with direct responsibilities for computer-based information systems management; and senior management to whom the computer resource management reports.

Among the topics to be considered are integrating the information systems plan with corporate strategy; data processing personnel selection, organization and evaluation; hardware/software selection decisions; the role of minicomputers and distributed processing; design of cost control and internal controls within the EDP organization; the computer as an instrument of change; patterns of distributed operations; project management approaches; and privacy and data banks.

For further information, contact: **Administrative Director, Managing the Computer Resource, Glass Hall, Harvard Business School, Boston, Massachusetts 02163.**

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CIRCLE 20 ON READER CARD

IN FOCUS

FIG. 7

OUTLAYS FOR PACKAGED SOFTWARE

PERCENT OF SITES SPENDING OVER $20 K PER YEAR

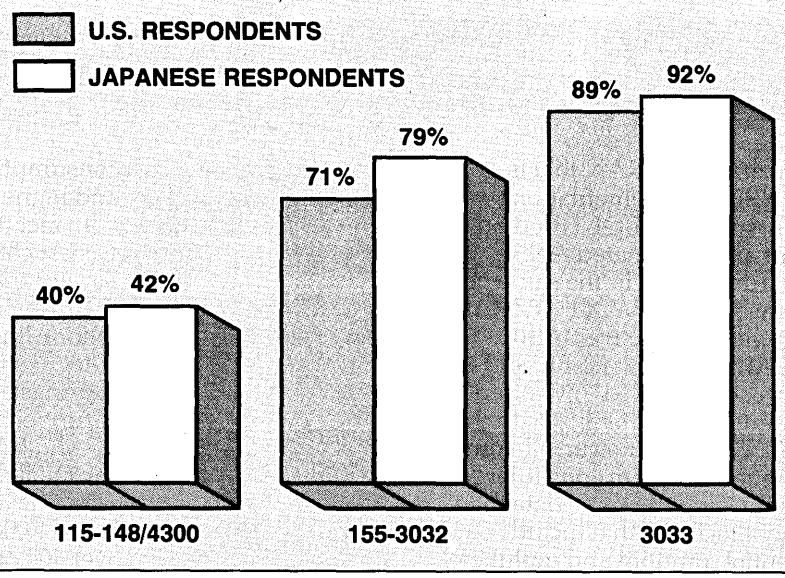
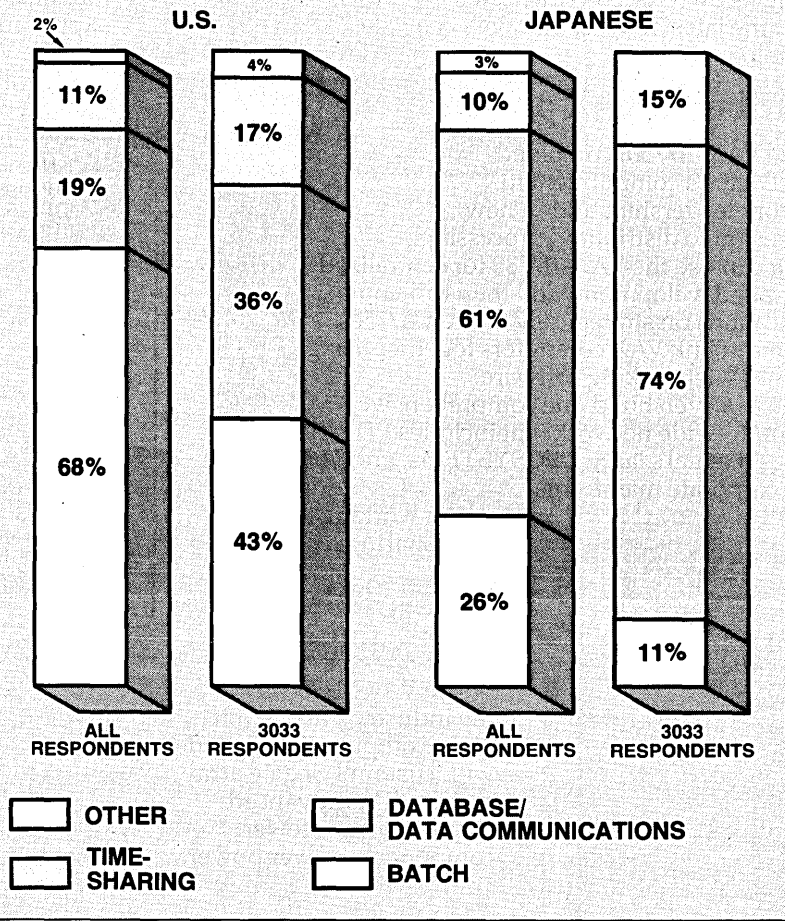


FIG. 8

DB/DC PROCESSING ORIENTATION



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INTRODUCING THE EMULATOR™

The trouble with video terminals today is that most of the low-cost models just don't have the performance to handle your tough applications. And the few that do are usually not compatible with your existing system. But now, Intertec has resolved this age old dilemma with the introduction of its new Emulator™ video terminal.

The $895* Emulator™ performs exactly as you command. With the depression of just a few keys, Emulator users can select terminal control codes of any one of four popular video terminals: The Lear-Siegler ADM-3A, The Soroc IQ-120, The DEC VT-52, Or the Hazeltine 1500. Incredible! It's like having four terminals for the price of one.

But, best of all, not only does the Emulator replace these terminals, it outperforms them by offering enhanced user oriented features. Features that those other terminals just don't have - at any price.

Standard Emulator™ features include a sharp, crisp 12" non-glare screen with a full 24 line by 80 column display. Twin RS232C serial ports - one for the host computer and one for your printer. Four separate cursor control keys. A separate 18 key numeric pad. Keyboard selectable baud rates and operating modes. And, a host of visual attributes.

No matter which dumb or smart terminal you're using today, don't buy another until you check out our new Emulator™. You'll get the performance of four terminals for the price of one. And you'll probably save hundreds of dollars over the price you paid for your last terminal. Plus, you'll get unparalleled reliability, nation-wide service and quick delivery. Call or write us today for all the details. Intertec terminals are distributed worldwide and may be available in your area now.

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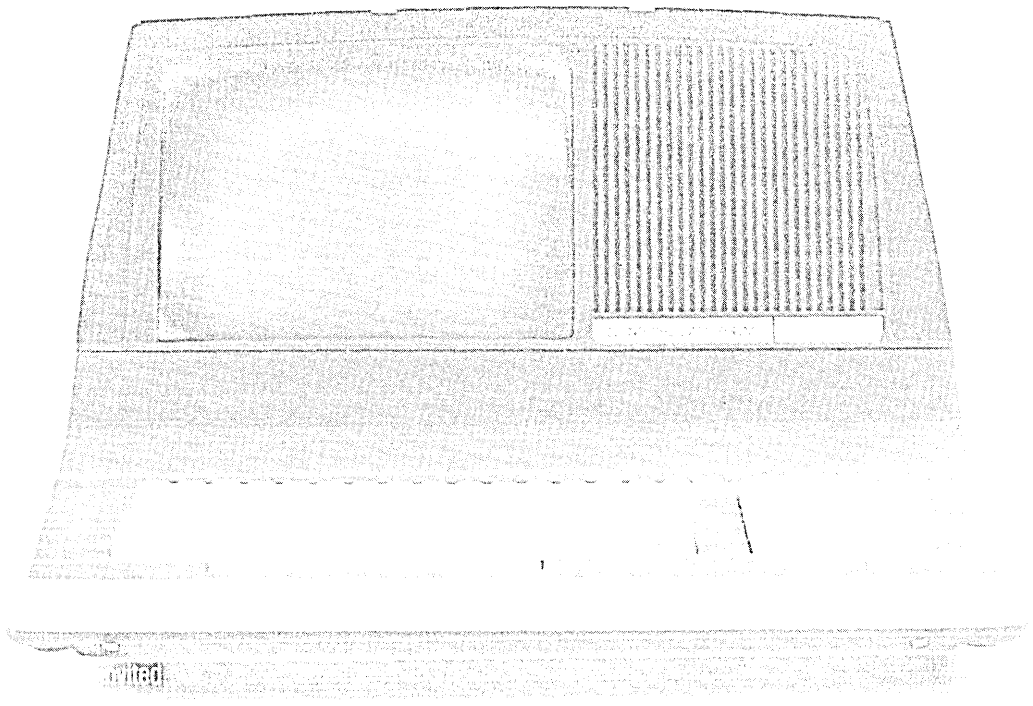


FIG. 9

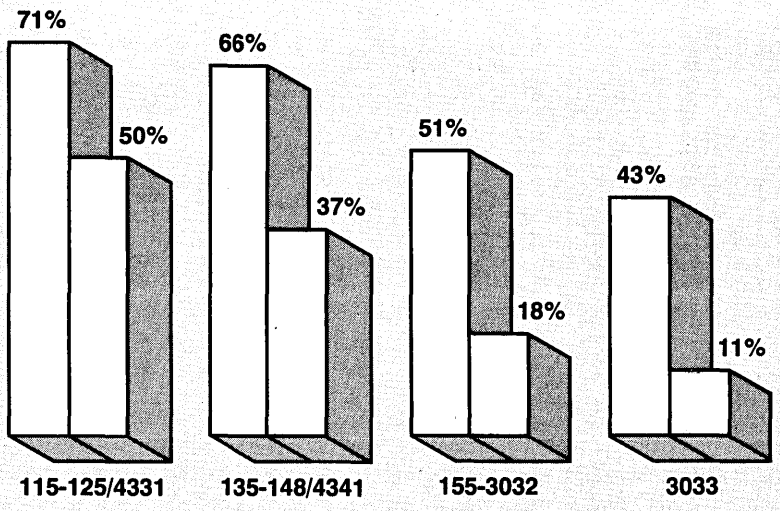
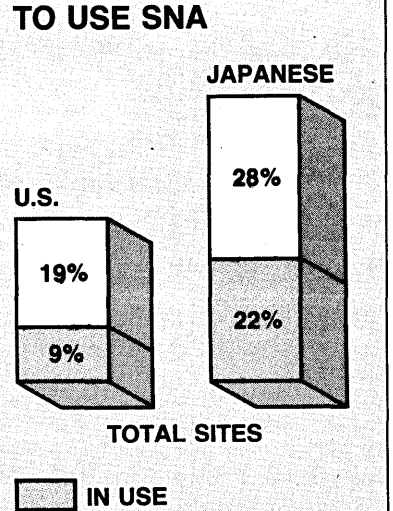


FIG. 10



marketplace. According to the survey data, however, PCM penetration is nowhere near as great among IBM mainframe users in Japan as in the U.S., with the PCMs accounting for 23% of the Japanese disk installations (versus 30% in the U.S. survey population), 19% of the crt terminals (versus 33%), and 20% of all add-on memory (versus 40%).

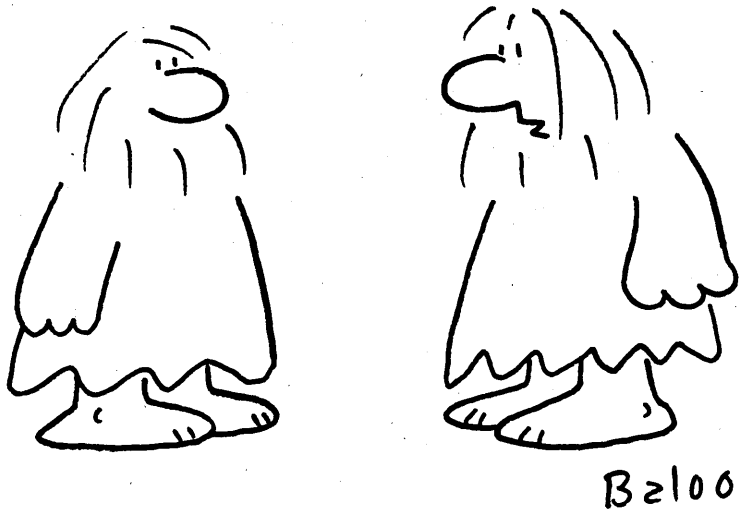
Memorex is the PCM market leader in disks, with a 14% share of the add-on installations projected for 1981-82 by the respondents, followed by Calcomp (6%) and Storage Technology Corp. (3%). Intel and STC are the major PCM add-on memory suppliers, with 5% and 4% shares respectively. And in the crt marketplace, Harris is the market leader with 9%, based on the survey data, and Memorex has a 1% share.

The data in Fig. 4 depict the percentage of sites in the Japanese survey compared with the percentage of U.S. sites planning higher spending in 1980 than in the prior year in each of a number of categories. What stands out most notably in the accompanying data is that while the average per site increase for salaries indicated by the Japanese respondents was only 6.7% (evidently a reflection of the lower rate of inflation than in the U.S.), it was quite substantial for software packages (16% versus 11.6% for the U.S. respondents). This suggests a very sizable market opportunity for U.S.-based IBM-compatible packaged software suppliers in Japan.

As for the highly important DBMS (data base management system) segment of the packaged software market (see Fig. 5), survey data provide convincing evidence of the strong share position enjoyed by U.S. suppliers in the packaged software market in Japan.

Looked at for all packaged software, Japanese users typically appear to spend more for unbundled software than do users in the U.S. This is depicted in Fig. 6, which provides a distribution of spending amounts for packaged software for each of the two survey populations, and in Fig. 7, which shows the percentage of Japanese respondents (juxtaposed with those in the U.S.) spending in excess of $20,000 per year for outside software by class of cpu installed. In every case the percentage is greater in the Japanese base than in the U.S.

On the other hand, the rate of increase in spending for hardware over the next three to five years was less for the Japanese survey population (8.3% per year) than for the U.S. sample (10.7%). Presumably this reflects, in part, the lesser rate of inflation in Japan. Relatedly, though, the Japanese respondents spend somewhat more on maintenance of old applications software (48% versus 46% for the U.S respondents) and less for new applications than is spent in the U.S. (52% versus 54%), and new applications implementation is what fuels the growth of user spending on the hardware side. ✱



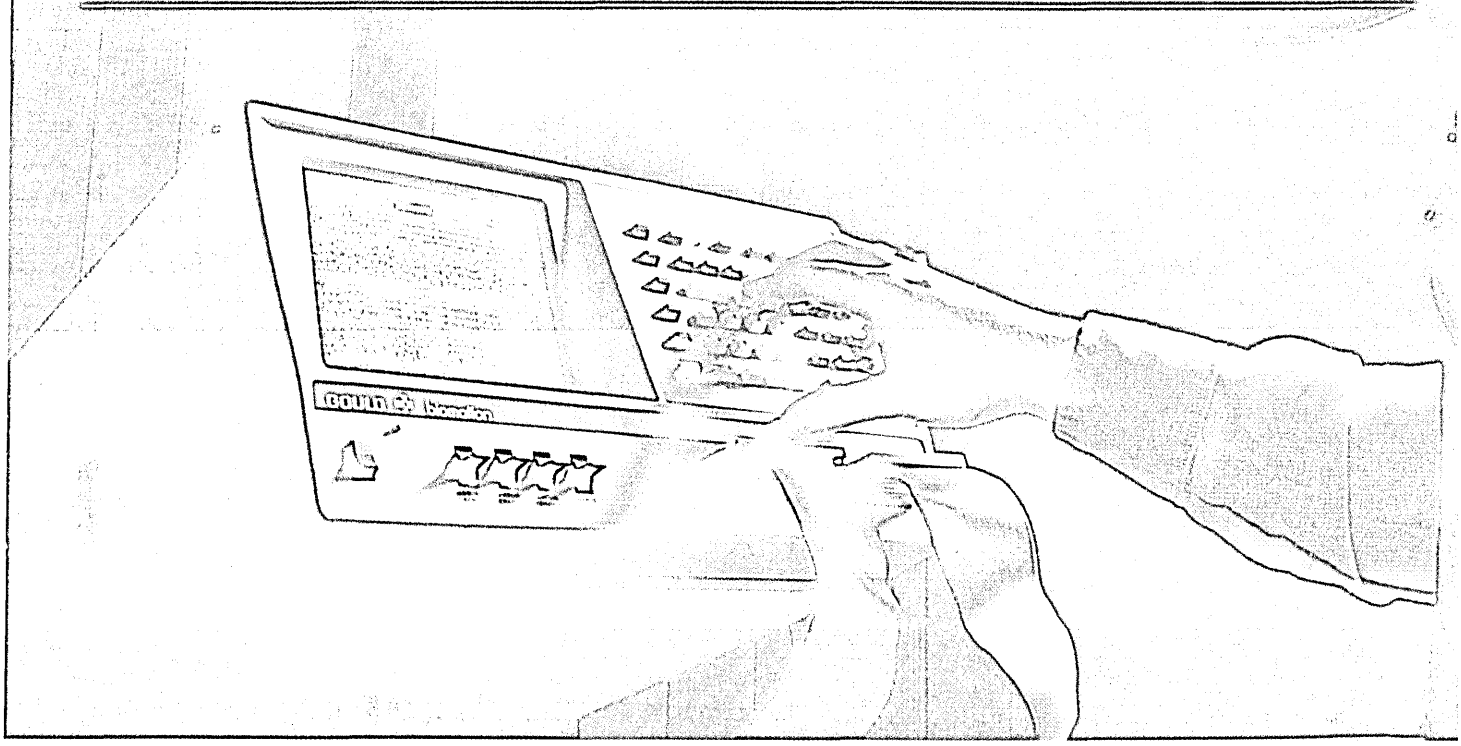
"How about I hunt and you gather?"

©DATAMATION

CARTOON BY REX F. MAY

DP Dialogue

Notes and observations from the IBM Data Processing Division that may prove of interest to DP professionals



Demonstration of a Biomation logic analyzer. IBM's COPICS system helps the Gould Incorporated division assemble electronic instruments such as this one at much lower cost.

At Biomation, An Assembly Line With a Steady Pulse

Today, assembly lines at the Biomation Division of Gould Incorporated almost always flow smoothly, with never a threatened stop to production because of missing parts.

"We used to operate with 130 days of inventory on hand," says Robert Nazarenus, vice president, finance. "We've cut that down to between 85 and 95 days. And on expensive parts, we time our orders so the items arrive just when we need them. We use less space for storage, and we don't buy and hold them before they are needed.

"At the same time, we've cut work-in-process time in half: from 24 weeks to 12 or 13 weeks."

Biomation's line of high-performance waveform recorders and logic analyzers is a materials-intensive business, Nazarenus points out. About 70 percent of the cost of a completed instrument is in the parts. To minimize the costs of lost production and out-of-balance inventory, the Santa Clara, California, division installed IBM's Communications Oriented Production Information and Control System (COPICS) in a 4331 Processor.

"Now that we can plan manufacturing," Nazarenus notes, "we can enter into long-term contracts with component manufacturers. Before we had COPICS, 50 percent of our purchase orders were for delivery in one or two days—which meant that we were buying from distributors, at 20 to 40 percent more than we would have paid the manufacturers."

COPICS is a complete online system for control of manufacturing, with modules for material requirements planning, inventory accounting, shop floor routing control and other specific tasks. At Biomation, the first module of COPICS to be installed was the bill of materials processor.

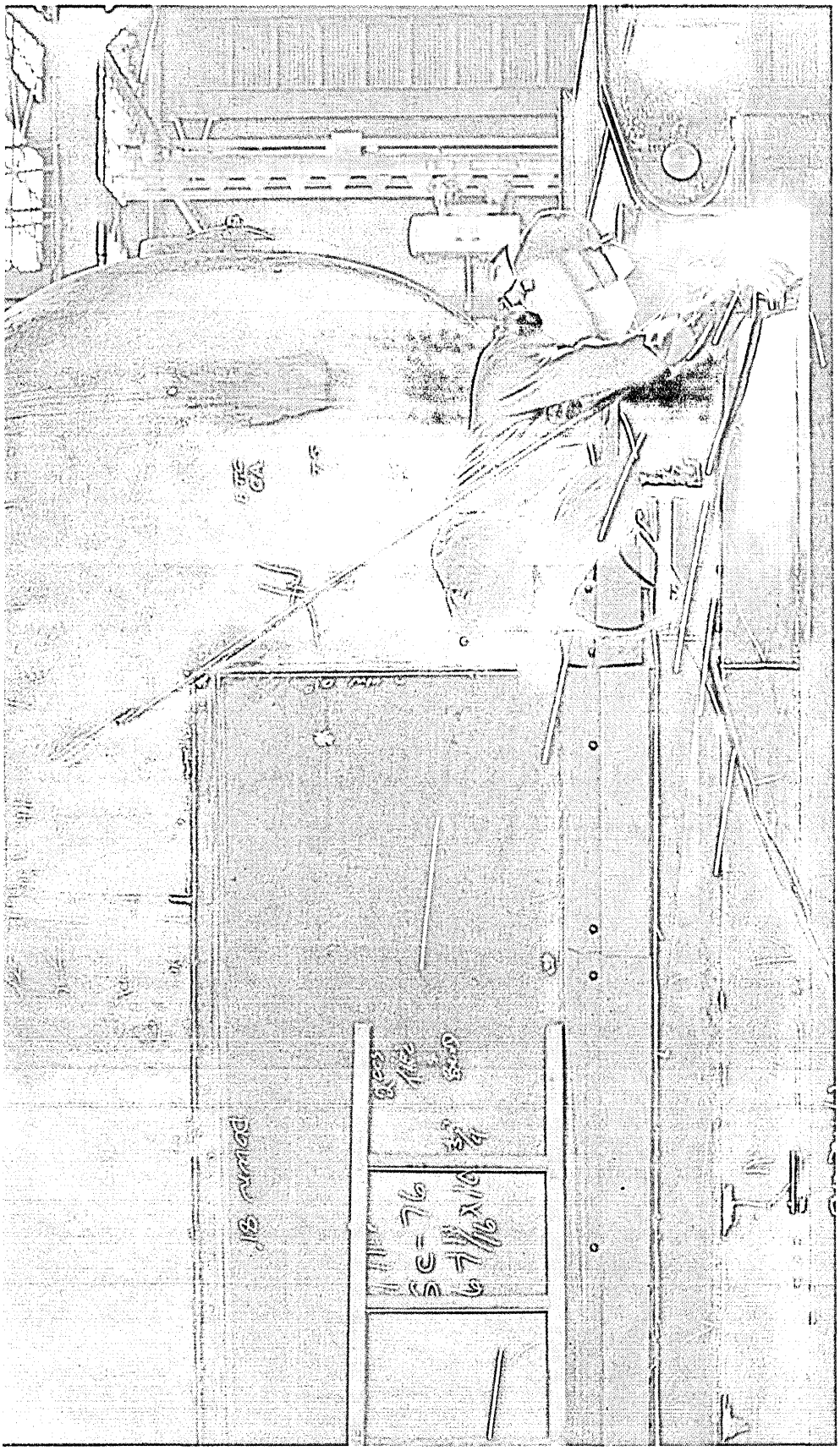
"There are 2,000 parts in a typical Biomation product, and frequent engineering changes to most models," Nazarenus explains. "So our bills of materials often contained errors. Since purchasing is done from the b/m's, this meant shortages of needed parts and purchases of unneeded ones. And expensive, high-level people spent time running around looking for materials.

"With COPICS, we achieved a 100-percent-accurate manufacturing document, and then a time-phased bill of materials to take account of engineering changes. With that and a valid master schedule, we were able to begin material requirements planning (MRP) using COPICS, letting us schedule shipments from our vendors to coincide with need.

"This mode of operation is profitable," he notes. "Putting out fires was not."

Capturing Heat from Exhaust Gas Makes Fuel Go Further

Valuable energy can be salvaged from the exhaust of gas turbines, industrial furnaces and other heat sources. At Henry Vogt Machine Co., engineers custom-design heat recovery equipment for each customer's specific needs, with the aid of interactive computing under IBM's Conversational Monitoring System (CMS).



The heat exchangers convert heat that would otherwise be wasted into usable hot water and steam. "The computer tells us the amount of heating surface and the number of tubes to use after the configuration of the external fins has been selected," says Robert Precious, general manager of the Heat Transfer Division of the company, headquartered in Louisville, Kentucky.

Characteristics vary

"Each exhaust heat source has its own characteristics—temperature, mass flow, and allowable back pressure," he points out. "And each customer selects his own desired steam flow, pressure and temperature. He may want to use the recovered energy to generate electricity, heat a chemical process, drive a steam turbine for rotary power, or warm a building."

Each specification is unique. The design engineer must find an optimum balance of heating surface in a superheater, boiler, and economizer section for each of as many as three pressure levels. He can do this by entering the variables through a terminal online to an IBM System/370 Model 138. The system responds by promptly displaying this optimum design.

Cost estimate in minutes

"It used to take a week to design a unit," Precious notes. "With the computer, our engineers get a detailed configuration and cost estimate in minutes."

In the early stages of heat recovery program analysis, many variables must be considered. The interactive computer can help to evaluate each of these quickly and accurately, and to select the most efficient arrangement of heating surface at the most economical price.

The computer program can calculate the performance of the heat recovery steam generator at less than full-load operating conditions. This is an important aid to the customer who must estimate steam production over the entire operating range of a gas turbine.

"Before we had the interactive system," Precious says, "we did well to provide one calculation at the design point. The customer wouldn't know what the performance would be at other operating levels. Now that we can analyze the whole range of heat rates accurately, we are in a much better position to receive an order based on this performance feature."

Putting the finishing touches on a Vogt Module Steam Generator. It once took a week to custom-design one of these units, also called a "waste heat boiler." With the help of an IBM interactive computer, engineers have a detailed configuration and a price estimate in minutes.

A truck loaded with food prepares to depart from Roger Williams Foods. The first customer to install an IBM 4331 Group II Processor, the food distributor uses it to support an online system with 17 terminals.

First 4331 Group II Goes in Fast, Boosts Power

At Roger Williams Foods, Inc., an IBM 4331 Group II Processor is serving as an online order processing and receivables system, supporting 15 visual display terminals and two remote printers.

Scott Laurans, executive vice president and treasurer, explains that the unit is an upgrade of a 4331 Group I, and that it doubled the processor speed and provided twice as much memory for the Cumberland, Rhode Island, food distributor.

"It's incredible how easily it went in," he says. "The job was done in eight hours on a Saturday.

"With the Group I system, the online load was starting to slow our response time at the terminal. Now, from an average of four seconds, we're back to less than one second. With a change of disk drives that we made at the same time, from the IBM 3340 to the 3370 Direct Access Storage Device, we've achieved a net *saving* of $15,000 a year on hardware while doubling our disk storage capacity."

The online system supports Roger Williams' meat and perishable food operations. "In meat, we turn over inventory 80 times a year, and prices are volatile—literally, they change hour by hour," Laurans points out. "At the same time, our margins are very low—no more than four cents a pound—so you can see that we need the quick response of an online system, but we can't pay a whole lot for it. The 4331 Group II gave us the power we needed at a price within our means. It was perfect for our needs."

Can't move without the Computer

"In perishables, we can't move without the computer," adds Jim Teixeira, director of data processing. "And the customer won't wait—he'll go to our competitor. That's why the excellent availability of the 4331 has been so important to us.

"We installed the Group I with absolutely no impact on operations or programs," Teixeira continues. "Later, when we converted to DOS/VSE, we made some minor changes in computer-room operations, but none at all to programs. The Group II upgrade was completely transparent." Disk Operating System/Virtual Storage Extended (DOS/VSE) is IBM's primary system control program for the 4331 Processor.

Teixeira explains that programmers at Roger Williams work at terminals, using the VSE/Interactive Computing and Control Facility (VSE/ICCF). "Our programmers are getting faster turnaround—we're implementing new projects sooner," he says. "ICCF is a full-function facility, yet does not negatively impact system performance."

DP Dialogue is designed to provide you with useful information about data processing applications, concepts and techniques. For more information about IBM products or services, contact your local IBM branch office, or write Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

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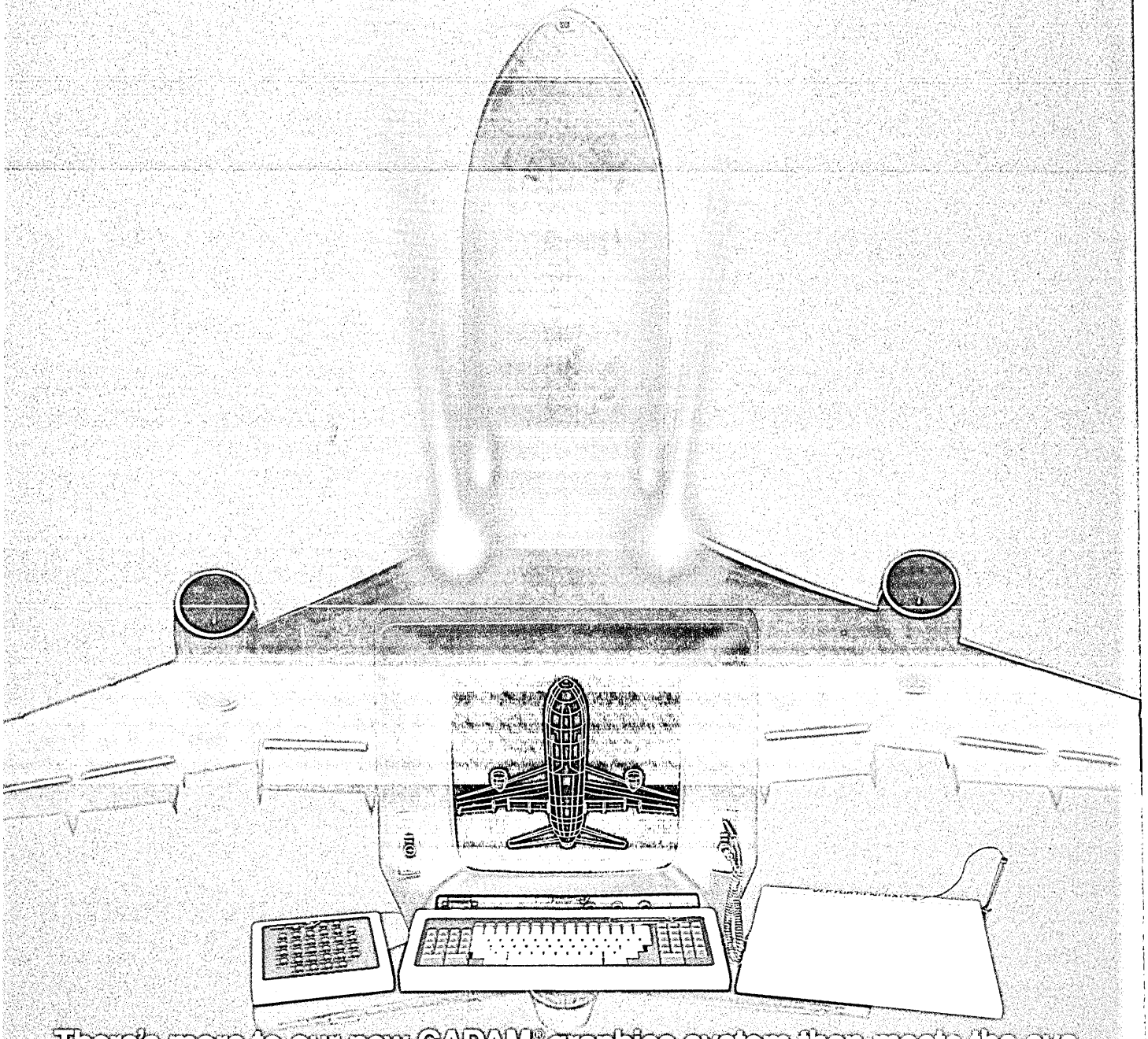

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And, there are more features. For example, there's a hand-held tablet/digitizer for designer convenience. There's "The Supervisor," the most powerful and advanced diagnostic and monitoring system available. There's a newly designed keyboard with functions expressly developed for design and manufacturing applications.

More Performance The VG 8250 has already proven itself in an extensive competitive evaluation of 3250-type systems, a major CADAM user* proved that the VG 8250 delivers superior performance with an overall 97% uptime. Their study also showed that with the VG 8250 fewer display stations were required to handle the multiple applications. The conclusion was that the VG 8250 delivers the best cost-effective performance.

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*Documentation is available upon request

LOOK AHEAD

(continued from page 14)

Japanese government's attitude toward restricting the money market. Restrictions are beginning to disappear, and Japanese corporations are looking beyond loans for expansion toward manipulation of earnings on idle cash. It's in the planning now in a number of large Japanese banks.

WHAT DOES PERTEC MEAN?

Pertec Computer Corp. is spending a bundle on a 1981 advertising campaign to answer the question "What does Pertec mean?" The campaign will try to bring together the many conceptions the company thinks the data processing community has about it -- a peripherals company, a data entry company, a hobbyist computer firm -- but it isn't mentioning software. We hear, though, that the Los Angeles subsidiary of Volkswagon will be getting into software this year with the introduction of two new programming languages. But what Pertec wants us to think of now when we hear its name is "perfecting technology."

BETTER LUCK THIS GO AROUND?

Joseph W. Rooney, who as president of the RCA Data Processing Division in 1971 presided over that division's phase-out of the computer business, and who later held executive positions with ill-fated Itel Corp. and the not much luckier Keydata Corp., has found a new home. He's the new president and chief executive officer of Image Resource Corp. of Westlake Village, Calif., a computer graphics company that emphasizes color graphics. Its primary product is Videoprint, a desktop unit making full-color photographs from crts. "Graphics is in the forefront of growth in the computer industry," said Rooney in his first week on the job. And he likes the small size of his new firm: "It has an entrepreneurial approach, and I like that."

RUMORS AND RAW RANDOM DATA

It's a well-known fact that computer consultants often are hired to put out fires. Robert Patrick of Northridge, Calif., may be the best of them in terms of being equipped to do that. Patrick has purchased a 1920s full-size fire truck, complete with a siren and blinking lights....We hear Century Data Systems, acquired by Xerox from California Computer Products in 1979, is having financial difficulties. Word has it the firm is discontinuing successor lines to its Marksman series of disk drives, as well as laying off personnel.

NEWS IN PERSPECTIVE

STRATEGIES

CITISHARE OR CITIGRAB?

Preambles and preliminary moves by Citibank have already turned it into, at the very least, the 26th largest independent computer services company in the country, sources say.

The mighty Citibank, one of the world's largest banking operations, has positioned itself to grab another crown—that of king of the computer services business.

Sources claim that moves over the past year, including the acquisition of at least seven computer services companies and the formation of 10 new subsidiaries, have laid the foundation for a new dp empire that seemingly has no limit.

The bank has proceeded through "legitimate" channels to secure federal approval for spinning off its internal dp arm, Citishare, which was set up in 1977. This application has been greeted with a hail of legal blocks from the services industry.

It is now clear that even before the legal question of Citishare is clarified in the courts, Citibank has gone ahead with the acquisition and expansion plan that relates to it—seemingly without seeking approval from the authorities.

"They're just waiting for the law to catch up with them," said one former Citibank employee. "But they figure that under the current government climate of deregulation, their plans will win out anyway."

It might not take too long to test this theory. A routine on-site investigation of Citibank's operation by a federal examiner in August apparently revealed violations of the Bank Holding Company Act, well-placed sources reveal. These "alleged" violations are believed to concern the bank's dp acquisitions and subsidiaries and are currently under review by the Legal Division of the Federal Reserve of New York.

Since its quest for approval of Citishare, which began in January 1979, Citibank has "openly" acquired the California-based Lexar Business Communications to supplement its internal office automation push. But last year Citibank set about buying other computer services concerns (at least seven) actively engaged in selling to the industry. Three are service bureaus for smaller and regional banks: Southwest Data Center (Texas), P.G. Data Center (Ohio), and Colorado Computer Center. Other acquisitions cover companies involved in more general financial services: Thrift Data Corp. (St. Louis), BSI (Dallas), Intercontinental Computing Inc. (Kansas), CPU (in Southfield, Mich.). The latter is also the subject of litigation from Computer Services Corp., also in Southfield, which seeks confirmation that Citibank bought CPU without federal approval. The CSC suit also calls for an investigation and appropriate action.

Citibank is keenly aware that current bank holding company regulations don't give it enough leeway to carry out its master plans. So, with its Citishare application, it is suggesting amendments to the law, observers explain. Former liberal interpretations of both the National Bank Act by the bank's regulator, the Comptroller of the Currency, and of the laws pertaining to bank holding companies, by the Federal Reserve Board, have broadened the stipulation of the law that such services must be directly "related to the business of banking."

Citibank is now pushing for the regulation to be so wide that it encompasses not only the selling of banking, but also of finance and economically related data.

If this happens, and the legal shackles are thrown off, the bank's dp operation is certain to explode. The face of the current $12 billion independent computer services industry—a profile, mostly, of thousands of small entrepreneurial outfits—will change irredeemably.

Sources within Citibank suggest that since it began selling its services on the outside in late 1976, it has nurtured them into a $100 million to $150 million a year operation.

That means, according to experts, that what amounts to preambles and preliminary moves by the bank have already turned it into, at the very least, the 26th largest independent computer services company in the U.S. This is from International Computer Programs' list of some 7,500 ser-

Since its quest for approval of Citishare, Citibank has openly acquired several computer services concerns.

vices companies that generate any mentionable revenues at all, as well as the hundred or so who do more than $10 million a year in business.

This slice of the marketplace has been generated by an operation that until recently, at least, was at best just ticking over.

When filing for Citishare early in 1979, the bank said that 60% of its external revenues at that time were generated by selling the "excess" from its own computers. The rest came from the General Electric time-sharing network and in-house installations of its systems. They said then that

ILLUSTRATION BY TUDOR BANUS

25% of Citishare's computer resources went to service outside clients.

It is anyone's guess how these percentages might have changed since. But with the increase in outside client base following the new acquisitions, and with Citibank's organizational changes to incorporate them into the bank's Financial and Information Services Group (FISG) under vp Robert B. White, the percentages changed a great deal, sources claim.

Citibank has been less than open about the definition and aims of its Citishare concept. Since its application, it has been repeatedly pressed by the Federal Reserve and ADAPSO to throw more light on the subject. So far, both privately with the authorities and publicly in the courts, it has not done so.

So what are these plans? And what do they mean to the dp and services business?

Sources from both Citishare and Citibank, as well as the public record, have thrown up some clues.

Having been the single largest driving force behind the move to distributed processing in the 1970s, Citibank clearly wants to profit by selling this expertise in the 1980s. Much of its pioneering work in decentralizing its massive IBM central functions was achieved at great cost and much pain. There was a time in its ambitious Project Paradise (DATAMATION, September 1978) when it seemed that the bank had become a shop window for every green and untried minicomputer and terminal in the book.

All this costly education has given the bank a fierce resolve to profit on the outside from its experiences. In addition, the fading profitability of Citibank and others from their conventional banking business has added an economic argument to its plans.

But perhaps the most potent argument that Citibank will eventually unveil for the authorities to justify its peneration into computer services comes from the modern nature of banking. One former Citishare employee says: "Banking in an abstract form is keeping track of information —monitoring it, storing it, and dispensing it." He adds, "As the technology has grown, the banking industry, as defined, is starting to look more and more like the information processing industry."

The source added that it obviously represents sound banking principles to profit from the degree of similarity of the two converging areas. He said he thought the Fed and the new Administration would see it that way. What we are beginning to see, he concluded, is a new argument of a monopoly in the services area being justified as a "national resource."

So far in Europe, observers point out, the Post Offices (PTTs) have not been restricted from offering services to their own communications monopolies. Now, in the U.S. computer services field, Ma Bell is beginning to do the same thing.

ADAPSO members have privately expressed the fear that their diverse and varied industry would sooner or later be centralized through control by several giants—each a monopoly in its own field. In addition to the banks and AT&T, IBM is beginning to offer services (after having been precluded by law) to its own hardware "monopoly," Exxon and Xerox to the "office of the future," and so on.

What is clear from the Citibank plan is that it anticipates that each "monopoly" will go hunting outside its own traditional turf. It clearly intends to do the same.

Already under development within Citibank's Lexar unit is an advanced function semiconductor-based PABX system. This will provide the heart of a new company that Citibank is expected to spin off at the end of this year, say sources. It complements the System 90 management workstation which has already been sold to users outside the bank.

Both of these forays into office automation are believed to be part of a new subsidiary, BHC Resources Inc., which is expected to blossom into a full-blown challenger to Exxon and Xerox in the office of the future. Another offering in this area is the bank's Automated Information Management (AIM) service, which integrates database management, text manipulation, micrographics retrieval, front office transmission processing, and the like.

Yet one more important ingredient believed to be within this subsidiary is a 200-man marketing team in Florida, Citicorp Information Services, which sells minicomputers to bank holding companies.

BHC Resources, like at least nine other subsidiaries, was incorporated last year in Delaware, where the laws covering the process are well known for their "softness."

As far as can be known at press time, approval to form these subsidiaries—all cogs in the Citishare wheel—was never sought by the bank. Until the banking laws are amended in the manner that Citibank wishes, its operation would seem to violate the statutes. Perhaps this is why approval wasn't sought.

Former employees of the big bank point out that it tends to shuffle subsidiaries around the Citicorp's vast holding structure frequently and deftly. So the exact place of each piece within the Citicorp computer services jigsaw is at best an educated guess—even for its own management.

"Their strategy seemed to change every five minutes at one time," said one former Citibank employee. "Executives would go to their respective homes each night, each using his own piece to form an idea of the 'grand plan.' "

The ex-employee added that the bank did originally intend to follow up its Citishare application with a more detailed plan: "This was intended to be formulated some four months after the application for approval," he said.

Following the legal blocks to its move, Citibank now seems content to stall the requests for more detail and wait for the general situation to develop on the outside. "It has not pushed more than $7 million and 40 employees into Citishare; it's waiting to react," said a former employee. But on the inside, away from prying eyes, it has gone about building its empire.

A new subsidiary, BHC Resources, is expected to blossom into a full-blown challenger to Exxon and Xerox in the office of the future.

Two of its subsidiaries, Correspondent Resources Inc. and Citicorp Remote Computing Services Inc., will acquire and develop service bureaus to build up a nationwide computer network to service smaller and regional banks. Each bureau currently sits at the center of a network of banks in each state. When interstate banking networks are allowed, perhaps in the mid-'80s, Citibank is positioned to meld them all into a massive national banking network.

Another subsidiary, Thrift Resources Inc., takes its services out to savings and loans institutions. Yet another, to credit unions (C.U. Resources Inc.). A more general subsidiary, Government Resources Inc., is believed to be the locus for Citibank's push into health care and medicaid, as well as municipal tasks such as violations processing.

On top of all this, Citishare itself has already offered a wide range of financial packages, time-sharing services, and database services to the industry. Citibank personnel are beginning to pop up with bids for all kinds of general purpose services contracts, including one for a recent large time-sharing contract awarded by Price Waterhouse (which it lost).

Within Citibank's suggested definition of banking, financial, and economic services, there seems to be no conceivable limit to the types of things it intends to do. What we've seen, say sources, is just the tip of the iceberg. What is under the water could easily sink the small-ship computer services concerns that are bracing themselves against Citibank's big wave. Their industry, they say, has thrived because of its variety and diversity—both by company size and customer requirement. These ingredients have created a competitive atmosphere which has fueled innovation and entrepreneurial flow. They are very much afraid that "monopolists" can only kill such an atmosphere.

They point out that banks (especially the largest) can operate from a position of privilege that is denied the rest of the services industry. As well as fueling business with their money, they are privy to all kinds of sensitive information from their customers and the government alike. All of this can be used with weighty (ADAPSO would say "crushing") effect in the unregulated services area.

So far, ADAPSO has used "at least six figures" worth of its members' money on litigation, say insiders, and is reluctantly moving toward a seventh figure. While resembling a mosquito repeatedly stinging an elephant, ADAPSO still hasn't come up with the mouse to frighten away the giant beast.

For ADAPSO there are encouraging signs that both the Comptroller of the Currency and the Federal Reserve are moving toward a unified approach to the laws governing bank holding companies. As one legal source said, "If the Fed reads the existing laws literally, ADAPSO's case at the next round in May is rock solid." But he added, "If the Fed reads the laws from the background of the evolution of technology, ADAPSO's case is not so good."

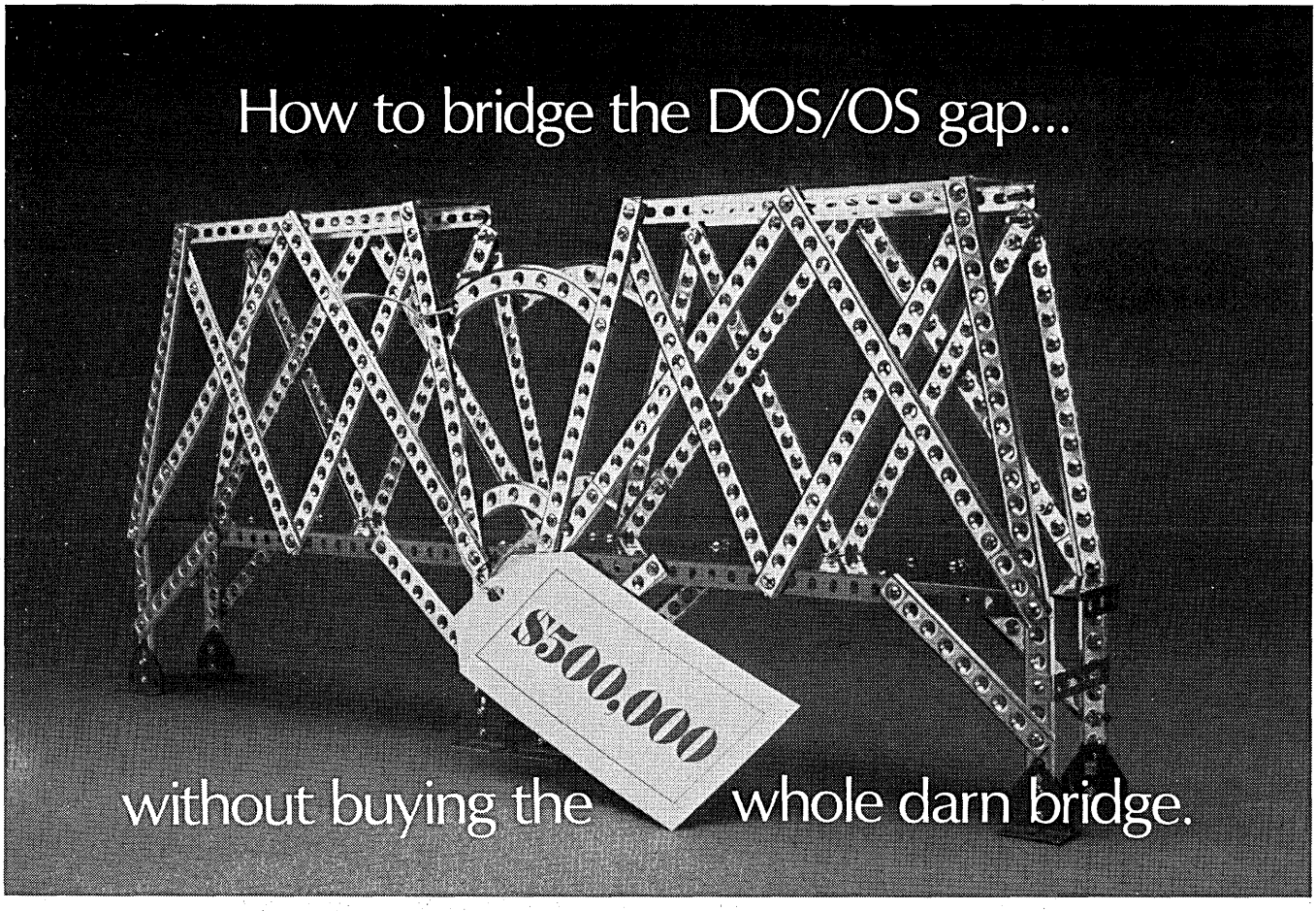
As the authorities deliberate, Citibank continues to do the thing it has done so successfully in the past—position itself to take advantage of change. Its big guns are being quietly moved to the front, and are primed and waiting. A favorable nod from the courts could be all that's needed to change the face of a whole industry, and at the same time herald the entry of other major banks that have been watching with interest, such as Bank of America and Chase Manhattan.

Even the most optimistic proponents of the ADAPSO stand feel that if Citishare is stopped this time, it will just reemerge in some new form from within Citicorp's vast corporate womb. For Citibank, there seems to be no turning back.

Already the talk is of computer service companies hedging their bets by sounding out AT&T for future contracts in the "coming battle of the monopolists." Some of the more adaptable ADAPSO members could, of course, profit from *all* the key players in the services game.

But until the game is forced upon them, they'll continue to search for the illusive stone to topple a Goliath.

—Ralph Emmett



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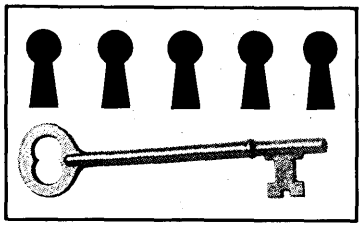
CIRCLE 35 ON READER CARD

MAKING THE TOUGH DECISIONS



A budget-management report from United Way

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The people decide

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LITIGATION

ADAPSO VERSUS CITIBANK

Through legal wrangling, the trade group is trying to keep the big banks off its turf.

Beware, all ye data processing entrepreneurs. The big, bad banks are hungry to swallow you.

Or so the Association of Data Processing Service Organizations would have a federal district court and the Federal Reserve Board believe.

The trade group has been promulgating that theory rather successfully since 1977, when it sued Citibank and the Comptroller of the Currency. The suit alleges that the offering by Citibank of certain dp services is in violation of the Bank Holding Company Act. The act requires that a bank holding company or its subsidiaries engage in only those activities that the board has determined to be "so closely related to banking or managing or controlling banks as to be a proper incident thereto."

The complaint also asks that a 1974 interpretive ruling by the Comptroller be declared a violation of the National Bank Act. That ruling gave banks an opportunity (ostensibly in the name of progress, according to then-Comptroller James Smith) to sell "excess" computer power.

At the moment ADAPSO has a slight lead, having persuaded Judge Kevin Duffy, U.S. District Court-Southern District of New York, in late December to dismiss Citibank's counterclaim. Citibank had charged that ADAPSO conspired and combined with its members to delay the bank's entry into the data processing services business and that the action constituted a violation of the Sherman (antitrust) Act.

The action has since shifted to the Fed, and all bets are off. That body gained jurisdiction of the controversy when the $110 billion Citicorp, Citibank's parent holding company, applied for authorization to engage in certain data processing and transmission activities through a subsidiary called Citishare. That authorization would presumably require changes to some of the Fed's current regulations.

ADAPSO, joined by members ADP Network Services, Comshare, National CSS, On-Line Systems, Quantum Science Corp., and Tymshare, took strenuous objection to Citicorp's request. It asked the board to either deny the application or order a formal hearing on it. The board decided in November to hold a hearing on the application, which included a proposed amendment to the Fed's Regulation Y. Pursuant to that notice, Judge Duffy placed the case on the suspense calendar pending the outcome of the hearing.

The antagonists had at each other in a recent prehearing conference before administrative law judge Walter Alpin. ADAPSO's counsels were armed with an 83-page prehearing memorandum; Citicorp's attorneys were free of such weighty tomes. The judge made no reference to the written words, preferring to concentrate on the spoken ones.

If Citicorp has its way, Regulation Y will be drastically amended. It currently authorizes nonbank subsidiaries of bank holding companies to engage in dp activities only for providing bookkeeping or dp services for the internal operations of the holding company and its subsidiaries and storing and processing other banking, financial or related economic data.

Citicorp's argument is that the two provisions of Regulation Y, while well-intentioned, are not flexible enough to accommodate the current diversity of dp services offerings nor to anticipate future technological developments. Its revision would "clarify the fact that it is directed solely at the banking, financial, or economic nature of the underlying services and information being provided by means of data processing and transmission, while leaving to the bank holding company the latitude to choose the manner in which those services and information are to be offered."

In addition to the amendment, which would greatly widen the scope of permissible dp activities by bank holding companies, Citicorp proposes that Citishare will, among other dp activities, provide to others byproducts resulting from permissible dp and transmission activities and sell to others for any purpose any excess capacity on data processing and transmission facilities used in connection with any of the newly authorized activities.

Citicorp argues that the Fed's regulations aren't flexible enough to accommodate the current diversity of dp services offerings nor to anticipate future technological developments.

"No artificial restrictions should be placed on the natural evolution of technology," Citicorp counsel Richard Whiting told Judge Alpin. "Much of our competition comes from unregulated companies, and banks must be able to utilize fully the latest technology to stay competitive. Protestants [ADAPSO and friends] are trying to limit the use by holding companies of this technology and therefore prevent them from effectively competing."

"That is not the issue," countered

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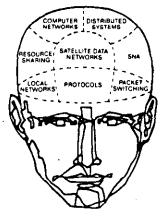

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CIRCLE 41 ON READER CARD

ADAPSO general counsel Milton Wessel. "There's no question that banks can use whatever technology they want. Marketing of dp technology by banks is the issue."

That's not all, folks. ADAPSO challenged Citshare's proposed sale of excess computer time and time-sharing services as means for evading restrictions on processing non-financially related data. It contended that since a purchaser of the proposed time-sharing service would have a terminal on its own site, it would be impossible to monitor the purchaser's use of the computer services to prevent the impermissible processing of non-financially oriented data. It also claimed that many of the proposed dp services were not the kinds traditionally offered by banks.

Going for the jugular, ADAPSO argued that Citicorp's unrestricted entry into the computer services business would result in unfair and decreased competition, undue concentration of economic resources, and the likelihood of unsound banking practices. The adverse effects of allowing the newcomer in would, in this view, far outweigh any potential public benefit.

"The heart of the case," Wessel said, "is to what extent a corporation—a bank holding company—holding a government grant of monopoly power can use that grant to enter another market that has been thriving and competitive.

"For ADAPSO, Citishare equals Citibank. We protest the linking of the bank, the holding company, and data processing. We don't believe that the power of the bank and the holding company can be effectively separated. We are unwilling to rely on maximum separation."

The Fed gained jurisdiction when Citicorp applied for authorization to engage in dp and transmission activities through a subsidiary called Citishare.

After several hours of testimony, the judge gave Citicorp until May 18 to submit its statement on why it should get what it wants. ADAPSO will then have three to four weeks to respond. And as tomorrow and tomorrow and tomorrow creeps in, each side will bring in witnesses and cross-examine them. A firm decision from the Fed, then, is surely months away.

"It continues to be ADAPSO's belief that banks and holding companies should stick to the business of banking," ADAPSO president Jerome Dreyer concluded.

Will they or won't they? Not even the administrative law judge knows for sure. This show has several more acts.

—Willie Schatz

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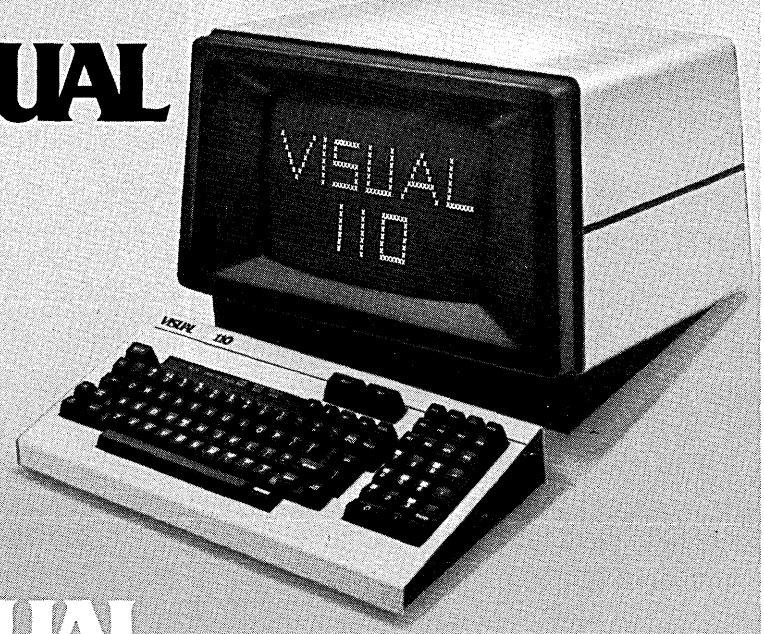

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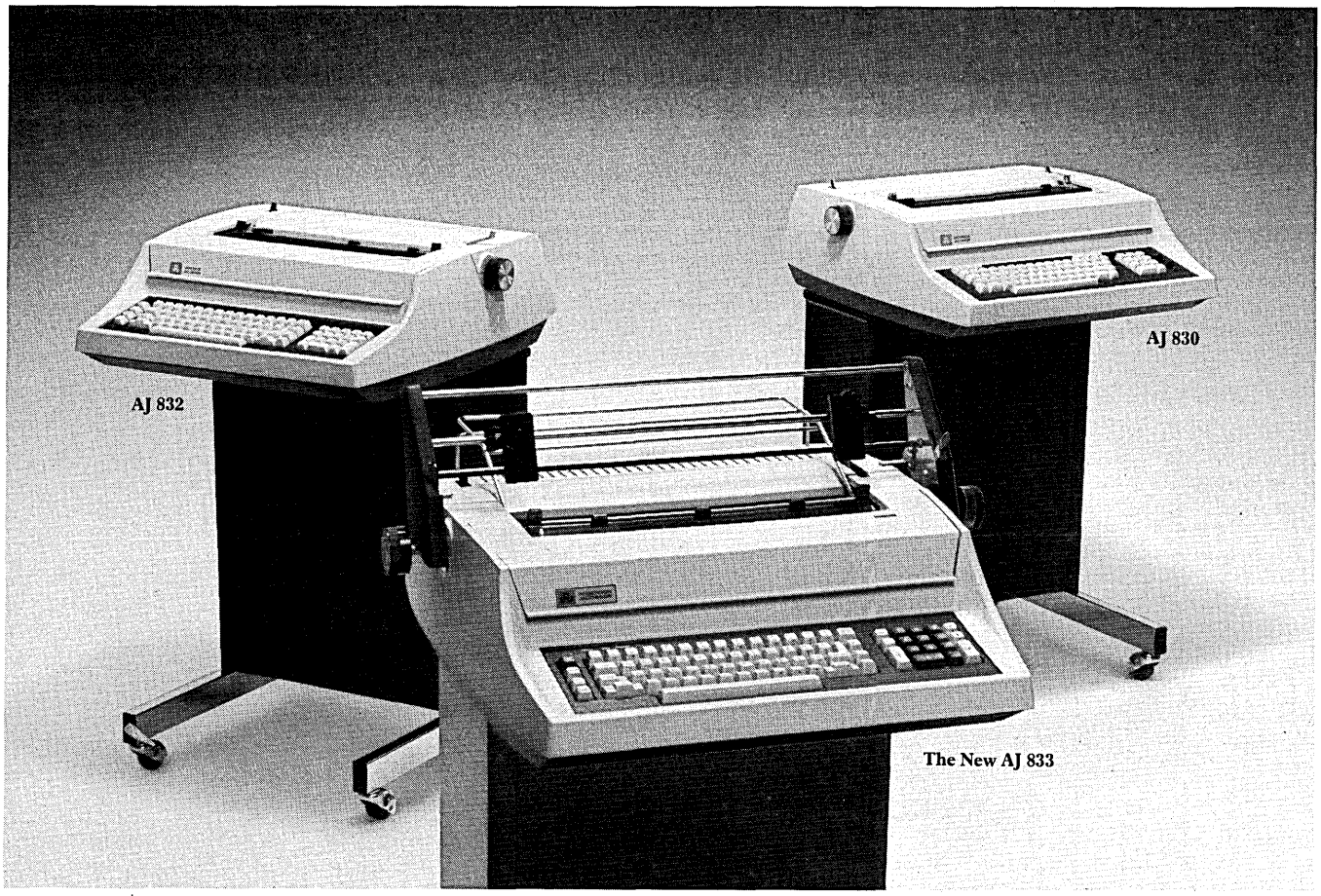
THE PCMS

TAKING A PCM STANCE

Bad times for the economy bode well for the PCM vendors, believes National Advanced Systems.

Ridiculously high interest rates, a lousy economy, and double-digit inflation seem to be providing the shot in the arm needed by the plug-compatible mainframe industry. When businesses are forced to run lean, reduce expenses, but still add to computing capacity, that's when the lower-priced alternatives to IBM systems gain credence in the marketplace. In bad times, says David N. Martin, executive vice president of National Advanced Systems, ". . . we gain market share *percent* and we're impacted less on an absolute basis than, say, IBM or Burroughs is."



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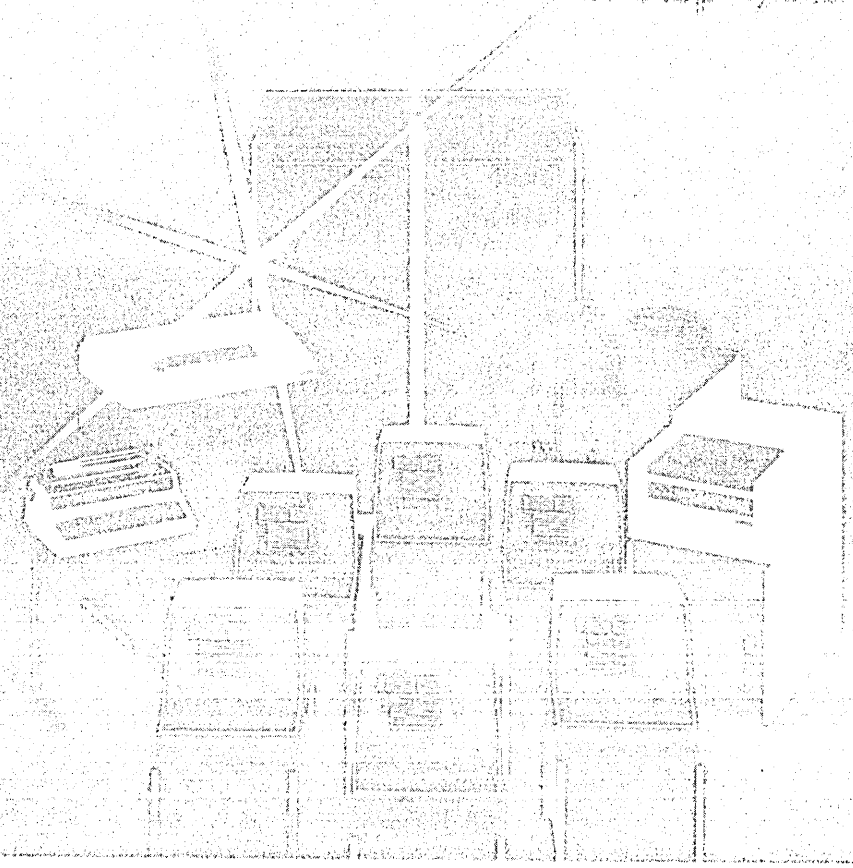

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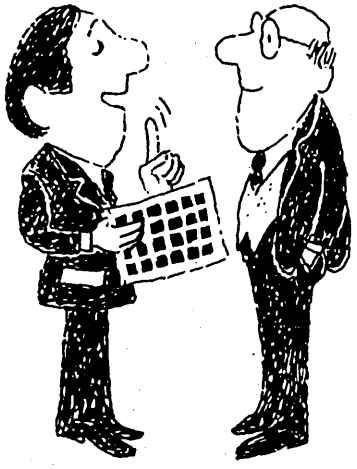

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CIRCLE 45 ON READER CARD

NEWS IN PERSPECTIVE

By Martin's reckoning, the installed base of PCM mainframes worldwide at year-end 1980 looked about like this: NAS has between 500 and 600 processors installed, Amdahl Corp. has from 400 to 500, Magnuson Computer Systems has from 150 to 200, and the IPL/Control Data combine has from 100 to 150. All this has taken place in the few short years since the first of these plug-compatible machines was installed by Amdahl back in 1975. Further, Martin points out, NAS and Amdahl and Magnuson all shipped more hardware in 1980 than ever before. "And that will happen again in 1981."

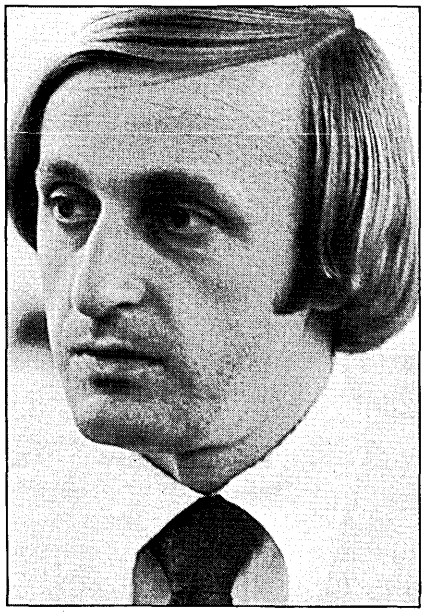
He cites at least two reasons for this. One, the tarnish has about worn off the image of the PCM industry. When IBM established a startlingly new price-performance level with its 4300s, introduced in January 1979, the market went into a tailspin as mainframe customers put a hold not only on new orders but also on deliveries of previously ordered machines. Itel Corp. was forced to turn over its PCM business to National Semiconductor, which found that its first priority had to be to convince its customer base that National was in this business for keeps, that it would be able to continue supporting those customers. Martin personally had to make presentations to his customers' key managements about five times a week, trying to convince them of both the PCM industry's and National's viability. "I can't remember the last time I did one of those," he says now.

NAS strives to have the broadest line of IBM-compatible equipment in the business.

Secondly, he adds, user indecision that stemmed from their uncertainty over IBM's future products and prices has gone away, after announcements of the 4300 Model Group 2s and the more recent 3081. "So people are back in the decision-making mode," he avers.

The Mountain View, Calif.-based NAS strives to have the broadest line of IBM-compatible equipment in the business—not only a line of computers from small-scale to large but also tapes, disks, and communications gear. For many customers, NAS wants to be the single alternative to IBM. The company manufactures medium-scale processors in San Diego, Calif., hardware with power comparable to the IBM 4341 and on up to the 3031. To date, San Diego has produced more than 500 of these computers. In addition, National handles larger mainframes supplied by Hitachi Ltd., these spanning the IBM line from the 3031 to more horsepower than the 3033-AP.

And earlier this year the company added the AS/9000dpc, a tightly coupled system with almost twice the performance of the previously top-of-the-line 9000 imported from Hitachi. The 9000, comparable in power to the IBM 3033MP, is about three times more powerful than the AS/7000, which is also supplied by Hitachi. With the announcement of the 9000 dual processor complex, NAS also lowered the price of a 16MB, 16-channel 9000 to $3,685,000, down from the original $4,520,000.



DAVID N. MARTIN: "Right now we're moving 5000 family products at a higher rate on a worldwide basis than at any other point in the history of the company."

The new processor, of course, puts NAS into the same marketplace as the IBM 3081, as well as Amdahl's V/8 and the new 580s. And for the first time it puts NAS in touch with the nation's largest corporations. The company in recent weeks has hosted representatives from AT&T, GTE, Bank of America, Manufacturers Hanover, General Motors, Ford, and Lockheed—people who have had to come and take a look at what the newest store on the block has to offer. "They never really had reason to be here in the past 12 months," Martin says.

As for installations in '81, NAS says it may be held back not by market demand but by its supplier, Hitachi.

The first two NAS 9000s, announced in September 1980, were installed in December, one at Lockheed in Palo Alto, Calif., and the other at Guardian Royal Exchange Life Assurance Society in the U.K. Martin won't say how many NAS expects to install in '81, citing corporate policy, but says the company might be held back not by market demand but by its supplier. Hitachi reportedly underestimated its domestic demand for the M-200H by a factor of more than two, and the NAS/9000 is based on the production-bound M-200H.

NonStop™ DBMS

5 Unique capabilities in a relational data base of a series

The challenge: NonStop™ operation in an on-line environment.

To design a fault tolerant system (no single points of failure) requires a multiple processor environment and thus a distributed system. Programs must be able to run anywhere and to access data anywhere in the system without specific knowledge of physical location. In the event of a failure, system loads must be redistributed dynamically without changing application software. All this whether the application is running in a single multiple processor system or in a multi-node network. Nothing less could assure availability of all resources through an otherwise crippling failure.

Consider the burden facing data base management in such an environment.

Users must be able to distribute a data base not only across multiple processors, but also across multiple systems in a network.

If the data base model is dependent on hard coded pointers within the files, updating all these pointers is a nightmare. The problem is compounded if any one remote location is not available at the time of an update. Without concurrent access, the state of the data base is potentially inconsistent.

These pointer problems make both hierarchical and network data base models inflexible and difficult to modify. When the requirement to move files and applications among processors and among systems is coupled with the need to maintain the ability to transparently access the data base from any point in the network, the problems become staggering.

The solutions are in the relational data base model.

A relational data base is a collection of data items represented logically as two dimensional tables. Files use logical fields within records as their only required linking mechanism. Users need not be concerned about details of structure, only about the logical relationships which exist between files. This simplicity and the ease of use inherent to relational data bases has been obscured historically by attempts of vendors to shoehorn or add on relational structure to a conventional operating system. The results are laboratory curiosities, interesting but cumbersome, and they give relational models an undeserved reputation for poor performance.

The Tandem data base management system, ENCOMPASS, is the world's first on-line relational DBMS designed right into the operating system.

It is optimized for high performance and NonStop™ operation. Residing in each processor, ENCOMPASS provides complete independence from concerns about physical location of data. A user or an applications programmer need only know the file name of the data, peripheral device or system to be accessed.

Fully integrated into the operating system, the data base system handles enormous numbers of transactions with speed and efficiency.

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NonStop™ Systems

NEWS IN PERSPECTIVE

In addition to the 10 MIPS AS/9000, National is also getting its AS/7000 from Hitachi, the latter machine having about a third the power of the former. Martin notes that customers who have had their 7000 for three years are now looking for upgrades,

To assist in the migration of its 7000 customer base, NAS last month announced the 9000N, a processor with 80% the performance of the 9000.

and says a half-dozen or so prospects for the 9000 are from NAS's own customer base. But, apparently to assist in that migration, the company last month announced the 9000N, a processor with 80% the performance of the 9000.

Below the 7000 is the 5000 family, which traces its lineage back to the Itel AS/7031 made by National Semi and announced by Itel in November '77. The 5000s, including upgrades announced late last year that incorporate features from the IBM 4300s such as DOS-VSE in native mode, are said to be gaining in acceptance. Martin credits this both to the new capabilities and to a stimulation of the market resulting from IBM's 4300 Model Group 2 announcements. "Right now we're moving 5000 family products at a higher rate on a worldwide basis than at any other point in the history of the company," he says. He sees this continuing through the year.

But what excites Martin is that while he expected his smaller processors to be sold to smaller companies, larger mainframes to the largest corporations, he has begun to see 5000s being ordered by the latter for use at their second- and third-level remote sites. It's distributed processing, and just as IBM has been installing 4341s at customers' remote sites, some 50 to 100 at a crack, so also this has begun at NAS, albeit on a much smaller scale. "We now are starting to see some business in that area as well," he says with a smile. That has become an important new market for them, and it's nice to have in one's product line the large-scale mainframes to go along with them.

When National Semiconductor acquired this business in late 1979 from Itel Corp., which earlier this year entered Chapter 11 bankruptcy proceedings, it got some 2,000 customers, the vast majority running some plug-compatible peripherals that required continued servicing by National. Now there are more than 2,000 customers in the U.S. alone, and of them some 300 to 400 are cpu-only customers. Since the acquisition, National has increased the number of customers some 10%, says Martin, but "that hasn't been our focus, adding new customers." The immediate need was to infuse the customer base with confidence in its new vendor. And there is reason to believe that this has taken place.

In 1981, says the confident Martin, the largest shippers of medium- and large-scale computers in absolute numbers will be NAS and Amdahl Corp., following IBM. And this by two companies that five years ago hadn't yet shipped their first computers.

—Edward K. Yasaki

COMMUNICATIONS

M/A-COM PLANS B/C-NET

In a short time, Microwave Associates has grown from a supplier of microwave components to a builder of datacom nets.

It was not so long ago that Microwave Associates was a supplier of microwave components that operated within a relatively narrow segment of the electronics indus-

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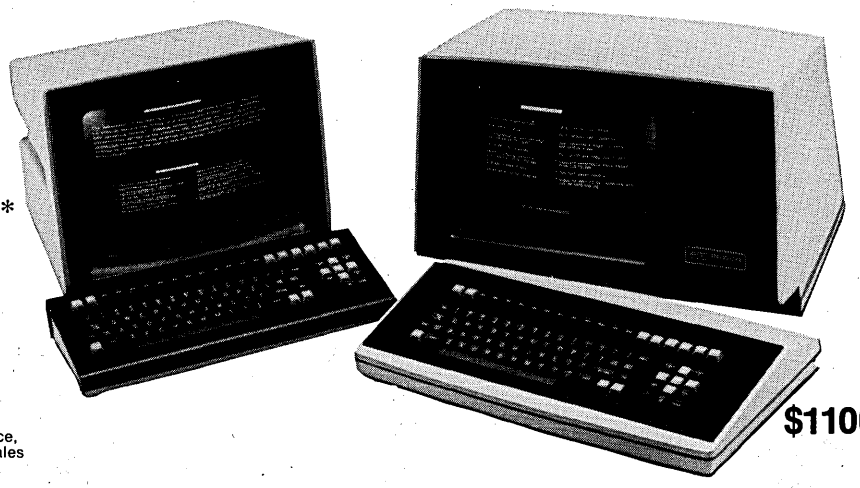

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NonStop™ Network

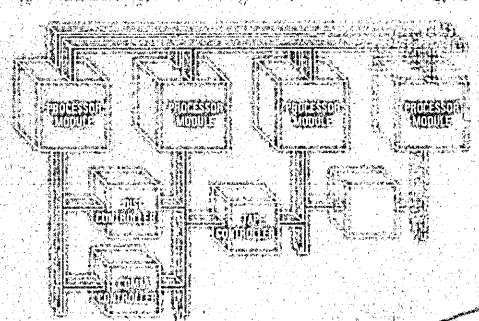
8 Unique network system architecture of a series.

The goal: NonStop™ operation in an on-line 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.

The solution: build on the right foundation. Every Tandem system is effectively a local network comprising two or more processors.

So even the minimum system is already a complete, true distributed processing NonStop™ network. A unique message system at the heart of every system controls communications among processors. Networking software simply increases the scope, to allow communications among as many as 255 separate Tandem systems—each ranging in size from two to sixteen processors. To the user, Tandem's network, EXPAND, appears as a single set of computer resources rather than a collection of individual systems.



The result is something totally new in on-line 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 users' 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, classes and the uncertainty which accompanies other systems when updating 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.

As computing requirements grow, they can add memory, processors or peripheral devices to any site and still retain total compatibility of operating system, data and applications programs.

In fact, nodes consisting of 2 to 16 processors can be added or removed and communications paths altered, all without recompiling or changing a single line of code in existing application programs.

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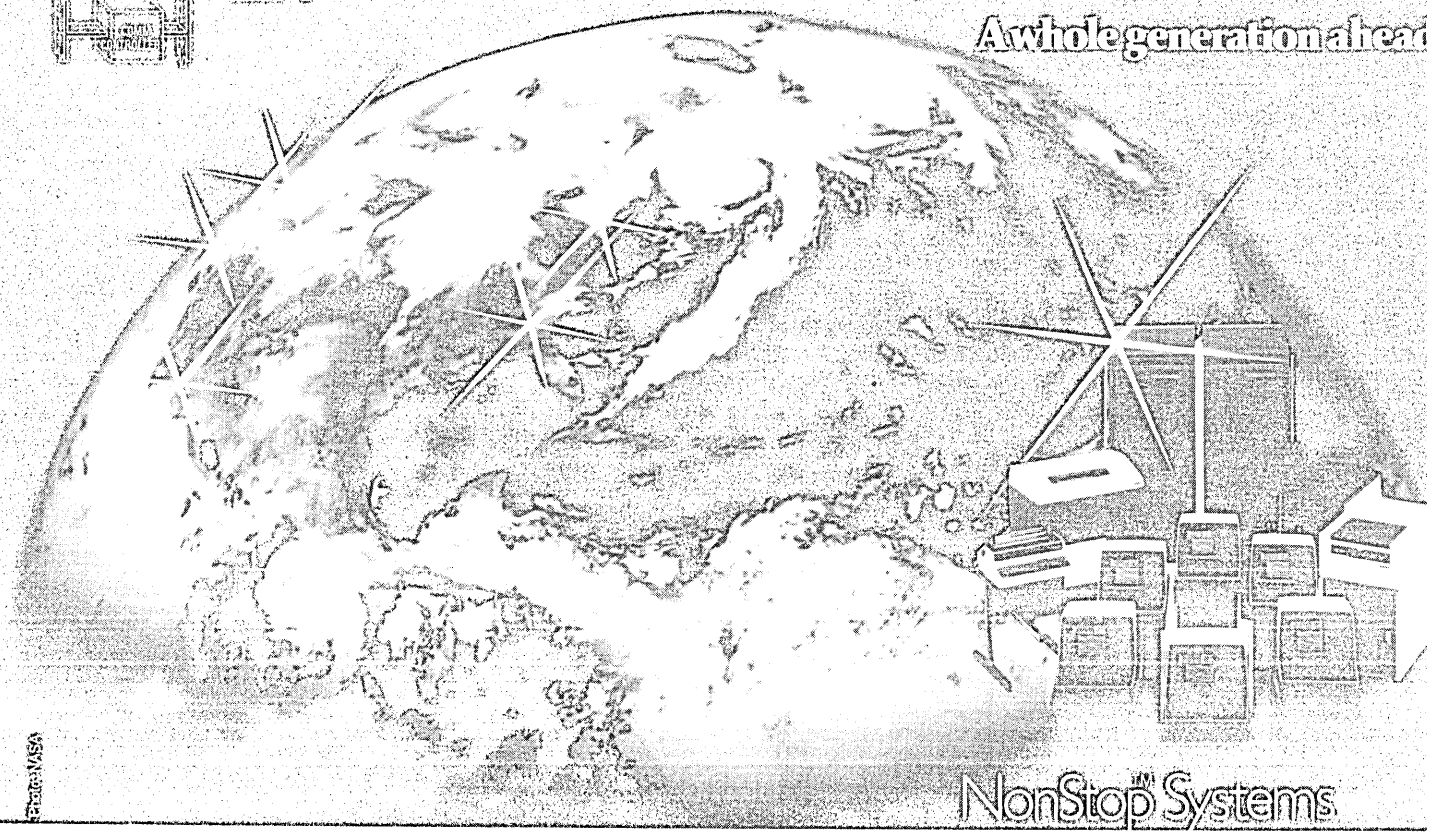

Photo: NASA

NonStop™ Systems

try. But all that has changed since the company went on the acquisition trail in the late 1970s.

Today M/A-Com Inc. is involved in virtually all the burgeoning phases of telecommunications. Of particular interest has been the company's growing involvement in data communications networks as typified by its acquisition of Digital Communications Corp. (DCC).

Having concentrated on assembling the pieces needed to build advanced networks, M/A-Com now appears ready to put it all together—in more ways than one.

In order to meet its own internal communications requirements, the company has announced plans for a network that will initially serve in-house needs but will also form the basis for a commercial network product available to dp and other users. To be called Macomnet, the coast-to-coast system will connect corporate locations with such capabilities as electronic mail and teleconferencing, in addition to data transmission.

For M/A-Com's internal communications, Macomnet will connect corporate locations with such capabilities as electronic mail and teleconferencing, as well as data transmission.

Using satellite communications for long-haul transmission, Macomnet will provide an end-to-end network capability. Earth stations in the system will be 4.6 meter, 15 foot antennas produced by the Prodelin division of the company, according to Andrew Werth, senior vice president of DCC. Locations to be interconnected include Burlington, Mass., which is M/A-Com's current headquarters; Germantown, Md., where DCC is based; North Carolina, where the Valtec division producing fiber optic and other cable is located; San Diego, Calif., where the Linkabit division makes microprocessor-based control equipment for military satellite systems; and Boca Raton, Fla., where M/A-Com will establish a new corporate headquarters.

A key element of Macomnet will be the use of Dynac earth stations which are based on Dynamic Network Assignment Communications using time-division multiple access (TDMA) modulation. Local distribution elements of the network will use the same systems that are being tested in a cooperative venture that M/A-Com is conducting with Satellite Business Systems (SBS) and Tymnet Inc.

Through another affiliate, Local Digital Distribution Co. (LDD), M/A-Com is demonstrating the feasibility of Cable Packet Communications (Capac) and Radio Packet Communications (Rapac) systems. These will be included as part of Macomnet, depending on local transmission requirements, Werth said.

While B/C-Net will be primarily a private network, the company doesn't rule out its ability to interconnect with public data networks.

For the corporate network, such applications as subminute facsimile, both slow scan and full motion teleconferencing up to 1.5M bit/sec, 56K bit/sec data transmission, and other uses will determine the equipment to be used. The follow-on commercial network offering, to be known as Business Communications Network (B/C-Net), will draw on a variety of options so that each configuration is tailored to the needs of the customer, he said.

With Macomnet scheduled to be operational in the spring, the company expects to have a commercial version ready before the end of the year. Discussions have been held with several prospective companies about the installation of B/C-Net, Werth revealed.

The Rapac system was originally part of the cellular radio concepts proposed as part of the Xerox Xten network, and

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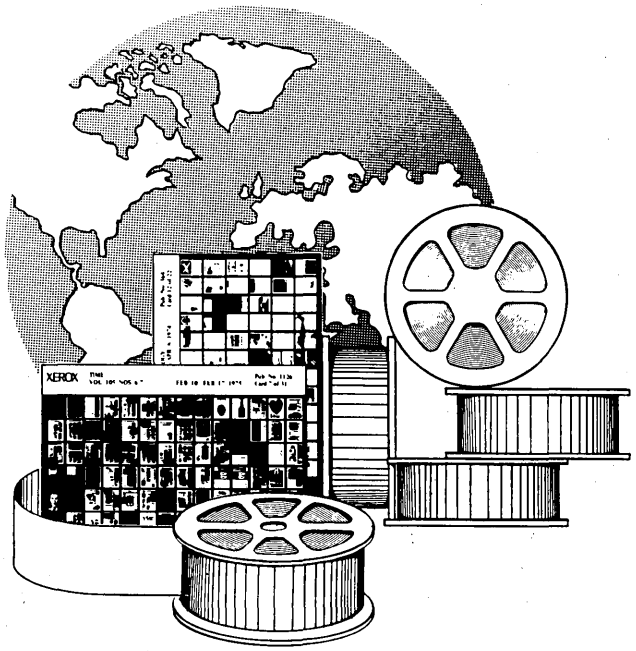

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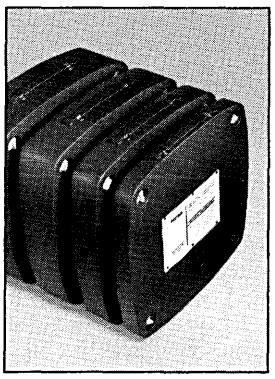

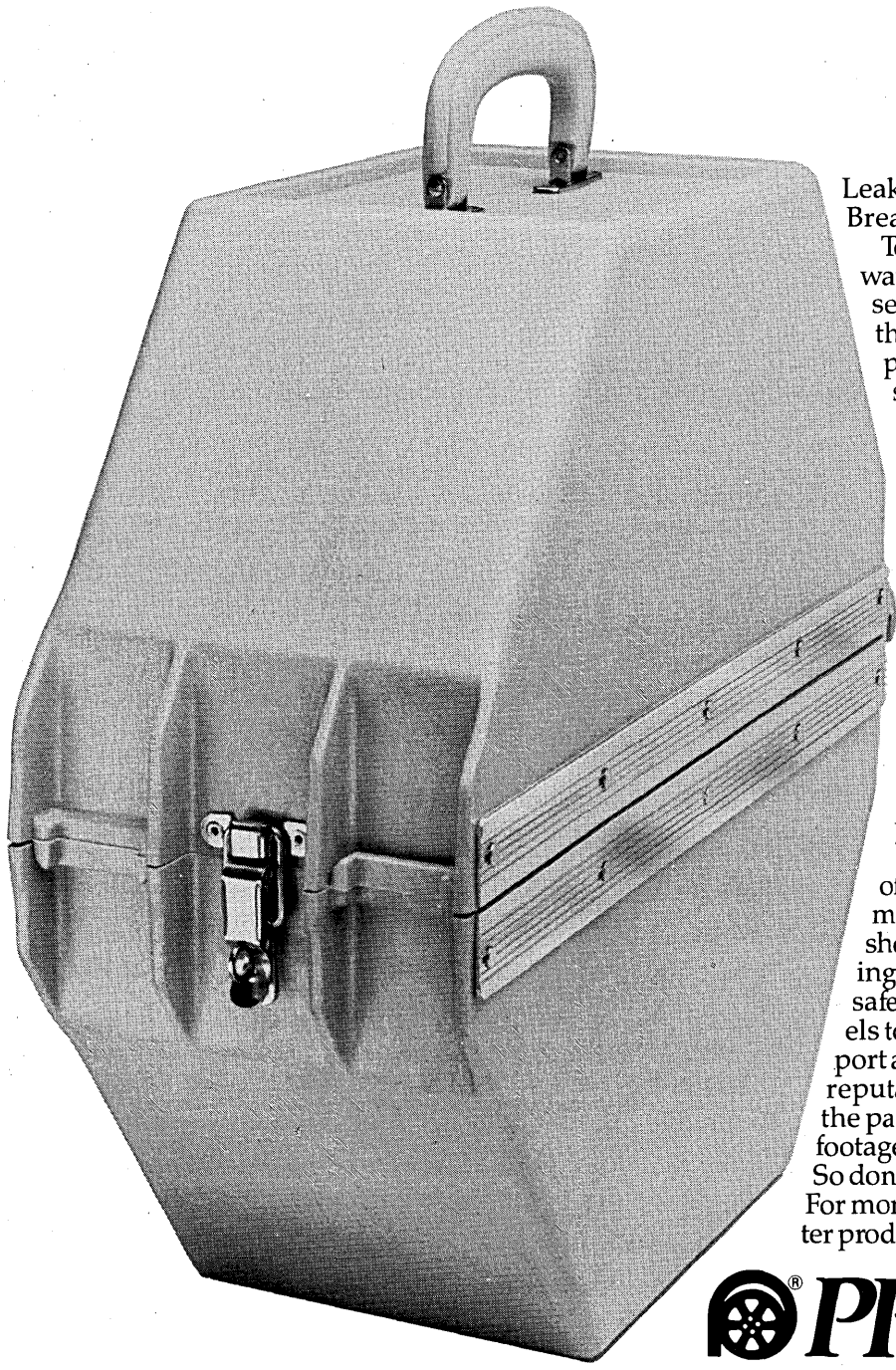

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CIRCLE 50 ON READER CARD

some FCC approvals may be required before this type of distribution system can be included in the company's commercial offering. The highly directional, low power radio system was proposed to operate at 10 GHz, but this could be modified for other frequencies if the Xten proposal is not authorized, he explained.

While B/C-Net will be primarily a customized private line network offering, Werth did not rule out its ability to interconnect with public data networks if customers need this type of extension. Although the network offering will depend greatly on each customer's requirements, Werth said that costs could come down to "about $90,000 per earth station site."

The key advantage of B/C-Net, according to Werth, is that the user can get a customized network, including intercity, intracity, and even intrafacility interconnections. Satellite links can be replaced with other long haul transmission if that seems more feasible, and all-digital Dataphone Digital Service (DDS) facilities would be compatible with the system, he said.

Essentially, B/C-Net is an integrated corporate network solution for large business users. In order to prove the concept, Macomnet will be used to link the most demanding customer of all—the parent corporation.

—Ronald A. Frank

A PRO AT SNA SOFTWARE

A software package from Comm-Pro Associates allows teletypewriters and similar asynchronous terminals to transmit data to IBM mainframes operating in SNA nets.

While users of IBM's Systems Network Architecture (SNA) wait for the vendor to provide support for terminals attached to X.25 nets, a small telecommunications software supplier already has such a product.

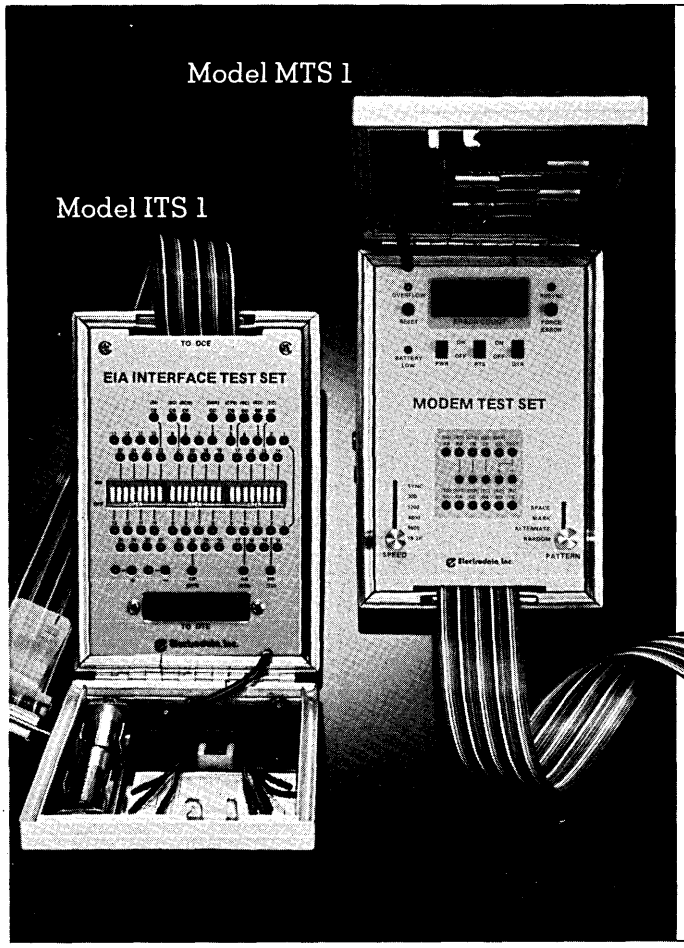
Comm-Pro Associates, which specializes in giving IBM 3705 users features not available from IBM, has a package that allows teletypewriters and similar asynchronous terminals to transmit data to IBM mainframes operating in SNA nets.

Called Network Access Software (NAS), the package later this year will be upgraded to support IBM's main line of 3270 type crt terminals, according to Steve Dubow, a Comm-Pro partner. While admitting that his X.25/SNA software has drawn a high level of interest from IBM network users, Dubow pointed out that his firm has specialized in such products since 1973.

Starting with packages for the earlier IBM 2703 line controller, Comm-Pro later phased into software for the 3705 when it became the main front-end for IBM network customers. Today the firm has packages running at more than 200 user sites, and in each case the software makes maximum use of IBM software so that existing applications and network operations are not adversely impacted.

Does Dubow worry that the software modifications developed by his company will be announced by IBM? Not really. He explained that IBM cannot afford to write specialized teleprocessing software unless its market studies show that enough users will want it and use it to justify the development effort.

So what about SNA support for X.25? Dubow said that it would take widespread support for the international standard on a network like AT&T's long promised Advanced Communications Service (ACS) for IBM to make a major commitment. He hastened to add that IBM might offer more limited X.25 support before that, but in either case he doubted that such a move would severely restrict Comm-Pro's opportunities.



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CPDS

A similar situation exists with the impending upgrade to the 3705. While the new front-end may include more liberal SNA features for users, IBM has so much software development folded into the 3705 that it cannot afford to completely obsolete existing SNA software systems, Dubow believes. Also, users have put significant effort into migrating to SNA, he added, so any new front-end capabilities will have to be approached in an evolutionary manner.

The list of Comm-Pro software packages, which now number more than 10, read like a cookbook of features that users of IBM front-ends would like to have. Such capabilities as automatic speed select by a 3705 of teletypewriters and IBM 2741 terminals on the same line; code conversion between ASCII and BCD terminals; the ability of low-speed terminals to access multiple IBM hosts through a 3705 are routine with software from the independent supplier.

Comm-Pro was an outgrowth of an early data communications company called American Data Systems (ADS). In the early 1970s, ADS had a front-end that had many of the advanced features not available until much later on the 3705. When the company went out of business, its ADS 900 front-end had more power than an IBM 360/40, Dubow said.

So with ADS gone, Dubow and others formed Comm-Pro to provide software that would give many of the advanced features to IBM front-end users. Although there have been few suppliers of front-ends, Dubow gave credit to Comten, which he said was comparable in capabilities to the ADS equipment. Comten is now part of NCR, but for many years it was one of the few independent front-end suppliers.

Getting back to the Comm-Pro X.25 package, Dubow explained that the key to making a teletypewriter compatible is to make it look like a known terminal device to the IBM host. "On either end of the X.25 connection it looks like a Teletype, and when it gets into the Network Control Program (NCP), it maps the Teletype to SNA. That's how it's done," he said. This software mapping is done by the IBM Network Terminal Option package—with modifications developed by Comm-Pro.

Asked if the overseas products available from IBM will be similar to U.S. X.25 support, Dubow said the current overseas versions rely on both software and hardware. "It's much cheaper to do it in software than to do it in both hardware and software," he said, suggesting that IBM would probably use an all-software approach for U.S. network users.

For IBM, the stakes are high in deciding what features it will give its network users. As IBM unfolds its capabilities, the specialists at Comm-Pro look for little niches that have been overlooked where they can tailor a package.

—Ronald A. Frank

APPLICATIONS

SOCAL'S SOLUTION

Programmers produce an average of 4,000 lines of debugged code per month in the programming environment at Standard Oil of California.

There's something to be said for those things called programming environments. Especially one that enables a programmer to produce an average of 4,000 lines of debugged code per month. And one where the dp management is equally ecstatic about other benefits it is getting.

The company is Standard Oil of California, based in San Francisco, and its environment is called the Chevron Program Development System (CPDS). It is an integrated applications programming environment centered around its own version of PL/1. Programmers write only macros of executable code in a language called PL/X (for programming language/extended), and from each programmer-written line of PL/X code the system generates between one and 10 lines of PL/1 code. This explains in part applications programmers' high output.

Because the system generates the source code, it also achieves a very high level of standardization. This, in turn, eases the maintenance job. But the CPDS also facilitates system definition and documentation, analysis and design, system test, installation, and production, in addition to programming and system maintenance. For management, it also provides access to information about project cost and progress to date.

The CPDS has been used by SOCAL for just over four years, developed at a cost of about a half-million dollars when the company had to develop a credit card processing system. At the time, that was considered a large job, perhaps requiring 15 to 20 man-years. After that came a wholesale marketing project, which appeared to be a 200 man-year endeavor. With a project that

The many facilities offered by the CPDS also chew up a lot of machine cycles, making computer costs high.

large, requiring at least 80 people, "we had to have something, especially in the IMS environment, which is very complicated, to try to hold them together," says David P. Davis, application consultant with the

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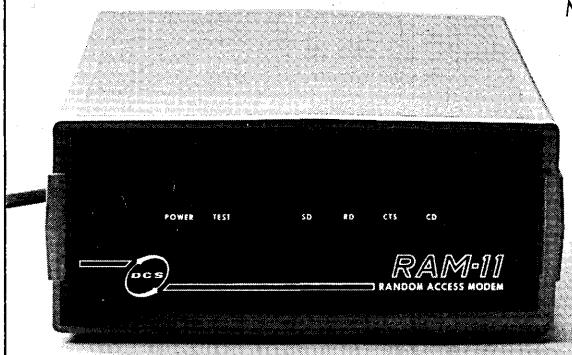

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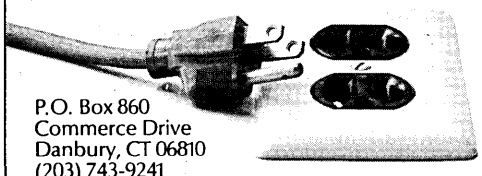

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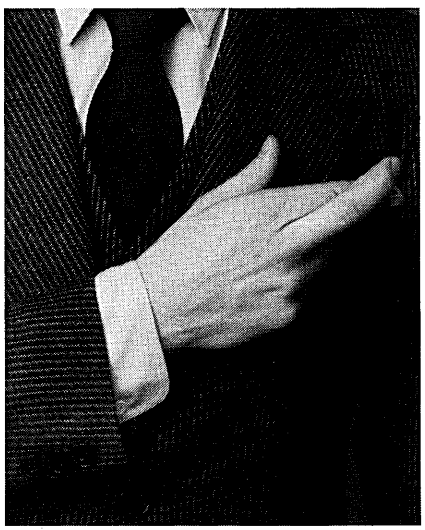

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Computer Services Dept. at SOCAL.

For the wholesale marketing project, the productivity of each programmer was about 2,000 lines of PL/1 code per month. But Davis explains that on large projects something less than 50% of the people are actually producing code; the remainder are support people and management folks who, obviously, are not programming. So if one takes the 2,000 lines of code and dilutes that by including the other people on the project, it comes out to about 1,000 lines per month. More recently they've had programmers on smaller jobs and here the output has been about 4,000 lines. Typically, on small projects everyone programs, so there's no dilution. And that gives you a 4 to 1 ratio between a three-man project and a 50-man project.

"During the period when people are programming and testing," he says, "we figure we gain somewhere between 5 to 1 and 7 to 1 over the more manual methods we used prior to this." But the CPDS does not make much difference in productivity in the front-end activities, getting the specifications and doing the design work. In the early days, programming and testing was perhaps half the project, but now it's more like 15% to 20% of the total. "Also, modern methodologies put a lot of emphasis on the front end—doing lots more design before you start programming." This has made the front end bigger and helped lower the ratio.

SOCAL feels it has been able to get programmers productive in a couple of months, even when they know nothing about IMS.

Davis says it is difficult to cite statistics of the CPDS as a maintenance tool because of a lack of numbers that make comparison possible. But the credit card system is being maintained by only three people. He says another large oil company is still using manual programming methods, has the same size credit card customer base, and has 35 people maintaining its credit card system. "It wouldn't be fair to take full credit for all of that, but there's a fair difference in maintenance," he adds.

But the many facilities offered by the CPDS also chew up a lot of machine cycles, and in the maintenance mode they try to do everything with the computer. "The computer cost, for maintenance, is high," Davis admits. Traditionally, when it had to estimate the cost of a project, SOCAL used to figure 50 cents of computer chargeout per dollar of manpower. With this system, at least in the maintenance phase, it's two dollars of computer chargeout per dollar of manpower charge-out.

This, however, does not bother them because the number of people required has gone down dramatically. Besides, the cost of people is going up while the cost of computers is coming down, so they figure it's a good trade-off.

If SOCAL had it to do all over again, would it take this same programming environment approach? "Oh, yes," enthuses Davis. "Primarily, I think, because we really don't see how we ever would have accomplished those two enormous projects without some programmatically enforced standards. To get people to try to enforce them is almost hopeless in that environment."

An additional benefit has been the ability to front-end IMS, "trying to keep the programmer from having to know so much about [IMS] in order to use it," he explains. The company feels it's been able to get programmers productive in a couple of months, even when they know nothing about IMS, with this system. Before CPDS, it might have required two years to get them productive to the same level. Davis explains that CPDS is not for IMS exclusively, and is used for other things, but the major thrust has been with IMS, perhaps because it's the hardest thing to code.

Significantly, the system has become so popular with programmers that they consider it *the* development technique. "For the first time in this company's history," says Davis. "It looks like we finally have development under control, in the sense that almost everyone is doing it the same way. We know how they're doing it because they're going through programs we've written and so we have the control to change those programs and therefore change their output. We didn't really anticipate that direction, but these days that's probably one of its most important benefits."

Recently the company performed an inventory of the programs written in this manner, finding something like 100,000 modules—individually compilable PL/1 programs. If something about IMS were to change, or if their understanding of IMS were altered, and they wanted to modify the way those programs deal with IMS, it would be virtually impossible to locate that many programs and change them to deal more effectively with IMS. But now they know where the programs are. Much more significantly, they can (and quite often do) change the code generators in the CPDS, then pass all those programs through over a weekend, and they'll have all the Standard Oil systems pick up on that new technique.

A significant benefit is that the cost to train programmers is said to be "much, much less."

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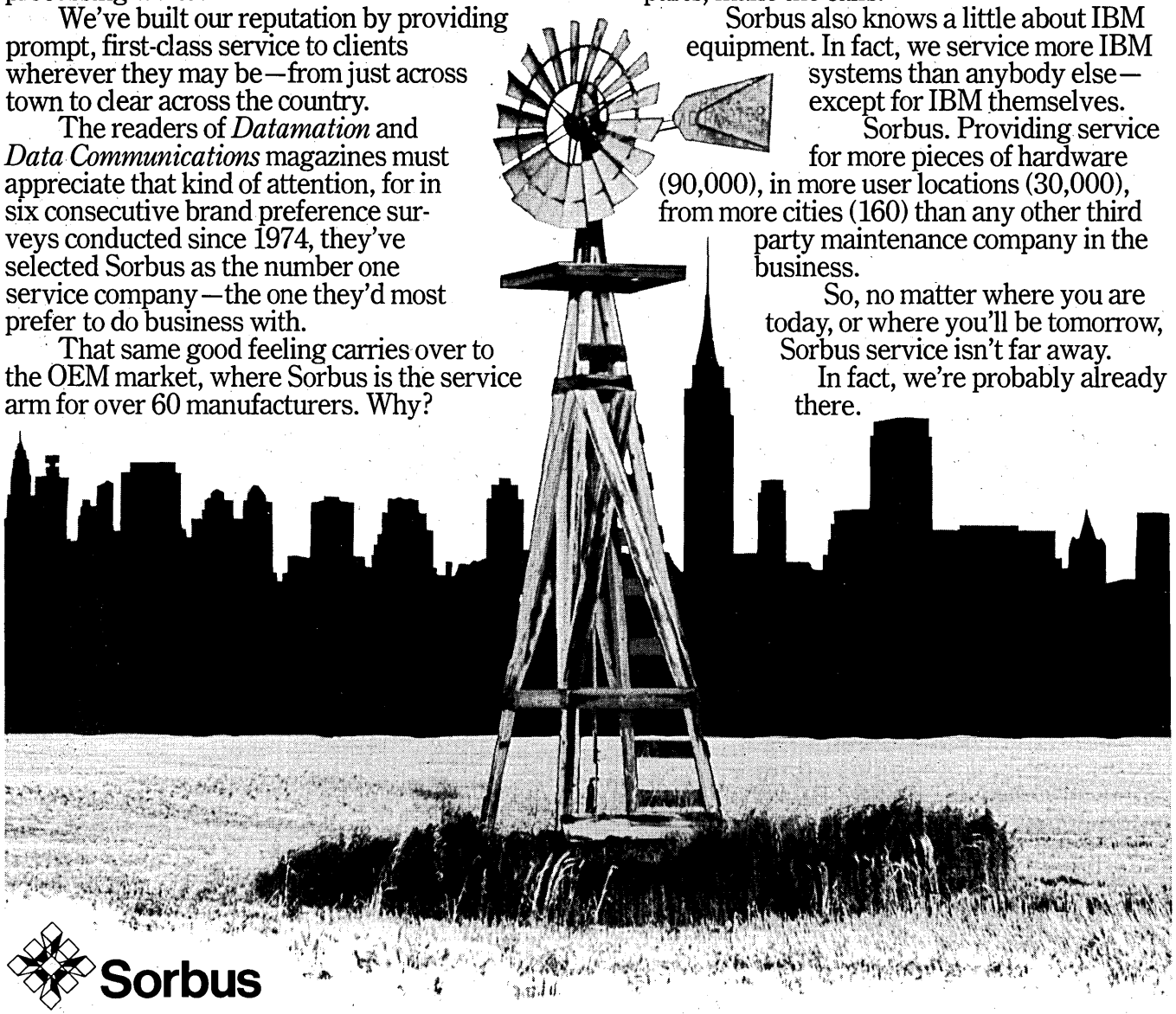

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ically maintained by programs, we have the underlying data to do the job with," says Davis. "Because of that, I think we'll get there sooner than many other companies."

Hiring programmers to work in this environment hasn't been a piece of cake for the people at SOCAL. College graduates, having been taught that the latest thing is structured programming, tend to be enthusiastic about using modern methods; the oil company has had its best luck with these people. Older, more experienced people tend to feel that what they have to sell in the job market are the skills they've developed under the old methodologies, and so some of them don't like this environment; others like working with new techniques. So it's a push.

"On the other side tend to be people like myself who are interested not so much in the application but in the internals of the computer," says Davis, "how it works, what goes on at the bit and byte level. Those people don't like it, of course, because what we've done is to put up a big piece of software between them and what's really happening." Fortunately, these people are in the minority. Most get their kicks out of the application, producing the code and seeing it work. They're happy because they can do this more quickly, can turn out more code, and can see how happy the end user is.

Programmer turnover at SOCAL, then, has not been inordinately high or low, but is thought to be in line with industry norms.

A significant benefit is that the cost to train programmers is said to be "much, much less." This is because of all the software positioned between the programmer and most of the things that are difficult to deal with—JCL, IMS, library maintenance, change control. "most of those things happen automatically," Davis explains. "You just say, 'I'd like to change this program,' and something marvelously does that." As a result, SOCAL is able to get a programmer to a productive state more quickly. College graduates become "reasonably productive" at writing IMS transactions in a couple of months and a few have become very proficient at writing applications in 18 to 24 months.

Davis is quick to admit to a disadvantage. "If you're shielded from all this stuff, you really don't have a deep understanding of what's going on behind the scene." Novice programmers might become productive much more quickly, but the technical knowledge is harder to come by—unless the individual takes it on himself to study it. "We don't encourage them to do that, but we don't discourage them either." There's a large backlog of applications programs, and that's the focus of management's effort.

But while the average programmer might have a poorer understanding of the host system, it also need not be a problem. Davis, who says the system can also be a good teaching tool, notes that most of what he's learned about programming has come from reading other peoples' programs. The programmer is able to see the code generated by the system, "and it's a fairly good teacher that way."

In that context, Davis says the code generators were written by highly experienced people, and he thinks they produce good code. Criticisms are often heard about a system producing inefficient code (like, you can turn it out fast but it's pretty bad). He doesn't think that's true of CPDS. "I would grant that you could probably, on average, take 15% or 20% out of the program by very careful hand-coding, by recoding by hand. But no more than that."

The next phase, which SOCAL has already started, is to automate the design functions, the front-end job.

Similarly, the system makes possible quick changes. If someone finds a way to produce more efficient code, this change can be made, and then the 100,000 programs run through once again to be updated with the new methodology.

Standard Oil of California's CPDS is obviously concentrated on facilitating the coding processes. Davis points out that fellow oil company Exxon has a system that puts the stress on the design functions, the front-end processes. "I'd love to meld the two," he says. But SOCAL has already begun an independent effort to automate the front-end job.

"I think we need to come up with tools that will allow us to prototype systems very quickly," he says. He defines "very quickly" as being within a week or two, by which time the user should be able to see something. "Then we use the information that the prototype gathers, just by virtue of doing it and the user trying it, to generate the final system." Such a prototyping system is under development and slated for testing this year. It is based on National CSS's Nomad system (see DATAMATION, May 1980, p. 165), which is said to have facilities that make that capability easier.

"But making that giant leap, from being able to put up a system quickly in Nomad to converting it programmatically to IMS . . . that's a big one." It won't be accomplished quickly or easily, if at all, he cautions.

Unfortunately the existing CPDS is not bodily transferable to other dp environments. The long list of impediments to pulling off such a job include the use by SOCAL of the National CSS operating system, VP/CSS, which is different from any other operating system, though closely related to VM/370.

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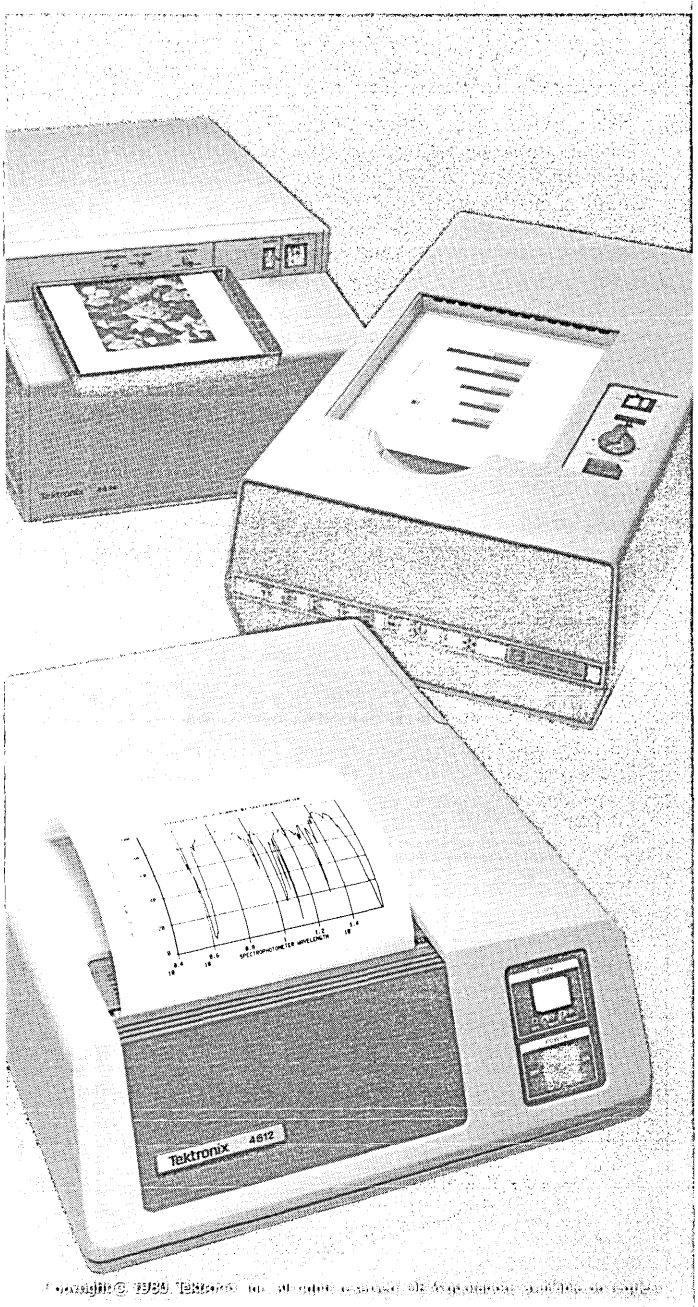

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SOCAL gave serious consideration to converting to VM and estimated it would require four man-years. If the conversion were instead to TSO, it would take eight man-years. And if, say, one had to go to a Univac system, it probably would be easier to start from scratch, retaining only the concepts.

Davis sees the Standard Oil systems as but an interim solution. It's very procedural, and he'd like to see it more declarative. "The solution to the programming problem is not to write better tools for professional programmers," he says, "but to get rid of professional programmers—and provide the end user with a language that's business-oriented so he can write his own." He acknowledges that that's a lovely solution but also thinks we're a long way from it.

—Edward K. Yasaki

SOFTWARE

A SEQUEL FOR DATA BASES

IBM offers the relational alternative.

IBM's experimental relational database system—System R—seems to be coming out of the back rooms of the R&D lab and into the commercial marketplace. On the last working day of January, Data Processing Division announced SQL/Data System, a licensed program product for IBM's "intermediate range of computers: System/370 (models 138, 145, 148, 158), 3031, 3033-S, 4311, 4341, or compatible processors supported by VSE/Advanced Functions Release 3."

General availability is slated for February 1982, with a basic license going for $300 per month and support for the licensed program priced at $105 per month.

SQL stands for Structured Query Language, although it is more than simply a query language. Developed as part of the System R effort headed by Frank King at IBM's San Jose, Calif., research center, SQL has been known since the mid-'70s. System R was an attempt to implement the relational model of data, formalized by Dr. E.F. Codd, also of IBM San Jose. The original definition of SQL (pronounced "sequel") was published under the authorship of Donald Chamberlin. It's a unified data definition and data manipulation language. Chamberlin did a great job, according to Larry Ellison, president of Relational Software, Inc., in nearby Menlo Park. Since the language definition was in the public domain, and since it is powerful, uniform, and relatively easy to grasp, Ellison and company chose to implement versions for a number of machines, from minis up. (SQL is the language of Relational Software's Oracle database management system.) As with minicomputer makers and distributed processing vendors, Ellison delights in IBM's "legitimization" of his company's offering. "IBM will educate people to SQL," says Ellison, adding that there's plenty of business to be had in sublicensing RSI's implementation to PCMs, as well as selling minicomputer versions.

Ease of use is perhaps the most ambitious design goal stated by IBM for SQL/DS. The SQL user doesn't need to know how the data are stored.

Developed under VM (and also installed under MVS), San Jose's System R has been seen by a number of people outside the company. Most who saw the system reported that it evidenced massive uses of system resources—both machine cycles and memory. As recently as a few years ago, observers were saying that System R would never make it out the door—it could eat a 370 alive, leaving little if anything left over for applications processing.

Still, cycles and memory continue to decrease in cost, while personnel costs climb rapidly. IBM's facility at Endicott, N.Y., took on the responsibility for taking System R out of the lab and into the computer room. Today's announcement is probably a polished version of System R, says Ellison, adding that it will take a few more years before the system can be totally rewritten.

SQL/DS, the IBM announcement states, should be useful in many applications, "particularly those involving user analysis, reporting, and planning—where the very nature of the applications is constantly changing. . . . These applications typify instances where it is of primary importance to be able to establish inter-relationships within the database, dynamically define new tables, and to have integral query/report writing facility."

Ease of use is possibly the most ambitious design goal stated by IBM for SQL/DS. Commenting on the commercial product offering several days after its release, Dr. Codd noted that "perhaps the most outstanding feature of SQL/DS is its support for *automatic navigation* to the target data." This lets the user access data "by specifying *what* he or she wants, not *how* to get it." The SQL user doesn't need to know how the data are stored, unlike the user of hierarchical DBMS prevalent today, systems which require skilled programmers with a knowledge of the underlying structure of the data and how to navigate through the database.

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established under SQL/DS readily accessible to end users who have little or no knowledge of programming," Codd says. He adds "This very same feature also makes application programmers more productive, since they can concentrate on the essential logic and data requirements of their applications, instead of concerning themselves with the details of data representation."

Those hierarchical database are out there, though, containing countless data

SQL seems planted in fertile ground—the DOS/VSE environment.

essential to the operations of organizations in every sector. The ingenuity of systems implementors and the rapidly falling price of hardware have, to a great extent, quashed the early objections to relational databases —no longer is it prohibitively expensive to run a relational system. The current roadblock is compatibility—an organization with a large investment in an existing DBMS isn't likely to chuck all its applications and rewrite them for a new system. And IBM, the market-driven organization that it is, doesn't seem in a position to shove its large IMS users into an incompatible system.

So, SQL/DS seems planted in fertile ground—the DOS/VSE environment. No IMS here, just DL/I. And SQL has a one-way bridge from DL/I: an extract function can copy information from a DL/I database into SQL tables (although there is no converse capability to transfer data from SQL tables into a DL/I structure).

As the 4300 announcement proved so emphatically, IBM can and will drop machine prices while raising performance—where it sees fit. The nearly explosive popularity of those 4300 processors attracted an avalanche of new users (and excited the PCM market as well), further aggravating staffing problems. SQL's ease-of-installation and ease-of-use design criteria place "additional requirements on the program product, which, in turn, may increase the system resource requirements (cpu cycles, real storage, I/O activity, and DASD space)." Without the 4300 foundation, it seems likely IBM would have trouble selling SQL, which requires at least 1MB of real memory and 2MB if the DL/I extract function is to be used.

With the 4300, IBM can sell to new users who are not yet locked into a hierarchical DBMS. And, Codd points out that applications can use both SQL and DL/1 databases concurrently. Under application program control, data can be written to both databases, with the actual commitment performed simultaneously (i.e., commitment succeeds in both databases, or is backed out of both). While IBM hasn't provided a two-way bridge, it has provided a foundation.

From a marketing viewpoint, one also notes that SQL/DS doesn't compete with IBM's best-known step towards relational databases—QBE (Query by Example). QBE works in a different environment: VM/CMS. A statement of direction released with the SQL/DS announcement concludes: "In summary, the SQL/DS announcement has expanded the IBM VSE data systems offerings. It is IBM's direction that any future analogous offerings in the MVS (CICS, IMS, TSO) and VM (CMS) environments will address similar customer data requirements."

—Bill Musgrave

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some time with the idea of a bigger presence in the U.S. But it was only over the last few months that it found the bargain it was looking for.

"DASD gives us 500 more employees, a company with a profitable growth record since 1974, and a network of 29 branch offices covering most of the U.S.," declared CGS vice president Phillipe Dreyfus after the late January takeover.

CGS' growth from a $6 million to a $200 million a year company in 10 years' time stems mainly from mergers and acquisitions.

But clearly attractive to CGS was the fact that DASD was still independent, giving it a similar company ethos to CGS, which is still controlled by one man, president Serge Kampf. Also, its geographical spread contrasted with the more regional nature of all but very large U.S. software companies.

At DASD, the takeover should mean little change in the early days. The French management is happy to let local staffers get on with a job they have been doing well. But they hope that there will be additional benefits to DASD in the takeover. Another CGS vice president, Jean-Baptiste Renondin, says he expects DASD's business to score in three ways.

Access to CGS' 60-odd European offices will help DASD sell its expertise to multinationals with overseas offices located near a CGS facility. Secondly, Renondin hopes DASD will be able to capitalize on some of the special know-how already present in France, "particularly in the electronic phone directory [cheap terminal] area and systems which dialog with the general public." Lastly comes the claim that the bigger company will offer more opportunities for existing personnel at the smaller U.S. firm.

Apart from strict financial reporting to a set formula, there is little chance that French management methods will be forced on DASD personnel, asserts Renondin. Nor will DASD employees or their customers have to brush up on their French. *Le software* will work equally well in all languages, he said.

The inexorable growth of CGS from a $6 million a year company just 10 years ago stems mainly from mergers and acquisitions, though the company is anxious to point out a 27.5% growth in sales last year when there were no significant structural changes in the company. Just why the growth occurred can be attributed to a number of French government planners and a few individuals like Kampf.

To have a share in world software and consultancy markets—which account for a remarkable 90% of the company's revenues—industry strategists came to the conclusion that the cottage industry approach, hitherto the primary mode in the software industry, would do for only extremely specialized outfits. So the plan was to build up software and services companies till they reached an "industrial" size. Backed by a little government money and a lot of moral support, the French companies have grown fat. Of the European top 10 in the software and services sector, the majority are French. Apart from government software contracts, CGS benefited financially from the French Nuclear Energy Agency, which controlled a 34% share of the group until recently.

Now, with 3,500 personnel including the DASD people, CGS reckons it has software production well tapped. One tool its programmers have been using for years (and which the firm has sold to a number of large users) is its CPL1 compiler, which can take a source program and output object code suitable for a wide range of mainframes and minis.

Products are still a relatively small part of CGS's activities compared with contract systems and programming work. Ultimately, CGS hopes, DASD will take over the marketing of its products in the U.S. Meanwhile, the firm has set up a small office in Boston to test-market some of these, mainly systems software programs.

For the future, the sky's the limit for the French group, which has been doing the ground control systems software for Europe's satellite launcher, Ariane. "While we may not set up worldwide, we want to be good enough to cover the world if necessary," says Renondin. "But we need time."

—Andrew Lloyd

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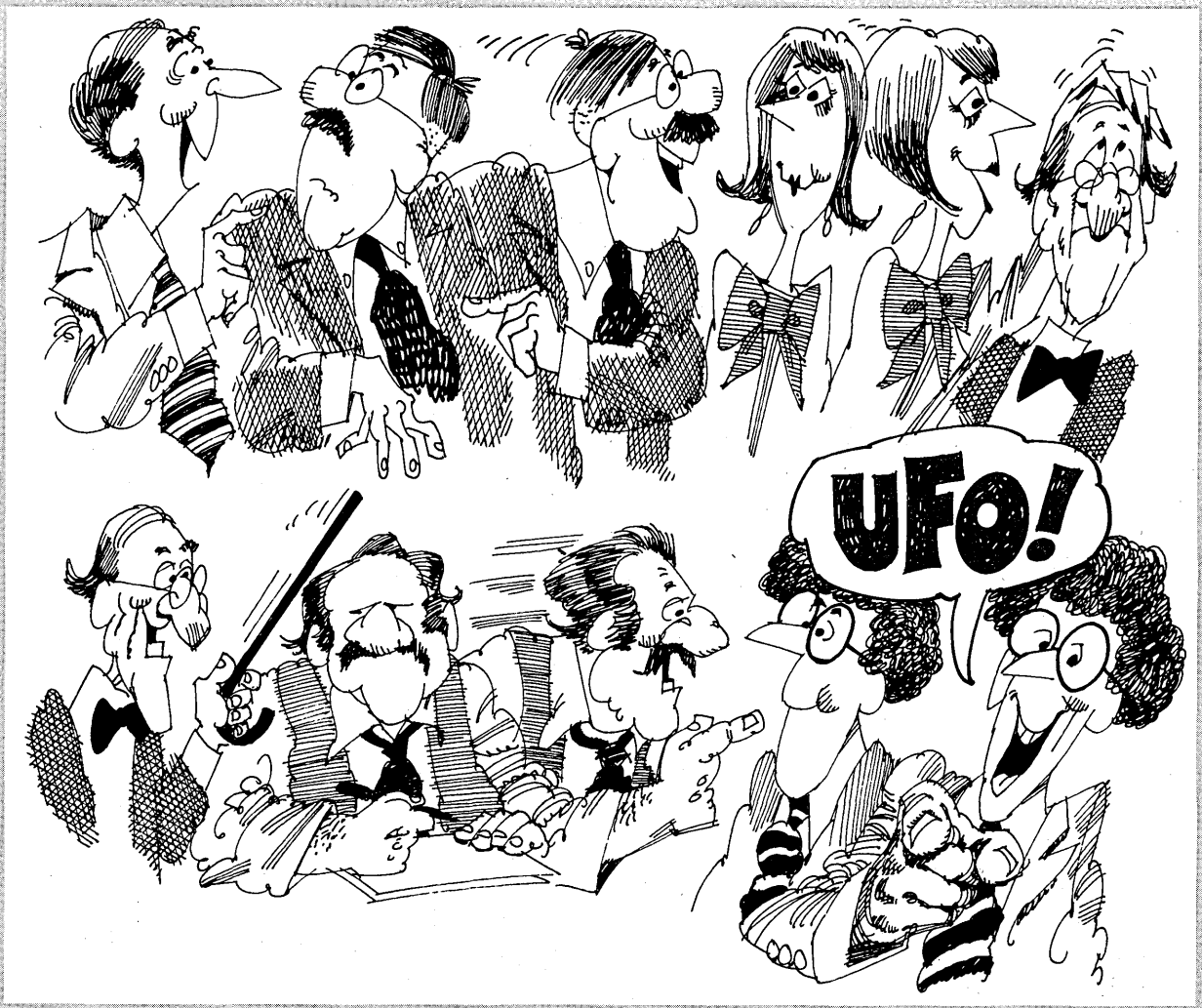
GOVERNMENT

A STANDARD SQUABBLE

The dispute over the government's I/O channel-level interface standards is far from over.

In promulgating its most recent set of I/O interface standards, the government has managed to alienate four of the country's largest mainframe manufacturers, go against the recommendation of the company on whose architecture the standards are based, and become entangled in a complicated lawsuit. The government's claim is

CIRCLE 62 ON READER CARD



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Steve Harris, Director of MIS, Children's Hospital, Boston, MA "The first thing I did when I joined the hospital was buy UFO because I used it for more than a year at my last job; we are simply more productive in our on-line development with UFO. Many projects which were too expensive with traditional CICS technology become cost-effective when you use UFO.

"UFO trades off machine power for people power. While it takes a reasonable amount of training to teach someone UFO, you certainly don't have to be a CICS programmer to use it."

Ken Cyrus, Database Manager, Carter Machinery, Salem, VA "We were looking to get on-line transactions up faster than under standard COBOL. We had DMS installed for two weeks, but got absolutely nothing done. Within the first two weeks with UFO, we had at least 20 to 30 VSAM update/inquiry programs up.

The most surprising thing about UFO was its execution speed. I never figured anything interpretive could execute as fast as it does."

Frank Scafidi, Director of Technical Services, University of Pennsylvania, Philadelphia, PA "Two years ago we had 10 applications up under CICS. Today, we have over 50 applications up under UFO. We never could have done so much without UFO."

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that there is some method to this madness—that the standards will, as intended, save the American taxpayer millions of dollars over the long run.

The latest battle has been raging for more than a year. When the standards, which the companies insist are hopelessly outdated, were first promulgated, Honeywell, Burroughs, Control Data, and Univac brought suit in U.S. District Court asking that they be overturned. But the government, despite conceding that the standards are harmful to non-IBM-compatible manufacturers and that IBM had urged it not to adopt them, successfully argued that the standards were an administrative matter and could not be challenged in court by vendors, who, the government said, were trying to tell it what kind of computer equipment to buy.

The plaintiffs obtained a stay pending appeal from the U.S. Court of Appeals, but that was overturned by the Supreme Court, allowing the standards to go into effect last June. The companies are now asking the Court of Appeals to grant them standing to challenge the original District Court ruling. A decision is expected imminently.

Meanwhile, the government, using the economy and efficiency phrase mandated in federal dp by the 1965 Brooks Act, is scouting for adapters that can make the government's existing systems comply with the standards. Systems under $400,000 are excluded from the standards. All others must comply. An agency that wishes to purchase a system which doesn't comply must get a waiver from the Assistant Secretary of Commerce for Production, Technology and Innovation. To obtain a waiver, the requesting agency must be able to demonstrate that a major adverse economic or operational impact will result in failure to procure that system.

The government argued that because the Brooks Act doesn't address vendors, the companies cannot legally protest that they have been injured by regulatory actions.

"The technology they're specifying is 15 to 17 years old," a Honeywell spokesman lamented. "The drawings of the interfaces had IBM parts numbers on them. IBM advised the National Bureau of Standards against adopting them, and they did it anyway.

"NBS was under pressure from Brooks to come up with standards because the industry couldn't do it in 10 years. And Brooks was under pressure from the peripherals manufacturers. The whole reason for the standards is to open up competition for PCM peripherals. Brooks got on his hobbyhorse for them. The industry recognized that the channel level is not the proper place for interface standards. That's why it never offered any."

That's also why Honeywell and its friends are fighting the implementation. The government told the appeals court that because the Brooks Act does not address vendors, the companies cannot legally protest that they have been injured by regulatory actions taken pursuant to the law—e.g., the adoption of the standards. When the judges appeared skeptical of such reasoning, the government informed them the companies have not been excluded from competition for federal contracts but, by their decision not to comply with the standards, have voluntarily removed themselves from that competition.

"There's lots of action out there in which the standards are being used," said Thomas Pike of NBS. "Any vendor of peripherals or mainframes can continue to do business with the government if it makes a reasonable investment to conform with the standards. Every company should be able to conform should it wish to do so. True, it may have to buy conforming equipment from a third party and add it to its system."

But NBS isn't waiting for the vendors to come up with "conforming equipment." It's going to those third parties itself in order to stimulate availability of adapters for the government's existing computer systems.

One contract has already been awarded by NBS under an adapter demonstration program. Dynamic Sciences, Inc., a high technology firm in Van Nuys, Calif., landed a $27,500 pact to provide an adapter for a Burroughs B 4700. Delivery of the adapter, along with necessary peripherals, will be made to a Navy site, where testing will take place late this month. DSI is also developing adapters for systems from other mainframe manufacturers, persuant to the second phase of the contract.

"Any vendor of peripherals or mainframes can continue to do business with the government if it makes a reasonable investment to conform with the standards."

According to NBS's Pike, DSI's adapter for the B 4700 looks like a native peripheral and requires no software modifications.

"We've got current adp gear in excess of $5 billion," Pike said, "and we're attempting to stimulate and determine the availability of adapters for that equipment. We're trying to give the agencies a source of adaptive equipment, make sure it works, then let them go out and buy peripherals on a competitive basis. The agencies can then

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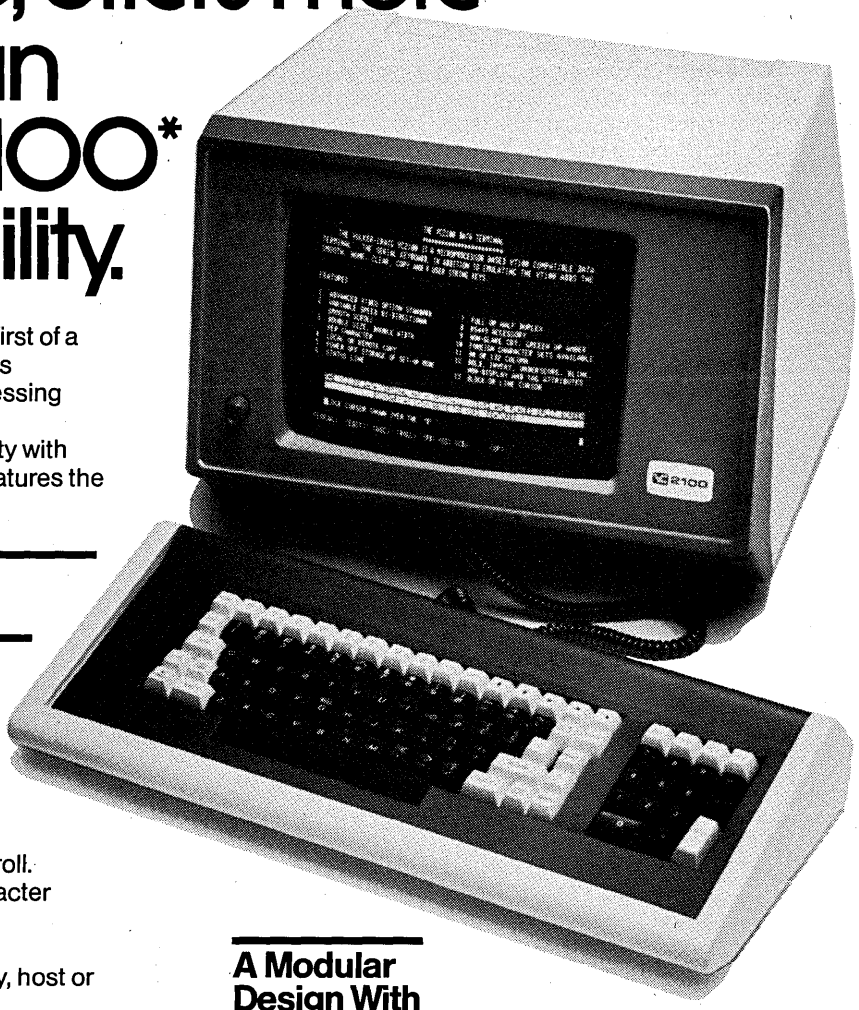
CIRCLE 36 ON READER CARD

A new terminal from Volker-Craig, the VC2100, offers more benefits than just DEC VT100* compatability.



The microprocessor-based VC2100 is the first of a new series of Volker-Craig display terminals designed for the more intensive data processing needs of the 1980's.

VC2100 provides plug-in compatability with the DEC VT100 and offers many useable features the DEC terminal does not have.

Advanced Features Standard On the VC2100:

- ☐ Microprocessor-based M6801 (Terminal Controller) and 8048 (Keyboard Controller)
- ☐ Advanced Video Option (AVO) standard, but non-AVO functions supported.
- ☐ Jump/Smooth scroll, key selectable.
- ☐ Bidirectional/variable speed smooth scroll.
- ☐ Double size, double width on a per character basis.
- ☐ User-oriented status line.
- ☐ 8 user string keys, 20 characters per key, host or user loadable.
- ☐ Host savable set-up control.
- ☐ Home and clear keys.
- ☐ Local or remote copy.
- ☐ Full and half duplex.
- ☐ Stored set-up mode parameters.

VC2100 Optional Features:

- ☐ RS449 interface accessory.
- ☐ Current loop accessory.
- ☐ National character sets.
- ☐ National Keyboard layouts.
- ☐ Serial peripheral interface (buffered).
- ☐ Non-glare CRT, green or amber.
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The new, first in a series, VC2100 combines features and price that surpass DEC VT100 and other emulators.

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CIRCLE 176 ON READER CARD

configure their systems to the appropriate adapter."

As far as Dynamic Sciences is concerned, it thinks it may be the only company currently making an adapter for the Burroughs machines. "We've been manufacturing adapters for the last five years, long before the government was even thinking about doing this," commented DSI vice president of sales Eli Shiri. "We have just entered the second phase of the contract, but I can't tell you whose systems we're manufacturing for, how much [the contract] is, or how many adapters we will make. I'm sure Burroughs is aware of our product, though."

Well, sort of. "We've heard comments about them," said Burroughs' director of products management for federal special systems, Al Kosla. "But we have no concrete information on them and we have no idea if what they're doing complies or not. We certainly didn't know about the contract."

As for going after government contracts, Kosla said, "The lawsuit has had no effect in terms of whether we bid or not. But it has affected our chances of winning. We do not have any intention to comply with the standards, so we're bidding with equipment that's excluded. If it looks like the specifications are such that we can bid under $400,000 or we think the agency can get a waiver, we're in the running. But if there's no exclusion or no waiver, we're out of it."

Kosla added, "We're bidding on procurements and taking exceptions to the standards on the assumption that the legal situation will resolve itself in our favor."

At least one other mainframer, however, appears to be hedging its bets. In a recent Control Data contract with a Commerce

For $27,500, Dynamic Sciences Inc. will manufacture an adapter for a Burroughs B 4700 at a Navy site.

Department agency, there are provisions for CDC to supply an adapter to Commerce's new Cyber 170/750 if the agency chooses to exercise that option to the contract. CDC has also applied to NBS for certification of that adapter. Obviously, for CDC to get the contract in the first place for a system that wasn't already in compliance with the standards, a waiver had to be granted.

"It's not necessarily a case of not being able to bid," a CDC spokesman said. "We first asked for a blanket waiver. It was denied, with the corollary that each procurement request for a waiver can be submitted to the procuring department within the agency. Thus far we haven't had any significant cases where a waiver hasn't been granted."

Others feel differently. "We are excluded from bidding on new procurements that require compliance with the standards," commented a Honeywell spokesman. He drew some solace from the revision of the waiver procedure. Prior to the standards' implementation, waivers had to be given before the bids arrived, requiring the waiving official to be something of a clairvoyant. Now the procuring agency can solicit bids, then request waivers for those that aren't conforming.

"I wonder what interface IBM has on its new series," he mused. "There's no question that the standards force you to maintain two product lines. It's going to take us and the others at least three or four years to comply."

Burroughs' Kosla added, "I don't have a good feel at this point in time. It's still too early to tell the precise effect. But it's bound to have some."

"The way they do this," said the Honeywell spokesman, "neglects the pervasive impact of the standards. It goes to the heart of your hardware and software. They got all this advice not to implement [the standards], then they just went ahead and did it.

"Then they'll have to review it again in three or four years."

—Willie Schatz

MANAGEMENT

WHICH COMES FIRST?

At BAI's recent productivity conference, a number of chicken-or-egg questions were addressed—people or technology, leisure or job, money or fulfillment?

The key ingredient is people.

This was the dominant theme that emerged from the Bank Administration Institute's first PATH (Productivity through Automation, Technology and Human Resources) conference in late January in Dallas.

Keynoter Clair Vough, who founded Productivity Research International, Lexington, Ky., when he retired from IBM in 1975, underscored the importance of people and their attitudes. "You have to have regular morale audits."

When he was with IBM, he said, and charged with a productivity improvement project, he decided IBM's company-wide

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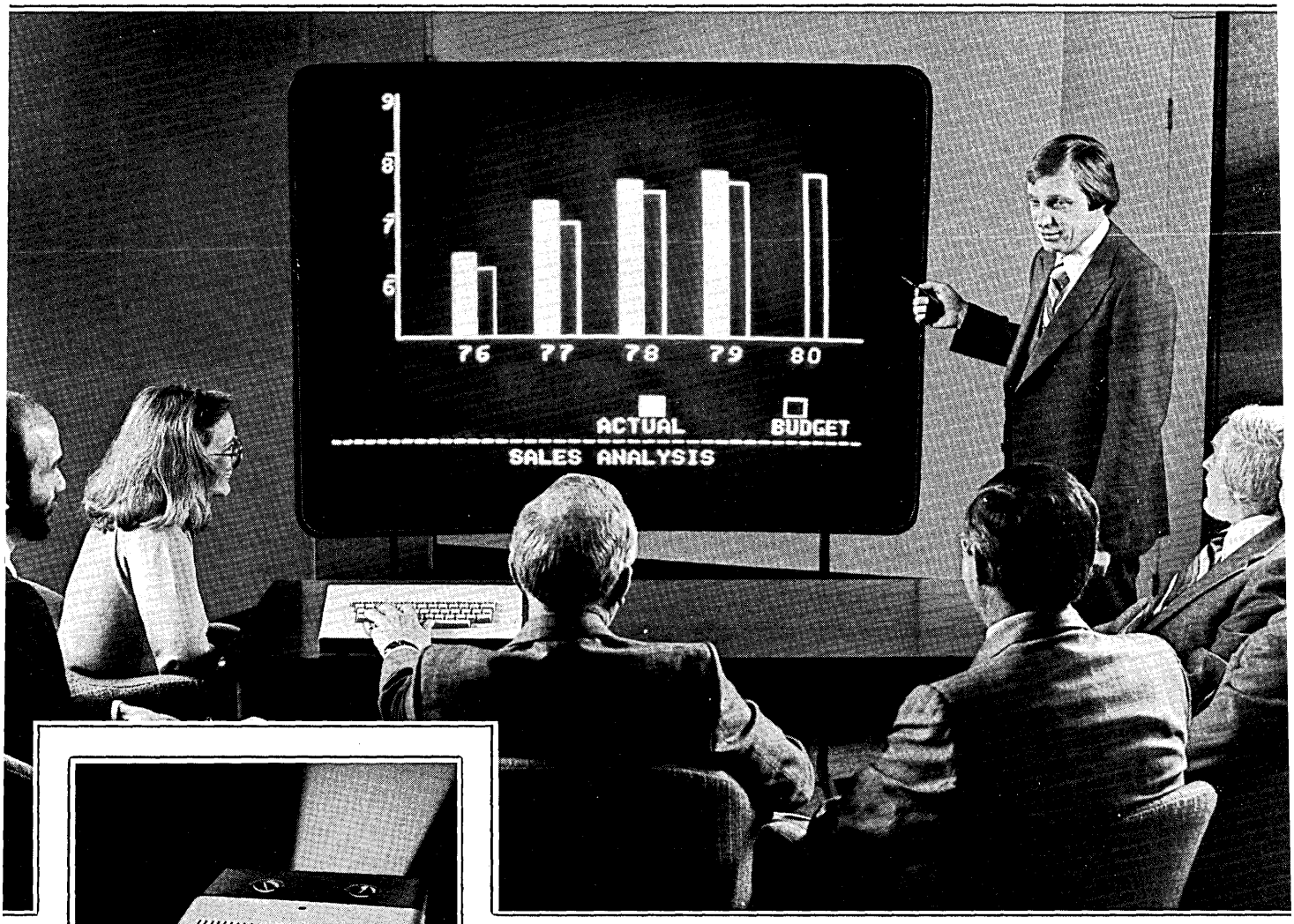

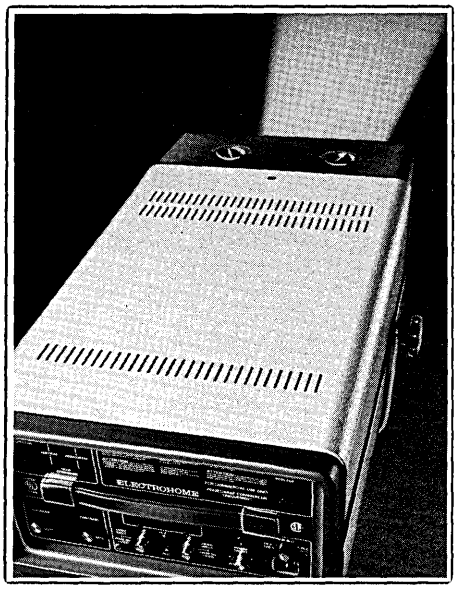

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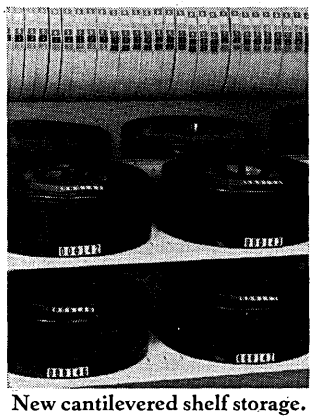

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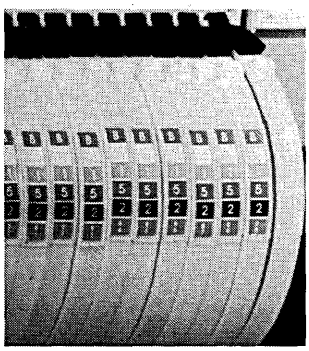

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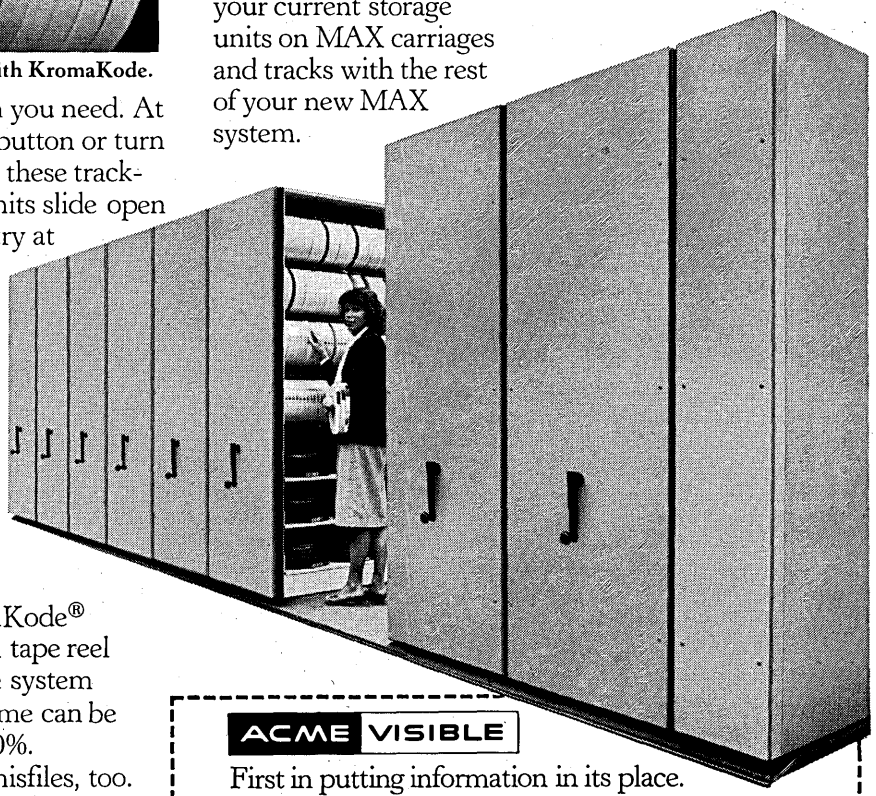

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CIRCLE 131 ON READER CARD

attitude surveys, conducted every 1½ years "were not enough. And 75% of the questions were irrelevant. We set up our own and surveyed one-fourth of our people every three months."

"The worker is the key," said Henk Koehn, vice president-futures research, Security Pacific National Bank, Los Angeles. He too was concerned with attitudes and talked about the "entitlement ethic," a feeling prevalent among today's workers that they are entitled to risk-free and rewarding environments.

He urged his audience to acknowledge this feeling in planning for productivity "because you can't measure productivity in a new era using old tools . . . it's not just counting . . . what matters quantity when quality has gone to hell?"

He berated the term "office of the future." "Any project called office of the future shows a failure to understand the true nature of the work place of tomorrow." His advice: "Examine the structure of the organization of 1990; examine the nature of work in the organization of tomorrow; add to that attitudes and values of workers of the '90s; then extend the scenario out and design, if not invent, the work place of the future. It's work, worker, work place, in that order, not the other way around." Koehn contended that his approach could lead to fewer abandoned projects and less equipment up for resale in the 1990s.

The "entitlement ethic" is a feeling prevalent among today's workers that they are entitled to risk-free and rewarding environments.

Lawrence Eldridge, vice president of Continental Bank, Chicago, talked about new work values, which he said are most prevalent in data processing.

One sign of new attitudes, he said, is that people are "committed to themselves primarily. The job and family come second. Their own fulfillment, satisfaction, and stimulation are first. It used to be a worker wanted money as a vehicle to take care of responsibility. The new attitude toward money is as a vehicle of gratification."

Eldridge said the new attitudes are displayed by 38% of the general work force, by 70% of systems people and by 50% of younger people (and this is growing).

He said there is also a marked shift in employees' attitudes toward leisure. "It used to be leisure was way down the line. Now it's up at the top and the job is way down the line."

Material things have a different meaning for these new wave workers, said Eldridge. "They're no longer 'keep up with the Joneses' symbols. They're not symbols of success, but instruments of gratification." If a new wave worker's money-gratification level is met, he said, then money becomes less important than the need for recognition, the need to be creative, and the dislike of boredom.

For such people, Eldridge believes, annual performance reviews are "not nearly enough. Divide these people into groups of committees which can actually fix policy and participate in work groups. Offer them flex-time and a cafeteria approach to benefits."

There is a marked shift in employees' attitudes towards leisure, which now is placed ahead of job in importance.

Eldridge said systems people are prime candidates for "quality circles," a term which came up often at the BAI conference.

James King, assistant vice president of Chemical Bank, New York City, defined the quality circle concept as "a total employee involvement approach to encourage employee/management communication and teamwork, through a small group which meets voluntarily and regularly to generate new ideas for improving productivity, quality and the work environment. The quality circle is really a way of capturing the creative and innovative ability that our employees have." He noted that the idea of quality circles was born in Japan in the early '60s. And he pointed out that it originally started with industry, but is applicable anywhere.

Richard Matteis, senior vice president, Citibank, New York City, said that Citibank achieved productivity improvement in operations when it "stopped looking at them as clerical operations." He said Citibank has reduced its back office operations from 10,000 people to 6,000 people in an eight-year period and has enhanced the quality of work at the same time. The bank did this, in part, with the introduction of minicomputer-based workstations—"new technology which is taking care of the ills of big machine technology."

A somewhat different view was presented by George DiNardo, senior vice president, Mellon Bank, Pittsburgh, Pa., who described himself as "a big iron bigot and chief mechanic at Mellon."

He said Mellon's data processing operation is divided into functional groups which report directly to the user. "I refuse to believe that minicomputers are worth a damn." He said Mellon has some 6,000 terminals dedicated to point of source activity and a big computer dedicated to nothing but programmer testing.

"With big machines you can build integrated systems. How can you do that with minis? Since 1970 I've gotten one of everything that's come out. Each of our branches has a local controller. Now if that's your definition of a mini, than I guess I like minis. I see them as extensions to the mainframe."

DiNardo appeared to see technology as the big key to productivity. "Technology can't improve productivity? Donkey dust! We can automate the world."

Robert O. Metzger, managing principal, Metzger & Associates, Tustin, Calif., seemed to share the more prevalent attitude that people come ahead of technology.

He described a visit to a prospective New York client, a large bank. "I was ushered into the executive suite by the senior vice president of operations. It was a magnificent showpiece of an office complex: hand-laid parquet floors covered with Persian carpets, a few Picasso etchings on the walls, and a large marble fountain on the 18th floor at the entrance to the executive dining room. We were given thick, matte printed menus dated that day and a choice of a sumptuous lunch, prepared by a French chef, replete with the finest cigars and brandy offered at the end of the meal.

"Following lunch, we went over to another building nearby, which was the operations center. There, around dim corridors, were organized 300 people on the same floor. The carpet was threadbare, the keypunch operators were lined up 10 abreast with an overseer standing behind them. The furniture was all metal with the paint peeling off. There was graffiti in the men's room.

"A general smell of air conditioned sweat was in the air and the operations cafeteria special that afternoon had been roast beef hash. The employee's lounge had furniture in it with the springs showing through and windows so encrusted with dirt that they were totally opaque. My host bragged proudly of his hardware and software, of the progress made in bulk filing, and of the newest generation hardware which was being installed this spring. I left him bemoaning his employee turnover and that fact that it really was difficult to find good people anymore."

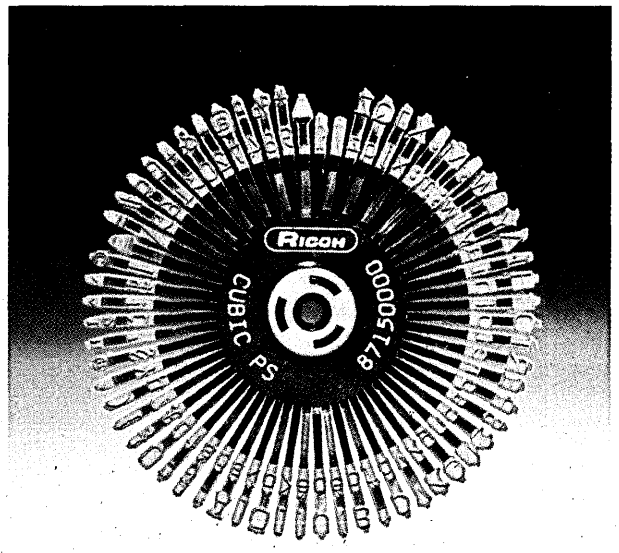
—Edith Myers

COMPANIES

ON THE ROAD TO HYPERBUS

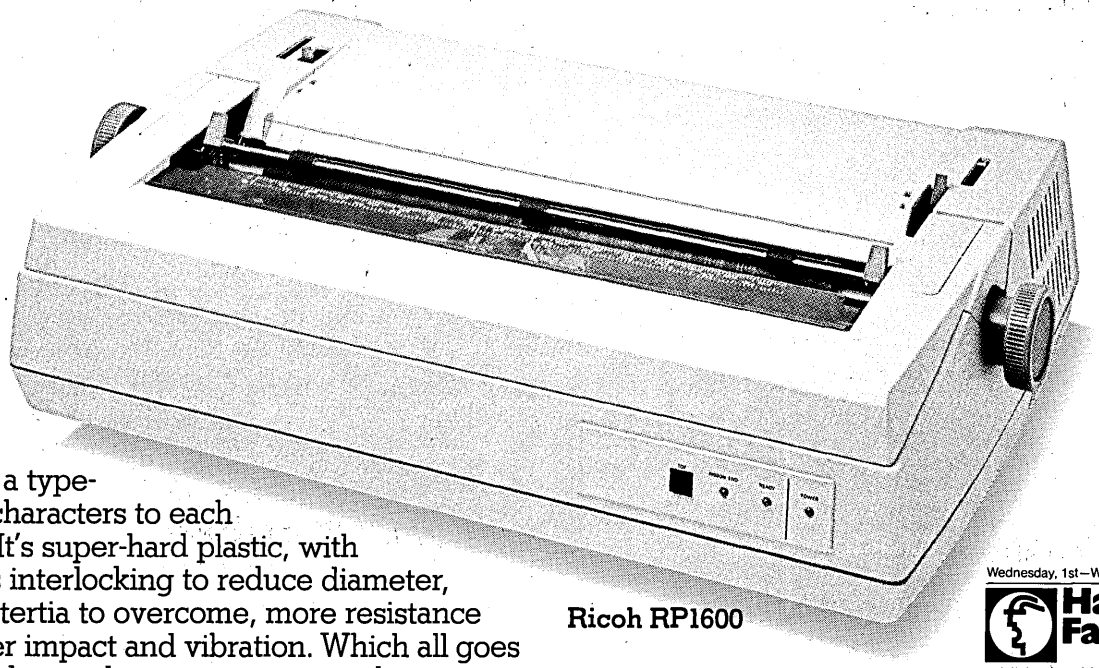
It took six years and many blank stares before Network Systems got its concept of local nets off the ground.

Like many other current phrases in the dp and telecommunications fields, there are a number of interpretations given by users to a local data network. Given the divergence



Actual size.

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



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CIRCLE 68 ON READER CARD

of definitions today, it is not surprising that a company trying to interest users in local networks six and a half years ago got little more than blank looks.

The company that began missionary work on the local data net concept over six years ago is Network Systems Corp. The firm's president, James Thornton, admits, "We have had to do a lot of educational work to get our Hyperchannel off the ground." Even after three years of production, users are just now beginning to see how Hyperchannel can be used.

While NSC maintains it has a local network product, there are some who disagree with that definition. Basically, Hyperchannel is a high speed bus that uses a contention scheme, has multidrop capability, and can interconnect cpus and other high speed devices that typically are part of a corporate dp center.

Having established itself in the high speed arena, NSC is now investigating other applications.

Using coaxial cable technology and Carrier Sense Multiple Access (CSMA) contention scheme, the Hyperchannel certainly is similar to other local data network products. But differences become evident when a customer realizes that the 50 Mbit/sec transmission capacity between Hyperchannel network adapters is far more bandwidth than a typical local data net.

The Hyperchannel emulates both the physical and logical characteristics of direct access subsystems typically operating with cpus. The adapter interfaces directly to a mainframe I/O channel so that on a system like an IBM 370 it appears to the host as an extension of the block multiplexer channel.

A Hyperchannel adapter costs about $36,000 and is used for high volume bulk data transfers, such as load sharing between mainframes. "Our product has to do with allowing the (dp) equipment to be spread out in the building," Thornton explained, "and while that sounds routine, it is also pretty important." Thus the key element of Hyperchannel is that it allows high speed data transfers up to 2,000 feet between interconnected devices. "We would not work if we did not have the high speed; we wouldn't be different from anybody else," he said.

So the typical Hyperchannel site is a dp center which has six, eight, or nine large mainframes that can't physically be installed close enough together. That's where the Hyperchannel comes in—to provide the interfacing and network that allows the cpus to interact together at their normal operational speeds.

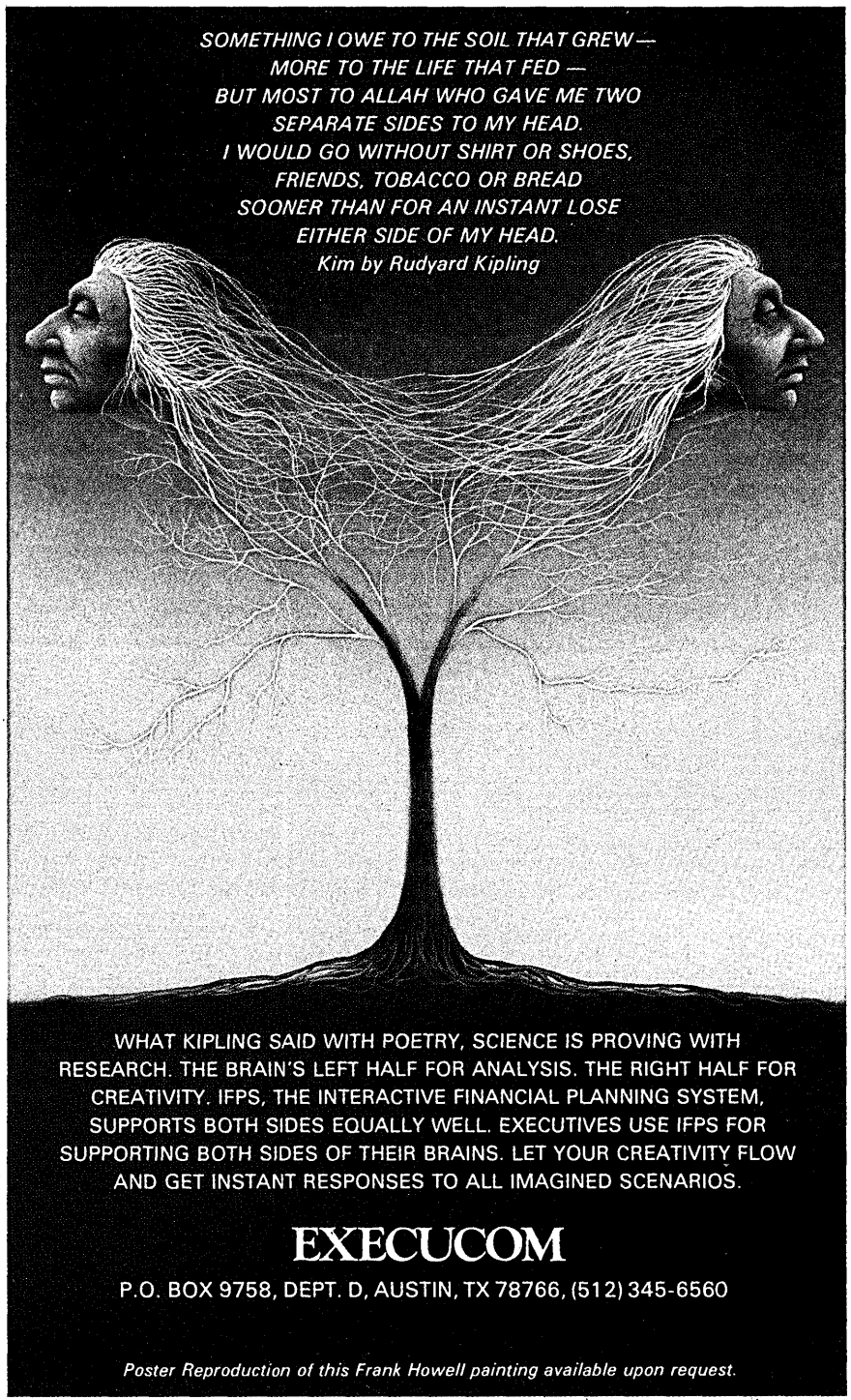
The key element of Hyperchannel is that it allows high speed data transfers up to 2,000 feet between interconnected devices.

In addition to connecting cpus, the NSC network adapters can also link large direct access peripheral subsystems such as tape and disk to a mainframe; and they can be used with other subsystem controllers such as minicomputers that transfer high volume data to a host machine.

According to Thornton, the company now has about 90 customers who may install as many as 15 Hyperchannel adapters, once they become familiar with the intended use.

Unlike other network systems, the NSC adapters do not seem to be oriented toward certain applications. Rather, they are installed when a user wants to create a "printer pool" away from a dp center, or when a tape subsystem might be moved to the tape vault to be nearer the data.

Having established itself in the high speed arena, NSC is now investigating other applications. It recently signed a developmental agreement with Satellite Business Systems to see how the Hyperchannel (or



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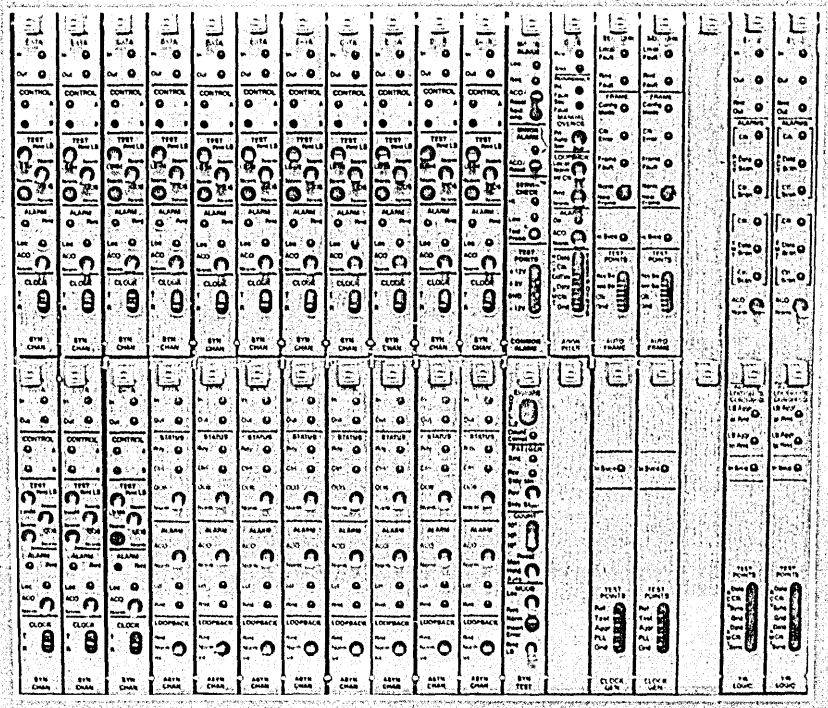

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modifications) will operate in satellite nets.

But Thornton does not ignore the more accepted definition of a local data network—to interconnect lower speed devices such as terminals to cpus. He understands

The Hyperbus product will compete with Xerox's Ethernet and similar products.

that products like the Xerox Ethernet are also providing users with a solution to their on-site network needs, even though the technical characteristics and uses may be different.

So NSC will address these more conventional needs in 1981, when it introduces its Hyperbus product that Thornton admits will compete with Ethernet and similar products.

For now, the purists may argue that Network Systems does not truly supply a "classic" local data network solution, but by the end of the year, it plans to have all the bases covered.

In the meantime, Thornton claims NSC has no competition in the 50 Mbit/sec Hyperchannel area. If that is true, it was probably worth six years as a missionary.

—Ronald A. Frank

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ANOTHER ONE BITES THE DUST

When Infotech International filed for bankruptcy last month, it left a string of U.S. industry experts out on a limb.

One of Britain's leading computer conferencing and training concerns has gone into bankruptcy, leaving a long list of U.S. creditors.

Some of the industry's most colorful and prominent personalities have been burned by the liquidation of Infotech International on Feb. 5. Among the gurus who are owed from several hundred dollars to over $5,000 each in expenses and speaking fees are Phil Dorn and Herb Grosch (both independent consultants); Bob Beamer, a Honeywell executive; Professor Howard P. Morgan, from the prestigious Wharton School in Pennsylvania; and Joe Ferreira, Diebold Group vice president.

Though unconfirmed at the time of writing, it is believed that the company went of business supposedly owing $1 million, but that its 150 or so employees were paid at the time of liquidation.

Infotech was owned and run by Roy R. Goodman, a Briton known for entrepreneurial activities on several continents. His companies are believed to be operated through a Swiss holding company, BK Wissenschafts-Informations-Service AG, in Zurich. Observers say that Goodman put Infotech out of business twice before, earlier in the '70s, and has aborted several U.S. subsidiaries.

In general, 1980 was a poor year for the conferencing business in the U.K. Infotech's major rival, Online, has had to lay off some staff to pare down operating costs. By the autumn of last year, some informed sources were saying that Infotech was heading for bankruptcy following poor trading figures by the $10 million a year concern.

At that time, several prominent U.S. speakers were owed money by Goodman from earlier summer engagements. A major conference in November attracting over 425 people at $1,370 a head seemed to herald a return to positive cash flow.

Now many of the unpaid Americans are trying to piece together what could have happened to this $550,000, and how it was distributed.

"The problem," said one of them, "is that Infotech was a paper flow company with no real assets other than its people." Several approaches have been made to the U.K. lawyers handling the liquidation to

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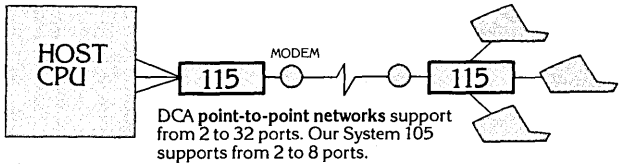

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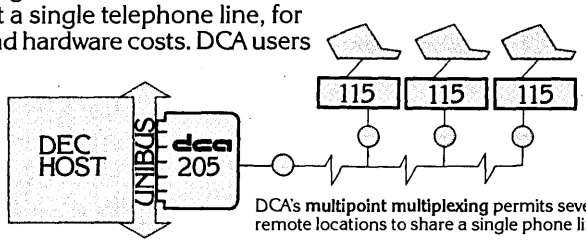

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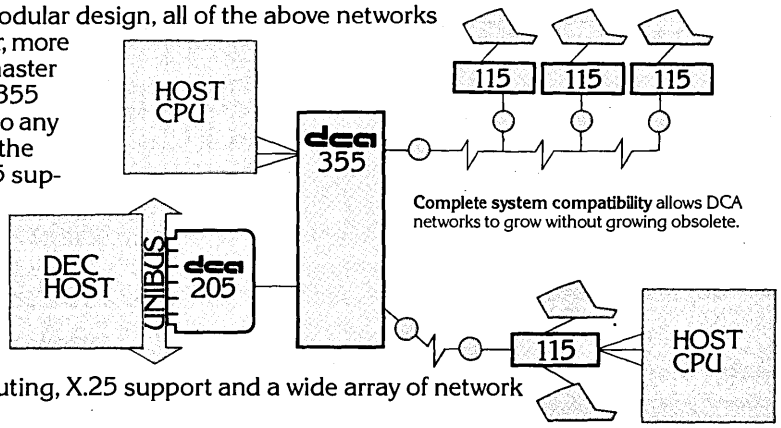

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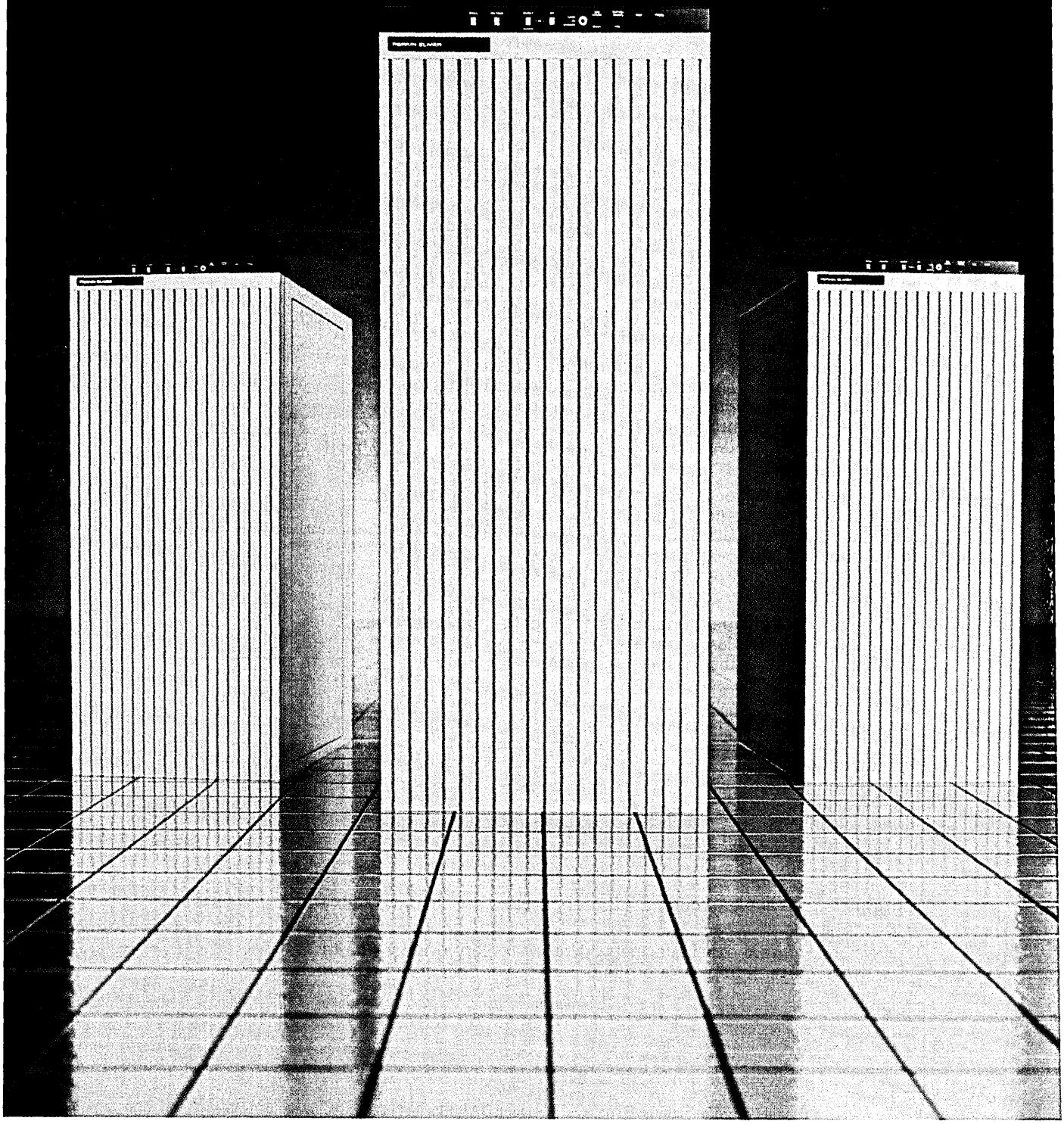

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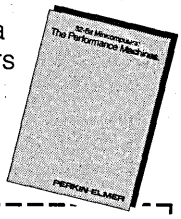

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see if anything "tangible" can be salvaged.

An unconfirmed rumor at press time was that an offer for the remnants of the operation might come from the Diebold Group in New York.

Also not known at this time is whether one of Infotech's conferencing agents, the large French software concern CAP-Gemini-Sogeti, which recently promoted some events in France for Infotech, was financially embarrassed by the collapse. Some sources feel that the French company may now try to recruit some of Infotech's key personnel.

—Ralph Emmett

LI'L HELP FROM ITS FRIENDS

Times may be tough for ICL in the U.K., but optimism is oozing from its North America Operations.

Debt-plagued ICL Ltd. may be having its troubles in England, but perhaps there's help coming from this side of the Atlantic.

The mood at ICL/North America Operations' new headquarters in Dallas is one of optimism. Reports from England indicate ICL is having trouble finding enough customers for its ME 29 systems (Feb., p. 14), but Jon Nicholls, vice president of marketing for ICL/North America, thinks he has found a market for them here.

This find is one of the reasons ICL/North America began to consolidate its marketing efforts in Dallas last October. The market is the oil and gas industry. "The ME 29 is a good machine in that environment. It's a good shared resource machine, and oil and gas operates in a distributed environment."

ICL developed its oil and gas system, which it calls O'Gas, in Calgary, Canada, where it has one system operating and sees a good market for more. Its second ME 29 commitment came from Texas. "It comes from an organization offering facilities management for oil companies. We're involved in a joint venture with them to Americanize the system."

The "Americanization" has largely to do with legislative reporting, which is different here than in Canada. "We're not for the Exxons of the world," Nicholls emphasized, but for joint venture type operations where a number of people invest and acquire rights to drill and explore. "There's a lot of accounting tied up in this and nobody else wraps that up in one parcel."

He explained that the system includes ICL's Interacct accounting system, general ledger, IDMS database, report writers, and COBOL language, and is designed to be parameterized. "We pick up the development ourselves and make the source code available to users—with hefty protection, of course."

While bringing the oil system from Canada to the U.S., the company is hoping at the same time to take a system it calls Revenue Data Collection from the U.S. to Canada. This system is for entities that derive revenue from a variety of different sources at one point of collection, such as government bodies (utility payments, dog licenses, etc.) golf courses (restaurants, green fees, pro shops, etc.) and universities (tuitions, dorm fees, etc.). The system produces receipts, does verification, and captures data at the point of collection. It then takes care of allocating the monies automatically. The first systems went to Arlington County, Texas, and to Washington State Univ.

ICL's oil and gas system, which it calls O'Gas, is based on the ME 29 machine.

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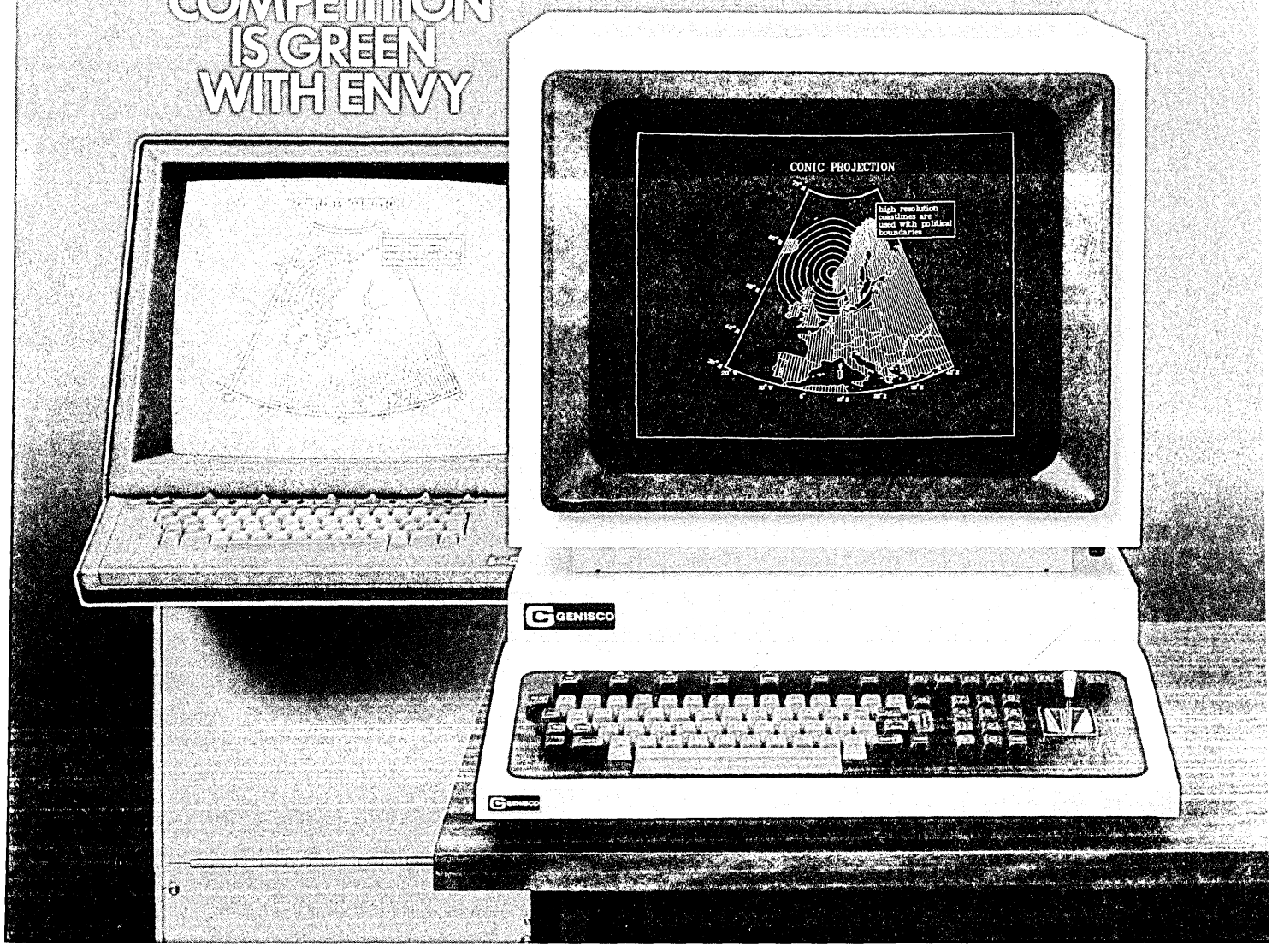

NEWS IN PERSPECTIVE

said Nicholls. "What we're trying to do is select areas where we can provide a basic system in which 75% of the work is already done. We operate autonomously [from ICL Ltd.] in the marketing area. We attack differently from ICL in the rest of the world."

In the point of sale (POS) field, Nicholls said, "we continue to outsell ourselves year after year." He said a "significant number" of ex-Singer POS users in the U. S. and Canada are not ICL users.

"We operate autonomously [from ICL Ltd.] in the marketing area."

Nicholls, who moved to Dallas from ICL's Toronto office last October to take charge of ICL North America marketing, says he was acquired with Singer by ICL. "I've been with Singer/ICL for 10 years."

In the last year, in Canada, he said, ICL ran neck and neck with NCR on new POS contracts. In POS, as in other areas, the ICL North America operation likes to zero in on specific targets. One of these is home improvement centers. "They sell both retail and to contractors. We can handle the strange mix of wholesale and retail with the same software and hardware. We have a good retail system and a good general purpose system."

—Edith Myers

BENCHMARKS

'TWAS TIME TO COMBINE: "Mergers and acquisitions in the computer services industry hit an all-time dollar volume high last year," says the ADAPSO/BROADVIEW Index, recently released by Broadview Associates, Fort Lee, N.J., merger specialists. Dollar estimates for the 87 mergers and acquisitions that took place in 1980 are placed at $688.4 million, compared to 107 mergers and acquisitions in '79 at a value of $671 million. The index shows that the average transaction went up 26.2% over '79 averages, most of these gains occurring during the second half of '80. Bernard Goldstein, a partner at Broadview Associates, says, "This growth is extraordinary in light of interest rates having peaked twice during fiscal year 1980," since high interest rates usually have a "chilling" effect on acquisitions and mergers. Further, Goldstein claims that the computer services industry is one of the most acquisition-prone segments of American business.

Jerry Dreyer, president of ADAPSO, agrees with Goldstein and says that "the computer services industry is one of the fastest growing segments of our economy," adding that the industry shows remarkable resiliency in the face of combined recession and inflation.

BULLISH ON BUBBLES: The latest predictions are that the shipments of bubble memory devices will grow from $18.4 million in 1980 to $226 million in 1985, an annual growth rate averaging 68%. This, according to the Venture Development Corp., Wellesley, Mass., consulting firm. VDC sees applications for the bubble memory devices expanding from those which specifically require the ruggedness and small size of the bubble to more general applications. Initial use will mainly be in machine and process control and portable terminals, but stationary computer and word processing applications will become more important. Slow growth rates in the last three years are attributed to the absence of price reductions that had been predicted. Instead of being priced lower than RAMs, bubbles have been more expensive. VDC sees prices declining over the next five years since bubble makers have now learned how to produce their product in quantity. Presently, Texas Instruments is leading the bubble memory manufacturing market, with Rockwell International and Intel hot on the trail. IBM and AT&T are continuing research (the latter producing units for its own systems); National Semiconductor and Motorola are new entrants; and Fujitsu, Hitachi, Siemens, SAGEM, and NEC are the foreign producers, expected to begin more active competition in U.S. markets.

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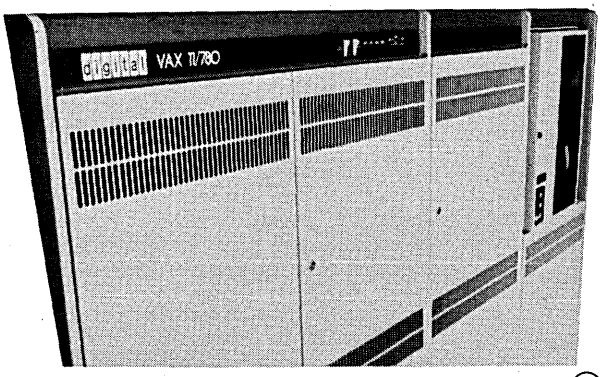

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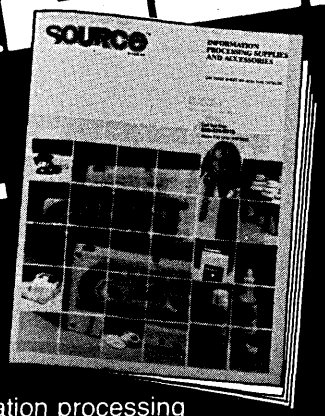

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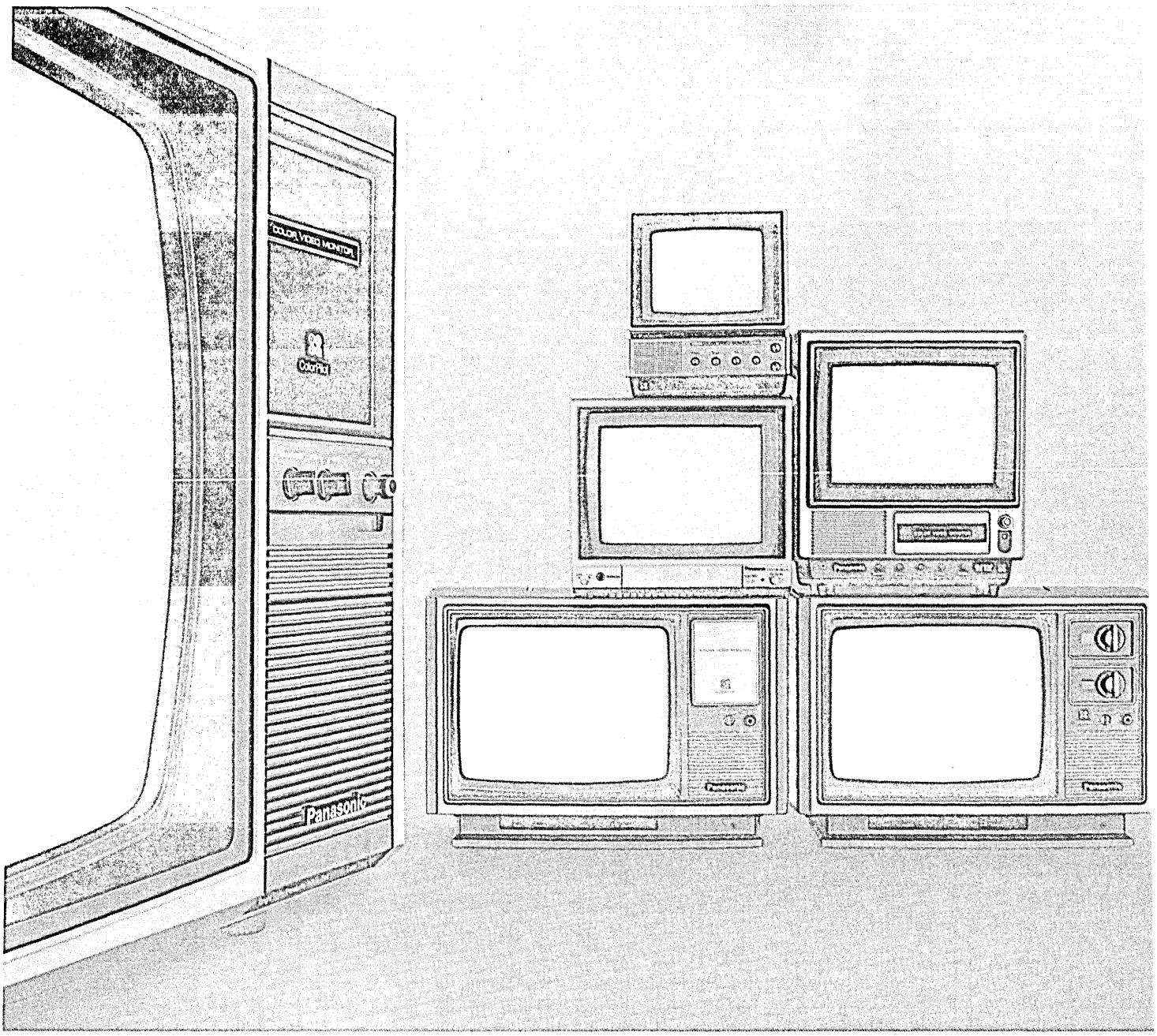

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We can only give you a bare idea of how the money can multiply over a 10-year span. For the sake of illustration, let's add up the fortunes of an engineer working for Aramco in Saudi Arabia making $35,000 U. S. in base pay, with no raises for the 10 years (not likely!). Remember this is just a hypothesis.

Right off, you see that our imaginary engineer in Saudi Arabia can gross around $149,000 more. The amount saved out of that grand total is strictly up to the individual.

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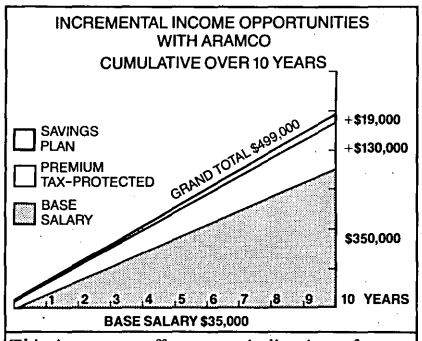
This graph doesn't show what you save on medical expenses, it doesn't show the allowances on your children's education, it doesn't show the travel allowances which cut down on vacation costs, it doesn't show the retirement benefits you may accumulate.

What it does show is that you have the chance of a lifetime to save a really important amount of money.



This is not an offer or an indication of wage scales. It is merely a hypothetical example of how your gross income can accumulate dramatically when you work for Aramco in Saudi Arabia. Employees are not fully vested in the savings plan until 60 months of continuous service. All projections subject to change.

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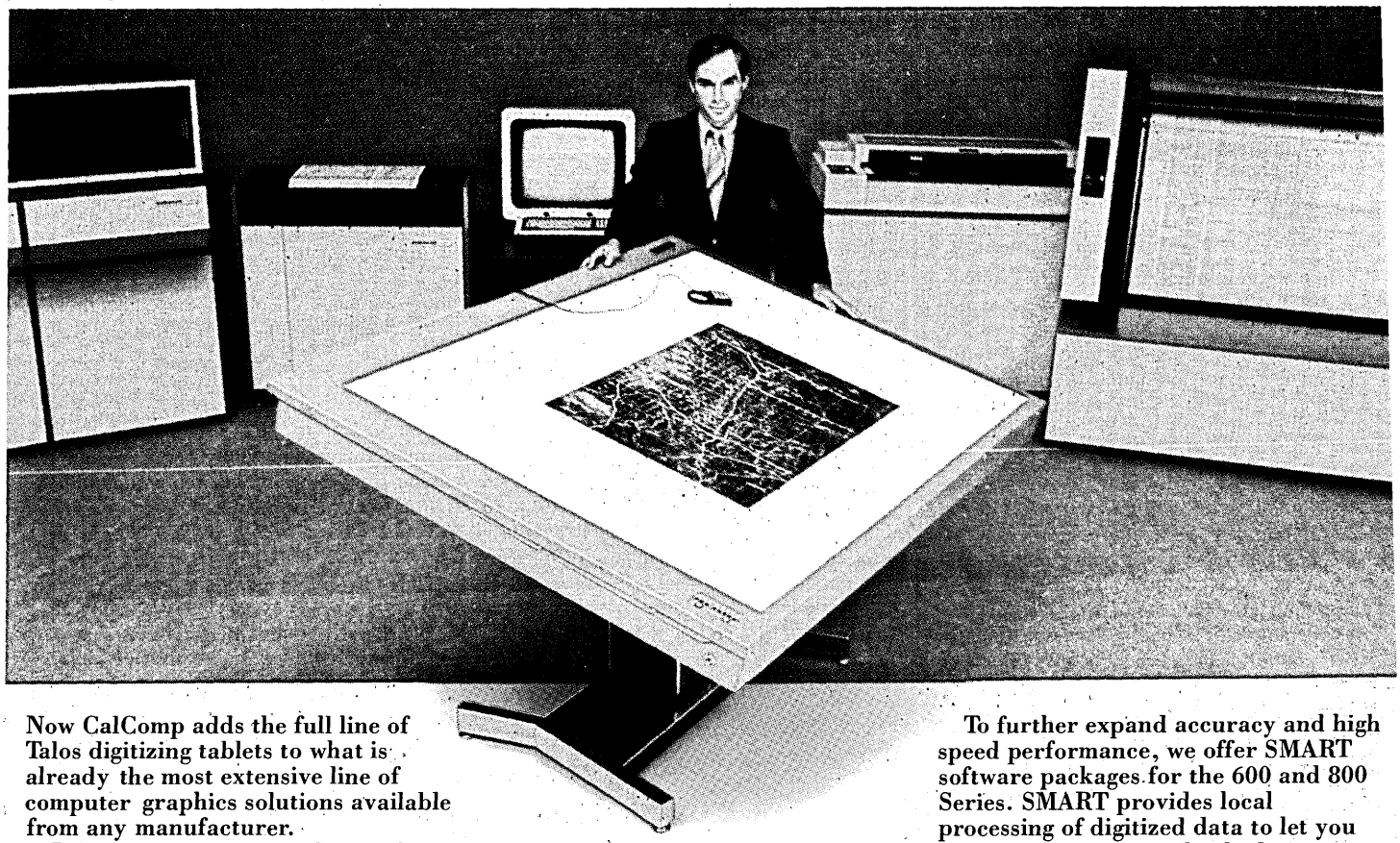

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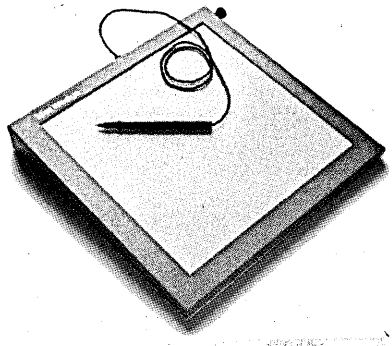

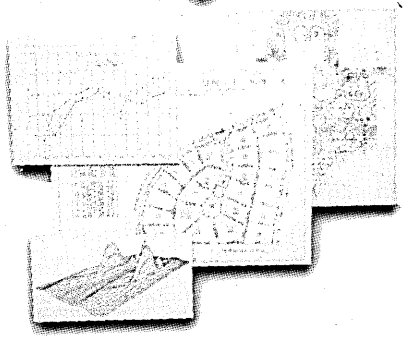

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CIRCLE 87 ON READER CARD

NEWS IN PERSPECTIVE

BATTLE FOR BIG BUCKS: It's the Sperry Univac 1100 vs. the Burroughs 5901 for the largest acquisition of commercial computers in the history of the industry. The winner earns an Air Force contract expected to exceed $1 billion. The loser goes home and sulks in its software. The two companies were the finalists among a reported eight competitors who bid on the Air Force Phase IV Base Level Data Automation Program under the recently instituted "Fly Before You Buy" procedure. Pursuant to its $49.7 million contract, Univac will demonstrate the capability of the 1100 and its operating system software for seven months, then show the machine's conversion and transition abilities for the following 15 months. Simultaneously, but at a different site, Burroughs, which was awarded a $45.3 million contract, will perform similar tasks with its 5901. After 22 months, the two will go mainframe-to-mainframe at Gunther Air Force Base. Following the four-month Qualifications Operational Test and Evaluation, the Air Force will make a Production Buy Decision to determine which manufacturer will have the pleasant and extremely lucrative honor of installing its hardware at 150 Air Force bases around the world.

CAUGHT IN THE NET: U.S. computer industry revenues from network products will grow twice as fast as total data processing revenues over the next five years, according to the Arthur D. Little impact study of the world computer industry. The study says network products, which will account for 20% of the $54 billion in total dp revenues for this year, are expected to climb to 40% of 1985's projected $80 billion to $90 billion (1980 dollars) in dp revenues. Major U.S. vendors showed a 16% increase in dp revenues between '79 and '80, to $36.7 billion from $31.4 billion. The value of their mainframe shipments and directly associated peripheral equipment increased 13%, from $19.5 billion in '79 to $22 billion in '80. The study predicts that major U.S. mainframe vendors will increase their dp revenues by 10% per year through '85. However, they will lose some of their present share of the network products market to independent suppliers, some of whom may not yet be in the running. American mainframe vendors also will lose computer market share outside the U.S., according to the study, since manufacturers based in other countries are expected to cut the U.S. share from the current 59% to 50%.

R&D FUNDS UP: Expenditures for R&D in the U.S. are expected to reach $6.8 billion in 1981, an increase of $8.2 billion, or 13.7%, over the $60.4 billion estimate for 1980. Most of the increase will be absorbed by inflation, says Battelle's Columbus (Ohio) Laboratories, but a real increase of 3.8% should come in 1981.

SURVEYING THE MANPOWER: The American Electronics Association, Palo Alto, Calif., has launched a survey to discover the nation's technical manpower needs over the next five years. AEA is sending out its questionnaires to over 1,300 companies in major U.S. electronics centers, with the end result (the AEA believes) being high motivation for educators to expand their training facilities for the electronics industries. Survey results will be announced this spring, and will include geographic breakouts as well as U.S. totals. In addition to aiding educators, the survey results will assist companies in assessment of future technical personnel needs.

DESKTOP TROUBLES: Desktop computer development will be inhibited through the 1980s primarily because of three factors: present-day systems demand that users have a technical, or logical, turn of mind, combined with an evident need for a computer (and the number of people in society who meet these qualifications is limited); substantially more powerful desktop computers must be developed so their use can be so simplified it is no more difficult to use than any other office machine; and the spread of desktop computing on terminals to giant computers and distributed processing will erode the market from above. So stated Business Communications Co., Inc.'s report, "Booming Markets For Desk-Top Computers—When?" The report forecasts that today's technology will continue through 1985, and then newer technology will take over and replace most of the old units. Sales between 1980 and 1989 are expected to number 2,355,000 for a total value of $10 billion. Desktop software packages are expected to generate $8.19 billion worth of business for this decade.

NEW NAME FOR IEEE? The Institute of Electrical and Electronics Engineers, acting on a motion submitted by director emeritus Donald G. Fink, is considering changing its name to "reflect the influence of computers." One proposal, by IEEE's Computer Society, is the Institute of Electrical and Computer Engineers. Robert W. Lucky, executive vice president, is chairing the committee in charge of a possible name change, and he plans on thorough discussions within IEEE before any action is taken. The IEEE's name originated in 1963 when it was created by the merger of the Institute of Radio Engineers and the American Institute of Electrical Engineers.

GSA EASES CSC SUSPENSE: Computer Sciences Corp. has resumed bidding for all new General Services Administration computer services business (except time-sharing) since the GSA eased the suspension placed on the company last Nov. 3.) The suspension resulted from a federal indictment against CSC, related to a GSA contract under which the company provided its Infonet services to federal agencies from 1972-77. Since the suspension order, a U.S. district court has dismissed most of the charges and set a trial date of March 9 to hear the remaining charges. In a separate action, NASA notified CSC it had completed its review of the company and that it could continue competing for technical support contracts from that agency, where it is the fifth largest contractor. Spokesmen for CSC stated, "These rulings are most welcome because they remove widespread concern as to our ability to continue serving major federal markets for our contract services technology." In its fiscal year 1980, CSC received $287.7 million, or 63% of its total revenues, from the federal government, with $243.4 million coming from contract services and $44.3 million from Infonet services.

DATABASE BOOMING: Revenues generated by online database services will reach $2.99 billion by 1985, says Creative Strategies International (CSI), the California-based market research and consulting firm. Contributing to the rapidly developing markets in the reference and source database areas are the growing concerns over professional and managerial productivity, improved software, and the increasing number of databases in a widening subject area (over 450 databases are currently online). Over the next five years, the industry is expected to achieve a compound annual growth rate of 38%. Reference segment information is usually less business oriented than the source area; there are currently more than 225 reference databases, with new ones coming online each month. The fastest growth area in the source segment is the numeric database, often used by the decision-maker without intervention by intermediaries. In the U.S., Canada, and Europe, there are presently over 270 producers and vendors involved in this industry.

MICROS IN EDUCATION: The Foundation for the Advancement of Computer-Aided Education awarded nearly $150,000 worth of micro-based systems to 26 educational groups—the fourth set of awards made by the foundation since October '79. The foundation was chartered originally in 1979 as the Apple Education Foundation and is a nonprofit corporation, organized to support and develop new methods of learning through small computers. The majority of the systems provided by the foundation are Apple IIs, aimed at projects in the elementary through university levels in such subjects as foreign language and special education. So far there 87 recipients of these micro awards, and G. Gregory Smith, executive director of the foundation, claims they have "greatly stimulated the use of micros in education."

—Deborah Sojka

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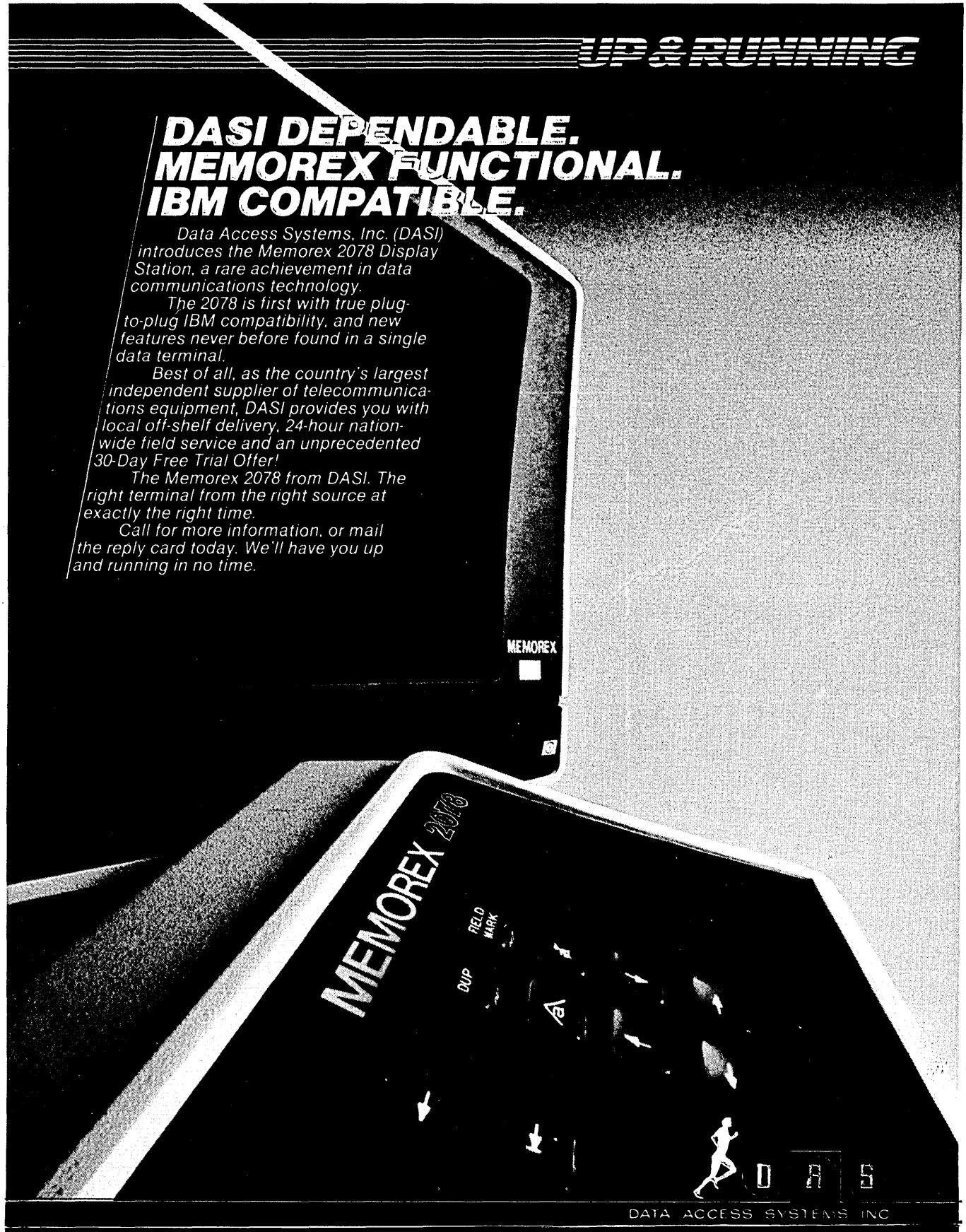

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CIRCLE 88 ON READER CARD

Local networks prove practical for datacom systems in close proximity.

by Howard Gravis

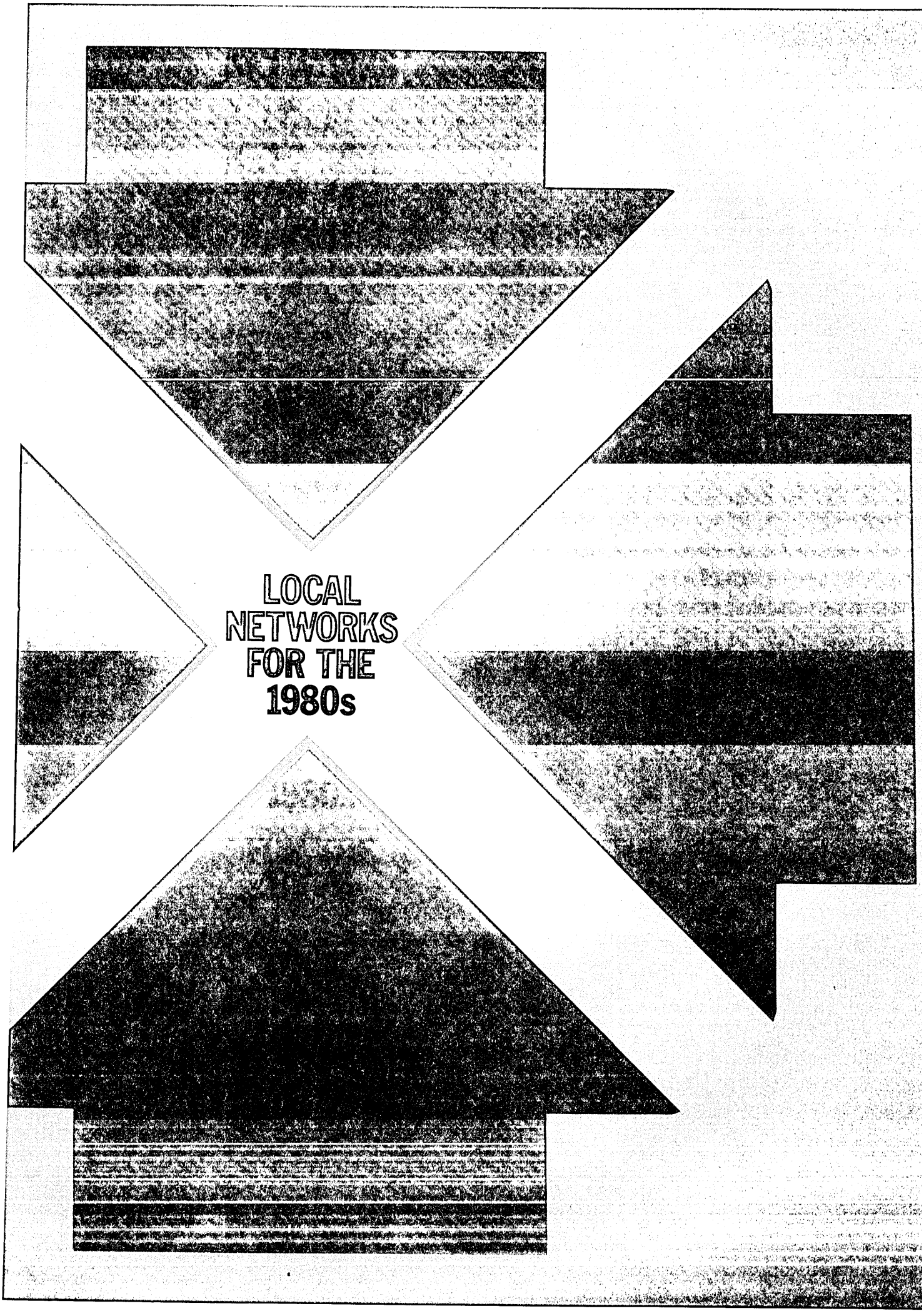
In recent years, local networks have increasingly occupied the attention of research workers, dp and communications equipment service vendors, and commercial and industrial users of data communications. The design, installation, operation, and performance of these networks have been discussed at conferences sponsored by the University Computer Center of the University of Minnesota in 1976, 1977, and 1978, and at a fourth conference in October 1979, sponsored jointly by the Computer Center and the IEEE. The Mitre Corp. and the National Bureau of Standards sponsored a similar meeting in Boston in May 1979. In early 1980, the IEEE organized a National Local Networks Standards Committee. Vendor interest in local networks is exemplified by the May 1980 announcement by Digital Equipment Corp. (DEC), Intel, and Xerox of a "joint project to develop electrical, logical, and protocol specifications for a local area communications network which the companies propose to use for many of their future products."

A local network is a data communications system for the interconnection of terminals and computers that are within one building, in several buildings on the same property, or in close proximity as contrasted with the more familiar local and long-haul networks for private lines, public switched services, and private switched systems. The total extent of a local area network may thus be as little as a few hundred meters, or as great as several kilometers.

Local networks are desirable for the same reason conventional networks are: they make possible the sharing of resources (such as computing power, databases, and switching services) by users at diverse locations. The characteristic that sets modern local networks apart from conventional local and long-haul networks is bandwidth, a group of consecutive frequencies constituting a band. It is feasible and relatively inexpensive to implement bandwidths or data rates of several megabits per second (Mbps) in local networks. These higher data rates are realized in paired cables, twisted cables, coaxial cables, and fiber optic media.

The earliest local networks are those implemented with private branch exchange (PBX) or Centrex telephone systems. Here a data terminal is substituted for the telephone, and data communications are established using the same switching system as that for voice. Thus, the data rate is limited to 4800 bits per second (bps) or perhaps 9600 bps under special conditions. In the SL-TDX system of Northern Telecom, there is an optional data feature that allows the station user to maintain normal voice communication con-

DATA COMMUNICATIONS BY HOWARD GRAVIS


LOCAL
NETWORKS
FOR THE
1980s

Any type of control can be used with any network topology.

currently with data communication at a speed of up to 9600 bps from a separate terminal. This is accomplished by installing an Add-on Data Module (ADM) in the telephone set and using for data one of two pairs of cable at the station. A different approach is represented by the Integrated Business Exchange (IBX) of InteCom, in which voice and data communications are also integrated. Here the total data rate at the station is 128 kilobits per second (Kbps), of which 9 Kbps is used for control signaling, 64 Kbps for voice, and 56 Kbps for data. In both the SL-1 and the IBX, additional equipment is required to extend data communications beyond the terminals connected to the PBX switching system.

LOCAL NETWORK CONTROLS

In each local network there is a control mechanism by means of which the connected terminals and computers share the use of the bandwidth. One of the simplest control methods is multiplexing, the transmission of a number of messages simultaneously over a single circuit. A network in which there is a separate cable pair, or other medium, per connected device exemplifies space division multiplexing; this is suited for the earlier kinds of local networks in which the data rate per cable pair is limited to 9600 bps or so. Modern systems with higher bandwidths employ both frequency division multiplexing (FDM) and time division multiplexing (TDM). In the former, there is a portion of the frequency spectrum of the medium assigned to each point-to-point connection, whereas in the latter, a time interval or slot is so assigned. (Both of these techniques are widely used in long-haul transmission, and TDM has been integrated in some cases with telephone central office switching.) At the Boston meeting in 1979, MITRENET, was described. This is a local area network implemented by MITRE Corp. in which the 300 megahertz (MHz) bandwidth of community antenna tv (CATV) cable system is divided by FDM into voice, data, and video channels, and, within certain of these channels, individual devices share the capacity by means of either TDM or contention control, which is explained later in the article.

A star network (see Fig. 1) with space division of the communications channels, and certain kinds of networks with FDM or TDM and fixed channel assignments to devices, are examples of centralized control of a local area network. In contrast, two other kinds of distributed control have been developed for the sharing of bandwidth in wideband local networks: ring control and contention control.[1] In one method of ring control, in the network of Fig. 2, there is a constant circulation around the ring of pack-

FIG. 1
STAR LOCAL NETWORK WITH CENTRALIZED CONTROL

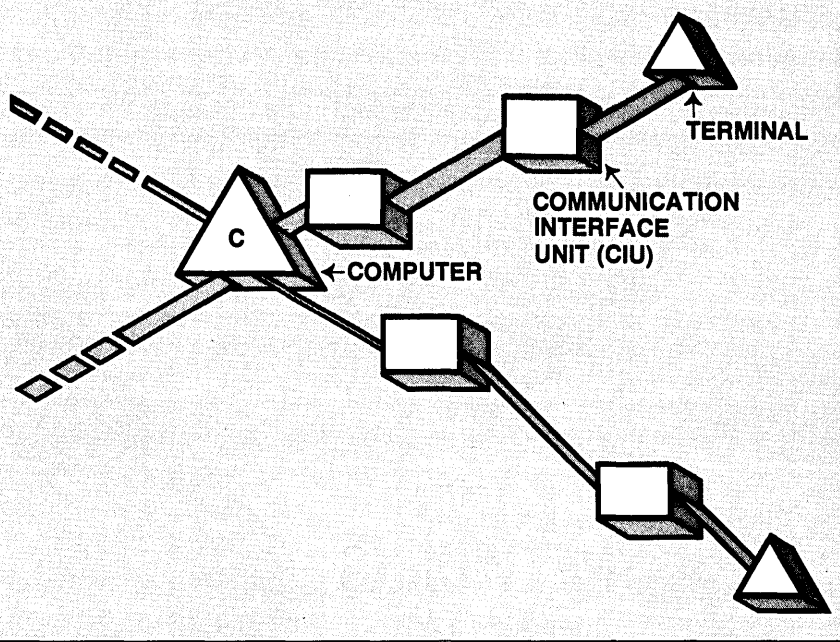
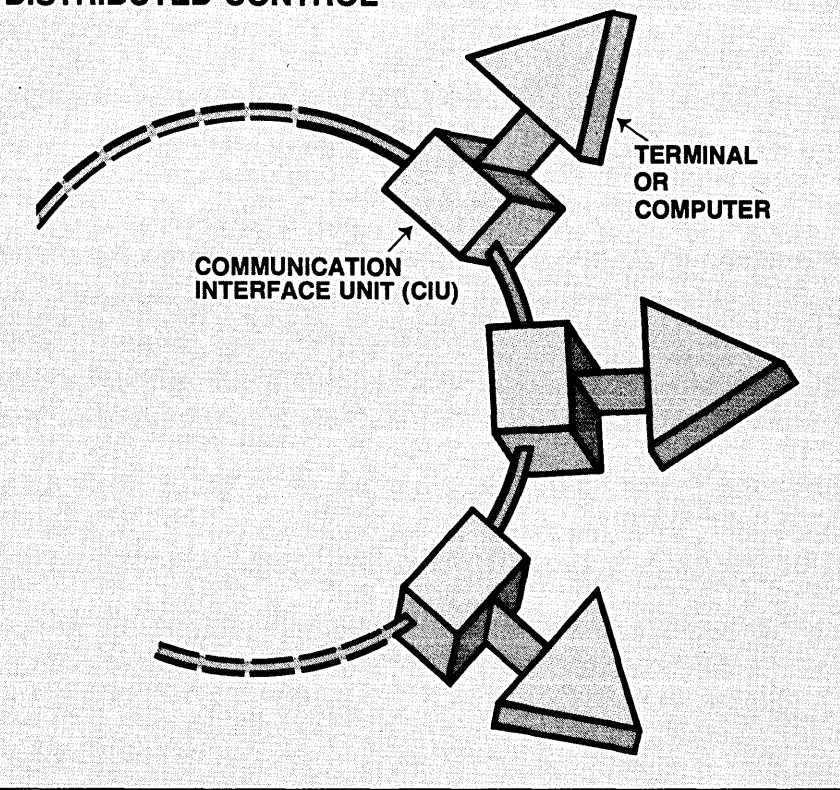


FIG. 2
RING LOCAL NETWORK WITH DISTRIBUTED CONTROL



CHARTS BY CYNTHIA STODDARD

1. D. C. Clark et al., "An Introduction to Local Area Networks, "*Proc. IEEE*, vol. 66, 1978, pp. 1497-1517.

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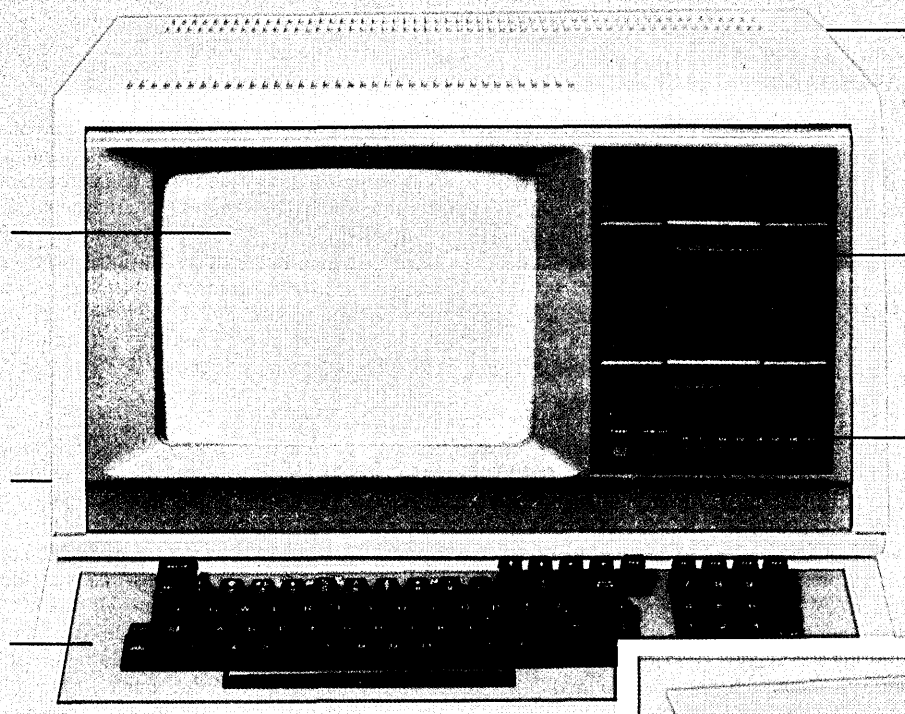

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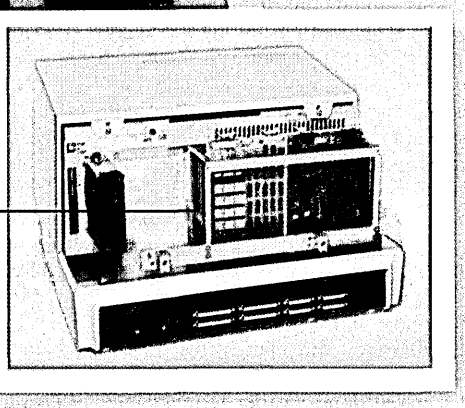

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Design of the CIUs has become the critical problem in distributed control local networks.

ets or blocks of data, some empty and some carrying information. When a device wishes to send information, it puts this information, together with an address, with the first empty packet to come along; the packet is marked at its destination as having been delivered, and then marked empty when it again reaches the sending device. This kind of network is in use at Cambridge Univ. in England.

Several kinds of contention control mechanisms have been developed as a result of experiments with the ALOHA packet radio system in Hawaii; the original work was sponsored by the U.S. Department of Defense. ALOHA is not a local network in the sense used in this article, but rather a shared radio network. The ALOHA researchers found that if several transmitters have low duty cycles, it is efficient to have them simply transmit packets when they need to do so, taking a chance that there may be a "collision" between two or more packets transmitted nearly simultaneously, in which case they must be retransmitted at a later time.

Several schemes exist for dealing with collisions. In order of increasing efficiency in utilization of the total bandwidth, these are 1) retransmitting a packet after a fixed or random time interval if an acknowledgement has not been received (presumably because a collision has occurred); 2) "listening," that is, finding out if another packet is on the channel *before* transmitting and delaying transmission if it is; and 3) listening not only before transmitting but also while transmitting, so that a collision is detected more quickly than in method 1. Method 3, known as carrier[2] sense multiple access with collision detection (CSMA-CD), is used in Ethernet, the proprietary local network system developed by Xerox that uses coaxial cable as the transmission medium. When the average device activity is sufficiently low, this method has the potential of more efficient use of the channel bandwidth than in the case of multiplexing; thus, a larger number of terminals at a given data rate per terminal may share the network.

It might appear from the foregoing discussion that centralized control is intimately linked with the star network topology, and perhaps with multiplexing; that ring control is linked with a network of ring topology (Fig. 2); and that contention control is linked with the kind of network in which it is often used, viz., a bus. However, as is also pointed out by Clark and his coauthors, any type of control can be used with any network topology. Thus, networks have been built with the bus topology and ring control, with the ring topology and contention control, and so forth. These variations arise from the desire of experimenters to exploit certain characteristics of the network, such as the collision rate in a ring network with contention which is lower than that in a similarly loaded bus network with contention.

DESIGN OF THE CIU

As the illustrations show, the terminals or computers are connected to the local area network proper by means of communications interface units (CIUs). In a network with centralized control, the CIU is simply a conventional or limited-distance modem; the necessary logic for access to the network is in the terminals and the central computer, perhaps with help from human users. On the other hand, in a distributed control network with ring control or a bus network with contention control, this logic is primarily in the CIUs. Thus the design of the CIUs has become the critical problem in distributed control local networks.

With few exceptions, CIUs have been custom designed for specific local networks. In the MITRENET, for example, the CIU has three main components. The first is a conventional CATV subscriber outlet, which makes accessible to connected devices 50 video channels of about 6-MHz bandwidth each. All of the digital connected devices use a high speed (1 Mbps) bus derived from one such video channel, thus requiring a special modem to modulate 1-Mbps serial data into a CATV channel and conversely to receive data. The third CIU component is called the bus interface unit (BIU). In a particular implementation of MITRENET with contention control by means of CSMA-CD, the BIU accepts data from the connected device, buffers this data until the channel is free, and then transmits it as an addressed packet. The BIU also receives data for its connected device by scanning the channel for its own address, buffering the received data, and transferring it to the device at the appropriate rate, which is generally much less than the bus rate of 1 Mbps.

The design of a CIU in general will depend on the speed and type of network transmission medium, the method of control, and the speed and code of the connected devices. In additon, the CIU's design is often influenced by considerations of network reliability, e.g., as to redundancy of components or special techniques for recovery from CIU failure. Further, it is in the CIU that error detection and correction are normally performed, although the inherent bit error rate performance of local networks is good, by reason of their limited geographic extent.

In the language used by the International Organization for Standardization (ISO) for describing "open systems interconnection," we have so far described local networks mainly in terms of the lowest layer—the physical link layer. By doing so, we have avoided some of the thorniest problems that face designers and users of local networks—those relating to protocols for the six higher layers (in ascending order, these are data link, network, transport, session, presentation, and application).

We do not have standardized, off-the-shelf local network products, such as CIUs. This is probably because of the varying views of local network designers and users in regard to the diversity of types of devices to be connected, the need for consistency of local network protocols with mainframe protocols, and the desire to interoperate local networks and various external networks, such as the packet-switched common carrier networks. The most successful local networks so far have been those in which less than universal compatibility has been sought, e.g., networks to which computers and terminals of only one manufacturer may be connected. Since the selection of "higher-layer" protocols for local networks is now gaining the attention of government and university researchers and the dp and data communications industries, some resolution of the more elementary questions may be expected before too long.

Let us now look at the details of some local networks that illustrate the ideas we have discussed. In the Cambridge Univ. ring network,[3] the transmission medium consists of two twisted cable pairs with a bit rate of 10 Mbps, duplex. The CIU consists of three components: a repeater containing 12 TTL integrated circuits (ICs), a station unit containing 65 similar ICs, and an access box. The first two of these are uniform throughout the network (the station unit contains a plug-in device address module), whereas the access unit is specially built to interface with a particular type of connected device; in some cases, the access unit is a card mounted within a computer. The entire CIU is housed in a metal wall box with suitable connectors. Maximum repeater spacing is 200 meters.

We have described briefly the ring control method, in which a device puts information into the first passing empty packet for transmission around the ring. Since it is possible for a packet to circulate around the ring indefinitely in the event of certain equipment faults, such as bit reversals, the Cambridge ring contains a monitor station to clean out such packets. It does so by marking as "empty" any packet that reaches it with a monitor bit on, this bit having been off when the packet was launched but turned on when the packet last traversed the monitor. Another interesting reliability measure is the logging station, which receives reporting messages from any CIU that detects an incoming parity

2. The word "carrier" is a holdover from the radio origins of this scheme. As noted by Clark et al. (*loc. cit.*), method 3 cannot be applied in radio networks, owing to local transmitter interference in the receiver, but it is suited for cable media.

3. The description here is extracted from the paper by M.V. Wilkes and D.J. Wheeler, "The Cambridge Digital Communication Ring," presented at the 1979 Boston meeting.

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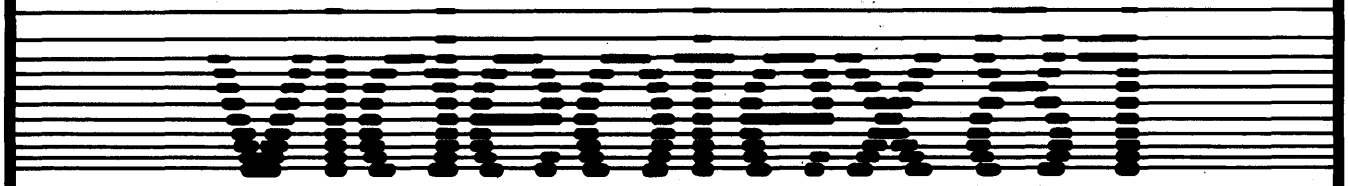

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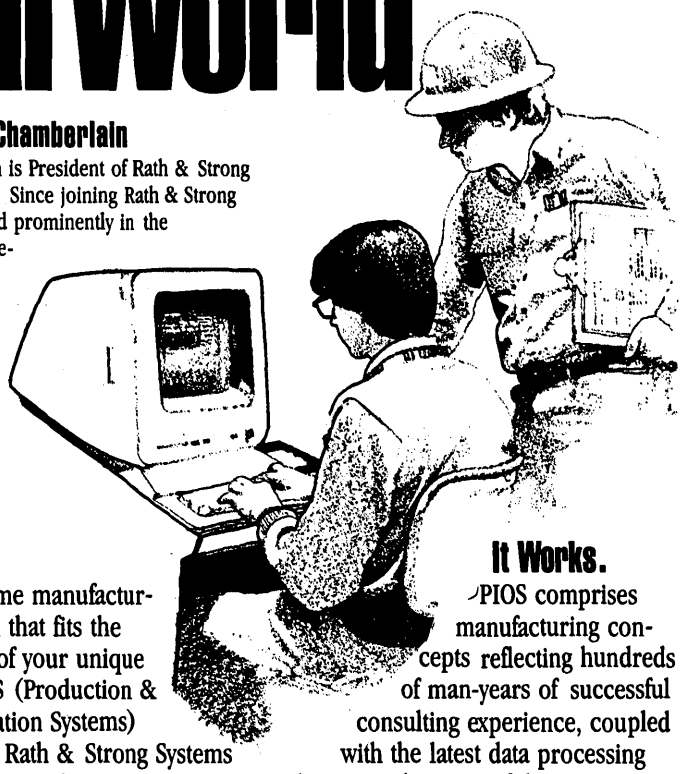

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error; this permits the network maintenance people to track down a CIU that has an intermittent fault or is near external noise that has entered the network.

Several computers are connected to the Cambridge ring, including a PDP-7, two PDP-11s, an experimental computer, a NOVA, and a Computer Automation LS-14. There is also a plotter, and cluster controllers for crt terminals are in preparation.

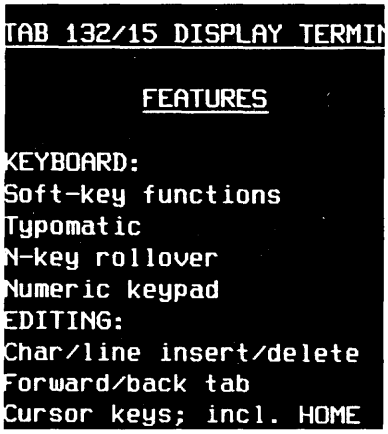
FordNet, implemented by Ford Aerospace and Communications,[4] is similar to MITRENET in that the transmission medium is coaxial cable with CATV hardware. The digital channel has a rate of 0.8 Mbps. FordNet is designed specifically for connecting com-puters of the PDP-11 family, and the network appears to each connected computer as an equivalent UNIBUS connection. To bring this about, the CIU consists of a CATV transceiver and a digital unit called the UNIBUS micro channel; the latter contains a 4-MHZ Z80 microprocessor with 32K RAM, a UNIBUS direct memory access (DMA) channel, three Z80 DMA channels, two multiprotocol serial input/output (SIO) channels, and programmable countertimers. The network control mechanism is CSMA-CD. The CIU in FordNet implements not only the basic, or first layer, network control method, but also a link-level protocol, similar to HDLC, for CIU-to-CIU communication, and a network-level protocol, based on datagrams, for host-to-host communication.

The 1980 announcement by DEC, Intel, and Xerox states that they will develop specifications for a local network using the Ethernet CSMA-CD method of control. The initially proposed characteristics of this network include a 10-Mbps data rate, coaxial cable medium with 500-meter CIU spacing, and a datagram link-level protocol. It will be interesting to see whether these specifications converge with those that might be adopted by the IEEE National Local Networks Standards Committee, or by other industry groups operating as committees under the auspices of such bodies as ANSI and EIA.

There are indications that there will soon be a number of off-the-shelf, more or less standardized local network products offered by vendors, probably emphasizing CIUs. Recently, 3Com Corp. of California offered a "Local Computer Network Vendor List" with technical and price information of some 40 vendors. The announcement mentions not only such well-known firms as Datapoint, GE, and HP, but also specialized firms such as AMDAX, BSR, Interactive Systems/3M, Nestar, Sytek, Ungermann-Bass, and Zilog. Perhaps we will know that local networks have come of age when someone starts a journal devoted to them! ❋

4. K.J. Biba and J.W. Yeh, "FordNet: A Front-End Approach to Local Computer Networks," presented at 1979 Boston meeting.

Howard Cravis is a senior member of the professional staff at A.D. Little, Inc., Cambridge, Mass., where he specializes in communications systems engineering studies of voice, data, video, facsimile, and composite communications networks.



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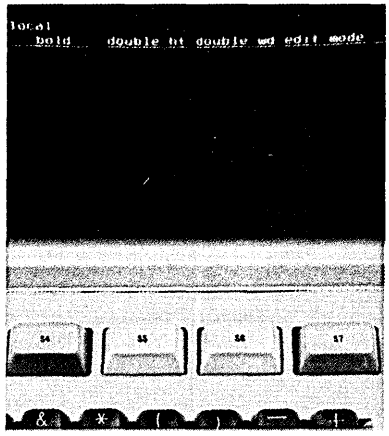
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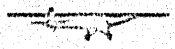

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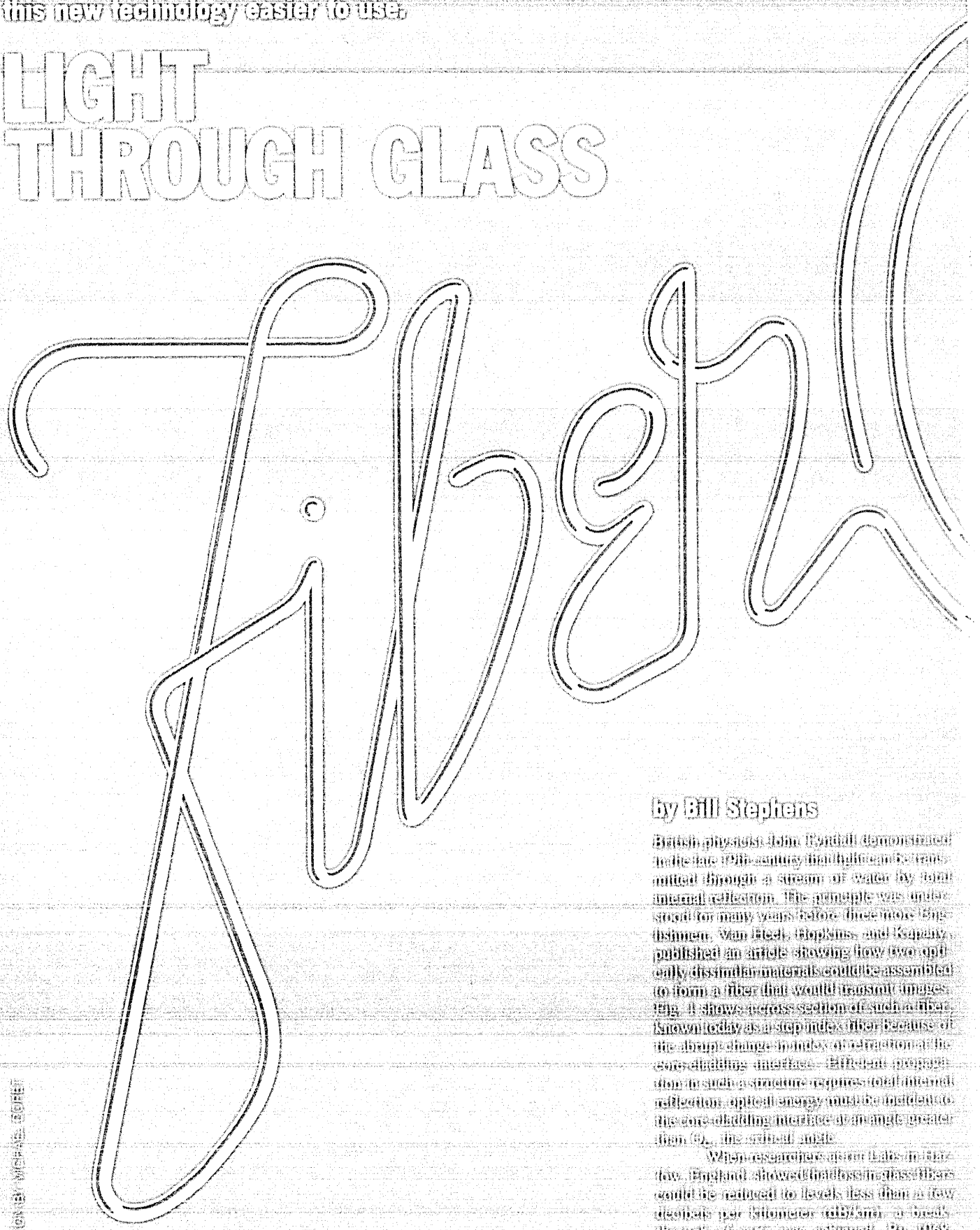


ILLUSTRATION BY MICHAEL COFFEY

by Bill Stephens

British physicist John Tyndall demonstrated in the late 19th century that light can be transmitted through a stream of water by total internal reflection. The principle was understood for many years before three more Englishmen, Van Heel, Hopkins, and Kapany, published an article showing how two optically dissimilar materials could be assembled to form a fiber that would transmit images. Fig. 1 shows a cross section of such a fiber, known today as a step index fiber because of the abrupt change in index of refraction at the core-cladding interface. Efficient propagation in such a structure requires total internal reflection, optical energy must be incident to the core-cladding interface at an angle greater than θ_c, the critical angle.

When researchers at Fort Labs in Harlow, England, showed that loss in glass fibers could be reduced to levels less than a few decibels per kilometer (dB/km), a breakthrough of sorts was achieved. By 1968, Japanese researchers had demonstrated low-loss graded index fibers, the predecessors of modern telecommunication optical fibers.

Optics

Between 1970 and 1972, engineers at Corning Glass Works broke the 10 dB/km barrier, paving the way for practical use of optical waveguides over long distances. E.I. Dupont has since completed major development work in large core plastic fibers with loss less than 400 dB/km, providing a lower cost alternative for short/medium distance optical transmission applications.

Parallel development of optical sources and detectors for fiber optic communications has concentrated on achieving practical solid state infrared laser diodes (LDs) and silicon avalanche photodetectors (APDs).

After development of the first gas laser in 1960, the primary goal was to develop a semiconductor laser to simplify construction of the source and make a more practical structure for communications systems. In the fall of 1962, three groups (R.N. Hall, General Electric; T.M. Quist, MIT; M.I. Nathan, IBM) announced solid state lasers, fabricated from gallium arsenide (GaAs). Fig. 2 shows a cross section of a semiconductor laser. Current is applied to the device transverse to the laser beam itself. Lasing action is achieved by controlling the length "L" (by special cleaving techniques) and the current path width so that lasing occurs at threshold currents on the order of several hundred milliamps.

Most lasers today are fabricated from gallium aluminum arsenide (GaAlAs), and chip sizes are small enough that a complete device could easily be mounted on the head of a pin.

High radiance light emitting diodes (LEDs) are also beginning to play a major role in the fiber optic evolution. The principle of spontaneous light emission was first observed in silicon carbide in 1907 by H.J. Round, although he probably didn't recognize it at the time. Today's LEDs are typically GaAs and GaAlAs, and provide a lower cost, lower performance alternative to LDs. By far the most important LED developed for fiber optics is the etched well surface emitter, shown in Fig. 3, usually a GaAlAs structure with a small emitting area that couples to a fiber optic pigtail in contact with the chip.

Fiber optic technology has provided the designer with a wide variety of cables, connectors, optical transducers, and modulation links from which to choose, and a wide range of applications has been demonstrated in the laboratory. Installations in the field are more rare, primarily because of a lack of standardization in the industry and a dearth of experience in electro-optics among potential users. Workers know how to hook up wire cables for optical cables, though, even the tools necessary for efficient installation may be lacking.

The coupling of optical cables, for example, poses relatively severe optomechanical problems. In almost every design the goal is to couple as much power into the optical fiber as possible within the economic constraints of the system. For telecommunications, this translates into maximum unrepeated transmission distance; for short distance systems, extra power is needed to compensate for fiber attenuation variation, termination quality, component aging, and temperature degradation.

Efficient power coupling to a fiber like the one in Fig. 1 requires both the launching of energy into the acceptance cone of the fiber (Fig. 2) that the source area be kept small compared to the fiber core diameter, and that the generation of light at a wavelength

matched to the minimum attenuation characteristics of the fiber. The .8 micrometer (μm) to .9μm band provides a low attenuation window in which modern GaAlAs semiconductor emitters efficiently convert electrical energy to optical energy. Core diameters typically range from 55 μm to several hundred microns. Small semiconductor sources and accurate alignment techniques are essential.

Lasers and Burrus LEDs have been designed to couple efficiently to optical fibers and are typically pigtailed at the factory to save users the problems of ultra-accurate alignment. Labor-intensive assembly techniques, however, have kept the prices of these pigtailed components high, discouraging their use in high volume applications. Lasers, ranging in price from $800 to $2,000 each, offer the best coupling efficiency achievable and maximum modulation bandwidths, but drive circuitry for the units must usually incorporate some sort of temperature compensation to stabilize power output.

Until recently, the Burrus LED has been the only high performance alternative to lasers where lower cost and simpler circuitry are desired. Coupling efficiency and modulation bandwidth of the Burrus LED is not as good as the laser's, but prices are lower ($300 to $600) and the Burrus offers better reliability and simpler drive circuitry. Still, the Burrus has retained some of the labor-intensive assembly requirements of the laser, as well as the lifetime problems of a small junction emitter.

SWEET SPOT LED

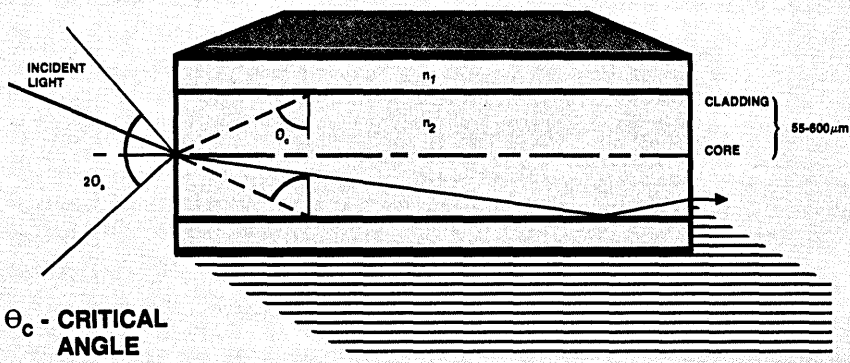
The Spectronics Division of Honeywell has developed a GaAlAs LED with an integrated micro-optical element (a small glass sphere) for achieving efficient coupling in a "pluggable" optical interface. Such interfaces are highly desirable for applications where less than state-of-the-art fiber terminations may be encountered.

The Spectronics Sweet Spot LED, shown in Fig. 4, is a surface-emitting device with an active area three or four times larger than equivalent Burrus structures, improving lifetime characteristics markedly. The optical element and fiber-source spacing are selected to conserve radiance relative to the pigtail configuration, thus coupling the same amount of power to a selected reference fiber. The Sweet Spot LED, however, projects a "sweet spot" of optical energy at the surface of the device window several times larger in diameter than most high performance optical fibers. This allows alignment tolerances to be relaxed, since placement of the fiber anywhere in the "sweet spot" will couple rated power to the fiber. Pigtail devices must have accurate fiber-to-fiber alignment to couple efficiently. This requires more expensive connectors and more optical expertise on the part of the user. Further, the Sweet Spot structure is compatible with high volume optoelectronic manufacturing methods, allowing comparable Burrus performance at about one-third the cost.

Detectors, a more mature component technology, are available at a variety of price and performance levels. Avalanche photo detectors (APDs) are used where maximum speed and sensitivity are required (primarily telecommunications applications), whereas PIN diodes provide a general purpose low-cost detector for short/medium distance applications. The main disadvantage of the APD is the requirement for high bias voltages (typically 180V to 350V) and temperature compensation circuitry to stabilize photogain. PIN diodes, in contrast, may be operated at bias voltages less than five volts and are inherently stable over a wide temperature range.

Modular fiber optic links also vary widely in performance and price. This allows

FIG. 1
OPTICAL FIBER CONSTRUCTION (STEP INDEX)



θ_c - CRITICAL ANGLE
$2\theta_A$ - ACCEPTANCE CONE
$n_2 > n_1$

FIG. 2
SEMICONDUCTOR INJECTION LASER DIODE

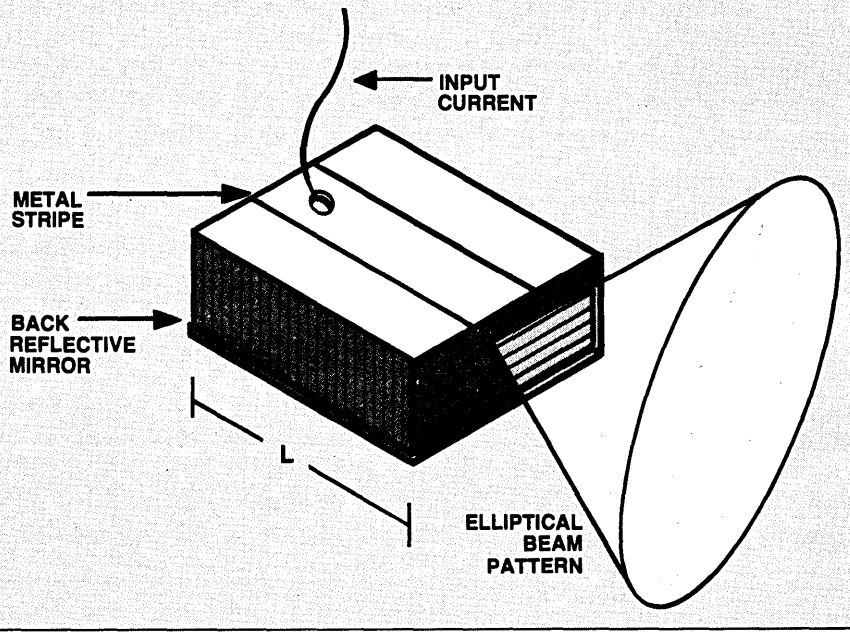
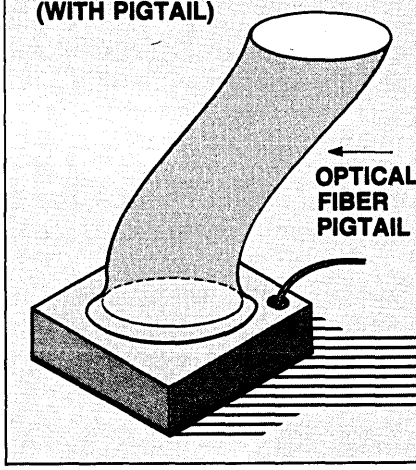


FIG. 3
ETCHED WELL BURRUS DIODE (WITH PIGTAIL)



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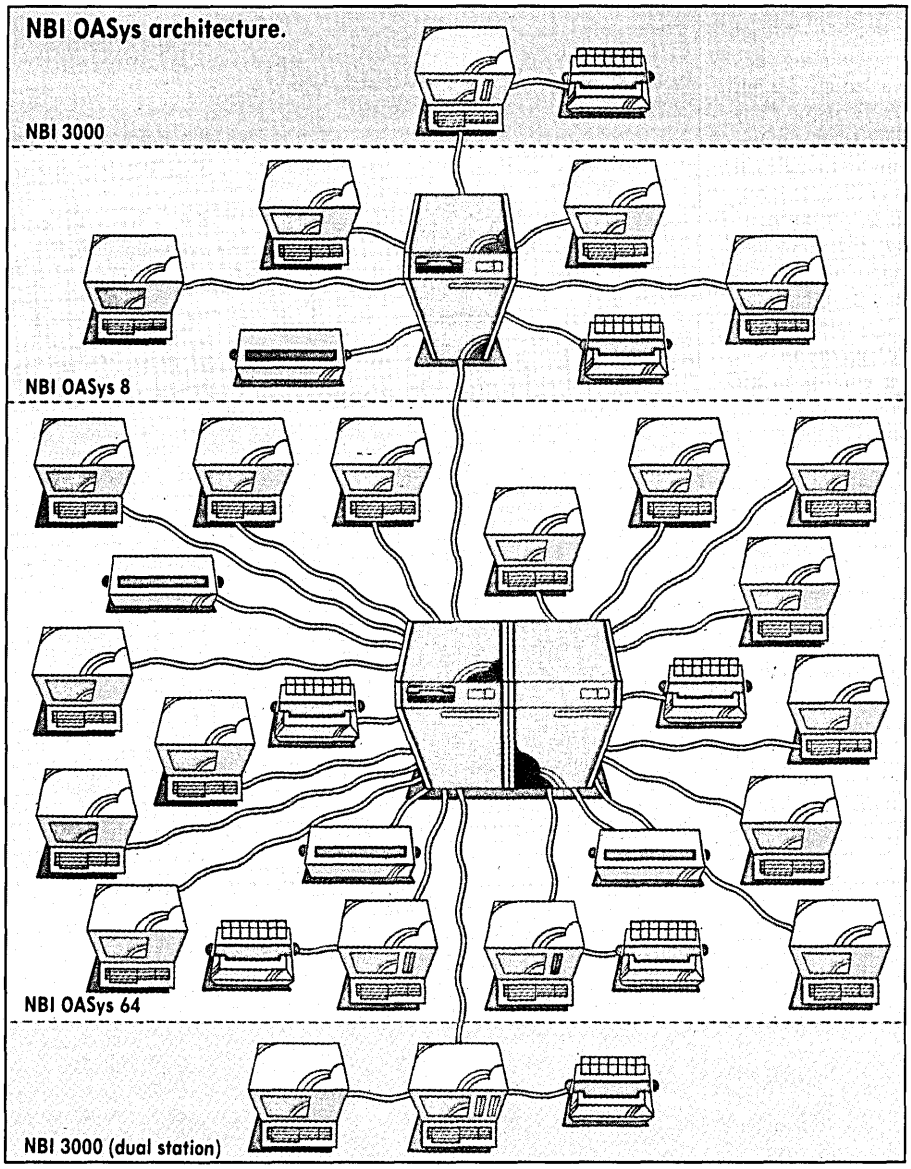

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Fiber optics is well suited for data transmission in a variety of environments.

users to design with fiber optics on essentially a modular basis, plugging in self-contained units with all the components (including connectors) needed to achieve point-to-point electrical-optical-electrical conversions. Exxon's Optical Information Systems Div. offers a family of laser transmitter modules in the high performance category (100MHz bandwidth). Manufacturers such as Spectronics, Hewlett-Packard, RCA, and 3M have developed complete integrated module links for data rates up to 20Mb/s at distances up to 2 km.

Fiber optics is well suited for data transmission in a variety of environments, and has found applications in control, instrumentation, and dp. Fiber optic modem bypass (or eliminator) units offer noise immunity superior to that of conventional wire units, with the capability for much higher data rates. Further, because of the wideband characteristics of the fiber, conventional wire modems are replaced by simpler optical ones, and equalization or line conditioning is unnecessary for long distance transmission.

While most light wave communications applications are digital (another plus for computer-to-computer conversations), analog information is often required for process control or monitoring in industrial environments. In these cases a voltage-to-frequency converter, together with digital fiber optic transmitter and receiver and a frequency-to-voltage converter, can provide accurate, low-noise, temperature stable transmisssion over a maximum length of 2 km.

FIG. 4

SE3352 SWEET SPOT LED

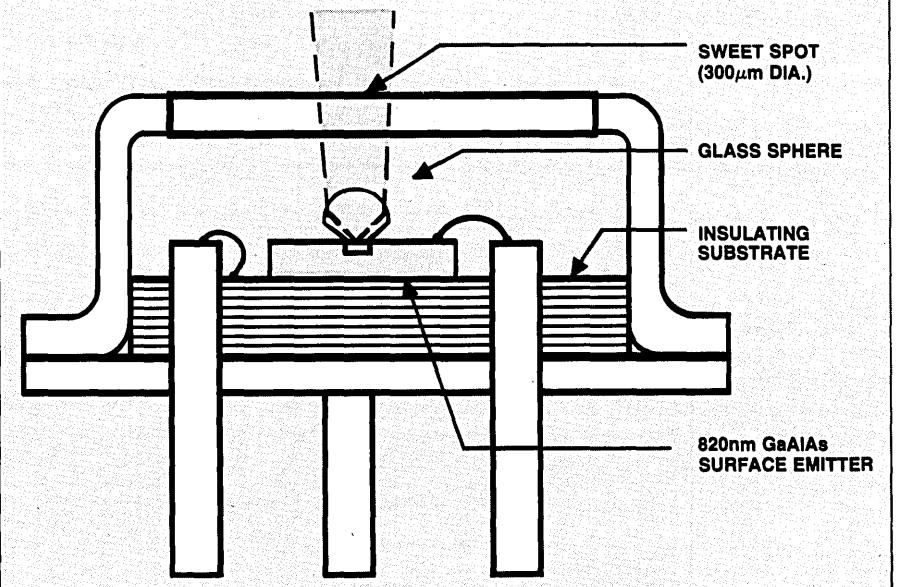
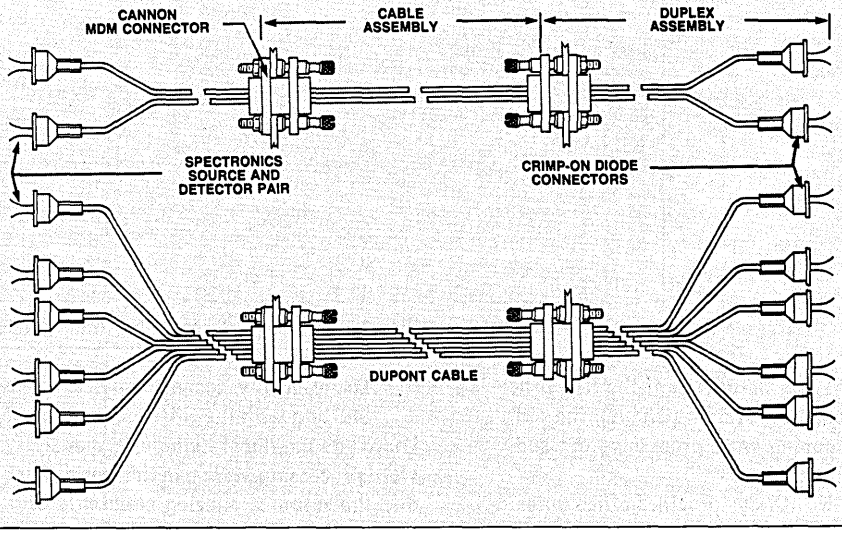


FIG. 5

HDC INTERFACE LINK



FUTURE OF FIBER OPTICS

As distributed processing networks develop in the mid- to late 1980s, fiber optics will undoubtedly find widespread use, particularly in short and medium distance applications within a plant site or a single office complex. Local networks tying processing for order entry, inventory control, invoicing, shipping, and normal dp functions will require transfer of large blocks of information at high data rates. Unexpected noise sources and ground loop problems can cause major complications in such systems. The advantages that fiber optics enjoys over wire—low noise susceptibility, low loss/wideband transmission, small size, light weight—will make it an attractive medium. Fiber optics will not replace other transmission techniques; it will be used where it is most useful, and many of those applications are only now coming into being.

Fiber optics will probably figure heavily in such exotic communication systems as the "wired city," where telephone, tv, radio, and mail services would be linked into each home via a single wideband channel. The same system could make it possible to conduct financial transactions remotely but interactively, in which case the electromagnetic security of optical cables will be useful.

Much work remains to be done in next-generation fiber optic hardware, particularly for short/medium distance applications. Cable prices are continuing to decrease, and optical transducers must follow suit for both high speed systems and for low-cost, low-performance applications. The labor-intensive methods of laser fabrication currently used must be streamlined if lasers are to penetrate higher volume sectors of the market. LEDs and PIN diodes must also be improved.

Manufacturers of components must focus on adopting standards, generating better application information, and compiling accurate lifetime/reliability data to allow use of such components as a part of normal engineering design cycles. One step toward that standardization was taken last May, when Dupont, ITT Cannon, and Spectronics announced a point-to-point data link called the HDC Interface. The link is suitable for short-distance, medium-speed applications, and

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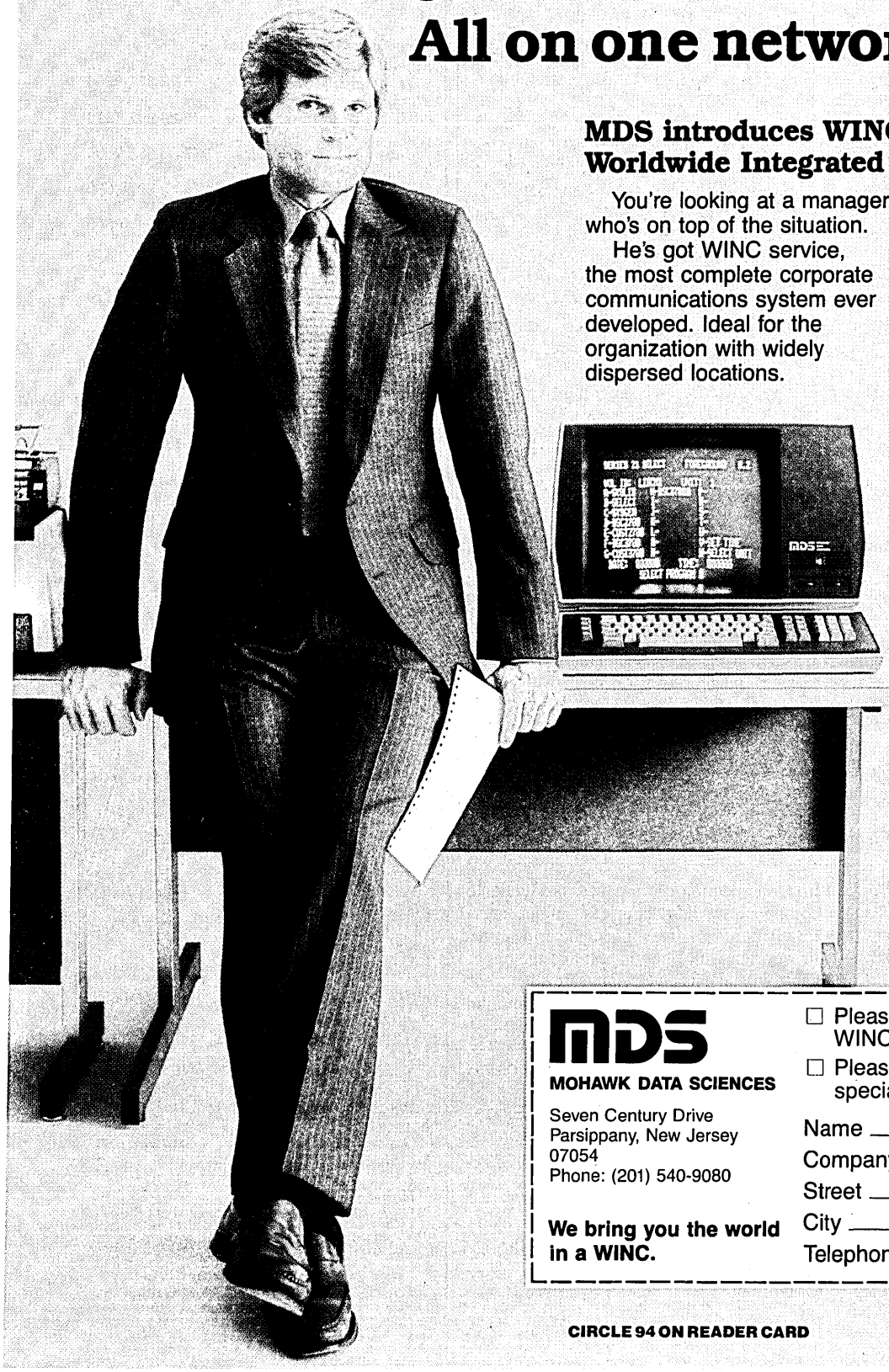

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CIRCLE 94 ON READER CARD

OUT OF THE LAB, UNDER THE STREETS

The best publicized uses of fiber optics for communications have been the big telecom projects undertaken by the common carriers. GTE has two Siecor cables in place in Fort Wayne, Ind., running two miles from a main switching center to an exchange building. AT&T has several installations, the most notable of which is probably the one in Chicago, a mile-and-a-half link that carries voice, data, and video between two Bell offices. United Telecom has a 12.3 km link between Carlisle and Mount Holly Springs, Pa. Most recently (last November) and most spectacularly, AT&T received permission from the FCC to install an optical fiber telephone trunk line between Washington and New York, part of the 631-mile Northeast corridor line the company intends to construct.

CATV companies have also been among the leaders in implementing fiber optics. One of the most ambitious projects is the CATV supertrunk installed in London, Ontario. This 322 Mb/s system carries 12 color tv channels and 12 stereo channels over eight kilometers. The system electronics were built by Harris Corp., and the installation uses 10 lengths of six-fiber cable manufactured by Canstar.

These higher power, longer distance applications tend to use different kinds of components than those appropriate for local data communications. Light sources are typically lasers (although LEDs are also in use at AT&T's Chicago installation). Receivers are usually avalanche photodetectors, and cables are of the low-loss, high-quality glass variety.

Smaller systems, by contrast, usually use cheaper plastic-core cable such as the Dupont Pifax. Light sources are generally LEDs, and receivers are PIN diodes or other lower-performance components. Designers don't want to pay for capacity they don't need.

One well-known local datacom installation is in the city of Houston. Terminals in the public library are linked to terminals in the firehouse with 3,200 feet of optical cable. These are connected to a Univac 1900 CADE in the city courthouse by coaxial cable. LEDs are the light source.

Spectronics recently signed a contract to provide system electronics for a fiber optic datacom system at NASA's Ames Research Center in California. The optical cables will replace a coaxial system. An entire wind tunnel facility is to be cabled; links will run from sensors on model aircraft to datalogging computers. Noise immunity and wide bandwidth for accommodation of high data rates were the main attractions of fiber optics in this case, and other high-technology facilities (such as Lawrence Livermore Labs and Grumman's Bethpage, Long Island, plant) use optical communications for similar reasons.

As with any new technology, there are problems to be solved as fiber optics moves out of the lab and into the field. One such was encountered by General Cable when, in conjunction with Manhattan Cable TV, the company installed a 5.2 km optical cable for video transmission between 23rd St. and Columbus Circle in Manhattan.

The best way to proceed was with no repeaters, because maintenance is difficult beneath Manhattan. The cable was laid in six lengths with only five field splices, achieved by accurately aligning two fibers end to end and using an electric arc to fuse the ends together. This resulted in a stable splice with attenuation of .2dB or less.

But there are a lot of arcane substances in Manhattan's crowded duct system, and no one is certain what sorts of sinister gases corrosion may be producing down there. For this reason open flame and electric arc devices are prohibited; how then to make the splices? The answer was the use of General Cable's special splicing module, a Plexiglas chamber which is sealed, purged, and repressurized with clean air. The device includes an organizing mechanism for precise alignment of the fibers. Each splicing operation took about five hours, long for an individual splice but not so long when the low number of splices necessary is taken into account.

—**Ken Klee**

uses Spectronics source and detector pairs, Dupont Pifax plastic core cables, and standard, low-cost electrical connectors from ITT Cannon. Components can be purchased separately, allowing engineers to design on a modular basis.

Equivalent components can also be substituted. For example, where longer range transmission than the HDC permits is desired, designers can use AMP Inc.'s ADM connector, which takes advantage of the Sweet Spot's greater power launching capacity in connecting lower-loss fibers. The ADM connector is also compatible with Motorola's Straight Shooter LEDs and detectors; in fact, this connector is so widely used that it has come to function as a sort of de facto standard for the industry.

As standardization develops, applications should multiply and mass production of components will lower prices. Engineers and installation workers will become accustomed to working with fiber optics, and the optical cable will take its place alongside other transmission techniques as a workaday communications tool. ✱

Bill Stephens joined the fiber optics division of Spectronics in 1977, working in marketing and sales. Since Honeywell's acquisition of Spectronics, he has handled product and business planning activities for fiber optics opto-electrical components and modules, as well as applications engineering. He received his BS and MS degrees from Texas Tech University.

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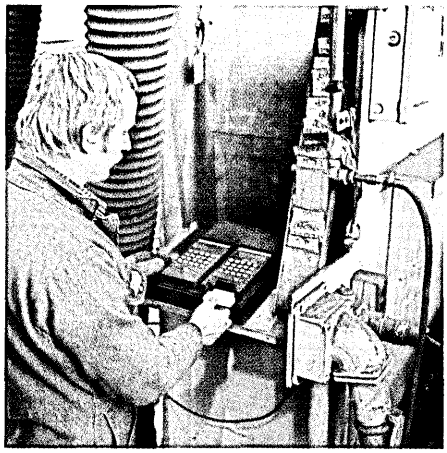

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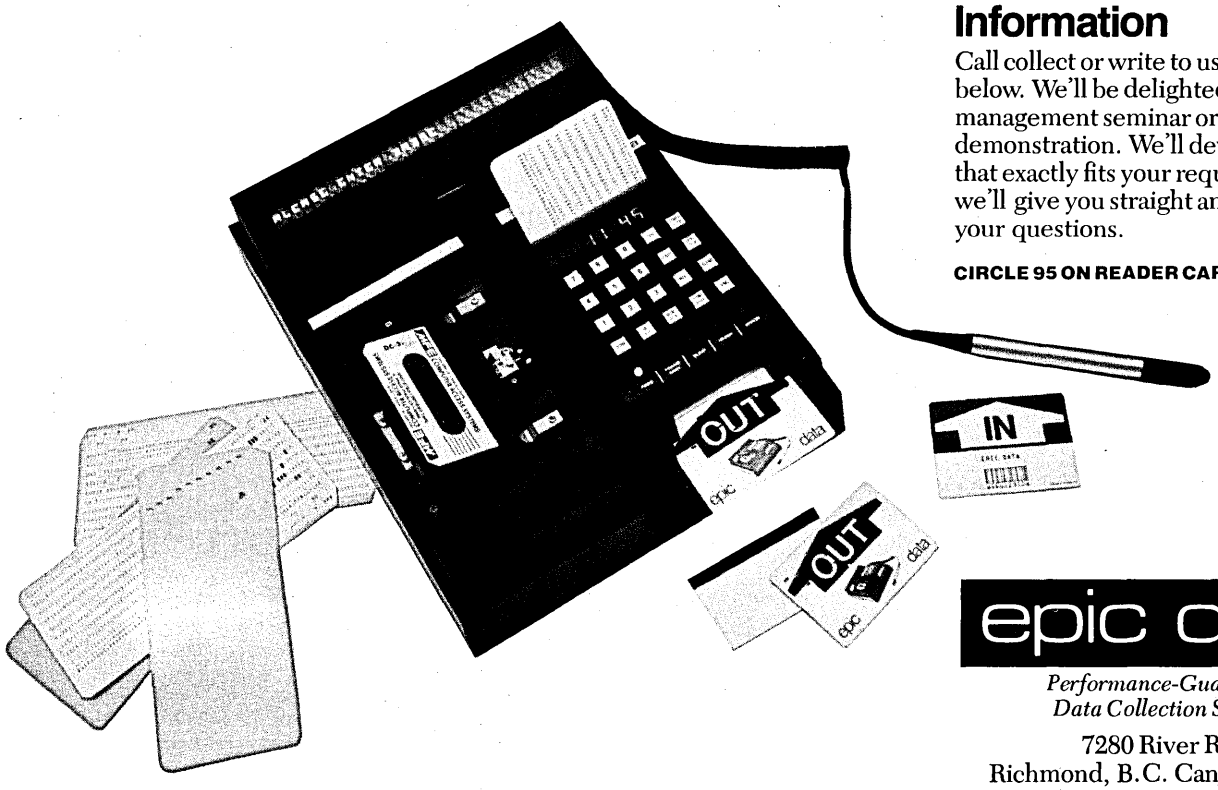

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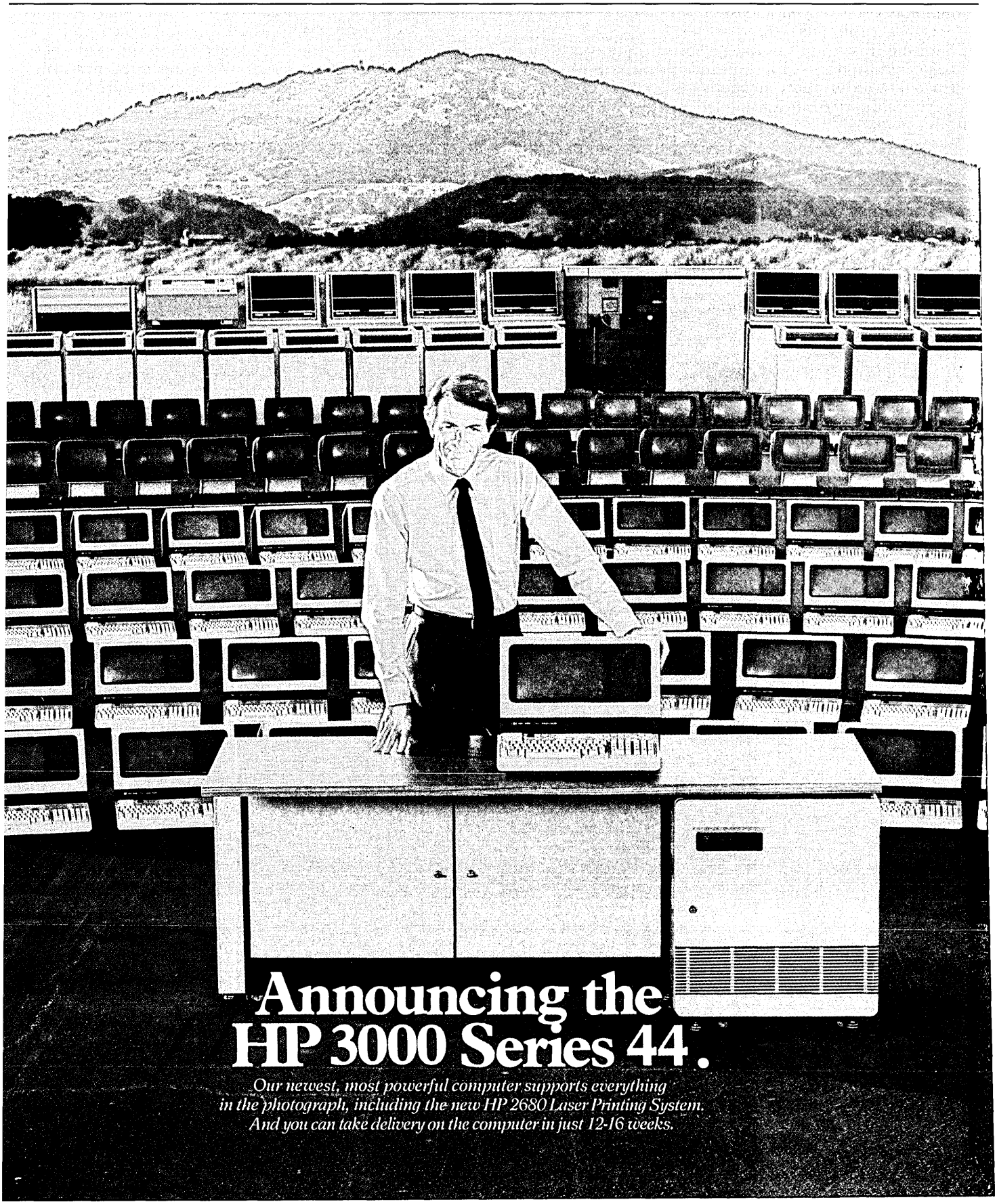

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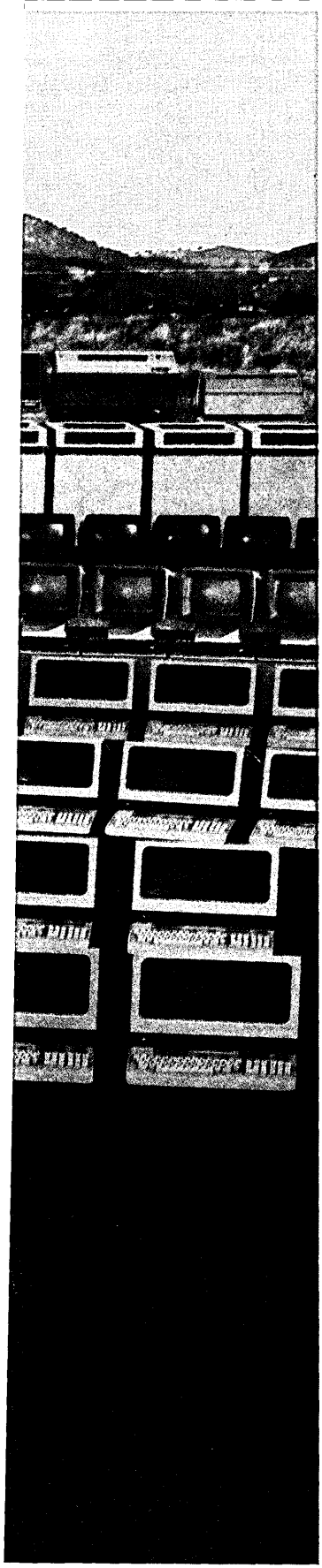

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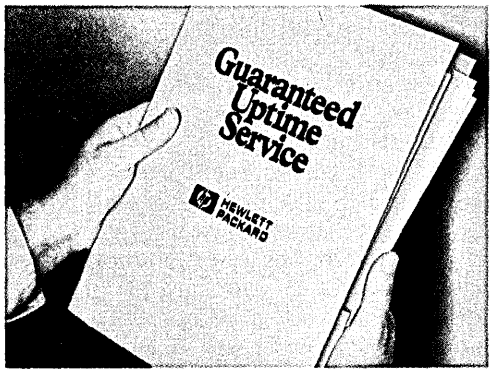

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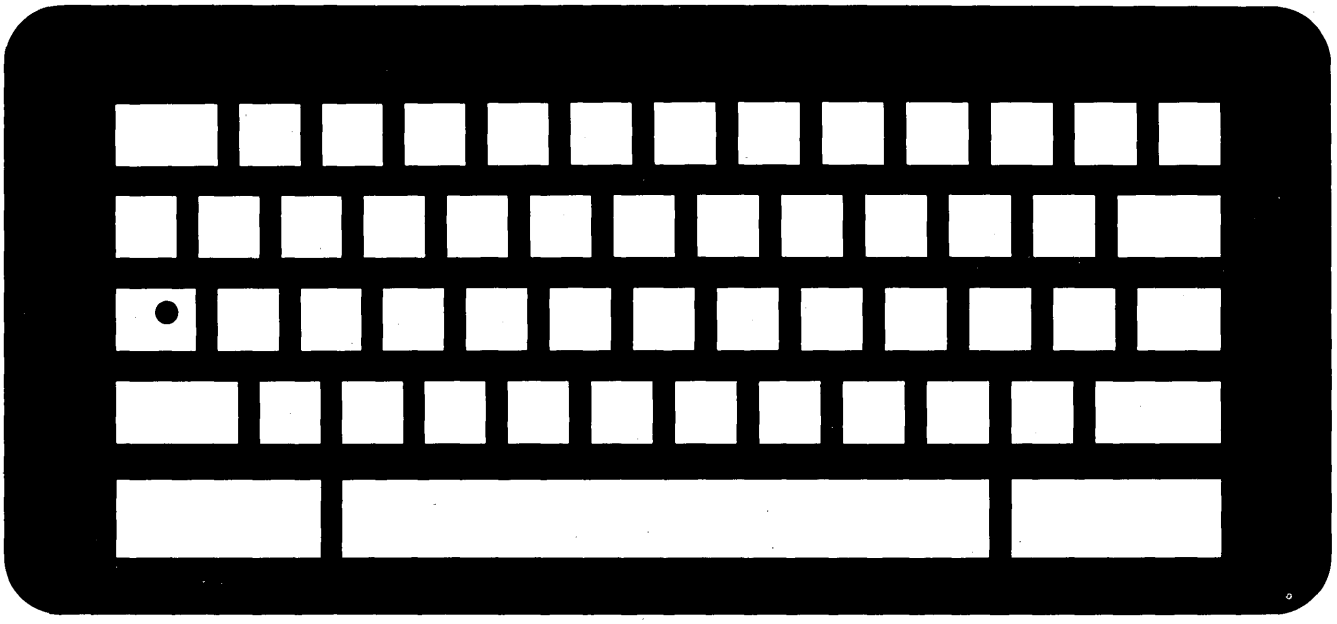

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CIRCLE 97 ON READER CARD

A preview of the subjects, seminars, and speakers at Interface '81, the world's largest datacom show.

CATCHING UP IN VEGAS

Quick change is the norm in the data communications industry, but events actually seemed to accelerate this past year. Fuzzy Koren characters have been using Xerox's Ethernet in the pages of *Fortune*. Between halves of NFL playoff games, Exxon sent the tiger who used to inhabit your gas tank wandering among chunks of an automated office. Satellite Business Systems has put hardware in the sky, and on the chilly shores of the Bay of Biscay the French telephone monopoly has been hooking up optical cables in the village of Biarritz. AT&T, a good-sized communications firm, has announced a major restructuring. And the Federal Communications Commission has ruled that there really isn't much difference between dp and telecommunications, two functions that are merging into a single information management marketplace.

Sound like a lot to keep up with? One way to do so might be to attend Data Communications Interface '81, this year's version of the world's largest datacom show. Interface started in 1973 as a nuts-and-bolts modem and multiplexor conference, but as the field has expanded, so has the show. Says Sheldon Adelson, president of the sponsoring Interface Group: "So-called office automation continues to take place within the data communications environment. Thus, Interface continues to broaden its traditional end-user charter to encompass new areas of information resource management. Such functions as the acquisition, processing, storage, retrieval, and communications of information blend into each other in increasingly complex systems."

Not that modems have been forgotten; the conference continues to emphasize productive use of what's available off the shelf, as evidenced by a group of sessions entitled Datacomm Interfaces. Attendees will learn how to get more out of modems and muxs as those old standbys are rejuvenated by micros and take on new tasks in network control, protocol translation, and terminal interfacing. There won't be any dearth of vendors of these products, either. General Datacomm will exhibit, as will Infotron Systems, Micom Systems and others.

Interface has expanded in size as well as in scope over the years. The 1973 show drew 2,000, but recent versions have attracted around 10,000. Because the conference will take place in Las Vegas, site of the extremely successful Interface '78, the organizers expect a hefty turnout. Over 200 companies will exhibit this year, ranging from big names like the Bell System, Hewlett-Packard and RCA Global to small ones like Tiffany Stand & Furniture.

The keynote this year will be struck by two speakers. William S. Anderson, chairman of NCR, will offer a ceo's perspective on the directions data communications is likely to take in the '80s, and Robert C. Hall, president and ceo of Satellite Business Systems, will take a look at banking and communications in the next decade.

People who make the trip across the desert to Interface '81 can expect to hear a lot about interfaces between different kinds of technology. As communications equipment proliferates, users are becoming increasingly baffled as to how the stuff fits together. Says Peter B. Young, conference program manager: "Integration is the key word at this year's conference. In our program listings, you'll find the word used more times than at a Mississippi cocktail party in the '50s." Users need to know how to assemble diverse technologies into working systems; in the next decade they will have to manage integration of networks, of hardware, of software.

Highlighting the conference will be 11 special focus seminars, which Interface hasn't done before. These half-day sessions will feature experts discussing core topics in datacom. Why the new approach? "Like everyone else in this business, we're always fiddling with our format in an attempt to discover better ways to present the information," explains Young. The Interface Group held similar seminars at the most recent Interface West conference, and they went over well. But while those sessions lasted all day and cost extra, the special focus sessions at Interface '81 will be three hours long, and there will be no surcharge. "The whole thing is structured to create a free flow of information," Young continues. "These sessions tend to be cheerfully argumentative. There's a lot of spontaneity."

HELP FROM EXPERTS

Indeed, several of the experts who will be running the seminars plan to bring colleagues with them to broaden the discussions, and also to allow a fair amount of time for questions from the audience. Says Frank Dzubeck, president of Communications Network Architects and the man in charge of the local networks seminar, "You get some nice questions that way. These are management people, a very interactive crowd." Dzubeck's panel will consist of four experts. One of them will be Tony Carlson, manager of data networks at the U.S. Senate computer center, who will talk about CATV for data, limited distance modem/twisted pair networks, and Ethernet I.

Einar Stefferud, president of Network Management Associates, will also have some help when he conducts his seminar on office systems planning. Attendees will hear from several users who are in the process of implementing office automation systems. The focus here will be on helping users figure out just what they want to accomplish with the systems they can expect to be building over the next 10 years. "By my reckoning," reckons Stefferud, "that's where a lot of people fall down. They don't recognize the general requirement." Of course, users can't buy anything now that will answer all their needs in 10 years—if they want to be up to date at that time. But they can make purchases right now that they can build upon. As Stefferud puts it, "You need an evolutionary strategy of incremental additions as new technology becomes available."

According to Stefferud, office automation is not a single system, but the achievement of something he calls interoperability between systems. A model of sorts is the way we currently move paper. Letters may be a bit slow, but they travel everywhere because all offices have systems for handling information in that form. Automated offices will be as adept at handling electronically borne information. Local networks are the key ingredient in creating that kind of productive environment, and Stefferud's panel will be talking about how local nets now becoming commercially available can hook up to long-haul public data nets. There will also be some

Eleven half-day special focus seminars will be offered for the first time.

discussion of the art of training workers to be productive with the new technology.

Dr. Joel Orr of Orr Associates, a Danbury, Conn., consulting firm, is in charge of the special focus seminar on business graphics. Business graphics is already a billion-dollar industry, says Orr, with firms like Merrill Lynch demonstrating daily that organizing information into a bar chart and disseminating it electronically can be worth more than a thousand words. "Using pictures is a denser mode of communication," explains Orr, and he will be telling attendees what special kinds of hardware and software they need to achieve that denser mode.

Dr. Del Hansen, Hewlett-Packard's section manager for fiber optics, will conduct a special focus seminar on his specialty. He and three other experts will discuss the uses of optical transmission in local networks. They will contrast what's happening in fiber optics with the uses of coaxial cable, including Ethernet, and talk about the economic and environmental considerations that determine which transmission technique is best in a given application. Link-level issues will also be discussed, as efforts continue to develop standards both within fiber optic systems and between those systems and other transmission techniques.

International networking is the subject of Leonard Elfenbein's seminar. Elfenbein is president of the Telecomm Systems group; together with Telecomm vice president Clark Okun and Barry McAdam, managing director of the company's British subsidiary, he will present a tutorial on "the whole array of equipment and regulatory considerations" that have to be faced when designing and operating private user networks between nations. There are tariffs to be paid and questions to be answered, such as "Does the local PTT allow transmission of voice and data over the same lines?"

TANDEM SEMINAR SLATED

Ralph Berglund, a contributing editor of DATAMATION, which is a cosponsor of the conference, will team up with Richard Deal of Deal & Associates to conduct the special focus seminar of broadest scope, entitled "Technology for Tomorrow." Berglund and Deal note that many managers are too busy to follow the vertiginous movement of the datacom industry; they aim to provide a map of information systems communication technology, with which managers ought to be able to make productive use of the rest of Interface. They'll offer ideas as to which technologies will soon demand consideration and which ones are still too far out to spend a lot of time on. The pair made a similar tandem presentation at the Computer Networks Conference in Houston in January, and Deal says the response was excellent.

Other special focus seminars are Network Security, with Hal Becker of Advanced Computer Techniques; Satellite Strategies, with John Nuwer of Atlantic Richfield's electronics and telecommunication division; and SBS and alternatives, with Max Beere of ICS Group.

An additional 53 sessions of conventional length (90 to 120 minutes), arranged into groups of two, three, and four, will cover a broad range of technological and management issues. One of the most popular of these groups is likely to be the show's traditional Datacomm School, four nontechnical tutorials designed to serve as a basis for further study. Attendees will learn the basic concepts and terminology of data communications. The school is as old as the show, and according to the organizing committee it has given many voice communication and dp professionals their start in data communications. The last time Interface was in Las Vegas, the school averaged nearly 700 people per session. Titles this year are the Telecommunications System, with John Nuwer of Atlantic Ritchfield; Datacomm Fundamentals, with Charles Joyce of Network Strategies; Datacomm Building Blocks, with Gil Held, datacomm chief at the U.S. office of personnel management; and Datacomm Network Concepts, with Dr. Phil Enslow, professor of computer science at Georgia Tech.

Integrating Information Resources—no small job, that—is the title of another group that's expected to be well attended. Incompatible systems have a lot of users wondering whether Rube Goldberg is alive and working as a communications consultant. The solution, obviously, lies in the integration of a variety of information at both the functional and technical levels, but how do you accomplish that? Sessions are Emerging Voice/Data Networks, with Ralph DeMent of Distributed Systems Hardware; the CBX as Network Integrator, with Dale Kutnick of The Yankee Group; Integrating Private and Public Networks, with Peter Moulton of Moulton & Co.; and Clearing Network Compatibility Hurdles, with Rubin Gruber, president of Cambridge Telecommunications.

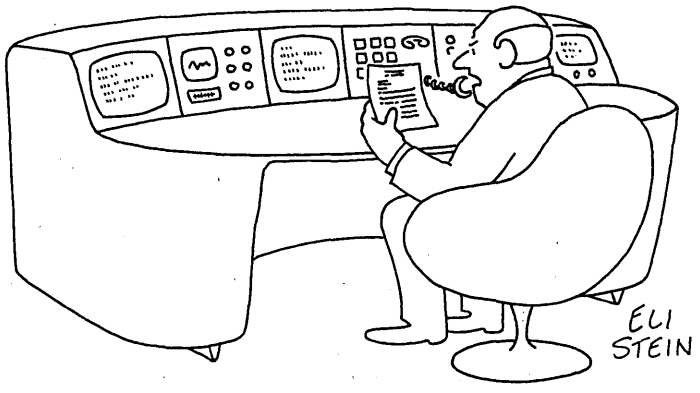
Because so many studies have indicated that there will be a serious shortage of programmers in the '80s, Interface will offer a group called Packaging Software Solutions. Off-the-shelf software packages and firmware will be taking on increasing importance; managers will need to know how to use them. Sessions are Filling the Software Gap, with Andrew Olson, managing director of TEAM International; Operating Systems—the Critical Linkage, with Richard Watson of Lawrence Livermore Labs and Ronald Sander of the Library of Congress; Integrating Multiple Applications, with Brian Fisher, a consultant to Booz Allen & Hamilton; and Software Tools for Data Base Management, with Gary Audin, president of Delphi, Inc.

Some of the other Interface '81 session groups are Distributed Data Processing Futures, Public Networks, the Integrated Office, Peripheral Highlights, and Issues for the Information Industry. The issues group will feature a session with Howard Anderson, president of The Yankee Group, who will discuss the reorganization of AT&T.

Interface '81 will take place March 30 to April 2 at the Las Vegas Convention Center. Headquarters hotel is the Las Vegas Hilton, with additional blocks of rooms available at other hotels. Registration fee for all four days of conference sessions and exhibit admission is $125; one-day conference/exhibit floor admission is $65. Exhibits-only admission is $10. For registration information, write The Interface Group, 160 Speen St., Framingham, MA 01701, or call toll-free 800-225-4620.

Las Vegas is warm in March.

—Kenneth Klee



"Miss Farber, would you please tell me what this piece of paper is doing on my desk?"

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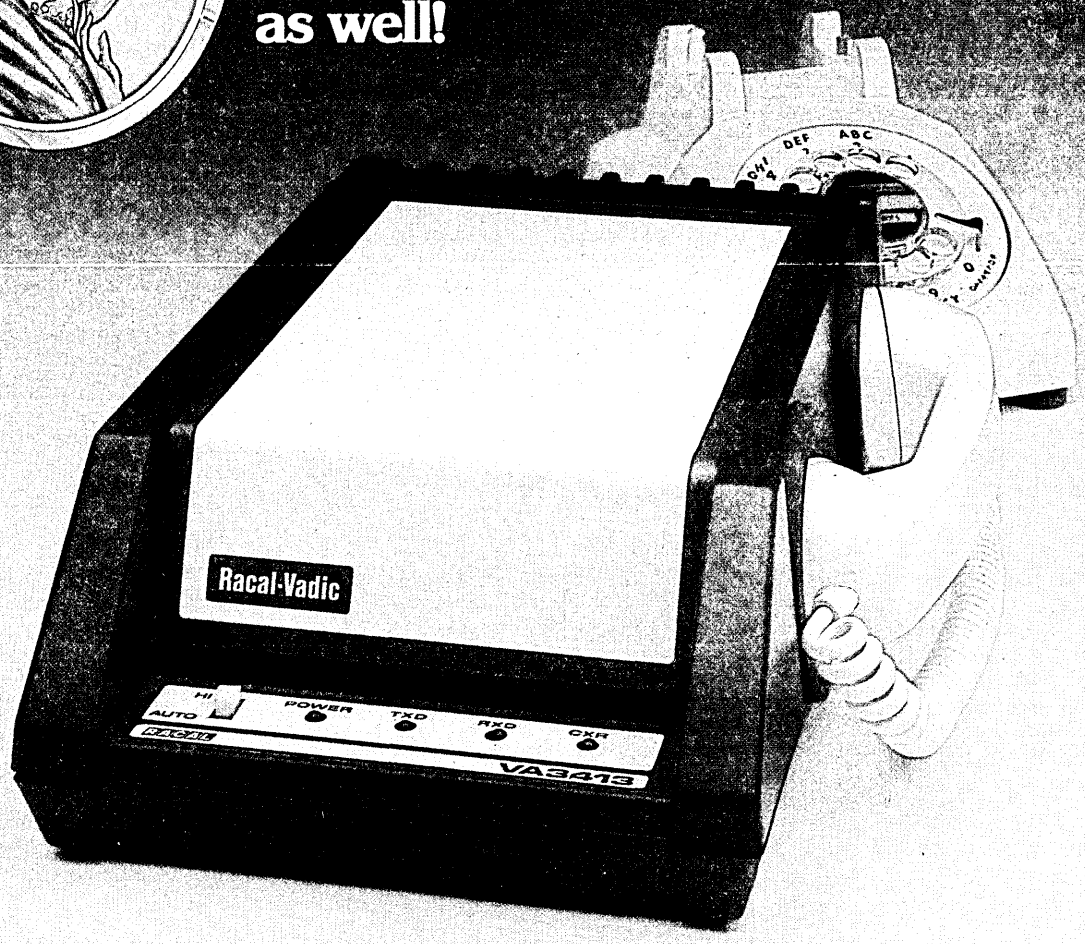
CARTOON BY ELI STEIN

Dear Ma:

Racal-Vadic has the world's first Dual Acoustic Coupler... 1200 bps full duplex and 0-300 bps as well!



Another winner from Racal-Vadic, Ma. It's the world's first DUAL acoustic coupler.

The compact VA3413 is fully compatible with Racal-Vadic's VA3400 and your 103/113 type modems. Just think, Ma, a single portable coupler can now handle virtually all originate applications for full duplex 1200 bps and 0 to 300 bps data transmission over the dial-up telephone network.

This is great news for remote terminal users who can, if they wish, instantly step up to 1200 bps full duplex, using the same 103 type protocol, yet can operate at 0 to 300 bps as well. It's two couplers in one!

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CIRCLE 98 ON READER CARD

Our new B-900 helps keep the DP department ahead of a growing demand for printout. It's the fastest member of our reliable B Series family of band printers.

Like the B-300 and B-600 models, it has Dataproducts' patented Mark V hammer system at its very heart. The system is virtually friction-free. The result is a remarkable level of reliability.

That reliability is proven, too. With over 16,000 units in the field, our B Series printers have become the industry standard for excellence.

Fast and easy.

The B-900 was designed for high performance, printing up to 1100 lpm with a 48 character set. It prints out 900 lpm with 64 characters and 670 lpm with a 96 character set.

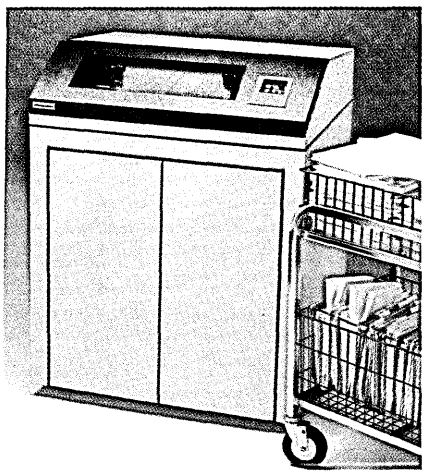
All the B Series were designed with the operator in mind. The long lasting ribbon cartridges are easy to load. The bands can be changed in less than a minute. Sophisticated self diagnostics let the operator identify problems and often correct them without a service call.

The quiet type.

With fully sound-insulated cabinets, the printers operate at only 60 dbA—even less than the noise level of a

With Dataproducts' B-900 Band Printer, every department gets what's coming to it.

GREAT MOMEN



typewriter. These cabinets are available on the B-300 and B-600, standard on the B-900.

A name you can trust.

Dataproducts is the world's largest independent printer manufacturer. For 19 years, we've built printers for the biggest OEMs in the business, putting their names on our machines. These customers make sure our printers live up to some pretty tough standards.

Now our B Series band printers are available with our name on them. Or with your name.

We're here to help.

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CIRCLE 99 ON READER CARD

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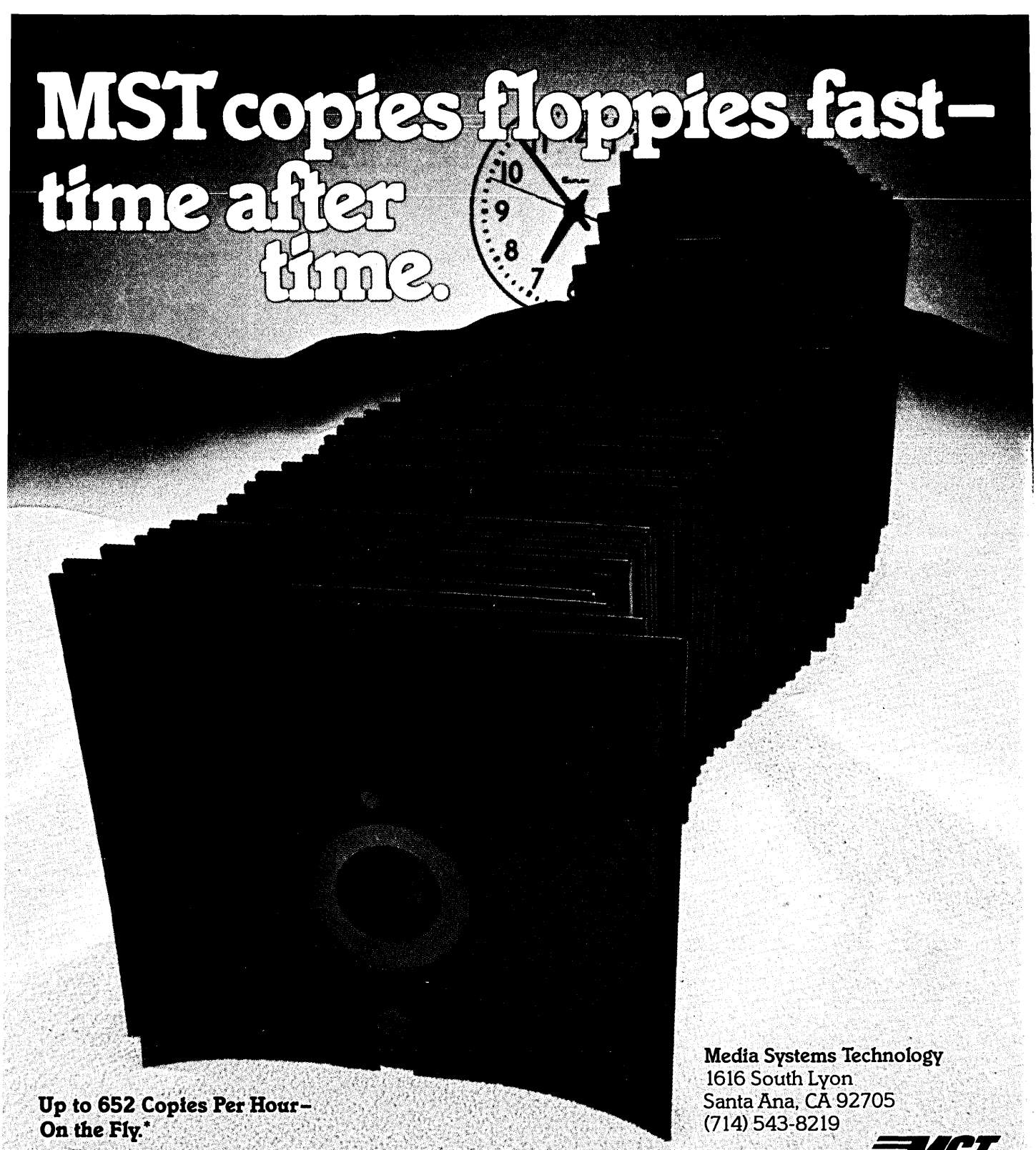

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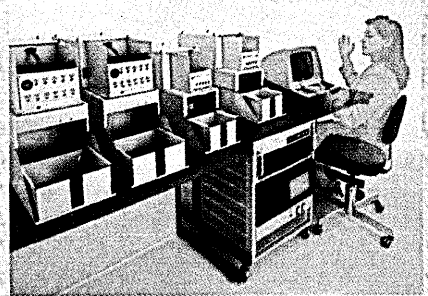


CIRCLE 100 ON READER CARD

A guide for the corporate exploratory team making the initial foray into the uncharted wp wilderness.

TEN OBSERVATIONS ON LIVING WITH WORD PROCESSING

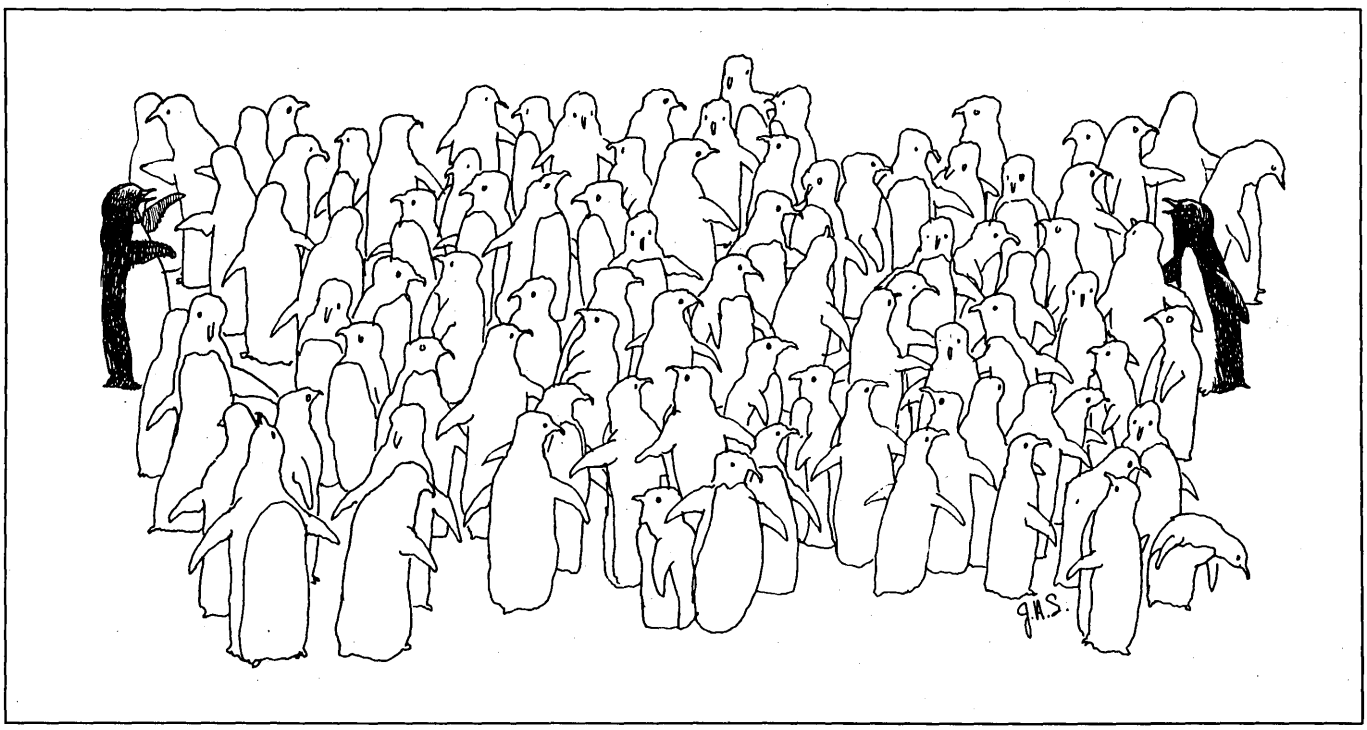


ILLUSTRATION BY JOSEPH SMITH

by Bruce Huffine

Trying to keep up with word processing (or its more mature brother, information management) can be a frustrating and humbling experience. To a dper just venturing into this technology, it is doubly hard to get a general view of this new industry and relate it to the more traditional dp world.

With the mounting awareness and growing affordability of wp equipment, more and more companies are entering the evaluation phase and catching up on new introductions. If you are part of the corporate exploratory team making the initial foray into this uncharted wilderness, you should know that other pioneering parties have returned with satisfying results.

Sometime in the distant past, a lot of companies started pushing something called the "office of the future." In all likelihood, it was probably invented by the same genius who started Betty Crocker's "kitchen of tomorrow." In the same way the stove has been enhanced by microwave technology, mag card typewriters have been upgraded with crts, central storage, and communication interfaces to traditional computer hardware. In five years we will all be searching for a way to cope with the inevitable integration of dp with all the information processing disciplines that are evolving.

The mastering of word and information processing only comes with some trial and error experimenting with various combinations of information recipes that meet a company's needs. During this initial experimental phase, the following observations may give some perspective on the nature of word processing. If some comments seem obvious, or appear to be just common sense, they probably are.

The attempted poetry of a frustrated poet is lighthearted, but the concepts illustrate that this technology requires the same disciplines as traditional dp development. Like many other things in life, wp can be more than meets the eye.

No. 1—The Color TV Theory

We're open to change,
And known to be pliable,
But wp is so new,
Can it be that reliable?

Remember Uncle Arnold who said, "I'm going to wait until they get all the bugs out of color tv before I buy one"? Well, he probably never found an absolutely definitive breakthrough that told him it was the "right" time to buy. He probably got tired of watching "Bonanza" in black and white and took his chances along with everyone else.

This same dilemma is prevalent among people considering wp at this time. The unsettling prospects of a whole new set of concepts, end users, and newness of most vendors can make this same thinking sound reasonable, but try and explain that to a user.

If you ask five different people on three successive days to define word/information processing, you'll get 15 different answers.

If you say "wait a few years," that user will wait another year, watch the price of equipment fall below his level of spending authorization, call it a "smart" typewriter, and give every office a different model, brand, and color.

Unlike the color tv set, wp equipment does not have the inherent relatively high price, low quality, and unreliability at this stage of its development. Secondly, this technology is too firmly entrenched to go to the scrap heap of fads along with quadrophonic sound and Pet Rocks. In other words, it is easier to get involved than to pretend it doesn't exist.

As a final solace, some of the more recently announced communication networks have protocols that *should* allow mixing of competitive equipment, making selection of most equipment viable if large communication networks are in your company's future.

No. 2—The Distributed Processing Theory

I call it a document,
They call it a member,
If they change one more word,
I'll never remember.

There's an adaption of an old saying, that goes "Ask five people what distributed processing is and you'll get five different answers." In the diverse as well as rapidly expanding field of word processing, if you ask five different people on three successive days what word/information processing is, you'll get 15 different answers. Why? Here are a few reasons.

The work activities duplicated or enhanced by wp cover a larger proportion of the corporate population. The net result is a much larger and better educated end-user base than when dp was born.

Enticing and thought-provoking articles and advertisements are appearing in the mass media, generating great interest and, at the same time, creating a highly interpretive and speculative perspective on the exact functions, capabilities, and effort involved in the implementation.

Word processing can, at its basic level, still be described as a "smart" typewriter. With this outlook, some dp professionals can still maintain the position that wp is outside the sphere of their jurisdiction. Whether or not it is now, it will be in the near future.

Soft-loaded programs and resultant packages are redefining the scope of wp equipment faster than cartridges on an electronic tv game. With the expansion of wp software beyond records processing and into commercial languages such as BASIC and APL, we are going to make definitions of wp functions virtually synonymous with dp.

In other words, the question of what wp "does" is getting fuzzier. The catch is to keep all the pieces simple, modular, and fitting together in a well-planned design.

No. 3—The Apples and Oranges Theory

I explain all my problems
And you nod and smile,
So why are your solutions
Always off by a mile?

In information processing, nothing is touted more than the need for "communication." But with such a wide variety of business people coming in contact with word processing, the level of comprehension and the ability to pick the right dialect when vendors and users get together is critical.

At a recent trade show, I listened to a record manager (end user) and a wp technical advisor engaged in an enlightening discussion. The user was describing a potential application that had nothing to do with word processing. The technical advisor was answering the question in terms of a file management option that was available. This apples and oranges conversation went on for 10 minutes; then they walked away from each other believing they had found a solution.

The nature of wp allows anyone from a file clerk to a heavy dper to get legitimately involved with a wp vendor (and the vendor representatives have their own varied and diverse set of backgrounds as well). Situations such as this one illustrate the continuing need for interpreters to bridge the gap between users who need help defining what they want and suppliers who can understand, demonstrate, and deliver a solution.

No. 4—The Nothing for Free Syndrome

I deleted the files,
My objectives were met,
So how could I tell
It was Mary's diskette?

As with other kinds of dp, wp has equivalents to the following:

- file security
- maintenance and servicing
- catastrophe planning
- physical file storage
- machine access
- document/file naming conventions and control
- procedure documentation and control
- work priority and scheduling
- training
- retraining
- backup

If a user hasn't heard of these items, it is wise to let these anything-but-insignificant responsibilities out of the bag slowly. Many vendors help identify and sometimes participate in resolving these design or operating questions. But this overhead time can be proportionally higher than the equivalents in the old version of typewriter and file cabinets. Keep management aware of these costs.

Corollary No. 4—The rest of the iceberg costs money too

Don't forget the potential costs of:

- installation and site preparation
- startup inefficiencies and support
- special paper/ribbons
- archive/off-line storage (diskettes and cassettes)
- communication lines, modems, multiplexers, etc.
- special office furniture, environment control and carpet static protection
- upgrade/penalty costs
- deinstallation (shudder)

Amazingly, some users think documents are just stored "somewhere." In most cases, that "somewhere" costs money.

No. 5—Deadly Words

Electronic mail is received
In seconds like they said.
But there's no guarantee
That it's delivered or it's read.

Anytime the words listed below are used, it never hurts to go a little further (most of the time *much* further) in getting a *precise* definition. This observation is really a corollary to the apples and oranges concept. The deadly words include the following:

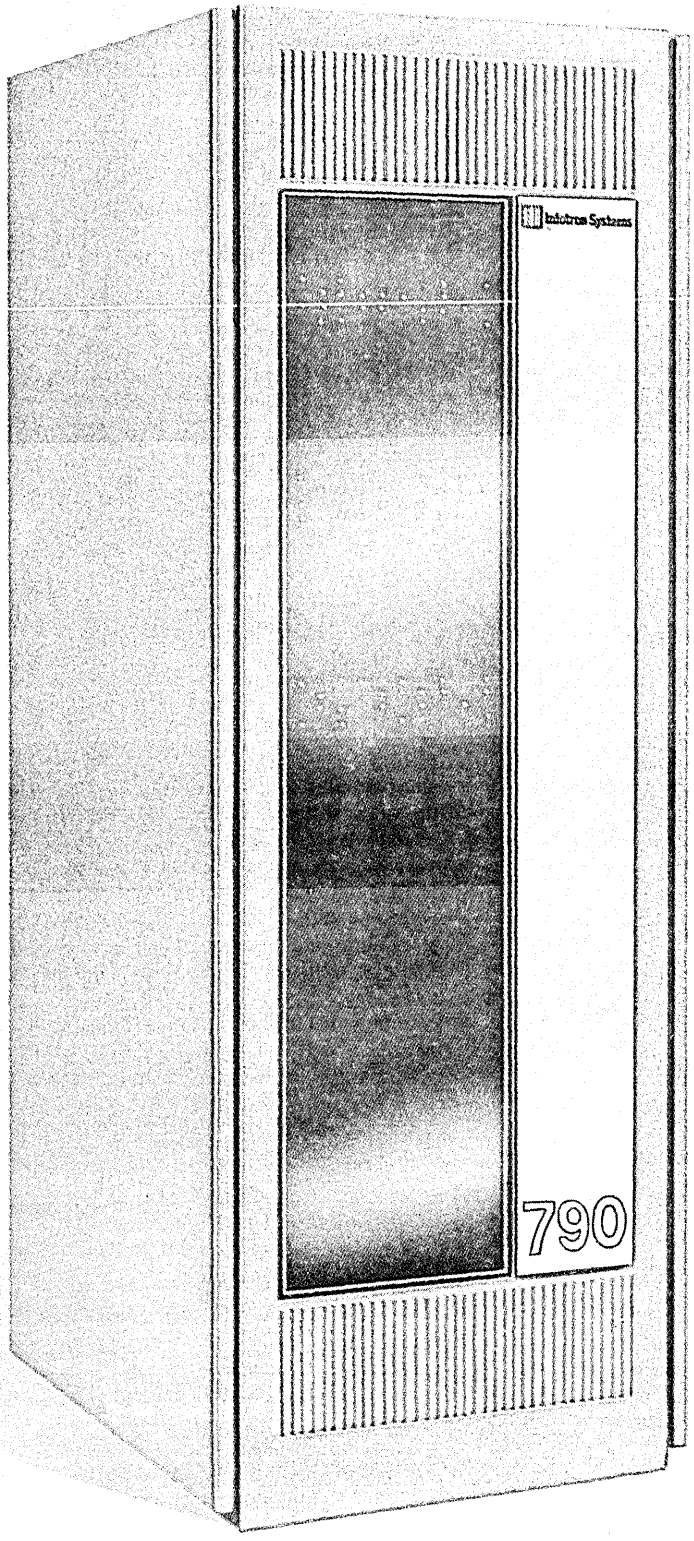
- multitasking
- communications
- computer
- simple
- cost-effective
- "friendly" system
- reliable
- records/list processing
- screen
- clustered systems
- shared logic
- shared resources
- output queuing (spooling)

Corollary No. 5—Deadly Phrases for Deadly Words

- "Can you demonstrate this with a prototype?"
- "I don't understand. Please explain it again."
- "Can you guarantee this price/configuration?"
- "How long have you worked in word processing?"
- "How long have you been with this company?"

The moral of Corollary No. 5 is to continue to ask questions until you know

Incredible Power!



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The Supermux 790 is an intelligent network concentrator with incredible power ... power that makes data transmission more economical, more reliable and more manageable than ever before.

The Supermux 790 gathers data from over four hundred inputs, concentrates it for economical transmission at speeds as high as 72,000 bps, and distributes it through as many as eight remote nodal locations to literally hundreds of destinations. The Supermux 790 also ensures that the data is error-free *and* keeps you up-to-the-second on everything that has happened every step of the way.

The Supermux 790 offers incredible control over the entire network. From your console you can reroute traffic, monitor and reconfigure any local or remote input or output and initiate powerful diagnostic routines to pinpoint problems—even problems in remote, unattended locations.

The Supermux 790 Network Concentrator talks to Infotron Supermux 480, 680 and 780 Statistical Multiplexers and, of course, other Supermux 790 units. This allows you to build multipoint networks using the most economical equipment in each location—without sacrificing data integrity.

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CIRCLE 101 ON READER CARD

Some users think documents are just stored "somewhere." In most cases, that "somewhere" costs money.

what is involved, and *be specific*. Phrasing a question five different ways and always getting the same answer probably indicates the question was understood.

As a footnote, respect the vendor who asks the potential client the last two questions: it demonstrates respect for the apples and oranges problem.

No. 6—The Nothing Up My Sleeve Concept

This little model is
So simple and so neat,
Please sign by the "X"
So my family can eat.

Prototypes are probably the most valuable and revealing method of evaluating equipment. Something can be said for the vendor who will take a particular problem and develop a solution with its equipment. It also aids in tapping the type of organization, talent, and system support that may be available for your use.

The problem with demonstrations is that the text edit show on the publicity flyer and the telephone directory example of records/list processing are really remarkably similiar to those of six other vendors. Whether you are attending a demonstration or presentation of a prototype, a good method of seeing the real difference in equipment is to raise your hand and ask this simple question: "Can you show me exactly how this demonstration was set up?"

The responses from the vendor may vary along the following lines. Judge them accordingly.

- "We'd be glad to show you right now."
- "We'd be glad to show you in private."
- "We'd be glad to show you in two weeks."
- "We'll show you when our technical specialist is in town."
- "You shouldn't be concerned, we'll do all of it for you."
- "It's so simple that we wouldn't want to waste your time."
- "We'd be glad to show you when you sign a purchase order."
- "I'm sorry, I didn't hear the question."
- "I'm sorry, but we've run out of time."

With enough explanation there may be any number of the following involved in the demonstration:

- special programming languages (simple to totally incomprehensible)
- macro procedures (prerecorded responses)
- special software loads
- special access/database techniques
- special software packages in use
- a very simple and easy-to-use set of commands

(Note the deadly words.)

In most cases, the degree of complexity is probably not the most important factor. You want to know exactly what to expect and to be able to technically train and emotionally prepare the right people to do the right job.

No. 7—The Know Thyself Commandment

I said keep it simple,
No glitter or flash,
So why is this monster
Draining all of our cash?

If you have been in outer space for the last five years and have just got a evaluation assignment, be prepared for a shock. Picking equipment from over 100 vendors is like being a lad in a candy store and surprisingly, just as much fun. With the introduction of soft-loaded systems, your main mission will be to evaluate the diverse extra functions and the "style" of equivalent functions on different equipment. Understand and then evaluate the extra software features to determine if they are valuable, usable, and worth the extra cost.

Depending on a number of variables, the myriad of vendors of wp equipment can probably be narrowed down to a manageable number of candidates. For starters:

What your company needs:

- size of company
- number of locations/workstations
- degree of self-sufficiency
- degree of centralization of information processing
- planning/support
- amount of money/capital available
- employee turnover
- intercompany disciplines
- viability of information/word processing centers
- degree of standardization and operator interchangeability desired.

What you might want to rate in a vendor for:

- types of screens
- standalone or clustered workstation concept
- size of vendor
- number of years in industry
- communication capabilities/protocols
- wp/dp bridges
- network plans—short and long term
- software packages
- maintenance performance
- equipment manufacturers (if not its own)
- amount of vendor support
- type and cost of training

How you see yourself and the role of short- and long-term word processing will probably help you rate the relative importance of vendor characteristics. There are many aids and methods to help you arrive at a decision on vendor selection, as well as a number of books, trade journals, and hardware guides that can save you a lot of demonstrations, blind alleys, and wasted time.

When you have narrowed down your choices to a handful of vendors, the axiom is "seeing is believing." Certain vendors will be more than happy to sell you a piece of hardware sight unseen and give you a set of training cassettes to get you on your way. The possibilities, options, and operating characteristics are just too varied not to review equipment in detail.

No. 8—Don't Forget the Physical Laws of Nature

If two days of training
Is all that it takes,
Then invest in procedures,
For the day when it breaks.

Wp requires power.
Wp requires space.
Wp requires proper lighting.
Wp can generate heat.
Wp can break down.
Wp can be noisy.

Although these are not earthshaking revelations, improper planning can subsequently yield:

- a skip-rope arrangement in avoiding cables
- fitting a 25-sq.-ft. piece of equipment into a current 20-sq.-ft. space
- asking everyone to take their plants home and rearranging the office furniture because the sunlight and shadows are hampering the readability of screens
- putting equipment in a tight or poorly ventilated room and realizing there's a problem when operators pass out from heat prostration
- trying to find typewriters that were stuffed into a closet when a really specialized task is necessary or the wp equipment is down
- finding that the possible noise of the printer or disk drive is making the wp workstation as lonely as the Maytag repairman

No. 9—Don't Forget the Laws of Human Nature

Whether lights twinkle red,
Or the lights twinkle blue,
When the system goes down,
They'll come looking for you!

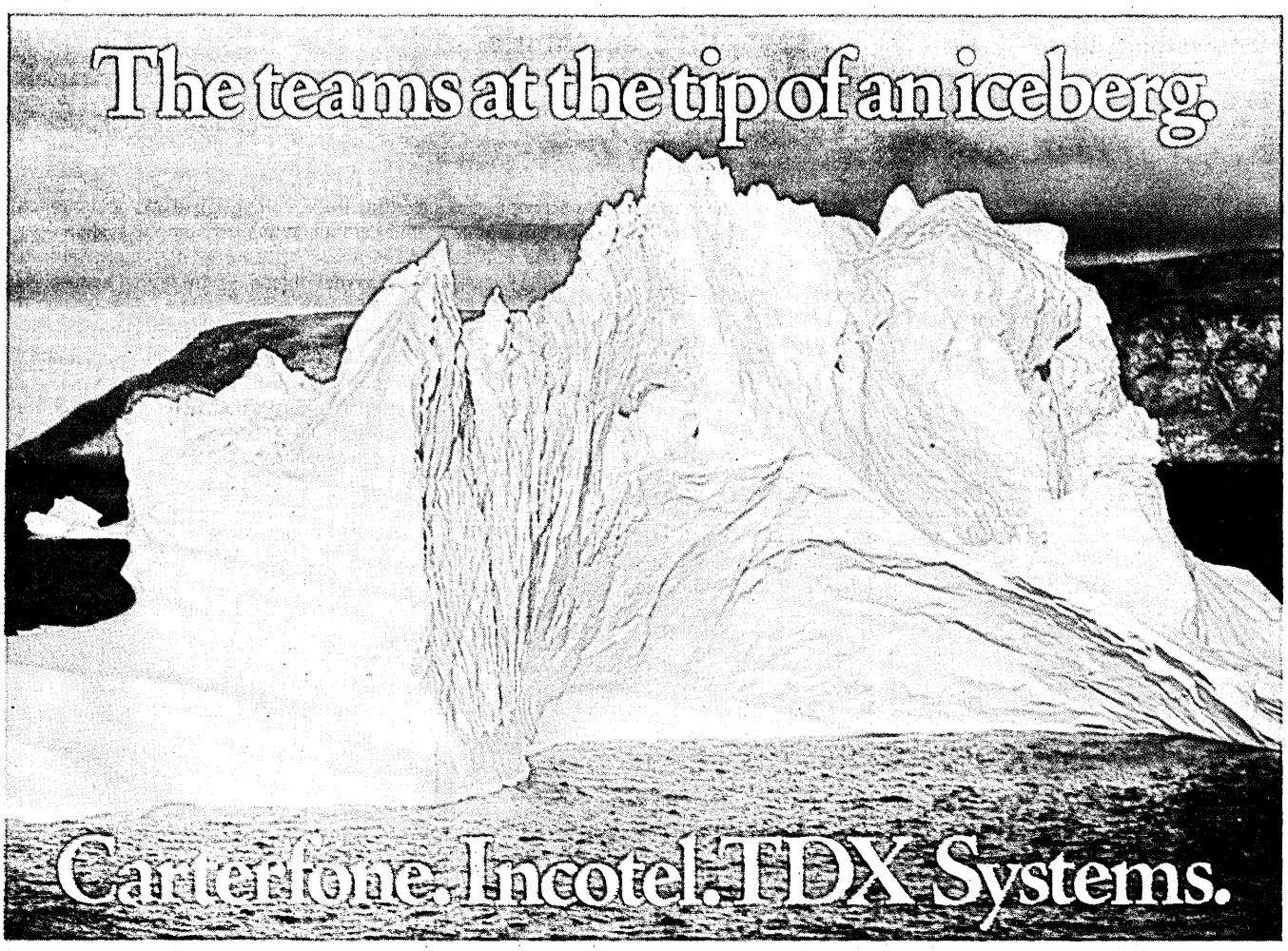
Some of the greatest proposed wp systems have been destroyed by the simplest questions. Human engineering sometimes doesn't keep pace with technology. Typical questions can be:

On a shared printer:

- Who mounts the paper?
- How do you know which preprinted form to mount?
- Must we have perforated edges on letters?

On documents:

- Do I have to be present when memos are transmitted or received?
- Can I verify successful communication by voice?



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TDX Systems specialises in telephone management and control services for small and medium sized businesses. Savings of up to 25% on monthly telephone bills have been achieved for customers using the TDX Systems computer based tele-management systems.

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Carterfone, Incotel and TDX Systems, being part of the worldwide Cable & Wireless Telecommunications Group, are the tip of an international iceberg. And, like an iceberg, the invisible resources are massive.

Cable & Wireless is one of the world's largest international communications groups, and its expertise spans the entire globe. In over 70 countries, Cable & Wireless has provided all types of specialist communications systems, including the operation of national telephone systems in 13 countries and the public networks in 31 countries.

The Cable & Wireless connection.
What does this mean for you?

Quite simply, it means that when you deal with Carterfone, Incotel and TDX Systems you're not just dealing with specialists in the American telecommunications market.

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CIRCLE 110 ON READER CARD

Watch out for the vendor who says, "It's so simple that we wouldn't want to waste your time."

On off-line storage:
- Why should I mount this diskette for someone else?
- Why do I have to walk 500 feet to load this diskette?
- Where are the specialized keys (scientific, etc.)?

Miscellaneous comments:
- Everyone wants this workstation at once.
- No one likes this equipment.
- The brown equipment does not complement this office.
- The letters on the screen are too small.
- I like blue, not green, lettering displays.

If a vendor or those evaluating such equipment do not have valid answers to such anticipated questions, a lot of people are going to think the practical side of operating this system is being ignored. There will be enough suspicion without fueling the fires of mistrust.

No. 10—Tunnel Vision Isn't Bad

While eight stations can run
On this system so new,
If you're new at this game,
Just start with a few.

The visibility of wp and its future development make the taking on of more than a rudimentary system a strong temptation. Based on the Nothing for Free Syndrome, just getting the system installed and documented, the training completed, and the system operating in a controlled environment should be the prime objective. In brief, keep these things in mind:

The system eventually involves personnel at all levels. Treat it like another modification of established work patterns, and expect a certain amount of resentment, confusion, resistance, or—at least—a little unexpected excitement. Remember, it's the operators who are going to make this system work.

Getting too many people involved at too early a stage can be counterproductive. It does no good to have some initial team members getting excited about various pieces of equipment that cannot meet short-term and probable long-term objectives. Get key operating personnel involved when the selection has been narrowed down to a final set of candidates.

Wp can ultimately have impacts on organizations of any size.

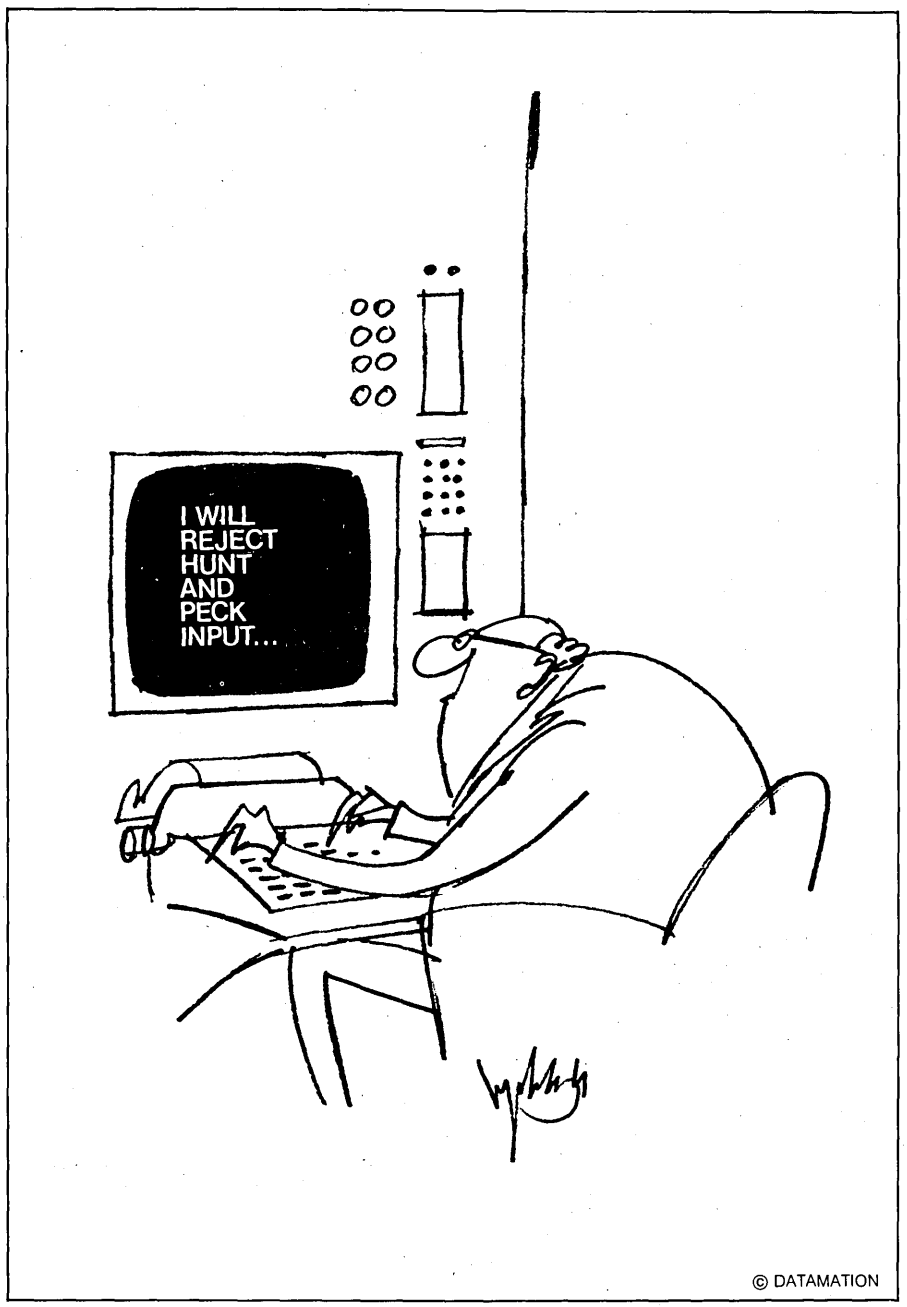
Buying another relatively inexpensive software package diskette is easy. Trying to develop cost-effective uses may take an inordinate amount of time or detract from more appropriate efforts. It's best to keep in mind that some software comes in small diskettes but has big icebergs. Be on the lookout for tinkering.

Word processing may not be appropriate for your company. It is not the universal solution to all of mankind's information problems.

Keep your first objectives controlled, disciplined and achievable. Success breeds confidence and, it is hoped, more success.

Finally, all these observations tell you that wp takes a lot of planning. Like anything else, you can only spend so much time making sure nothing "slips through the cracks" and there are no "big surprises." Unlike dp, major errors cannot be hidden behind closed departmental doors and glossed over in the monthly highlights. This visibility of both success or failure can slow down implementation to a less than practical pace. Be reasonable in your expectations and prepare the user for the events that usually follow any system start-up. Successful word processing gives the user a tool that most people can't figure how they lived without (remember when there weren't photocopiers?).

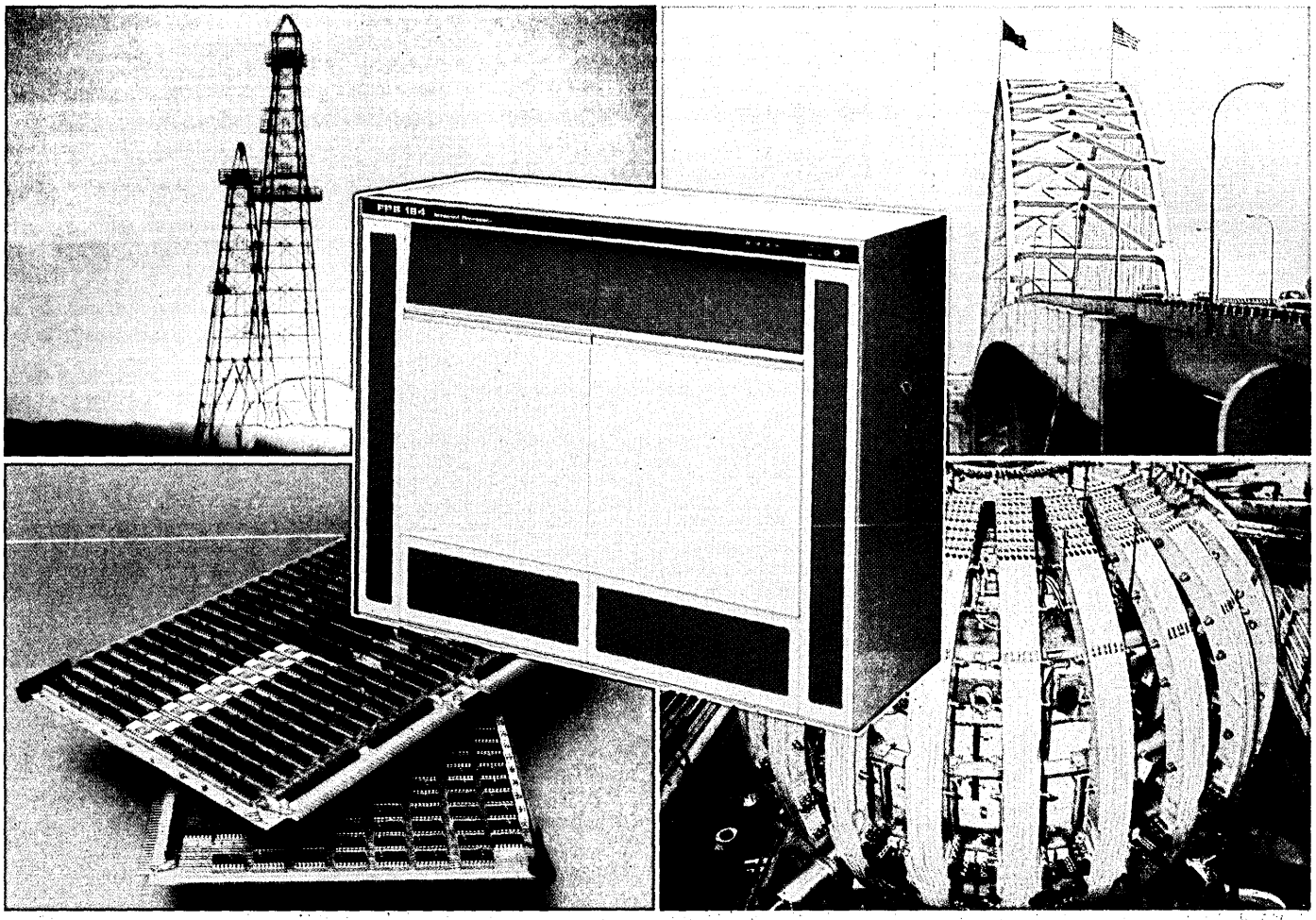
Now, if you'll only sign on the dotted line. . . . ❋



© DATAMATION

CARTOON BY DAVID W. HARBAUGH

Bruce Huffine is associate director, information services, for Charles of the Ritz, Ltd., New York City. He specializes in manufacturing planning and information systems, and is a graduate of the University of Southern California.



Why the new FPS-164 Attached Processor creates such interest

THE FPS-164 IS AN AFFORDABLE ALTERNATIVE TO SUPERCOMPUTERS ... from the company that has revolutionized cost-effective scientific computing

• The FPS-164 is a logical next step based on the proven performance of the established line of FPS Array Processors. The FPS-164 costs just a fraction of what you must otherwise spend for comparable computing power, yet it offers these "big machine" features:

EXTENDED PRECISION • 64-bit floating-point arithmetic provides greater than 15-decimal digit accuracy.

LARGE MEMORY • Main memory is expandable to 1.5-million 64-bit words (12 megabytes) for programs and data. Address Space is 16-million words (128-megabytes), allowing for further expansion as denser memory becomes available.

HIGH SPEED • 12 million floating-point operations per second concurrent with 6-million integer operations per second. Advanced array processor architecture with parallel 64-bit memories, multiple 64-bit data paths, and 64-bit arithmetic elements provides up to 60-million operations per second.

EASY TO USE • Full complement of programming and development software ... ANSI-77 FORTRAN compiler ... extensive math and application library... plus conventional support software.

FPS Sales and Service Worldwide: Boston, Calgary, Chicago, Denver, Houston, Los Angeles, New Orleans, New York, Orlando, Ottawa, Philadelphia, Portland, San Francisco, Seattle, Stratford, Toronto, and Washington, D.C. International Offices: Australia and New Zealand (Sydney • Techway P/L), France (Paris), Germany (Frankfurt and Munich), India (Bombay • Hinditron Computers P/L), Israel (Tel Aviv • Eastronix), Japan (Osaka, Nagoya, and Tokyo • Hakuto Co., Ltd.), Mexico (Mexico City • Equipos y Sistemas de Mexico, S.A.), Switzerland (Geneva), and United Kingdom (Bracknell Berks).

And there's more. The FPS-164 features a vectored interrupt structure, privileged instructions, and base and limit registers for multi-user protection. Since it is built on the dependable, proven design concepts that have made FPS the world leader in array processors, it offers a new standard for performance and reliability. In fact, FPS has now placed more than 1,500 38-bit array processors in applications from image processing to simulation, speech processing to seismic data reduction.

The FPS-164 is particularly well suited for solving large-scale scientific and engineering problems such as global weather modeling, structural analysis, multi-dimensional image processing, seismic data reduction using wave equation models, oil reservoir simulation, quantum chemical calculations, nuclear codes, and computer-aided design and analysis.

To learn more about what the FPS-164 can do for you, contact our sales office nearest you, or Carl Haberland, FPS-164 Product Manager, (503) 641-3151.

See FPS Array Processors in operation at the N.C.C. Island Booth 621 May 4-7, McCormick Place, Chicago, Illinois.

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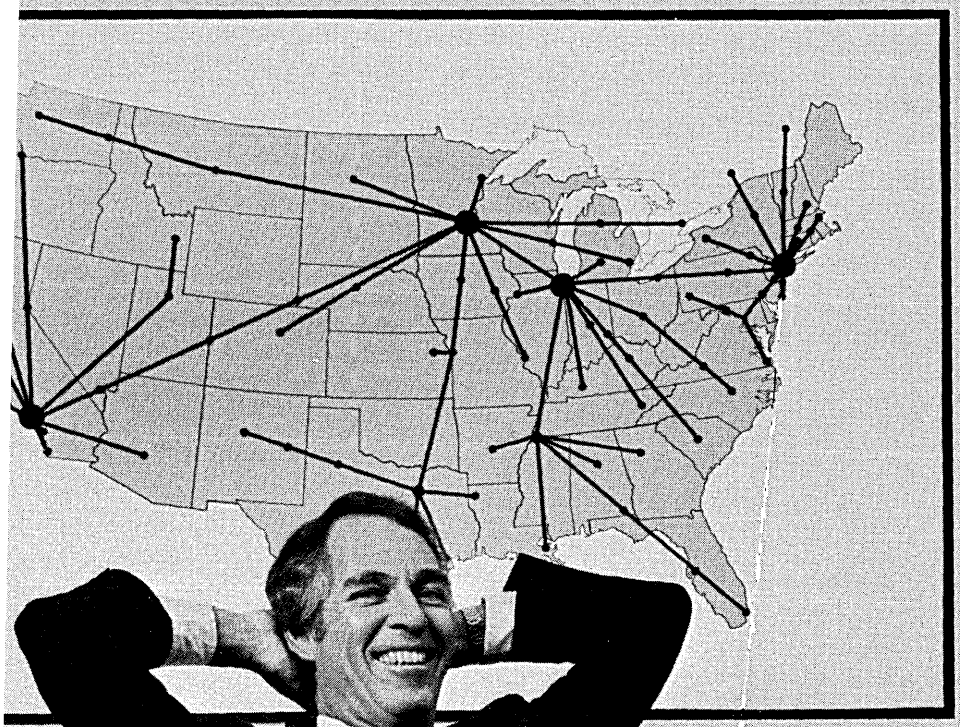
DDP MADE SPERRY UNIVAC



When it comes to distributed data processing, Sperry Univac Minicomputers provide an ease of use and flexibility you can't find anywhere else.

Our V77 minicomputer family takes the worry out of DDP—because we offer a unique variety of configurations fitting virtually any DDP environment you may have. Letting you retain central control. And putting problem-solving tools where the problems are.

Take it a step at a time for gradual controlled growth. And you don't have to be planning a large system.

EASY WITH MINICOMPUTERS.

When your mainframe needs upgrading, the lower cost of our V77s can reduce the load on the main system, or handle separate functions. And V77s as communication processors can significantly reduce your remote terminal communications costs.

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Would you expect anything less from a division of the $4 billion Sperry Corporation? After all, as the first ones in the computer business, we've a reputation to uphold. That's why we have over 10,000 field engineers worldwide, servicing equipment whenever and wherever it needs attention.

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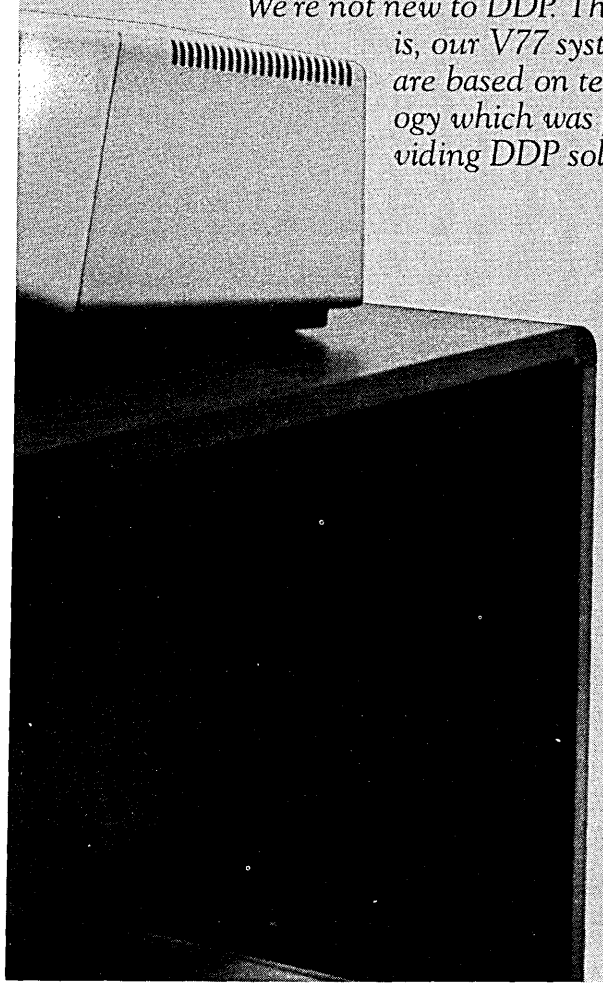
Or call toll-free **800/854-7517** *(8:00 a.m. to 4:30 p.m. PST). In California, call 714/557-9398 collect.*



SPERRY UNIVAC

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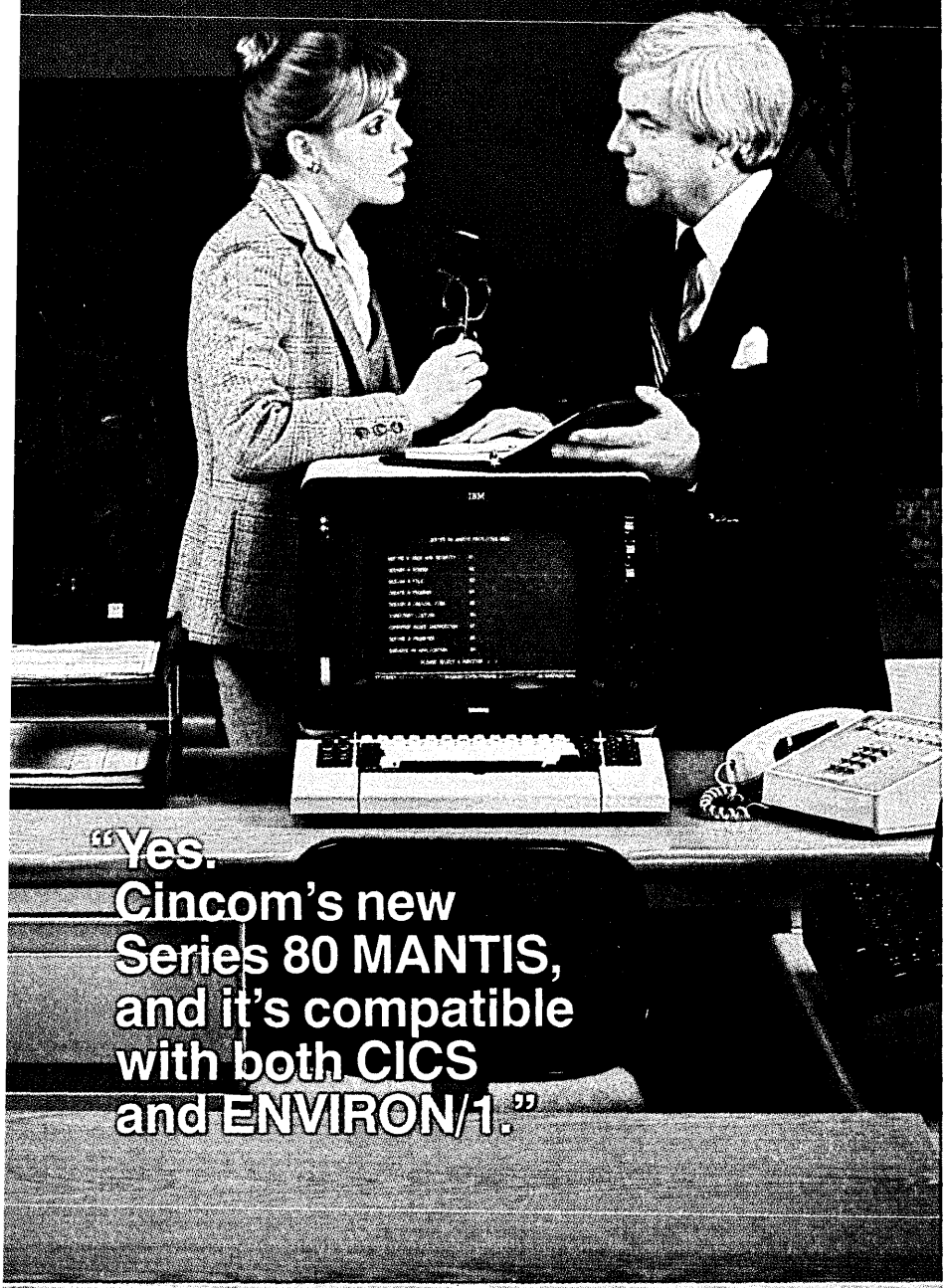
CIRCLE 113 ON READER CARD

"An application development system that's 5 times more productive than DMS?"



"Yes. Cincom's new Series 80 MANTIS, and it's compatible with both CICS and ENVIRON/1."

Will your system measure up to MANTIS?

	MANTIS	DMS/OTHER
Integrated directory	✓	
Full DOS/OS Compatibility	✓	
High level procedural language	✓	
Conversational debugging	✓	
Runs under CICS or ENVIRON/1	✓	
Menu driven	✓	
Online documentation	✓	
Oriented to both DP *and* end users	✓	
Dynamic file generation	✓	
Logical view access to files	✓	

Cincom introduces Series 80 MANTIS.

Series 80 MANTIS is the first application development system that dramatically increases programmer productivity by eliminating all batch steps in on-line systems implementation.

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CIRCLE 34 ON READER CARD

A comparative analysis of currently available data dictionary packages.

A SURVEY OF DATA DICTIONARIES

by Robert M. Curtice and E. Martin Dieckmann

Recently, there has been a significant increase in the use of data dictionary systems (DDS). These systems are becoming more complex and comprehensive in their updating and reporting capabilities, in the scope of the data and dp environment which they describe, in their extensibility for user-defined descriptions, and in the interfaces between the dictionaries and other software components. The general trend is toward a more active DDS, i.e., one that both describes and controls relevant system design, development, implementation, and operation activities.

This survey covers the primary functions of current data dictionaries for commercially available systems. Each of these systems runs on IBM 360/370, 43XX, and 30XX computers under most operating systems. Those that are database management system (DBMS) implementations, (seven of the nine surveyed), inherit all the characteristics of a DBMS application, including security, report/query capabilities, application program dictionary access, and applicable utilities.

Eight of the nine dictionaries include standard relationships between entity types, such as data elements appearing on records, data elements in transactions/reports/programs/modules, and so forth. Several systems allow the user to define his own entity relationships, and in one (DATACOM/DD), the user defines all the relationships.

All nine data dictionaries have a standard set of entity detail reports and relationship reports. An example of a relationship report is a "where used" list which identifies the transactions/reports/programs/modules in which a data element is used, or a list of which users receive a particular report. In addition to the standard reports, certain systems have special reports, such as a missing information report or a redundant information report.

The functions listed in the charts are as follows:

Entity Types. The fundamental object types directly describable to the dictionary.

Entity Characteristics. Descriptive properties of the entity types which the DDS records.

Inputs. The various ways in which the DDS may initially be populated and the ways in which it is updated. Along with the interfaces mentioned below, this is the primary function that gives the DDS its sytem control capabilities.

Interfaces. These include database definition, control block and source program data definition generation capabilities, and interfaces with preprocessors and TP monitors. Interfaces with automated software development and database design aids are becoming more available, but are not specifically called out on the charts because they most often involve *use* of the dictionary and are not strictly speaking part of it.

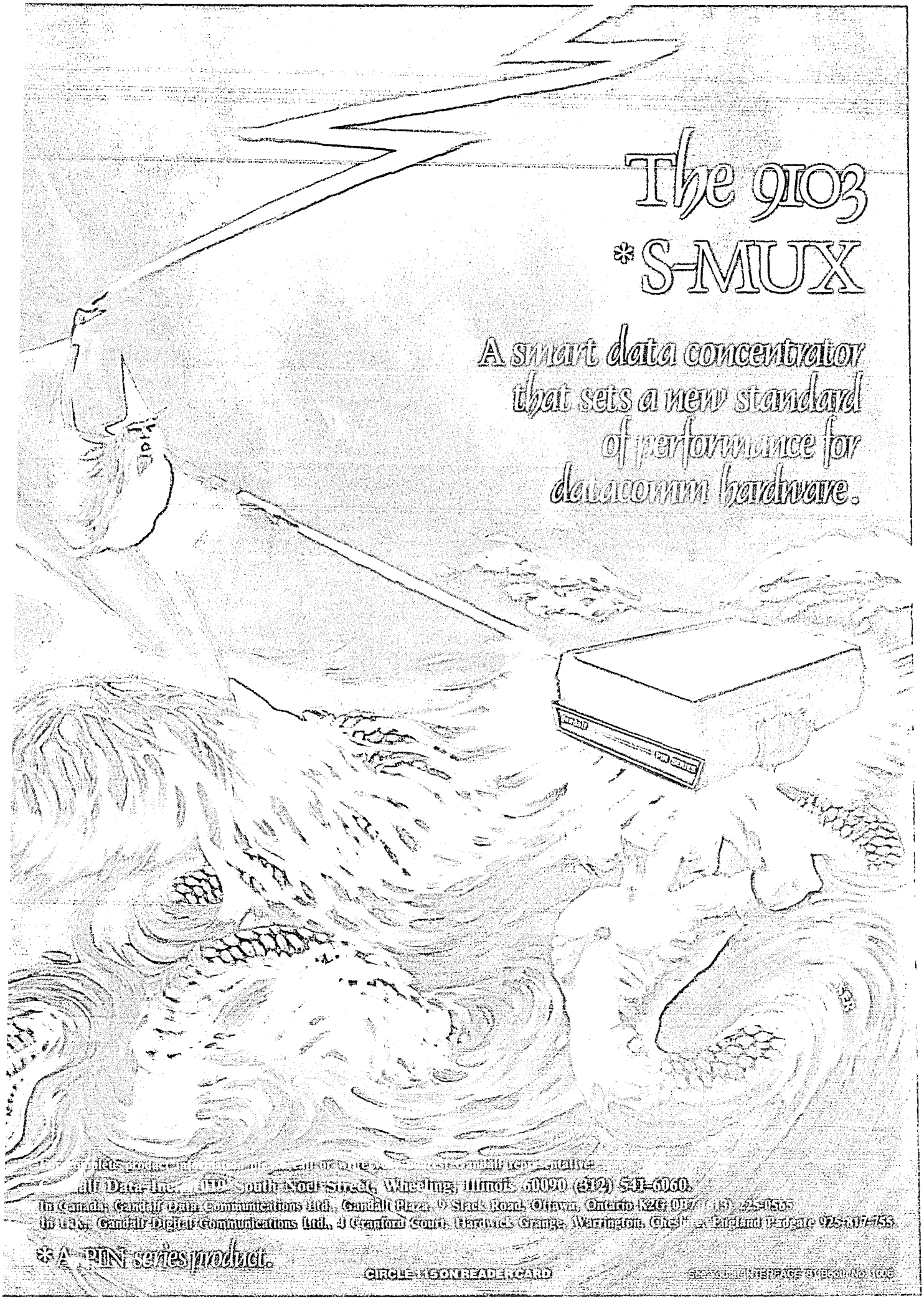
Special Features and Number of Installations. Special features include data transfer utilities, user exit facilities, automatic prefix generation for data elements, and any other unique characteristics not covered in the above four categories.

The Interface diagrams on the charts depict the data flow and control among the various dictionary-related systems which are to be found in a typical dictionary environment. Primarily, the data definition generation and dictionary input features are shown on these diagrams.

The authors have made a full data dictionary wall chart available; for further information, contact them at A.D. Little, Inc., Cambridge, Mass.

Robert M. Curtice heads up the data management unit of A.D. Little, Inc., Cambridge, Mass. His consulting activities involve all aspects of database management, including software selection, implementation, and standards and procedures.

E.M. Dieckmann is a consultant with A.D. Little, Inc., specializing in database management and data dictionary systems.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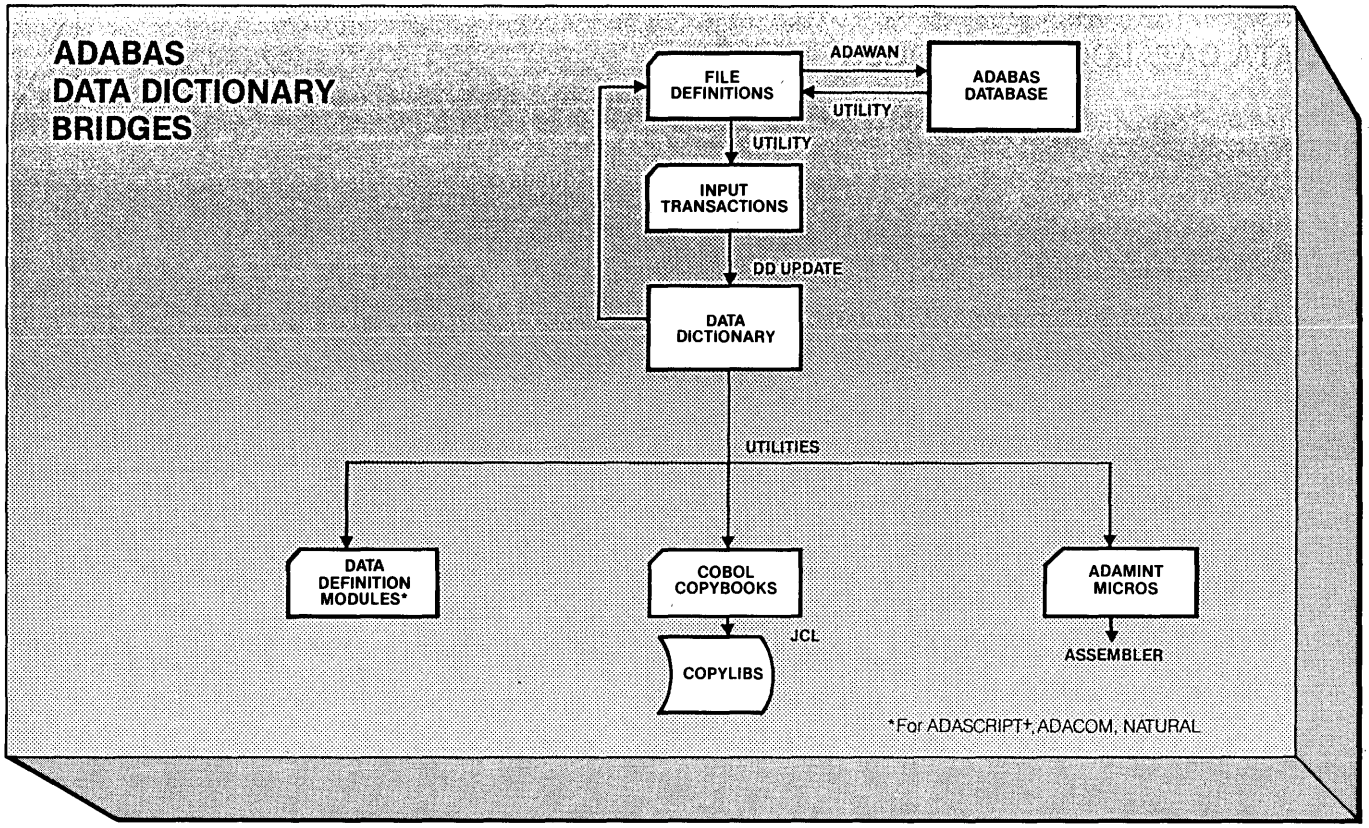
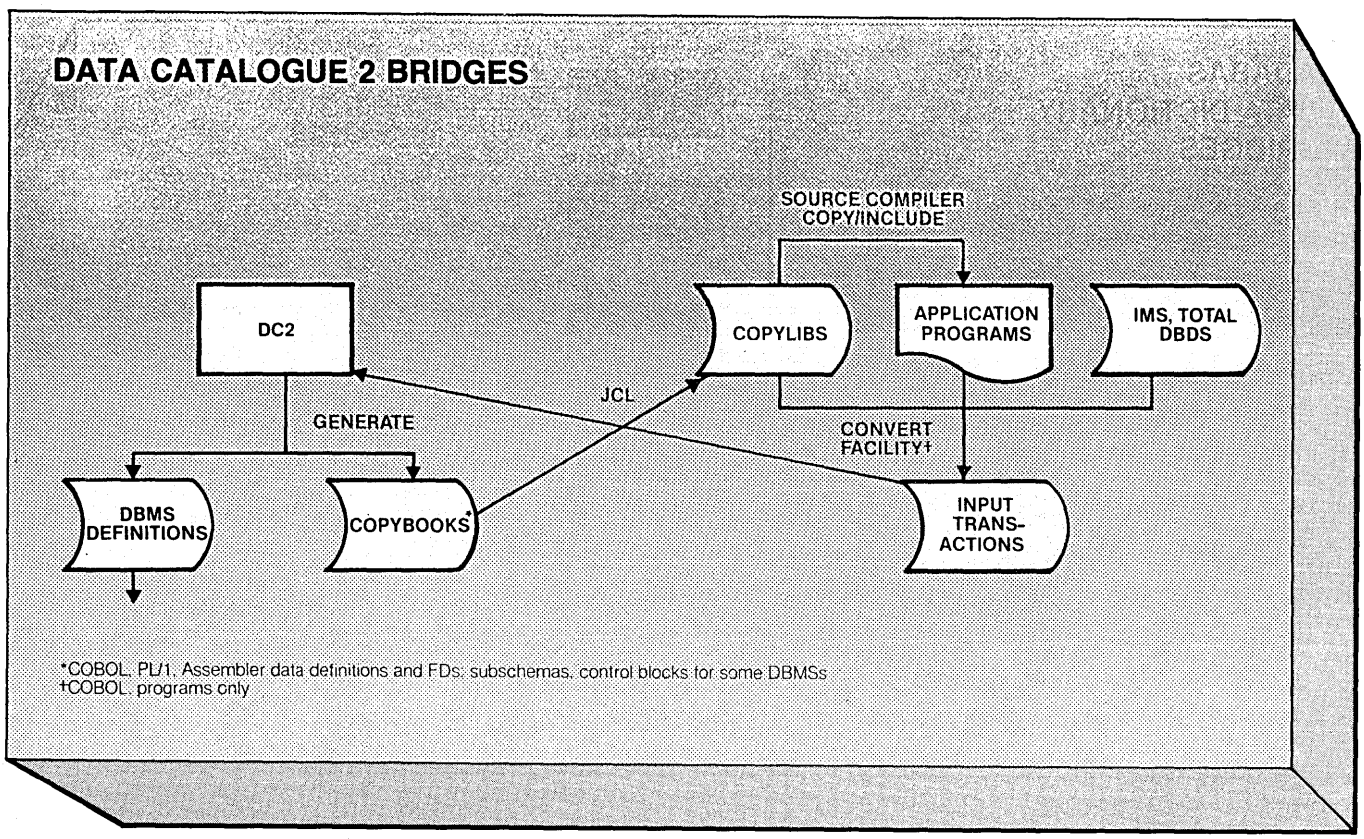


ADABAS DATA DICTIONARY

Software A.G. of North America, Inc.

ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Fields, relationships, files, databases, field verification procedures, owners/users, programs, modules, systems, reports, response codes, user views	Names are 3-32 character identifiers Comments are 30 characters per line, arbitrary number of lines Picture, 99 synonyms, range, edit mask, redefines capability, multiple output pictures for fields Type of file to support user views and standard (master) files 200 descriptors per ADABAS file	Fixed format card input transactions Existing ADABAS database description input capability Pull forward facility from standard file element definitions Automatic ripple facility for changes to data elements in multiple file types Initial load utility available Associator (for descriptors) created automatically at file load time	ADABAS is the only DBMS interface ADABAS file definitions generated COBOL data division statements generated with optional prefixes Data definition modules for ADASCRIPT+, ADACOM, and NATURAL generated Supplies data for ADAMINT preprocessor	600 installations

CHARTS BY CYNTHIA STODDARD

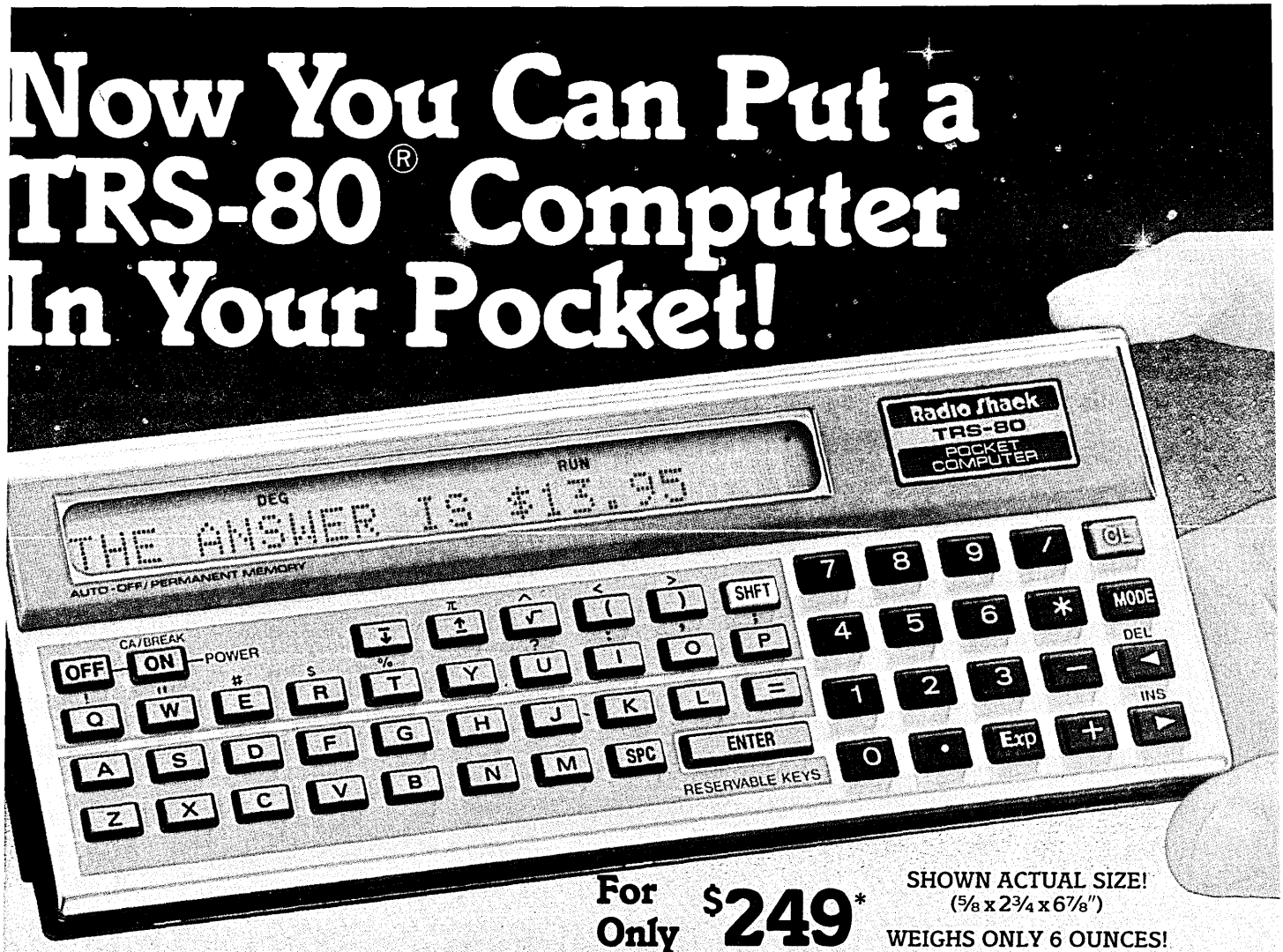


DATA CATALOGUE 2

Synergetics Corp.

ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Data elements, groups, records/segments, files, sets, databases/ schemas, areas, sets, subschemas, DMCL, modules/programs, forms/transactions, reports/screens, systems, users, manual tasks, external resource, DBMS specific entities, user-defined entities	Apply to all entities: Control (status, alias, user responsible . . .) Classification (keywords . . .) Description (9999 lines of 67 characters) Name (catalogue, COBOL . . .): name plus status define unique entity occurrences Data changed Number of times changed Version number User-defined characteristics Apply to elements only: Valid values Attributes (picture, range, redefines . . .) Test values	On-line and batch free-form keyword update, and batch fixed format update "Add same as" entity feature Rename allows retention of original entity On-line system prompts for missing data Formatted screens provided for CICS Data definition extracts from COBOL Entity "clones" which produce new entity occurrences of a different entity type Unknown entity types supported Dummy members for as yet unentered lower level entities produced automatically	DDL and control block statement data sets generated for IMS, DL/1-DOS/VS, TOTAL, ADABAS, IDMS,* DMS-1100, I-D-S/II,* S2000,* Mark IV Data definition statement data sets generated for COBOL, PL/1, assembler Run-time call interface Batch file interface * Spring 1981	Automatic cross-reference renaming feature Multiple dictionary data transfer feature Test data generation Screen layouts provided* *Spring 1981 150 installations 75 non-DBMS users

Now You Can Put a TRS-80® Computer In Your Pocket!



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Now you can carry computer power wherever you go. And with the TRS-80 Pocket Computer, you can create your own programs or purchase ours. These are available now: Civil Engineering, Aviation, Business Statistics, Games, Personal Finance, Math Drill, and Real Estate.

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Available Now! Exclusively at our 6000 Radio Shack stores, dealers and Computer Centers. Complete with carry case, manual, batteries for only $249. Optional Cassette Interface, $49, Minisette-9 Recorder, $79.95. Hurry, because everyone will want this sensational new computer!

Nothing Else You Can Put In Your Pocket Can Do All This!

```
10 Print "SHELL METZNER SORT": FOR X = 1 TO 100:
   PAUSE "DATA ITEM #";X:INPUT A(X+100): IF A(X+100
   )<0 GOTO 25
20 NEXT X
25 M = X - 1
30 M = INT(M/2): IF M=0 GOTO 107
40 J = 1: K = X - M - 1
50 I = J
60 BEEP 1: L = I + M: IF (A(I+100)<= A(L+100))
   GOTO100
70 T = A(I + 100): A(I + 100) = A(L + 100):
   A(L + 100) = T: I = I - M: IF I<1 GOTO 100
90 GOTO 60
100 J = J + 1: IF J>K GOTO 30
105 GOTO 50
107 BEEP 5: INPUT "PRESS ENTER FOR LIST"; A
110 FOR I =1TOX - 1: J = I + 100: PAUSE "DATA ITEM #";
   USING "####"; I; " "; A (J): NEXT I
```

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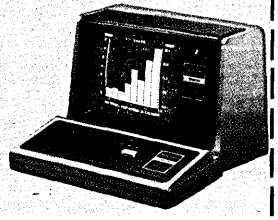

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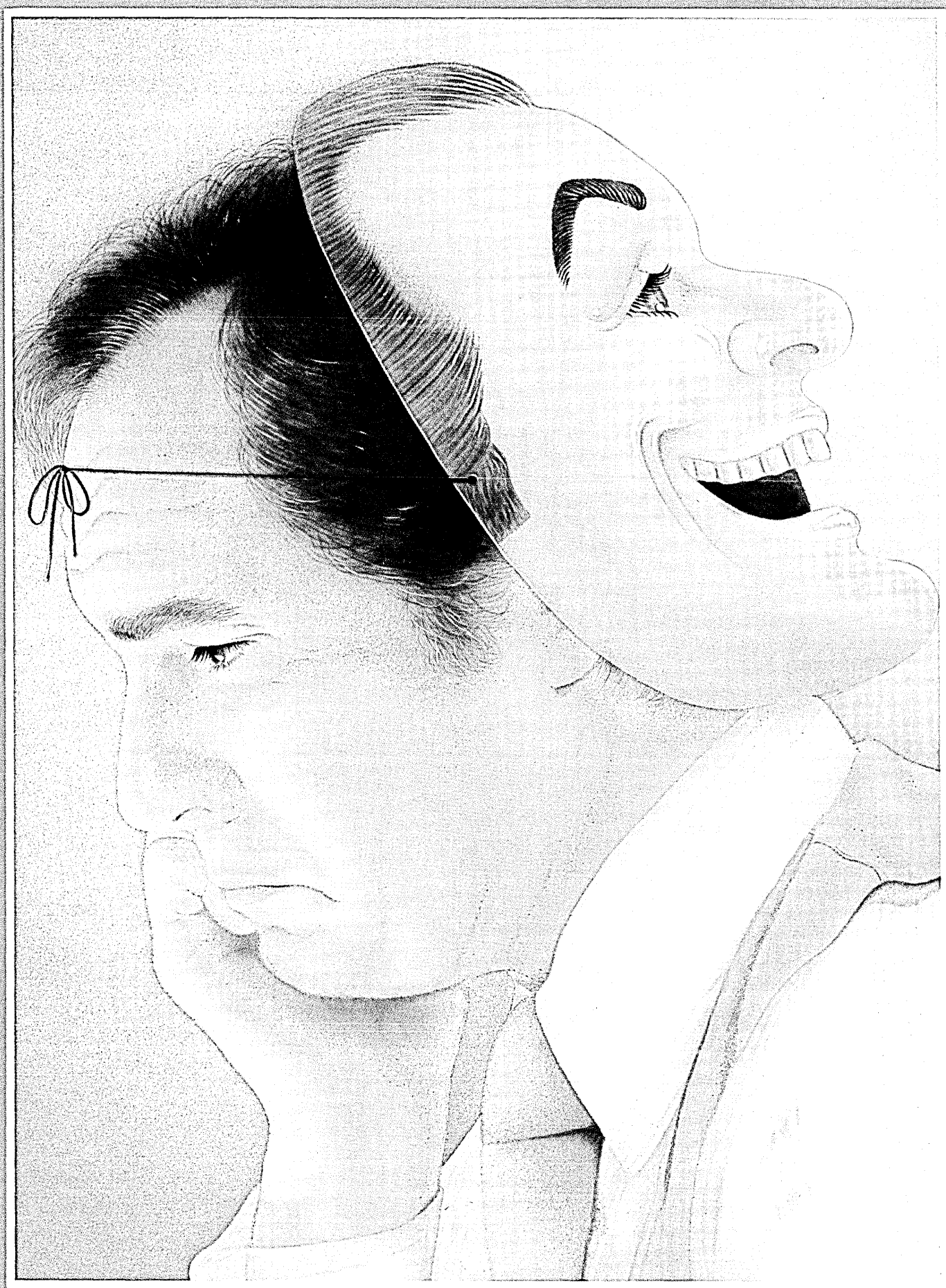

GOING TO OS WITHOUT UCC-2 TAKES A YEAR OR TWO . . . AND A GREAT SENSE OF HUMOR.

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But, let's face it: your objective is to get to OS, *not* to convert programs. And the UCC-2 DOS to OS Transition System takes you there the easy way.

UCC-2 can get the average DOS shop to OS in about six months, including preplanning. It allows DOS programs to run under OS or OS/VS systems *without program conversion*. UCC-2 has already expedited over 800 conversions — without a hitch. And, with UCC-2, you'll start getting the benefits of an OS operation a full year earlier. And isn't that the reason you started the conversion in the first place?

UCC-2: It's the easy way to OS. In fact, when you stop and think about it, it's the only way. Call us at 1-800-527-5012 (in Texas, call 214-353-7312) or circle 117

And, while you're at it, ask us about:

A Tape Management System that protects data from loss or destruction (UCC-1). Circle 118

A Disk Management System that can save the cost of new disk drives (UCC-3). Circle 119

A PDS Space Management System that eliminates PDS compression (UCC-6). Circle 120

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A Data Dictionary/Manager that really gets IMS under control (UCC-10). Circle 122

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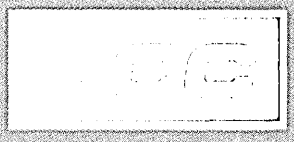

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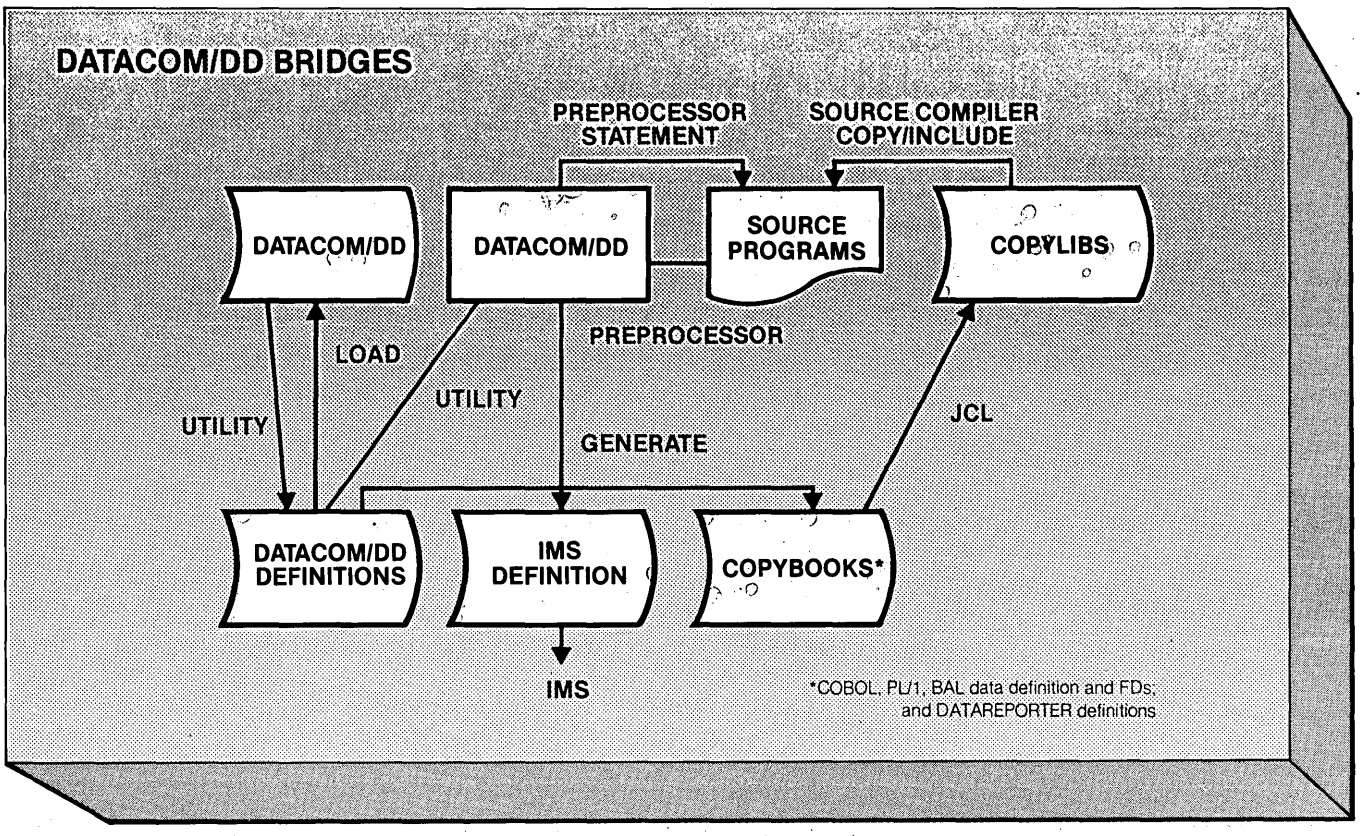


DATACOM/DD

Applied Data Research

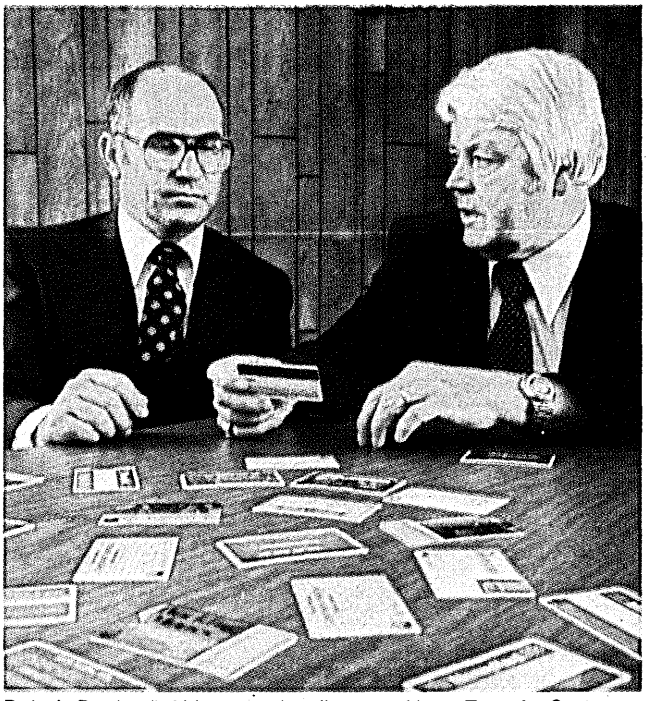
ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Databases, areas, files, user views, records, keys, fields, field groups, systems, programs, modules, authorizations, people, reports, jobs, steps, IMS structure entities, user-defined entities	Names are 15 character identifiers together with unlimited versions Unlimited text descriptions Passwords and three statuses for all entities Date and time of original entry and of last change for all entities Keyword descriptors and up to 15 aliases for each entity type User-defined entity characteristics Picture, range, alternate picture, initial value for data elements	Fixed format batch or on-line transactions for all updating Menu driven update transactions provided "Create same as" feature COBOL source language and COPYLIB data definition extracts COPYDD LIBRARIAN preprocessor statement updates dictionary program data definition relationships Inputs from existing data-base definitions	COBOL, PL/1, data definition data sets generated DATADICTIONARY controls LIBRARIAN source program updates Preprocessor links user views to application programs COBOL, PL/1, BAL, DATAREPORTER copybooks generated DATACOM/DB definition and IMS structure definitions generated	User ability to create unlimited entity relationships User-defined exists Dictionary automatically records new entity-type information in itself Global status change capability 70 installations

"Here are four reasons why we switched to NCR," says Dale A. Dooley of the Iowa Transfer System.

DOOLEY:
The Iowa Transfer System is the first electronic funds transfer system to operate statewide. Over 85 percent of the commercial banks in Iowa are supporting members. We recently installed an NCR 8450 as the central element — the switch — in our network.

NCR's SCHULTE:
It's the element that makes the remote connections, so that every terminal has access to every bank on the network. All across the state of Iowa.

DOOLEY:
Our first reason for going to NCR is monetary. With NCR, our costs are substantially lower than under our previous arrangement.



Dale A. Dooley (left) is executive director of Iowa Transfer System, Inc., in Des Moines. Jim Schulte is NCR district manager.

NCR's SCHULTE:
And at least a bit lower than the other alternatives you explored.

DOOLEY:
Then there is the support we received from NCR and from you, Jim. And NCR's known commitment to EFT.

NCR's SCHULTE:
NCR representatives are specialized. All the people in my group work exclusively with financial institutions. So we are in tune with current financial trends. Other NCR representatives have parallel specialties so they can be more responsive to the problems peculiar to their industries. It's a concept that is working well for us.

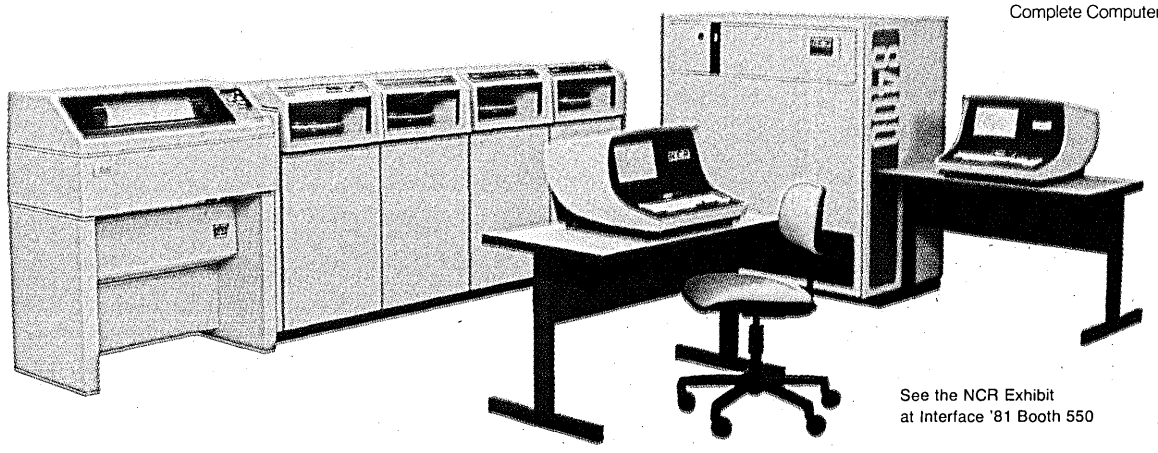
DOOLEY:
The third reason is software. Only NCR could provide the switch software we needed when we had to have it.

NCR's SCHULTE:
Not only did we meet the deadline, but the transition to our system was very smooth.

DOOLEY:
Finally, our decision was influenced by the dependable performance of the other NCR systems within the network. And we have had the same experience with this system. Our uptime level has been very high — a critical consideration when you're talking about a network switch.

In the NCR office nearest you, there is an account manager like Jim Schulte who specializes in your industry and knows NCR systems. Learn how an NCR system can help you. Phone him at the local office. Or write to EDP Systems. NCR Corporation, Box 606, Dayton, Ohio 45401.

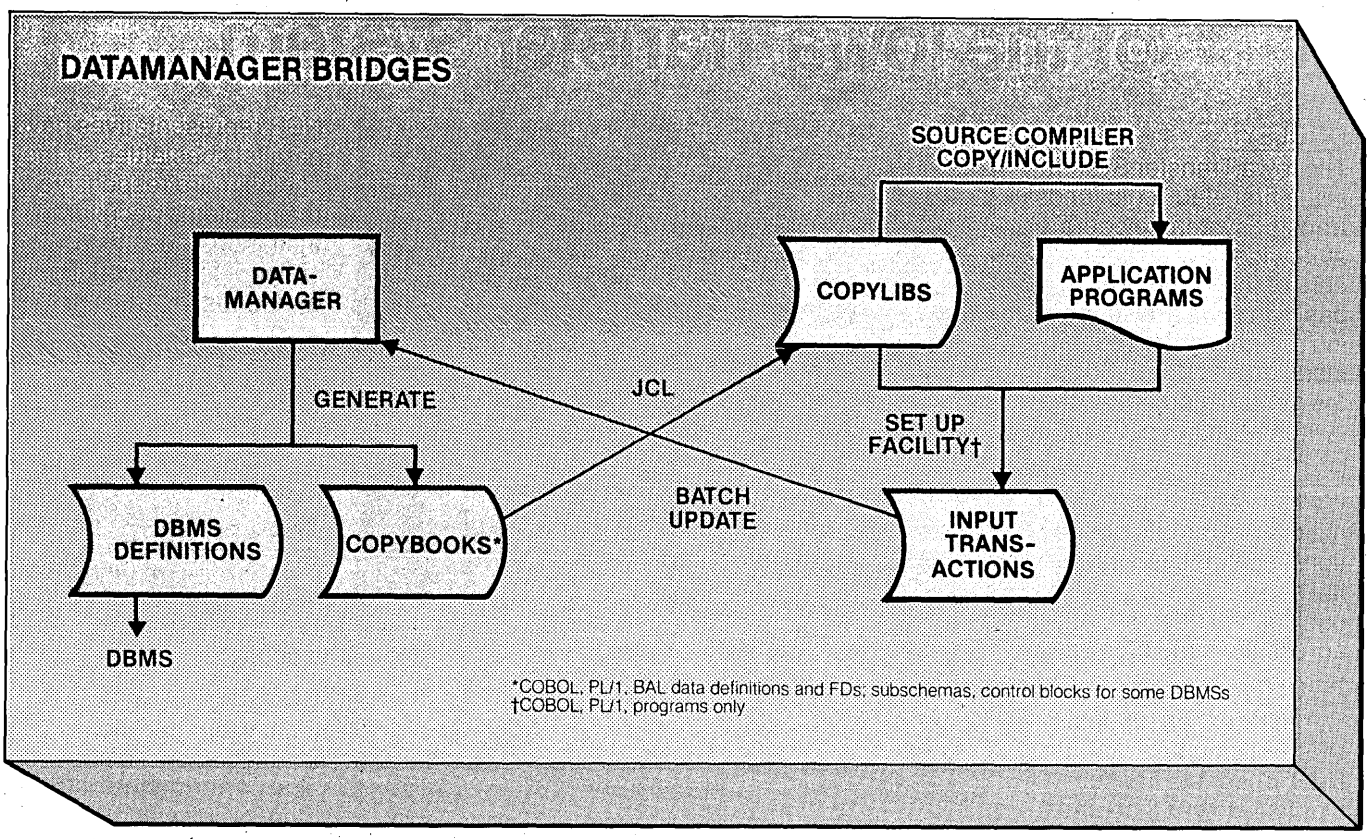
NCR
Complete Computer Systems



See the NCR Exhibit at Interface '81 Booth 550

CIRCLE 127 ON READER CARD

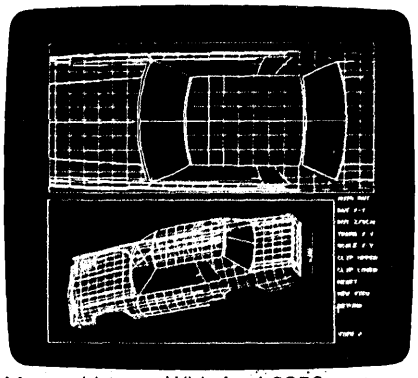
DATA DICTIONARY SURVEY



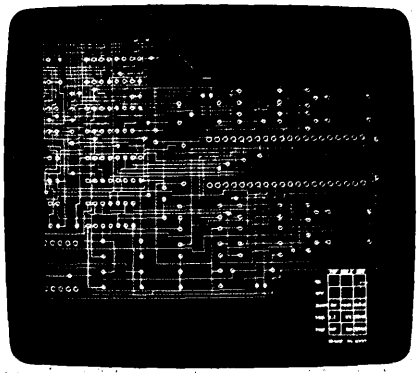
DATAMANAGER

MSP, Inc.

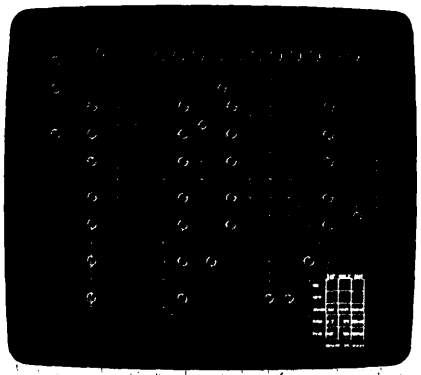
ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Systems, programs, modules, files, groups, data items, DBMS definition entities, user-defined entities	Names are 32 character unique identifiers together with status (up to 255 statuses) Descriptions are 65,000 lines 16 aliases and 15 versions for all entities User/owner responsible for Unlimited keyword descriptors Level, picture, range, alignment, initial value for elements User-defined characteristics* * Release 4.0	On-line and batch free-form keyword based command language Set default value feature Dummy members for as yet unentered lower level entities automatically produced Data definition extracts from COBOL, PL/1	DDL and control block statement data sets generated for ADABAS, IDMS, IMS, DL/1-DOS/VS, Mark IV, S2000, TOTAL Data definition data sets generated for COBOL, PL/1, BAL, and MARK IV Run time call interface Batch file interface	User exit facility Screen layouts under IMS/DC, CICS User-defined syntax allows choice of three additional dictionary structures Utilities copy data between physically separate dictionaries 500 installations



Megatek's new Whizzard 6250 raster system makes advanced computer graphics more economical than ever.

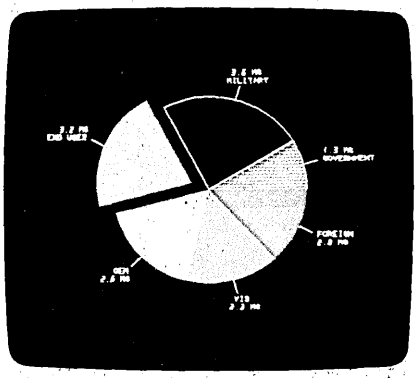


You can define your image in a 4096 x 4096 virtual space, with up to eight colors.

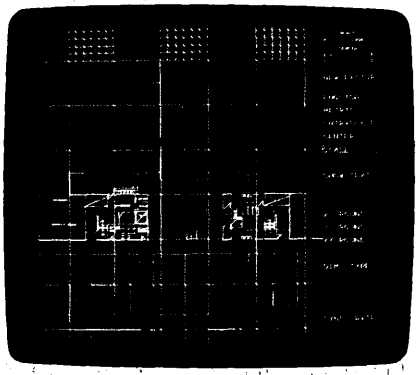


Real-time dynamics enable you to pan throughout this space, then zoom in with true scaling for added detail.

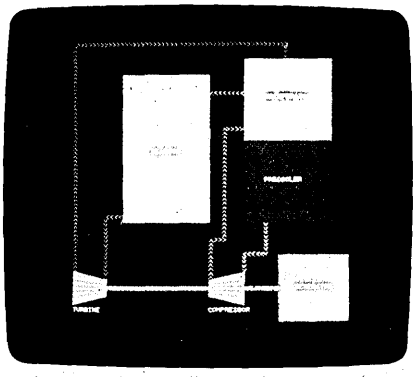
And our new system introduces you to low-cost, FORTRAN-based WAND software.



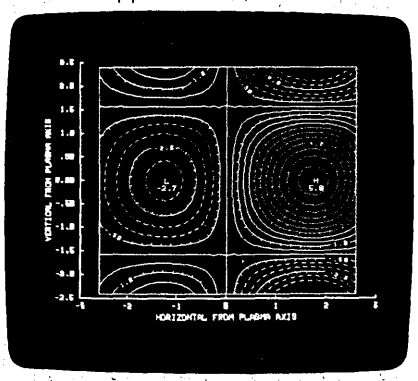
The Whizzard 6250 harnesses the power of Megatek technology for your business applications...



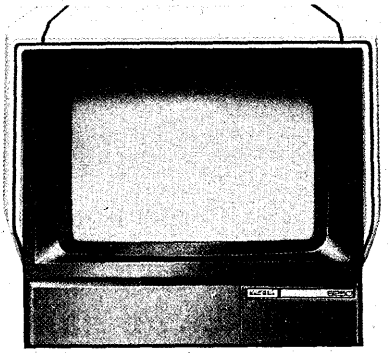
...for new flexibility in architecture and drafting....



...for an added dimension in process control...



...and wherever a visual presentation makes data easier to understand.



So imagine yourself at the Whizzard 6250 keyboard. Computer creativity has never been so affordable.

Imagine...all this technology for far less than you imagined.

At Megatek, we strive to set the standards for technology in computer graphics. Now we've set a new standard for value, too. Introducing our new Whizzard 6250 system.

It gives you graphics power you would expect from Megatek. For far less than ever before. You get the drama of full raster color. High resolution. Sophisticated dynamics implemented in hardware. Local vector memory. Double buffered bit planes. And the performance of advanced digital vector generation. Plus an RS-232 interface, standard.

The 6250 has its own version of easy to use WAND software. It's upward compatible to WAND 7200, software for our family of advanced systems and terminals.

MEGATEK

MEGATEK CORPORATION

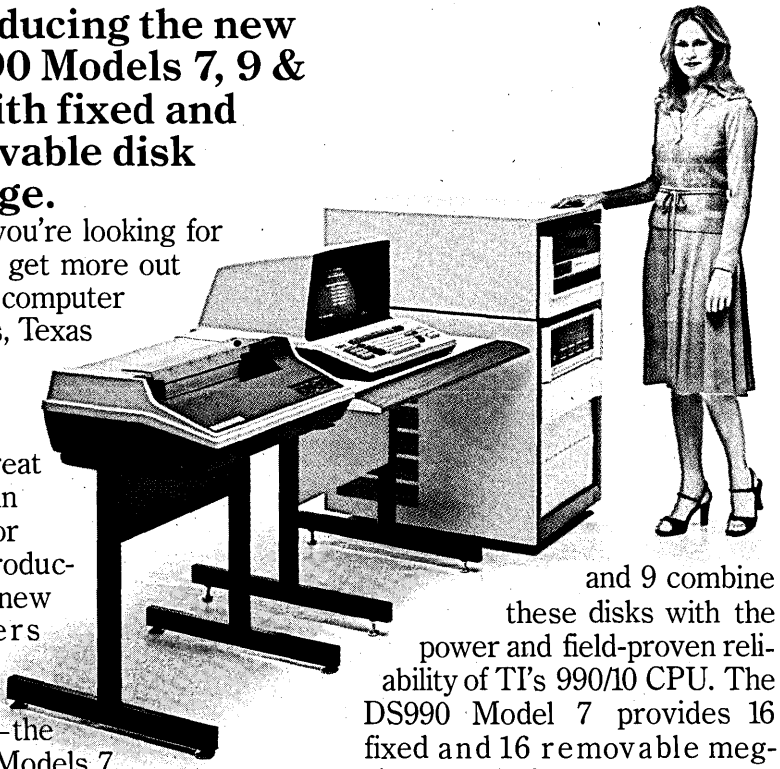
The new Whizzard 6250 is the perfect starter system for end-users. OEM configurations are available too. Imagine all the possibilities. Better yet, write for all the facts. Megatek Corporation, 3931 Sorrento Valley Blvd., San Diego, CA 92121. 714/455-5590. TWX 910-337-1270. Megatek International/Europe 11 Woudstraat, 4031 JA Ingen, The Netherlands. Telephone: 31 3443-2800. TWX 70619.

CIRCLE 128 ON READER CARD

TI Announces I a Growi

Introducing the new DS990 Models 7, 9 & 29 with fixed and removable disk storage.

If you're looking for ways to get more out of your computer systems, Texas Instruments has got some great things in store for you. Introducing the new members of our DS990 family—the DS990 Models 7, 9 and 29. Powerful computer systems that put the bite on disk storage costs.



New disks for easy back-up.

Flexibility is not forgotten at TI. That's why each of these new DS990 computer systems feature disk storage systems with both fixed storage and a removable cartridge. Fixed disk storage allows easy access to day-to-day information, while removable cartridge disks let users change information when needed. The removable cartridge disk also provides users with a safe, easy, and inexpensive way to back-up information without purchasing another disk drive or magnetic tape drive.

Both the DS990 Models 7 and 9 combine these disks with the power and field-proven reliability of TI's 990/10 CPU. The DS990 Model 7 provides 16 fixed and 16 removable megabytes of disk storage. For greater storage capacity, the DS990 Model 9 includes a disk drive with 96 megabytes of storage — 16 removable and 80 fixed. Should you need it, a second identical disk can be added to either system on the same controller for additional storage.

The DS990 Model 29 features a new, low-profile, 60-inch cabinet and offers the processing power of TI's 990/12 CPU — the strongest central processing unit ever developed for a DS990 computer system. With one disk drive, the Model 29 provides 96 megabytes of storage — 16 removable and 80 fixed. And you can double your capacity by adding a second drive on the same controller.

New members of a proven family.

The DS990 Models 7, 9 and 29 fit right into the DS990 computer family. So you can upgrade your system at any time with a minimum of cost and effort, they're upward-compatible with the other members of the DS990 family— from the microcomputer-based Model 1 to the highly-advanced Model 30.

With proven software.

As members of TI's versatile DS990 family, the new Models 7, 9 and 29 are available

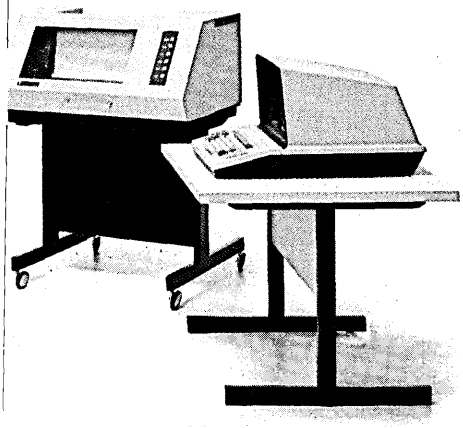
xtra Storage for ; Family.

vith proven software, including COBOL, BASIC, FORTRAN, RPG II and Pascal. They also lave valuable time-saving software utilities, including a powerful data base management system with query and report-generation facilities as well as TIFORM, TI's uniquely efficient screen-formatting language. Word processing software is also now available to let these systems perform a wide variety of office-oriented tasks.

With our communications software and hardware, these new systems will easily fit into your existing distributed processing environment. IBM 3780/2780 batch communications as well as 3270 interactive communications let our systems talk to other systems whenever information needs to be shared.

Worldwide service and support.

Every member of our DS990 family is backed by an extensive service organization with field locations worldwide.



Our customer representatives are skilled professionals with technical educations, formal TI equipment training, and in-field experience.

As a TI customer, you can take advantage of a wide variety of service and maintenance plans so you can pick the plan that meets your business needs.

By dialing our Customer Support Line, for example, you can talk directly with a selected staff of senior engineers and programmers at our computer headquarters in Austin, Texas. So your questions can be answered quickly and directly.

Also among our varied services are fully staffed Education and Development Centers in Austin and Chicago, which provide a wide variety of classes on the use of TI computer hardware and software. We even offer special classes designed for the needs of our OEMs.

For more information about our new DS990 Models 7, 9 and 29, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7884, Houston, Texas 77001. In Europe, write Texas Instruments Incorporated, M/S 74, B.P. 5, Villenueve-Loubet, 06270, France. In Asia Pacific, write Texas Instruments Asia Ltd., 990 Bendeemer Road, Singapore, 1233.

For fastest response, call our inquiry response center at 1-800-257-7850 (in New Jersey, call 1-800-322-8650). Please refer to code #100-F.

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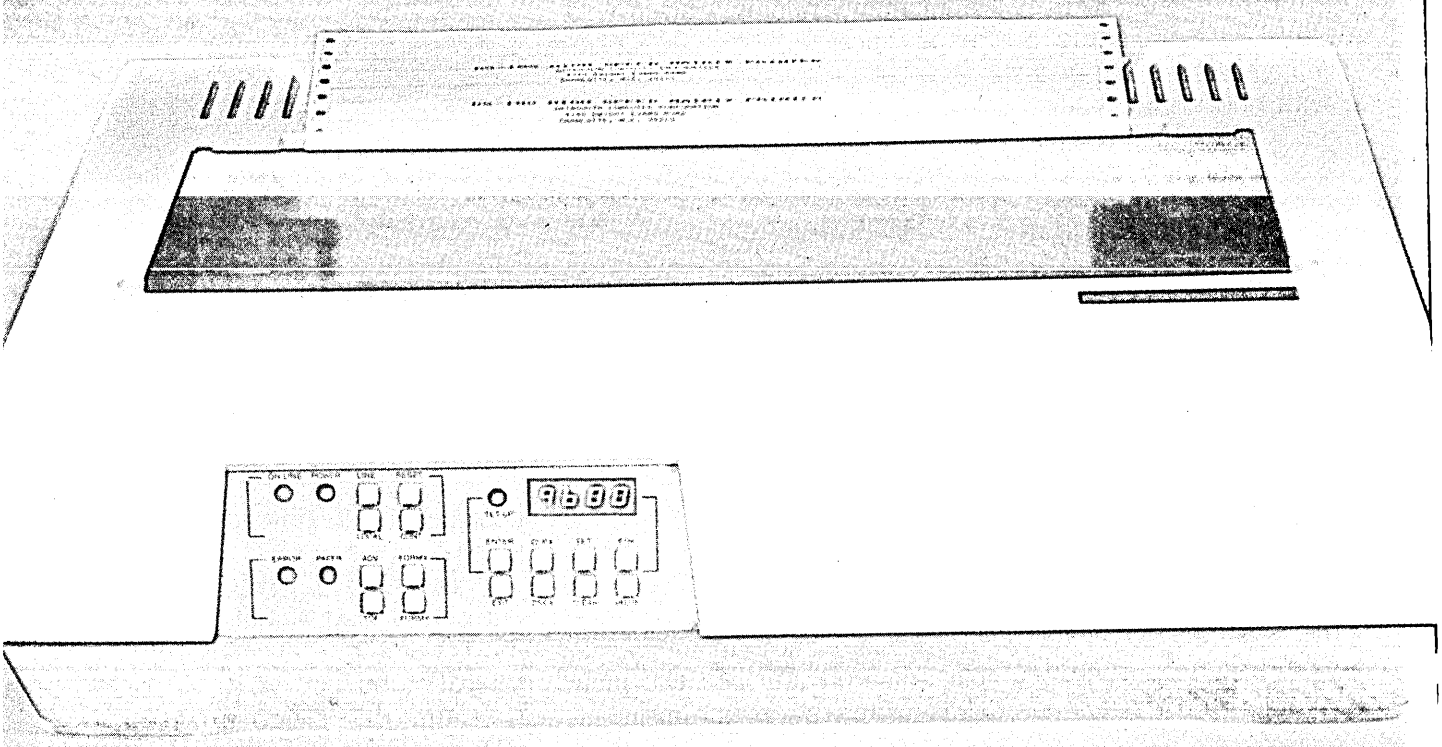
We put computing within everyone's reach.

TEXAS INSTRUMENTS
INCORPORATED

CIRCLE 129 ON READER CARD

datasouth announces...
THE TOTAL PRINTER PACKAGE!



With so many matrix printers on the market today, it may seem tough to find exactly the right one for your application. Some models may offer the speed you need, others the communications flexibility and still others the forms handling capability. But no printer offers **all** the features you need...until now.

The DS180 matrix printer provides the total package of performance features and reliability required for applications such as CRT slave copy, remote terminal networks and small to mid-range systems. Not a "hobby-grade" printer, the DS180 is a real workhorse designed to handle your most demanding printer requirements. And pricing on the DS180 is hundreds of dollars below competitive units.

High Speed Printing—Bidirectional, logic-seeking printing at 180 cps offers throughput of over 200 lpm on average text. A 9-wire printhead life-tested at 650 million characters generates a 9x7 matrix with true lower case descenders and underlining.

Non-volatile Format Retention—a unique programming keypad featuring a non-volatile memory allows the user to configure the DS180 for virtually any application. Top of form, horizontal and vertical tabs, perforation skipover, communications parameters and many other features may be programmed and stored from the keypad.When your system is powered down, the format is retained in memory. The DS180 even remembers the line where you stopped printing. There is no need to reset the top of form, margins, baud rate, etc....it's all stored in the memory. If you need to reconfigure for another application, simply load a new format into the memory.

Communications Versatility—The DS180 offers three interfaces including RS232, current loop and 8-bit parallel. Baud rates from 110-9600 may be selected. A 1K buffer and X-on, X-off handshaking ensure optimum throughput.

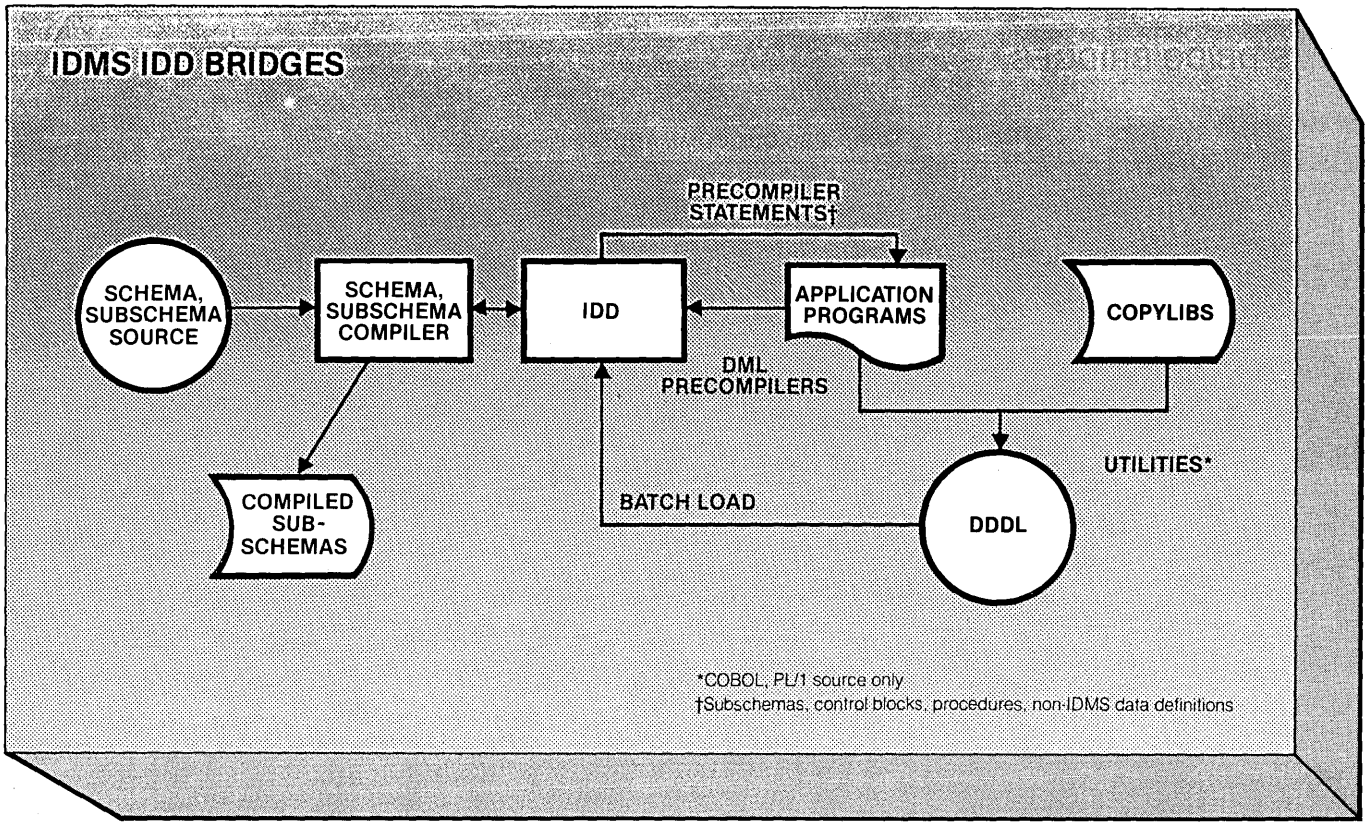
Forms Handling Flexibility—Adjustable tractors accommodate forms from 3"-15". The adjustable head can print 6-part forms crisply and clearly making the DS180 ideal for printing multipart invoices and shipping documents. Forms can be fed from the front or the bottom.

If you would like more information on how the DS180's low-cost total printer package can fill your application, give us a call at Datasouth. The DS180 is available for 30-day delivery from our sales/service distributors throughout the U.S.

CIRCLE 63

datasouth
computer corporation

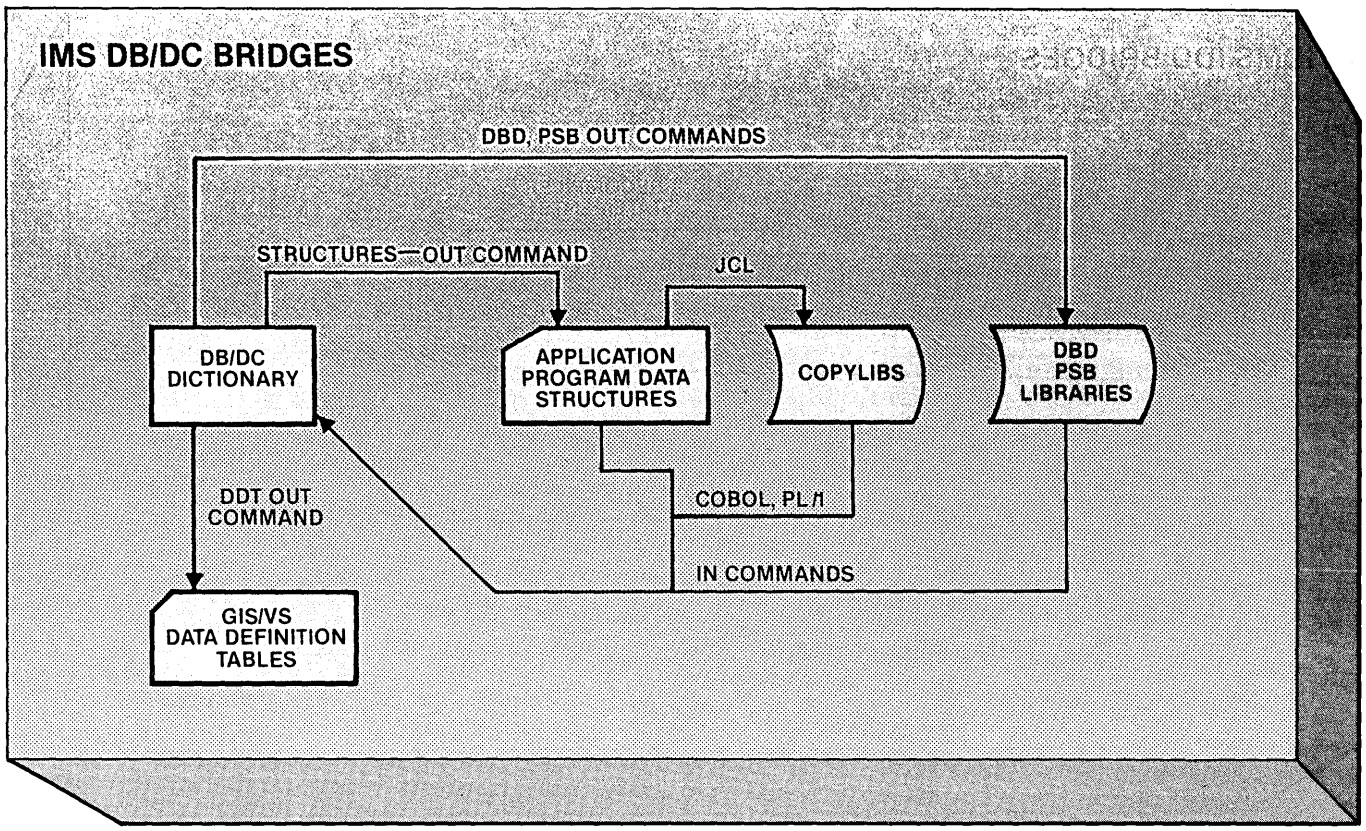
4740 Dwight Evans Road • Charlotte, North Carolina 28210 • 704/523-8500



IDMS IDD

Cullinane Database Systems, Inc.

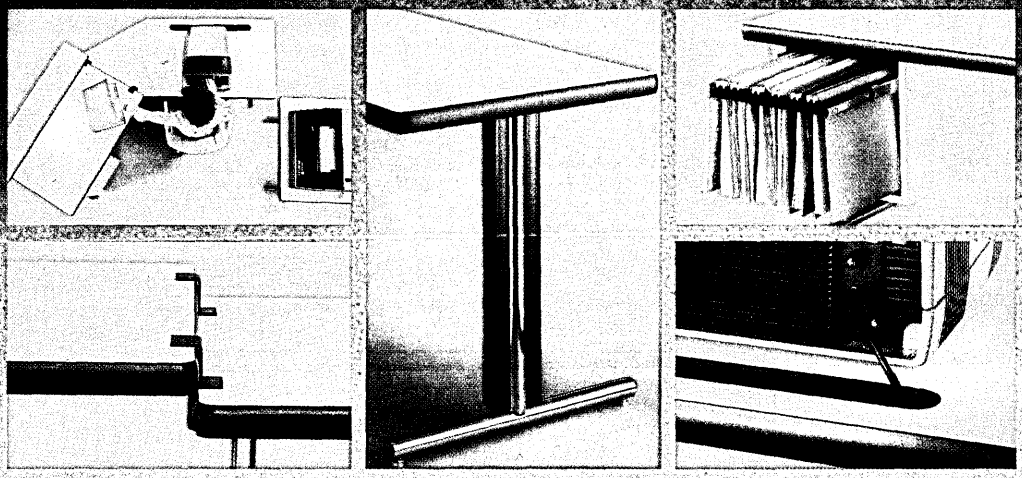
ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Data elements, records, files, schemas,† subschemas,†, areas,† sets,† DMCL,† systems, subsystems, programs, modules, entry points, users, tasks, reports, transactions, screens, logical-terminal, physical-terminal, lines, maps, messages, destinations, queues, classes,* attributes* * Allows user-defined entities † These entity types are in the dictionary via DDL, not DDDL; included in reports and may be deleted, but no other dictionary features	Names are 1-32 character identifiers together with version number (default to highest version number) 40 char. descriptions Unlimited length definitions/comments Unlimited keyword descriptors (40 characters each) Prepared/revised by name User name and responsibility for (create, modify, delete) Synonyms for data elements, records, files User-defined characteristics and values using class and attribute entities Range, initial value, redefines, picture and alternates for elements	Free format Dictionary Data Definition Language (DDDL) using keywords: ADD, MODIFY, DELETE, EDIT (for text definitions/ comments) commands User-defined syntax feature available Set Globals (default) feature for repetitious values "Create same as" feature COBOL, PL/1, RPG and BAL precompilers register program database usage into dictionary Data definition extracts from COBOL, PL/1 source and COPYLIBs Schema and subschema compiles update dictionary	IDMS is the only DBMS interface Precompiler statements copy subschemas, control blocks, non-IDMS data definitions, and procedures from dictionary into COBOL, PL/1, RPG, and BAL programs Interface with IDMS-DC at SYSGEN Interface with OLQ (run time) and CULPRIT Schema and subschema compilers derive some input from dictionary	Prefixes automatically generated for elements of a record type 200 installations



IMS DB/DC

Internatonal Business Machines Corp.

ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Systems, programs, jobs, modules, dictionary users, transactions, databases (physical and logical), segments, elements, PCBs, PSBs, plus user-defined entities and attributes	Names are up to 31 character identifiers plus status, subject, and occurrence (synonyms) qualifiers Status can be production or 29 levels of test Aliases for all entity types Up to 999 lines of 40 character descriptions per entity Up to five sets of 999 lines of 80 characters of free text per entity User defined attributes can apply to any entity Picture and initial value for elements	Batch forms or keyword command language On-line update via on-line commands or interactive display forms facility with IMS DC or CICS Data definition extracts from COBOL or PL/1 copy libraries Loads from existing DBD and PSB libraries "Copy same as" entities Input from database design aid	DL/1 only DBMS interface Generates the following: DL/1 DBDs and PSBs GIS/VS DDTs Stage 1 SYSGEN inputs COBOL, PL/1, BAL data definitions	

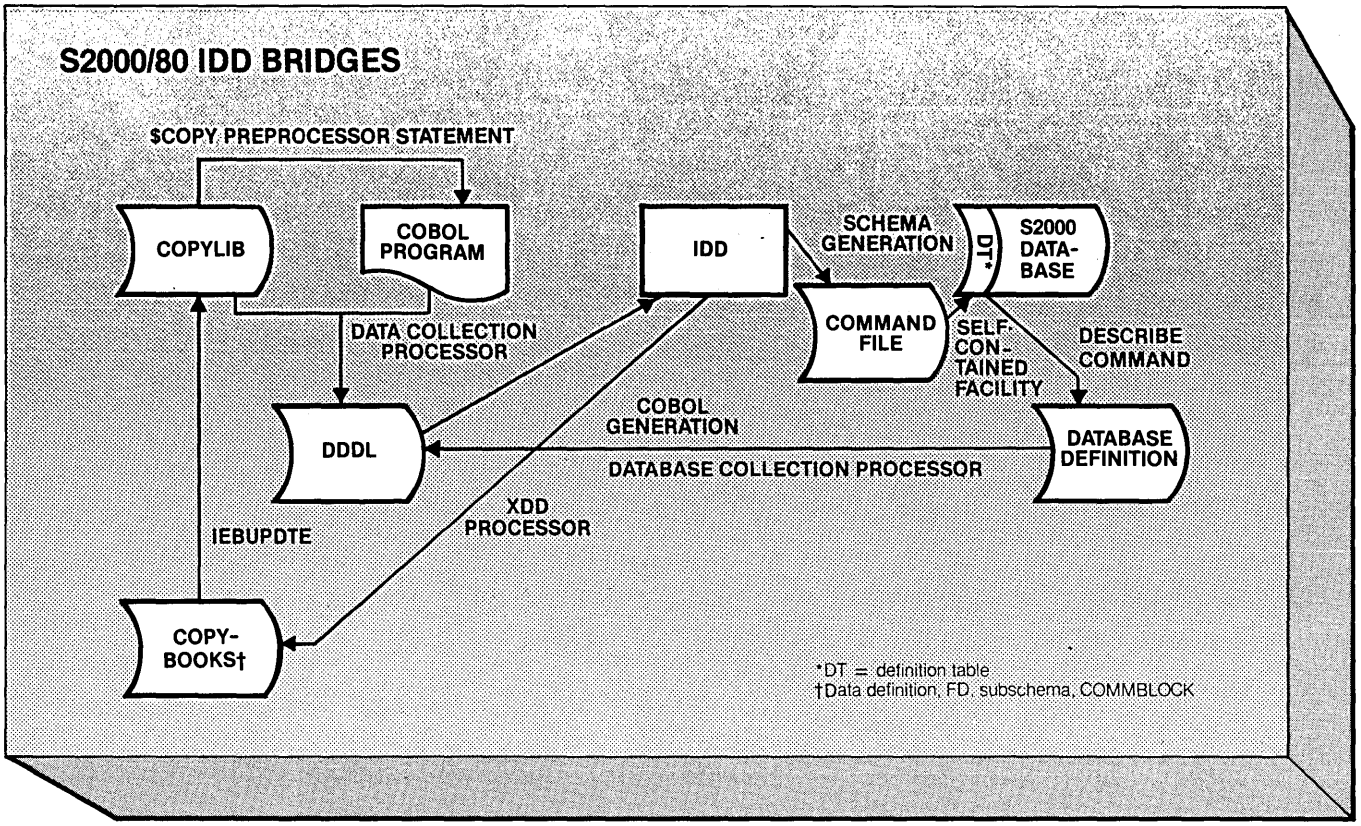


It's simple. Howe's Information Management Station provides the vital link between people, electronic equipment and office space. The end result? A more comfortable and efficient working environment. Versatile configurations of stations assure space efficiency. Two work heights, for writing and keyboard use, mean minimum fatigue and maximum comfort. A unique wire routing system provides unobtrusive channeling from equipment to electric outlet. And shelves and mobile pedestals provide active storage. Most importantly, the Howe IMS is designed to adapt to ever changing electronic equipment, assuring productivity for years to come. For details on the Howe Information Management Station, write: Howe Furniture Corp., Dept.13,155 E. 56th St., New York, NY 10022. Or call collect: 212/826-0280. Showrooms Nationwide.

HOWE

WORKSTATIONS WHERE THE PRODUCTIVE GET MORE PRODUCTIVE

CIRCLE 131 ON READER CARD



S200 IDD

Intel Systems Corp.

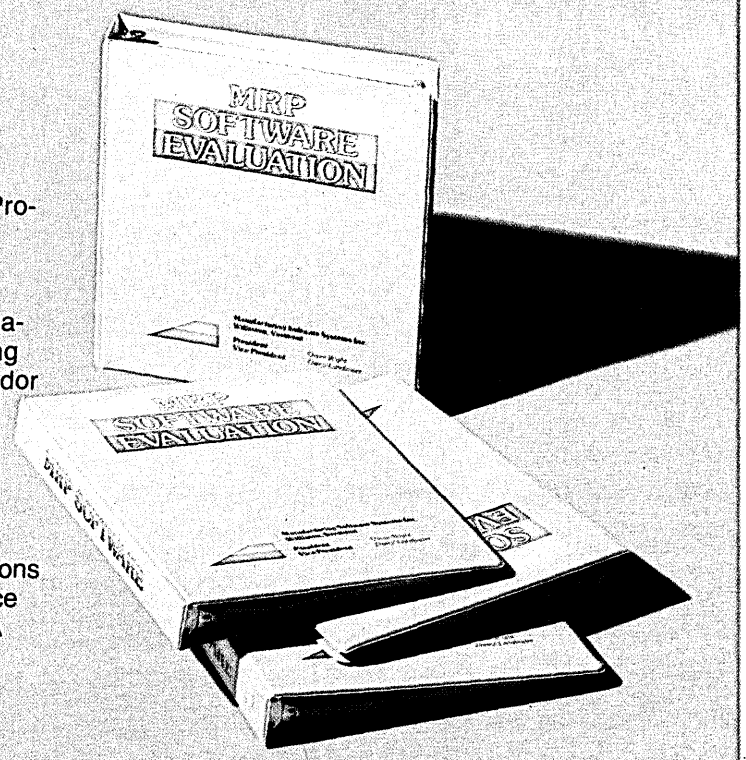
ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Data elements, records, files, databases (schemas), subschemas, users, programs/ modules, systems/ applications, work units, work structures, work areas, user-defined entity types	Names are up to 250 character identifiers Comments are arbitrary length Source, user and owner for all entities Version number, status, and dates for all entities Keywords and synonyms for all entities Range, initial value, picture, alternate picture for elements User-defined characteristics	Dictionary Data Definition Language (DDDL) using keywords Extensive update transactions provided "Create same as" feature S2K LOAD utility for initial dictionary load Collection processors read COBOL programs, copybooks and database definitions and produce DDDL On-line update also thru QUEST or QUBE or PLEX transactions	S2K is the only DBMS interface GENERATE COBOL command generates data description, subschema, and control block copybooks from dictionary for loading into COPYLIB. GENERATE SCHEMA generates database definition DML Preprocessor $COPY command copies from COPYLIB into COBOL programs with recursive copy feature	Interface between multiple copies of the dictionary available 32 installations

MRP Software Evaluations for Minicomputers

Manufacturing Software Systems, founded by Oliver Wight and Darryl Landvater, now offers professional evaluations of MRP software packages for many popular minicomputers.

Evaluations help save time and money, prevent costly mistakes.

Clear, in-depth, point by point descriptions of required system functions include MRP, Master Production Scheduling, Shop Floor Control, Capacity Requirements Planning, and Purchasing. The Evaluations are intelligent alternatives to wading through confusing terminology and volumes of vendor documentation.



Objective Evaluations based on what works in manufacturing.

No theory or speculation about what might work, these Evaluations are based on years of experience working with successful Class A MRP users.

Evaluations for popular minicomputer packages.

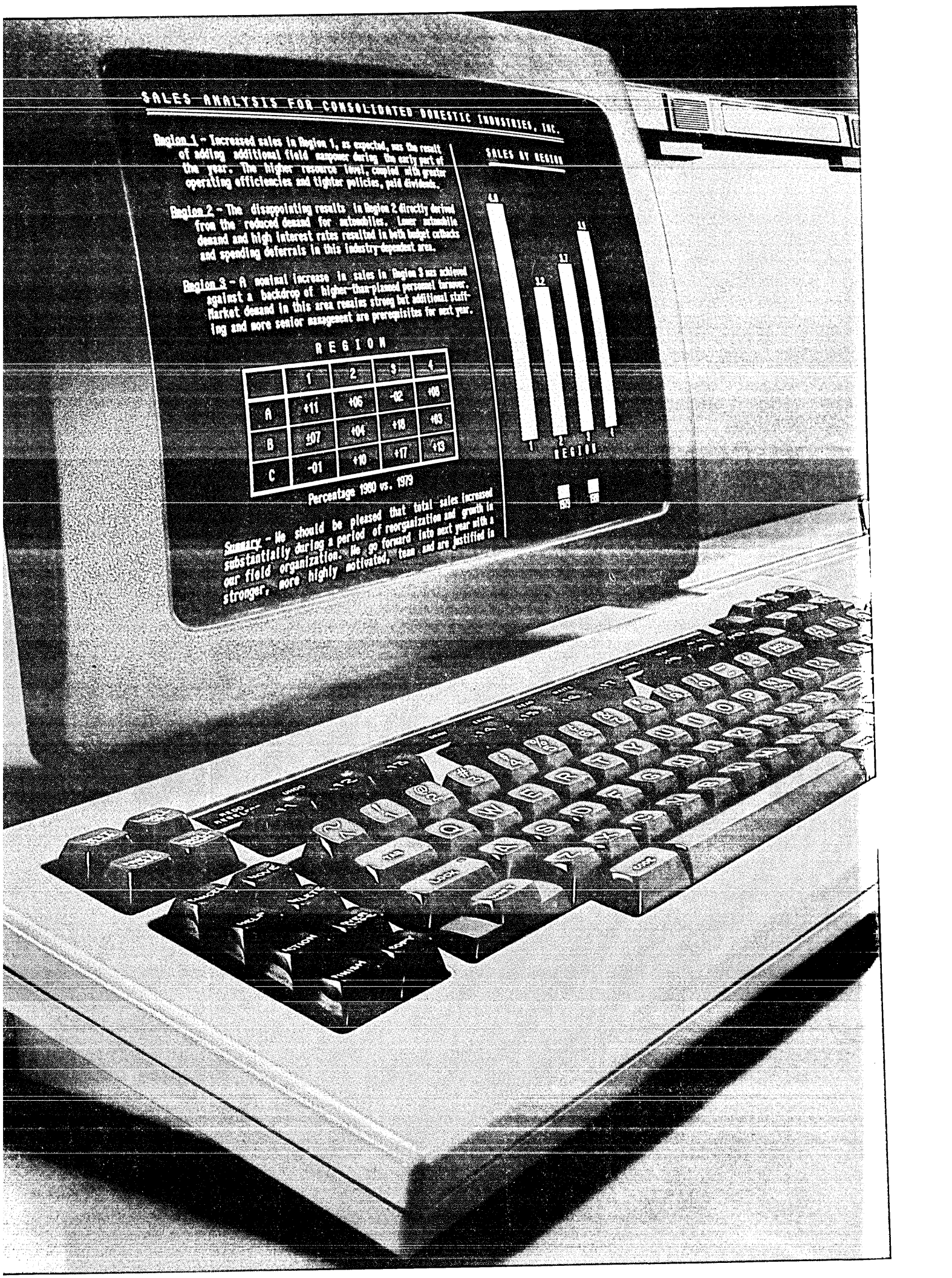
The list of Evaluations includes packages for IBM System/3, System 34, System 38, Hewlett-Packard 3000, Univac 90, Honeywell 62/64, Data General Eclipse, ICL, DEC PDP-11, and others.

MSS is tackling some of the practical problems of implementing MRP. For more information and a complete list of Evaluations, write us or call (802) 878-5254.

Oliver Wight, *President*
Darryl Landvater, *Vice President*
Christopher Gray,
Vice President

Manufacturing Software Systems Inc.
P.O. Box 278
Williston, Vermont 05495
(802)878-5254

CIRCLE 132 ON READER CARD


SALES ANALYSIS FOR CONSOLIDATED DOMESTIC INDUSTRIES, INC.
Region 1 - Increased sales in Region 1, as expected, was the result of adding additional field manpower during the early part of the year. The higher resource level, coupled with greater operating efficiencies and tighter policies, paid dividends.
Region 2 - The disappointing results in Region 2 directly derived from the reduced demand for automobiles. Lower automobile demand and high interest rates resulted in both budget cutbacks and spending deferrals in this industry-dependent area.
Region 3 - A nominal increase in sales in Region 3 was achieved against a backdrop of higher-than-planned personnel turnover. Market demand in this area remains strong but additional staffing and more senior management are prerequisites for next year.
REGION
1 2 3 4
A +11 +06 -02 +08
B +07 +04 +10 +13
C -01 +10 +17 +19
Percentage 1980 vs. 1979
SALES BY REGION
1 2 3 4
REGION
1979 1980
Summary - We should be pleased that total sales increased substantially during a period of reorganization and growth in our field organization. We go forward into next year with a stronger, more highly motivated, team and are justified in

THE FIRST MAJOR EVOLUTION IN COMPUTER DESIGN.

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

And it has some important implications for the computer OEM.

A megabyte mini on a desktop.

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

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

The ultimate OEM building blocks.

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

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

Exciting end-user appeal.

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

A new standard for the 80's.

Distributed intelligence has long been discussed as desirable.

Convergent Technologies has made it a low cost reality. And its advantages are so compelling that the majority of computer systems will eventually adopt it. Convergent is delivering now.

You can learn more about our computer of the future by requesting complete information today.

Now is the time to re-think *your* position in the computer market.

Convergent Technologies

Where great ideas come together.

Call toll-free (800) 538-7460, or Calif. (408) 727-8830 or return this coupon.

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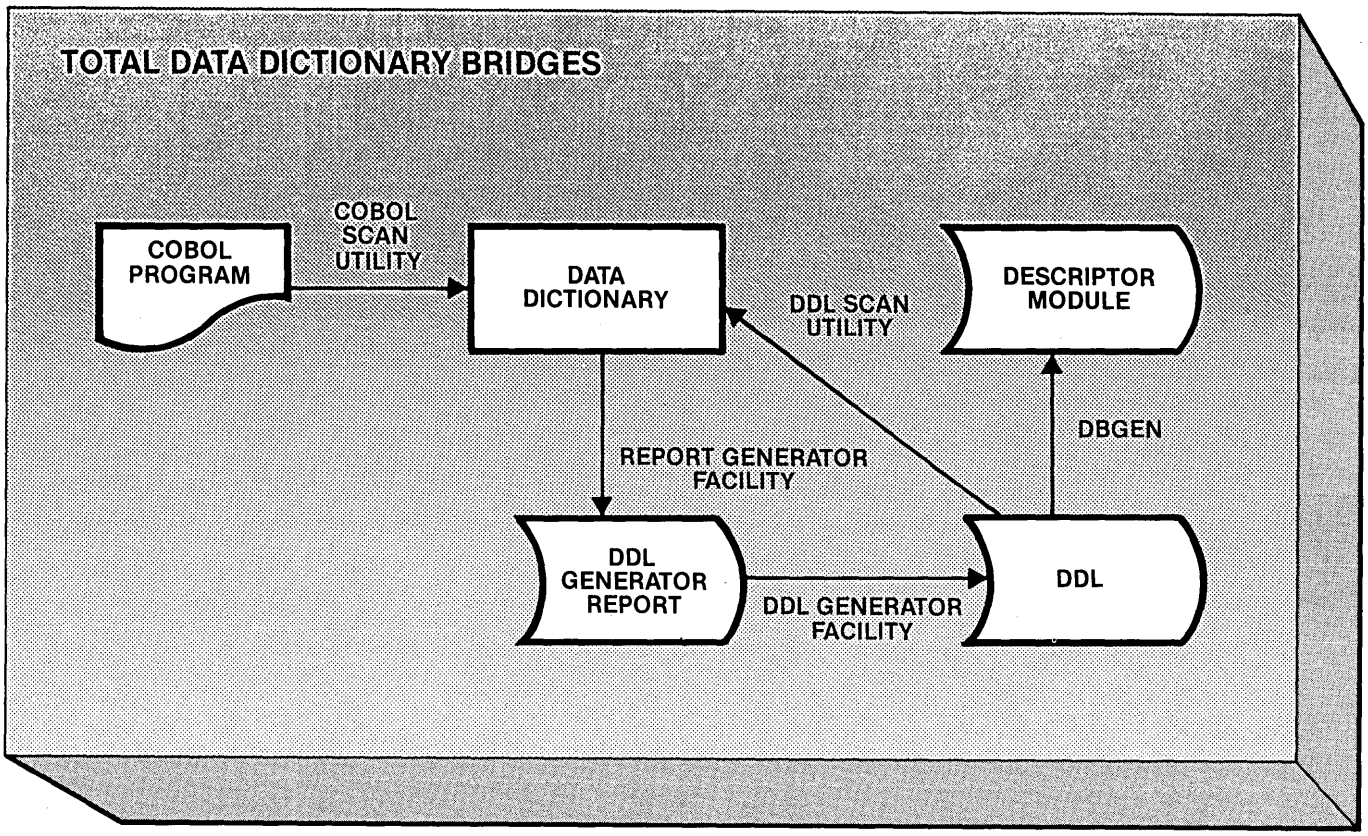


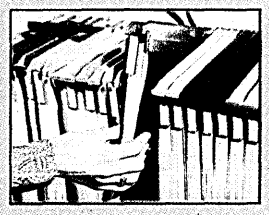
TOTAL DATA DICTIONARY

CINCOM Systems, Inc.

ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
Data elements, files, reports, transactions, programs, systems, databases, users, source documents	Eight-character entity name identifiers 25-character entity descriptions Multiple versions supported Alias data element names supported	Formatted input for initial load facility DDL scan utility for conversion of DDL statements COBOL source program scan utility to load relationships between data elements and programs Socrates label dictionary conversion facility Free-form keyword parameter ADD, CHG, DEL input Establish and use default values for attribute feature	TOTAL is the only DBMS interface DDL Generator Facility	Two data element entity types with a conversion utility to establish other entity occurrence and relationship between occurrences

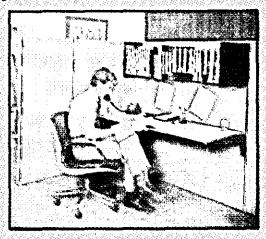
D.P. Documents... organize and control them in any environment with the DOCU-MATE® filing system.

A single filing method for all documentation, records and reports.
Think about the time and expense involved in the creation of data processing documentation, records and reports and you'll see the importance of organizing these vital information assets so they are under the control of management. Until recently, this problem of organization was compounded by the many sizes and shapes of documents which created an almost impossible filing, retrieval and referencing problem. Now, the DOCU-MATE filing system solves the problem by providing a single filing method for all documents regardless of their size, shape or location within the information network.



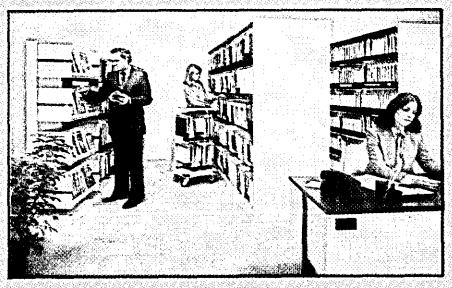
Combine DOCU-MATE filing with open office plan.
If your existing or planned office is designed with panel supported work surfaces, a wide range of DOCU-MATE filing components designed to coordinate with most popular panel systems is available. You can get the advantages of functional organization with filing capability that enhances the aesthetics of your design.

Combine DOCU-MATE with contemporary office furniture.
DOCU-MATE work station filing equipment including: cabinets, documentation organizers and mixed media open shelf files coordinate beautifully with furniture from leading manufacturers. You can plan work stations that provide both a modern crisp appearance and the functional efficiency of organized filing and referencing.

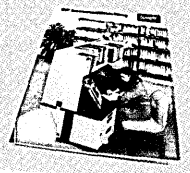


Build total DOCU-MATE filing environments.
While you can integrate DOCU-MATE filing into your existing office plan; you can also create total DOCU-MATE filing environments. A full line of specialized filing work stations, chairs, documentation organizers, cabinets and open mixed media files lets you plan environments that precisely meet the needs of the people involved.

Coordinate work station and library filing.



With the DOCU-MATE center hook filing and drop filing principle, you can build a total filing network involving group libraries and files and central libraries. Every imaginable type and size of document can be filed interchangeably at every location. You can even intermix sizes and shapes in the same filing equipment. And, since DOCU-MATE filing is designed for both high density, high security filing and high reference filing you can plan filing areas to meet the needs of the people who must work with them.



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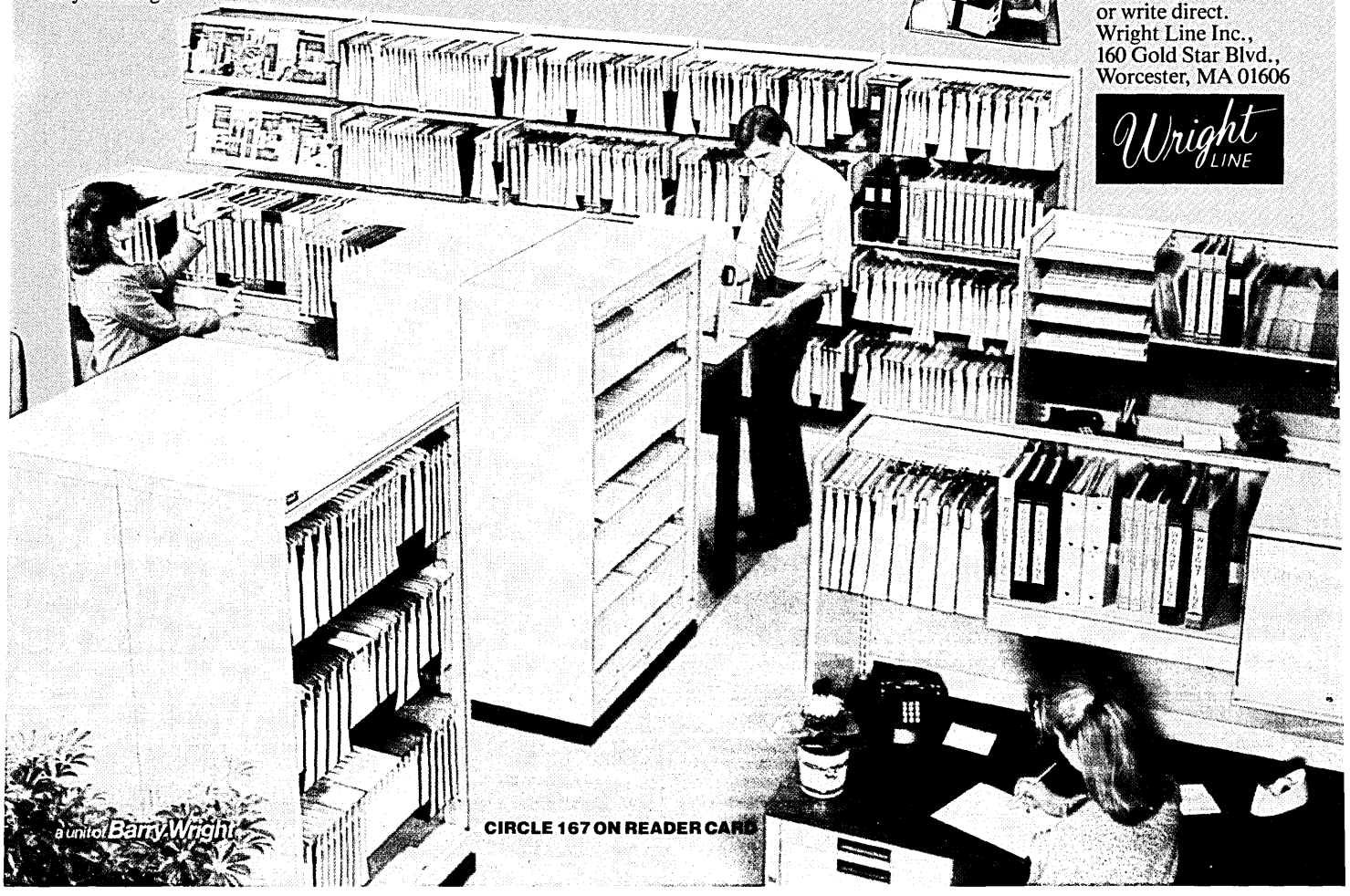
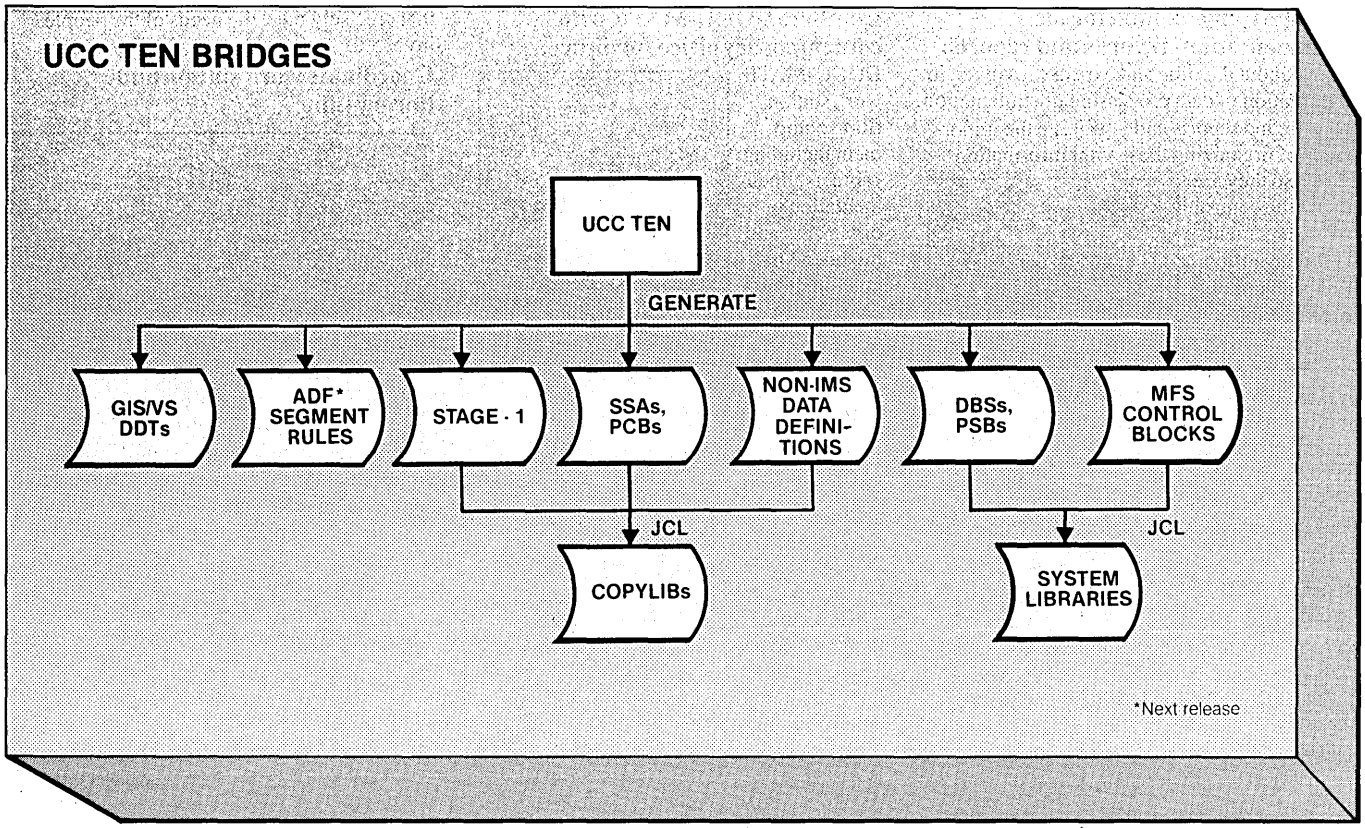


a unit of Barry Wright

CIRCLE 167 ON READER CARD

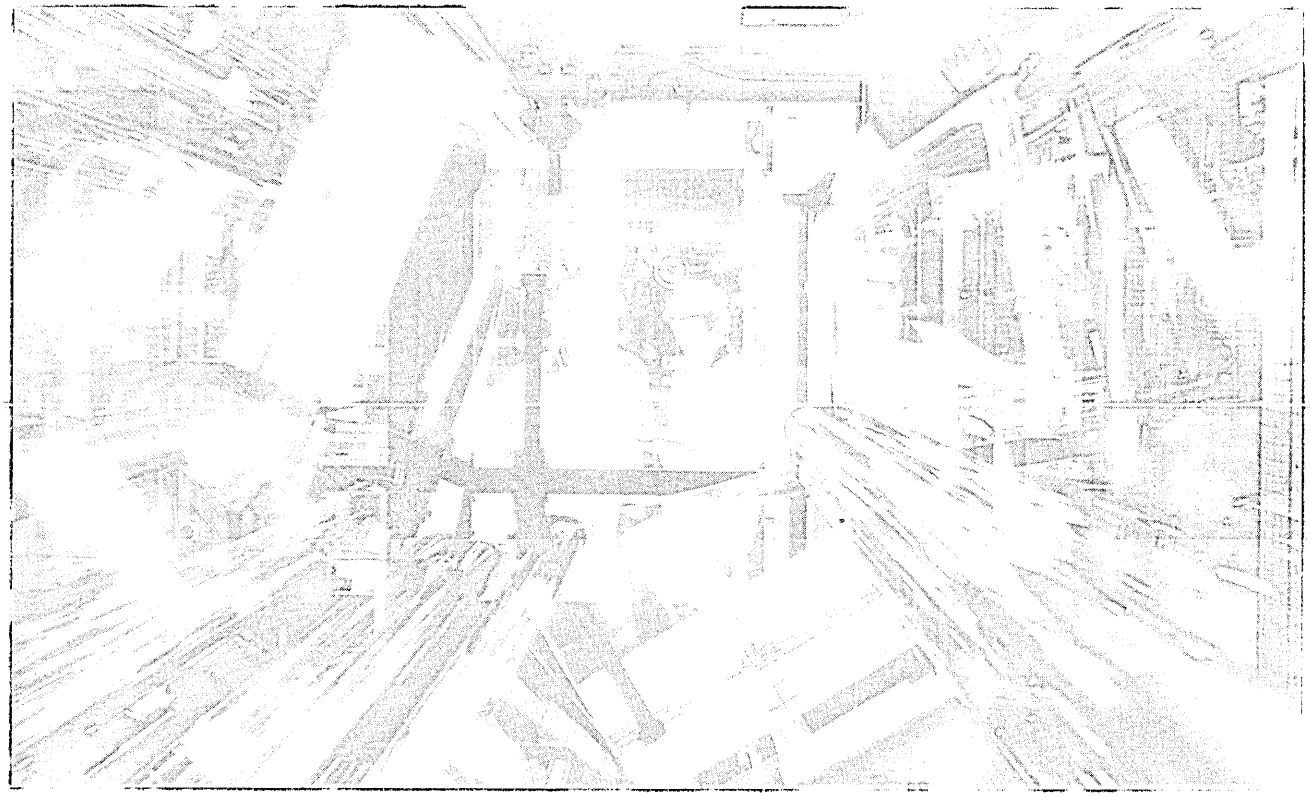


UCC TEN

University Computing Company

ENTITY TYPES	ENTITY CHARACTERISTICS	INPUTS	INTERFACES	SPECIAL FEATURES AND NUMBER OF INSTALLATIONS
All 37 IMS-DL/1 entities, including: Databases, segments, fields, programs, modules, applications, jobs, PSBs device, line group, message segments, formats, physical terminal, logical terminal, user-defined entity types	Names are eight character identifiers together with a sequence number Descriptions are arbitrarily long Keyword descriptors are arbitrarily long 255 versions per entity, each may be development or production Picture, alternate picture, justification, occurs, aliases for fields	On-line update using MENU (fill blanks), IMS transaction format Batch update in IMS transaction format Fixed format forms and transaction routines provide updates Input edit features Automatic keyword building facility Single entry definition automatically generates related IMS definition Create same as feature Set default values feature COBOL, PL/1 source data definition extracts Existing DBDs, PSBs, MFS control blocks, STAGE I SYSGEN conversion utility provided	IMS only DBMS interface Generates DL/1 DBDs PSBs, PCBs, SSAs, MID, MOD, DIF, DOF Generates GIS/VS DDTs Generates COBOL, PL/1, BAL data definition copybooks Generates Stage I SYSGEN inputs Generates message format service control blocks Interfaces available to MARK IV, RAMIS, ASI-INQUIRY Preliminary ADL Support Above generations possible for a given version	Old/new SYSGEN comparison feature Entity definitions without relationship definitions for design activity Structure transport utilities provided User exits provided Prefixes may be generated for data elements in dictionary Supports field sensitivity 300 installations

Imperial Chemical's Network ...



Production workers are reflected in a continuous sheet of triacetate film being manufactured at ICI's Bexford subsidiary at Manningtree, in Essex, England.

... is also a Tran Network.

With sales measured in £ billions sterling, Imperial Chemical Industries Ltd. is one of Britain's largest corporations, and one of the largest chemicals producers in the world. Its operations stretch from Kenya's Lake Magadi (whose soda ash is one of the country's top foreign currency earners) to Sydney, Australia (site of that nation's largest singly-controlled chemical complex), to Sri Lanka, the West Indies, Turkey, China, Japan, the U.S. and many more countries — 150 in all.

ICI's businesses comprise nine large manufacturing divisions in the United Kingdom and more than 300 associate or affiliate firms worldwide. All operate with some degree of autonomy, but corporate planning and coordination are handled by the company's head office.

By 1979, the conglomerate's formidable computing resources were running into telecommunications problems. The numbers of terminals and point-to-point communications links were increasing explosively and very long lead times were being experienced in acquiring telephone lines.

Corporate specialists decided that a switched digital network would help, and the resulting facility now links to a wide range of computers, including IBM, Amdahl, DEC, Burroughs, and Prime systems. Eventually these machines will be accessed from terminals throughout Western Europe as well as the U.K.

Applications already on the network include scientific/engineering processing, accounting, inquiry/response, and many more. Planned uses include electronic mail, videotex, digital facsimile, and other "office of the future" functions.

Tran has installed integrated networks for chemicals firms, telephone companies, educational and financial institutions, government agencies and private industry in the United States and other nations. Simultaneously performing X.25-compatible packet, circuit, and Pacuit® switching, its networks are unmatched by any others in the world.

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The heart of the Shared System is its Central Memory Unit. The CMU lets all your No Problem typewriters share mathematical calculation abilities, list merging, automatic repagination, standard document assembly, global search and replace, line drawing capabilities, and more.

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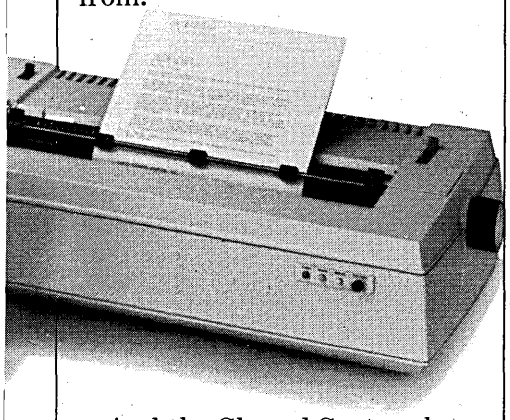

And the Shared System has remarkable record-keeping facilities. You can store over 30,000 pages. Your typists save time by reducing and often eliminating frequent media handling.

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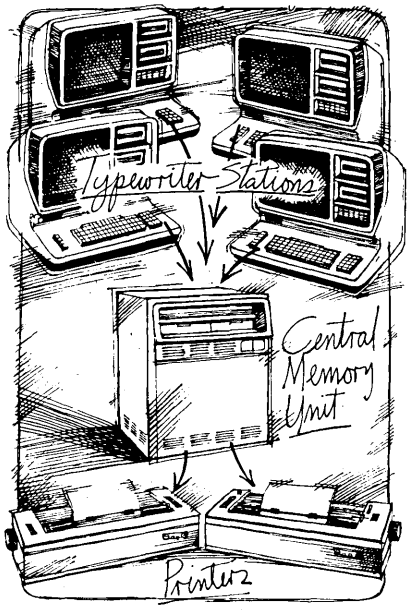
The Shared System is better than a good investment. Sharing starts to pay for itself right away.

Typists can work independently, or they can share the burden of larger typing jobs by working together to get the jobs done on time.



While a typist types, the Shared System can simultaneously print, do list merging and more. It saves time and money by getting your work back faster. You can even share printers.

Lanier today, No Problem tomorrow

If you're considering a typing system, consider this: The No Problem Shared System is the only typing system your company will ever need.

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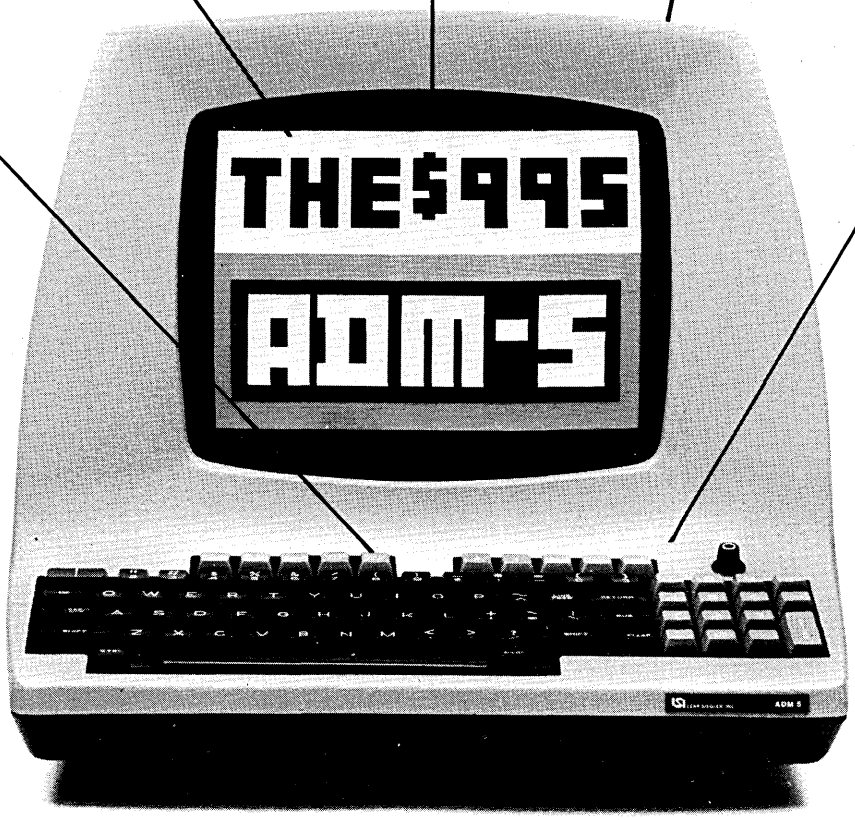

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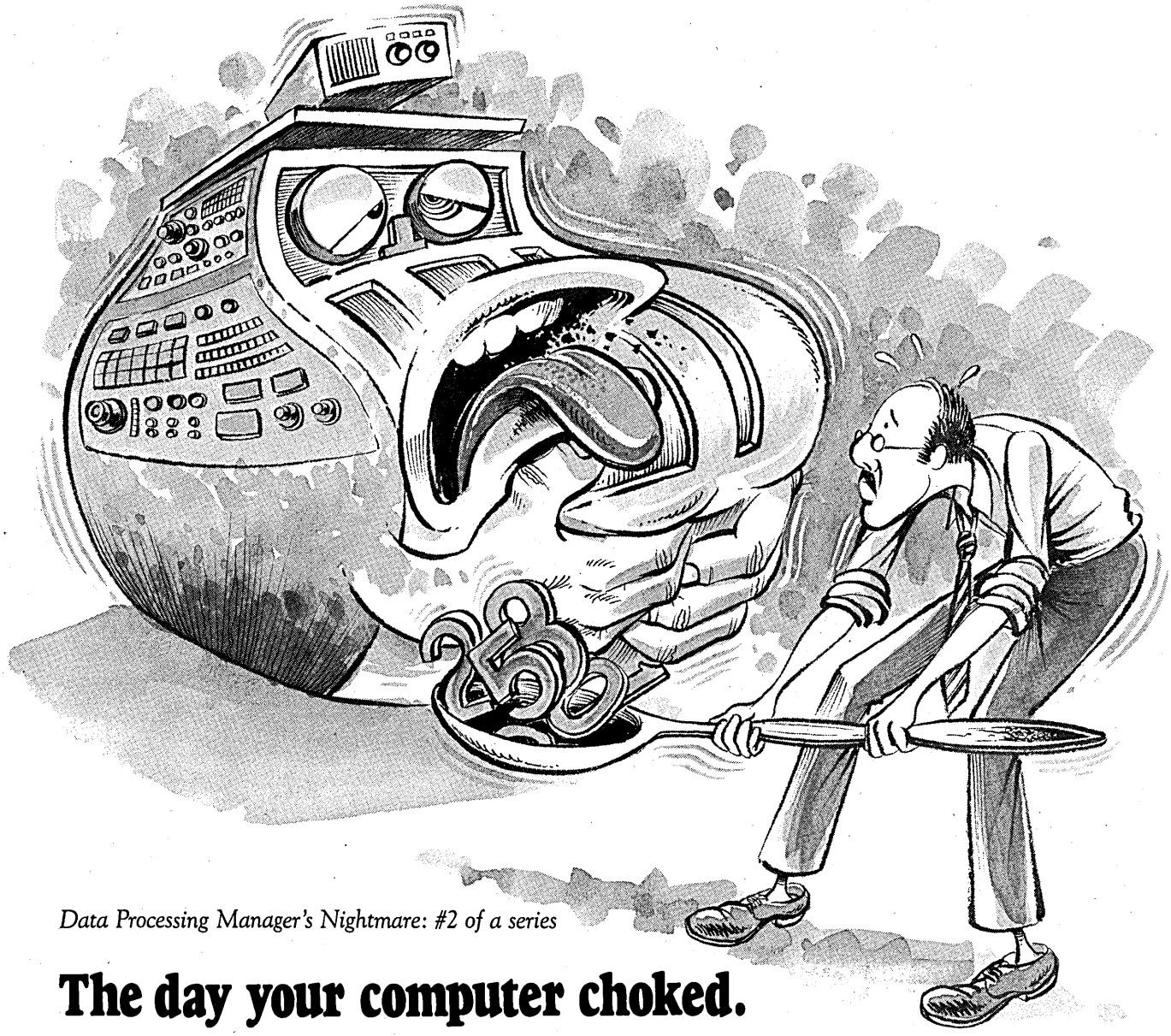

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APPLICATIONS DEVELOPMENT

SOFTWARE STILL A SORE SPOT

Applications development is still one of the industry's thorniest problems.

As the demand for information continues to skyrocket, the computer industry is increasingly under pressure to come up with new and better applications development tools: a quantum leap forward in applications development its clearly needed. But so far, that Herculean jump is still a hop and a skip.

Applications development remains one of the dp industry's thorniest problems. Since the '50s, when higher level languages emerged, there's been only slow, piecemeal progress. Some headway has been gained through the recognition of the need to structure a program. Positive strides have also been made in data base management, on-line program development, and program and system debugging.

Summing up the small successes to date, one software specialist complains, "We're still hung up on our COBOL-type higher level languages. We keep on hacking away at efficiency improvements within these languages. As a result, we haven't been able to provide professional programming people with tools that will significantly increase their productivity, nor have we been able to accommodate a wider variety of non-technical users."

Meeting the needs of the novice is the ultimate goal of systems researchers and designers. Economic necessity appears to be the main force behind this trend—the ever-shrinking programming pool pulling in ever-increasing salaries is the major catalyst.

The first big advance on the user-friendly front came with the birth of BASIC. But like BASIC, most recent developments are aimed at easing the job of the programmer or dp expert, and not at helping the non-dp user. When true user-friendly systems become a reality, people outside the dp domain will either be able to deal with programmers, or become programmers themselves to get their jobs done.

IBM, as well as a score of other savvy system suppliers, has set its sights on the user-friendly target, and has task forces looking into the problem. In the meantime, the mighty mainframer has come up with "applications enabling" aids—all of which are tailored to specific systems and directed primarily at the professional dp user. Some new applications enabling tools will be unveiled by the company before the end of the year. These systems, currently available in Europe, will be procedural and, in some cases, will require APL.

One key to IBM's strategy in this area lies in packaging. Says an IBM insider: "We keep working toward the packaging of things to make them with less options, so there's less chance of going wrong. We used to say everything was speed, accuracy, and flexibility. Now we're saying speed and accuracy through rigidity."

IBM's General Systems Div. is particularly interested in developing user-friendly wares to broaden its first-time user base. In an attempt to capture bigger chunks of this unsophisticated dp market, GSD offers products

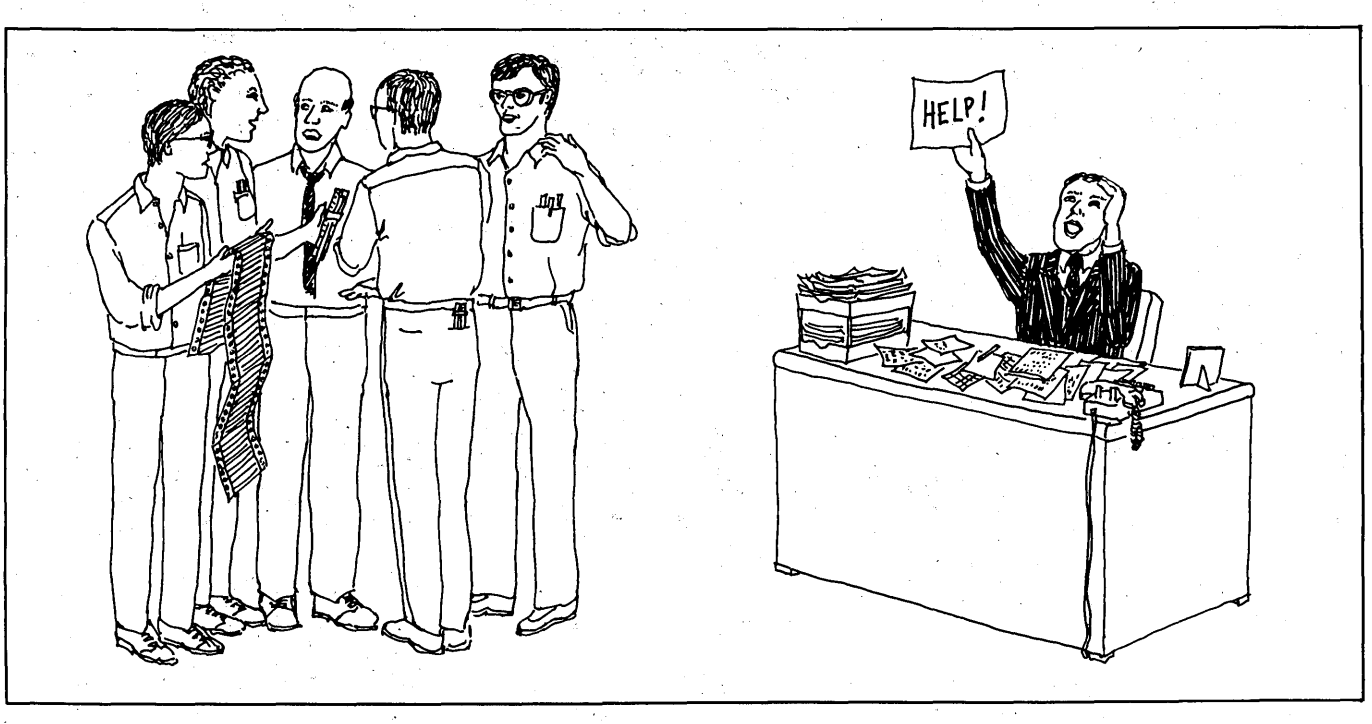


ILLUSTRATION BY SUSAN HUNT YULE

such as the Business Report/Application Development System (BRADS). Designed to run on the 5110 and 5120 desktop computers, this system allows users to tailor and specify common business applications such as personnel, inventory and sales analysis.

Some companies have zeroed in on the applications development dilemma from an automatic program generation angle. On the scene since the '50s, program generators haven't achieved much progress in cracking the problem. Occupying a low-key position in the marketplace, these tools tend to deal with a certain class of standardized applications that are needed on an infrequent basis. Using them to generate arbitrary systems is still very difficult, given the current state of the art.

The ultimate system touted in this area is of course the applications generator. No one believes, however, that this system will answer absolutely every applications need. Some industry practitioners feel though that applications generators could be a big boon if designers build them to certain specifications. The two most important criteria are to make sure the documentation for the generation is automatically produced by the machine, and to make sure the structure of the generated programs is created in a way which allows easy modification and extension.

The consensus among industry experts is that the day of true and successful applications generation is a long way off. There has to be a tremendous amount of research, they feel, before such systems become viable. In the interim, a different and promising type of research is under way at the University of Michigan.

Headed up by Dr. Daniel Teichroew, a professor of industrial and operations engineering, the ISDOS (Information Systems Design & Organization System) project was kicked off in 1967. It's sponsored by users and manufacturers in the U.S., Europe, and Japan. Some of the more heavy-duty backers include IBM, AT&T, Univac, Burroughs, and NCR.

The R&D work under the ISDOS project is aimed at finding ways to improve the system building methods of organizations. To achieve this, the researchers have concentrated on the front-end of the systems life cycle. That often overlooked phase, according to Teichroew, is where most of the problems and potential payoffs lie.

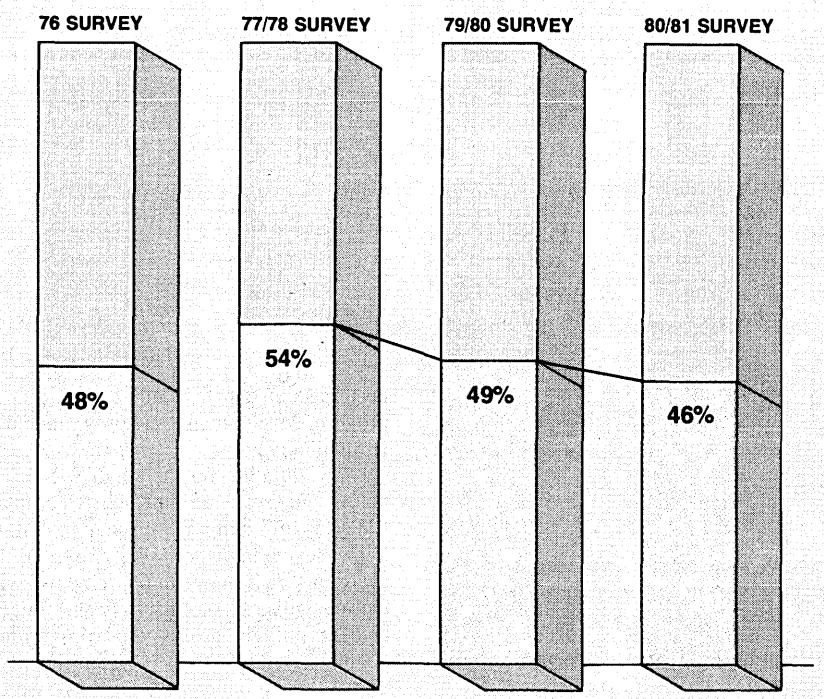
This front-end focus led to the development of the Problem Statement Language/Problem Statement Analyzer (PSL/PSA) system. PSA is an interactive tool for the systems analyst. The data base contains the complete description of the desired system from the logical side. Now Teichroew's team is working on giving the software designer the same kind of aid that PSA provides the analyst. Ultimately, Teichroew hopes to come up with tools that go "all the way down the stages in the systems life cycle."

Teichroew's work is important because it delves into the systems analysis phase rather than the programming stage, where most of the attention until recently has been centered. More than an idea dreamed up in an ivory tower, PSL/PSA is aimed at a broad class of applications, and has been installed around the world on most of the medium and large scale machines and operating systems. The first operational installation of the system was in 1973 at AT&T Long Lines. Teichroew says IBM has an "extensive" research, as well as applications, interest in PSL. And Univac, he reports, is using it to develop systems software, such as operating systems.

Many people believe the new applications development frontier with the most potential is nonprocedural languages. Dp veteran Teichroew claims the label of nonprocedural is "irrelevant." What you need to be able to do, he explains, "is describe a system in enough detail so people who have to understand it can in order to make design decisions."

Most industry watchers view nonprocedural languages as the next quantum

DISAPPOINTING DECLINE



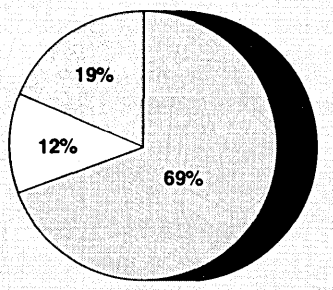
PERCENTAGE OF SOFTWARE STAFF RESOURCES ALLOCATED FOR:

MAINTENANCE OF OLD APPLICATIONS, SYSTEM CONTROL PROGRAMS, DOCUMENTATION, ETC.

NEW APPLICATIONS DEVELOPMENT

RESPONDENTS TO A 1980 DATAMATION SURVEY INDICATED A DROP IN SOFTWARE STAFF RESOURCES ALLOCATED TO NEW APPLICATIONS DEVELOPMENT.

WHITHER NEW APPLICATIONS SOFTWARE?



IN-HOUSE STAFF

IBM PACKAGES

OTHER

IN A 1980 DATAMATION SURVEY, MOST MAINFRAME USERS INDICATED THEY WILL RELY PRINCIPALLY ON IN-HOUSE STAFF FOR DEVELOPMENT OF NEW APPLICATIONS SOFTWARE.

CHARTS BY BARBARA KRAUS

Too often today, poor front-end and problem analysis has resulted in throwaway systems that don't meet end user needs.

ILLUSTRATION BY ANDREA BARUFFI

jump in the applications development world. Today the bulk of applications programming is done in procedural languages that were created in the '50s and '60s. To break away from the restrictions inherent in these languages, dp technologists are recommending a move toward nonprocedural, which would almost allow users to go from the preliminary design stage into programming.

The economic pressures on the dp field seem to make this a reasonable route. To get there, however, there has to be much more research. There also has to be a general recognition of the need for such an approach on the part of the industry as a whole, and the professional societies and academic circles in particular. So far, this research and recognition have not been forthcoming.

Even IBM has not given the nonprocedural notion the push many observers feel it deserves. If the concept indeed represents the much sought after step forward, then why isn't IBM solidly behind it? The answer, according to one industry pundit, lies in that company's profit-oriented roots. "IBM," he quips, "is driven by the balance sheet. When it starts hitting its ability to sell and install machines, then it will do something about it."

—Linda Runyan

DEFINING THE PROBLEM

Poor front-end analysis often results in throwaway systems

"The big problem is that an application is seldom what it seems. Even the people who need it don't know what they need."

With this deceptively simple statement Douglas Ross, chairman of the board of SofTech Inc., goes right to the root of the applications development dilemma.

Experts all agree that the hardest part of the applications development cycle comes right in the beginning, when end users have to decide if they indeed have a problem that the dp shop can help solve. This sticky stage is usually referred to as the problem or requirements definition phase. It's at this pivotal point where most of the trouble in applications development occurs.

Too often today, poor front-end and problem analysis has resulted in throwaway systems that don't meet end user needs. Various structured methodologies on the market can help avoid these pitfalls. One of the more promising approaches, called the Structured Analysis and Design Technique (SADT), is being offered by SofTech.

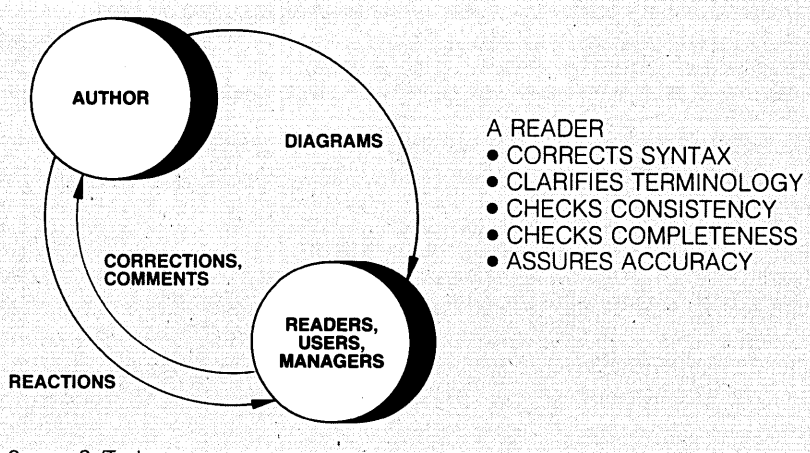
By involving all the people in a company with a particular problem—real or perceived—SADT tackles the requirements definition chore. Under the methodology, these people are taught to think systematically. To aid in this, SofTech has devised a simple graphical language consisting of rectangular boxes and arrows which serve as diagrams for the problem refining process. A collection of these diagrams hooked together creates a model that brings into much sharper focus the requirement parameters.

A key part of the SADT methodology is the author-reader cycle. Two basic types of people are involved in this feedback process. One is the "author" or structured analyst team that actually writes the diagrams after interviewing the "readers." This second reader group is made up of company experts who know the particular applications area, or are authors who've worked on related systems.

"SADT is a great way to get your head together before you start designing a system."

SADT AUTHOR-READER CYCLE

CONTINUOUS PEER REVIEW OF ALL WORK TO ENSURE QUALITY AND REDUCE ERRORS



Source: SofTech

Both author and reader teams are given special training in the SADT graphical language and technique. Because everything is on paper, this training allows the reader-expert to comment in writing on what the author-analyst has prepared. The papers are pushed back and forth until agreement is reached.

The SADT approach has been on the market for over five years. SofTech's Ross says sometimes a company using the methodology is surprised to find it doesn't even have a problem. "But more often," he adds, "it shows a company has a bigger problem than it thought, and in an area it didn't realize."

The SADT user base continues to grow. One satisfied customer is DuPont, which has been using the product for over two years. The company, which has used SADT to model the functional requirements of a profit sharing system, is now using it to pinpoint requirements for systems development.

Another SADT client, Chemical Bank of New York, has been successfully tapping the methodology since June 1979. To help the bank assess a revised dp need to centralize its personnel and human resources data base, SADT is currently used in designing a financial control system.

Adam Reisner, manager of structured techniques at Chem Bank, describes SADT as "a great way to get your head together before you start designing a system." He says that the use of SADT in the requirements definition phase on one particular project "helped us spot that management lacked a clear understanding of what they wanted the system to do. So we shut the whole project down."

While SADT seems to be a good tool for uncovering what the problem is or isn't, some people object to the mountains of paperwork it spawns. Others complain that it is expensive and complicated. On the last point, Michael Conner, general manager of SofTech's Commercial Systems Div., explains that "part of the problem with SADT is that it's very disciplined and requires training experience and a lot of hard work. And many people don't like to work or think."

"No structured methodology," Conner points out, "is going to replace thinking. If people aren't going to think and really try to evaluate what they're doing, nothing is going to help them."

—L.R.

LETTING GEORGE DO IT

The business of information systems is an adjunct to the business of the corporation

The folks at Hercules, Levi Strauss, Alcoa, and Purolator have learned a lesson: there is more to information systems than hardware and software.

Their teacher is Ivan George, who has shown them that the business of information systems is merely an adjunct to the business of the corporation, which is, as Karl Marx took great pains to point out, making money.

George, a former operations researcher at Manchester University and management consultant in South America, has devised an applications development tool called PRISM—People/Resources/Information Systems Management. Its purpose is to attack information problems as part of the overall business of the company, not as individual entities or systems.

"In this field," a respected industry consultant notes, "we've been trying to solve management problems in data processing that should never have gotten to dp, and dp ends up with egg on its face."

Not if the company has George as its chief cook.

"Nobody integrates people and information into a common structure," says George, now president of Deltacom Inc. of Southampton, Pa. "When you don't do that you have serious problems. The moment you relate information to computer programming and what computers can do, you're 360 degrees away from what the business can do. These companies may have leading edge information systems, but they're not in that business."

So George doesn't want to hear what a company's computers can do for it. He wants to hear what a company wants its business to do and where it wants it to go. Then, using the operations methodology, software, and database capabilities George devised at Manchester and applied during his years in South America, PRISM creates a matrix of the entire company. The technology allows the client to look at the strategic management areas of the company, then relate those to the functions and activities that have to be carried on efficiently and cost-effectively in order to make a profit.

"The information is developed against a matrix to support the business," George explains. "Then it's assigned into the organizational structure, depending on how the company wants to handle the information. You build information systems to support the business, not to support an individual or particular function."

They're true believers at Hercules and Levi Strauss. Hercules was undergoing a major reorganization in 1977, part of which was to make changes in the timeliness and responsiveness of its information systems approach. In addition, it needed assistance with an organizational analysis of one of its major business centers which was being relocated.

"We were looking for a methodology to take us from identification to definition," director of systems development Chet Norstrum says, "and we had to back away from the traditional technical approach because of

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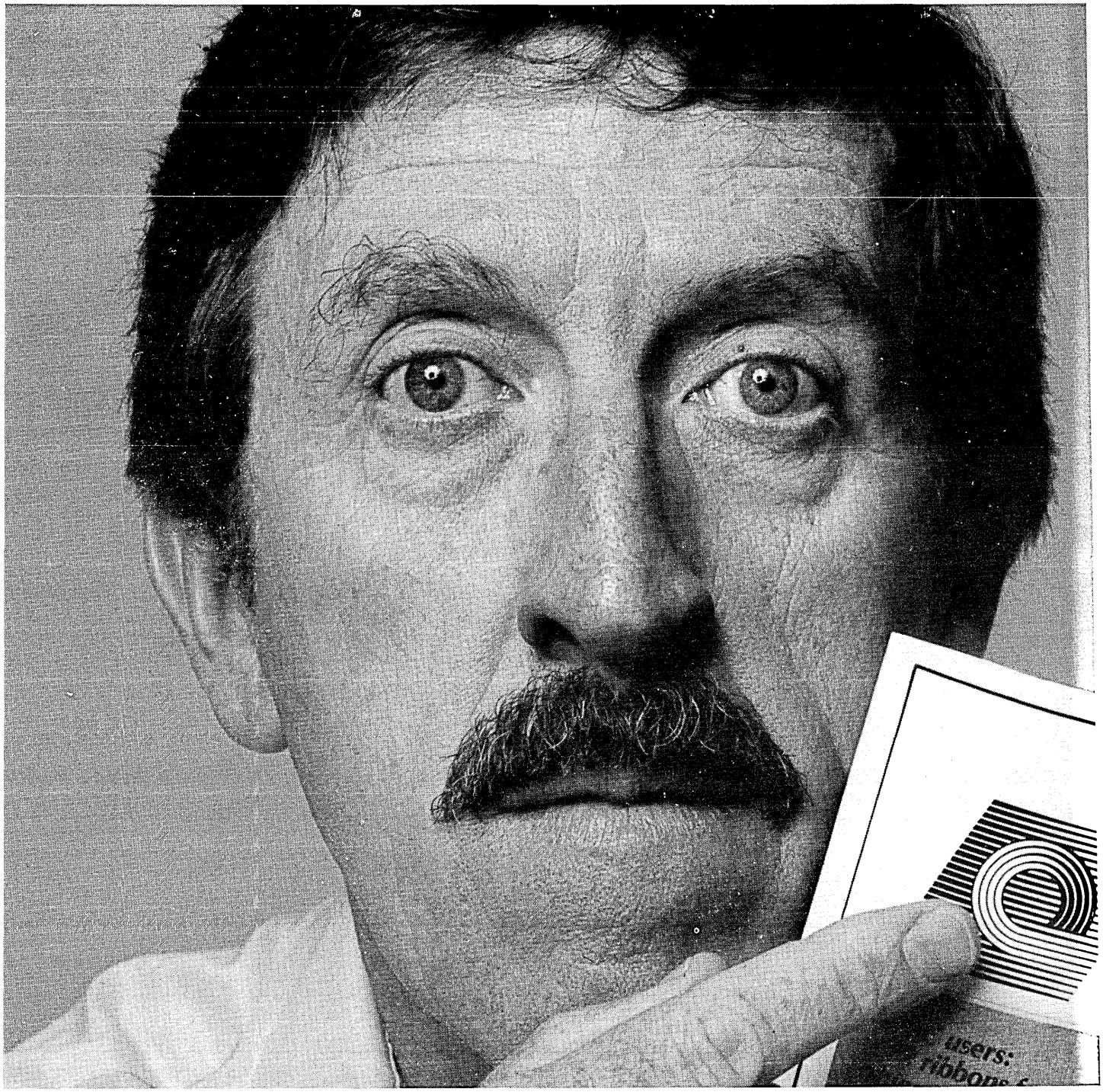
CIRCLE 145 ON READER CARD



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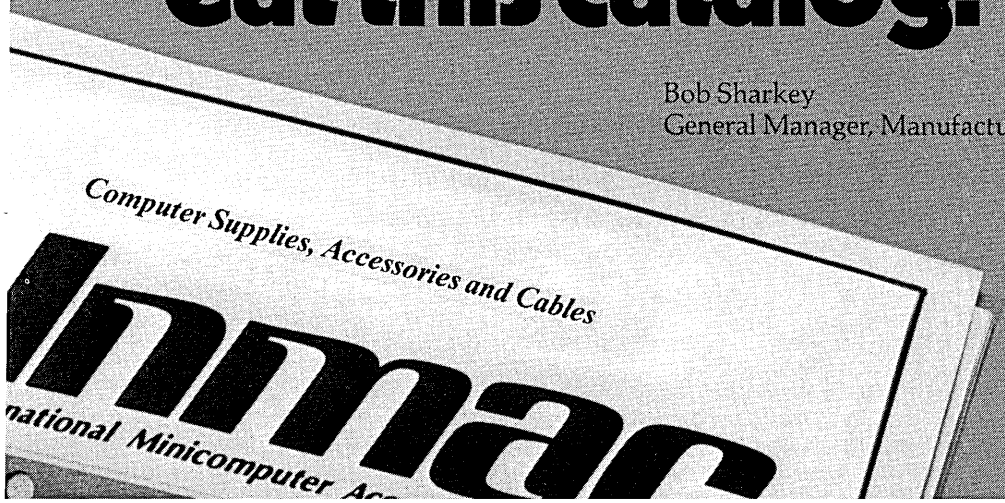
Bob Sharkey
General Manager, Manufacturing Operations



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CIRCLE 146 ON READER CARD

Discussions about programming languages often resemble medieval debates about the number of angels that can dance on the head of a pin.

the lack of communication between users and dp professionals.

"We came across Ivan, and we essentially bought his body and soul for a year and a half. PRISM does a good job of identifying user requirements in terms the user puts down. It allows the user to be a systems analyst. And it has real value in non-dp situations as well. Other methodologies assume it's a dp or computer problem. If they find it's not, they back off, and that's unfortunate for them and us."

At Levi Strauss, planning manager Donna Rund needed help determining the scope of an information system to support one of the company's divisions that is expected to quadruple in size. With the help of PRISM she got the answer, then went on to tackle in-depth, long-range systems planning for another, larger division.

"After six weeks, we've had great success with PRISM," Rund says. "The biggest problem is that analysts tend not to think in business terms. It's a process of changing the way you think. Managers don't have the same problem. Analysts get frustrated, but I expect that.

"It's an extremely useful tool, but unless you have an inside person who understands it, it would be difficult to implement. A company has to be ready."

—Willie Schatz

REBEL WITH A CAUSE

Challenging existing theories of programming

When John Backus laid it on the line to the computer industry two years ago, he received the treatment usually reserved for radicals and heretics. He became a rebel with a cause.

"It's been a very strange thing," Backus says with a chuckle. "I delivered a paper in 1973 with the same ideas and it was fairly well received. But the one I did in 1978 sank into a well of silence for a considerable time. A few people said they liked it, but it didn't arouse much interest.

"I expected it, though. It was fairly radical, and you don't expect everyone to agree with radical remarks."

Not even when they're spoken by the winner of the National Medal of Science for 1975 and the Association for Computing Machinery's (ACM) Turing Award for 1977. All Backus did, mind you, was challenge every existing theory of programming that had been developed over the previous 30 years.

"Discussions about programming languages often resemble medieval debates about the number of angels that can dance on the head of a pin instead of exciting contests between fundamentally differing concepts . . ."—that was one of his kinder assessments of higher level languages in his Turing Award lecture. "Fat," "weak," and "obese" were among his other descriptions.

Now, however, the "radical" is attracting more and more believers. There are obviously many people out there who agree he's not still crazy after all these [30] years [with IBM].

"Interest is growing quite a lot," Backus admits with a trace of satisfaction. "MIT is having a conference next year to discuss this. All of a sudden there's lots of interest. I guess it took people a long time to get used to the idea."

The idea is that high level languages are hardly what they appear. Backus argues that they take too much of everything—time, money, and energy—and give back nothing but headaches. In their place, he offers a "functional" style of programming founded on the use of combining forms for creating programs.

"I maintain that the kind of languages I'm talking about are much higher languages than what's commonly called 'high' or 'very

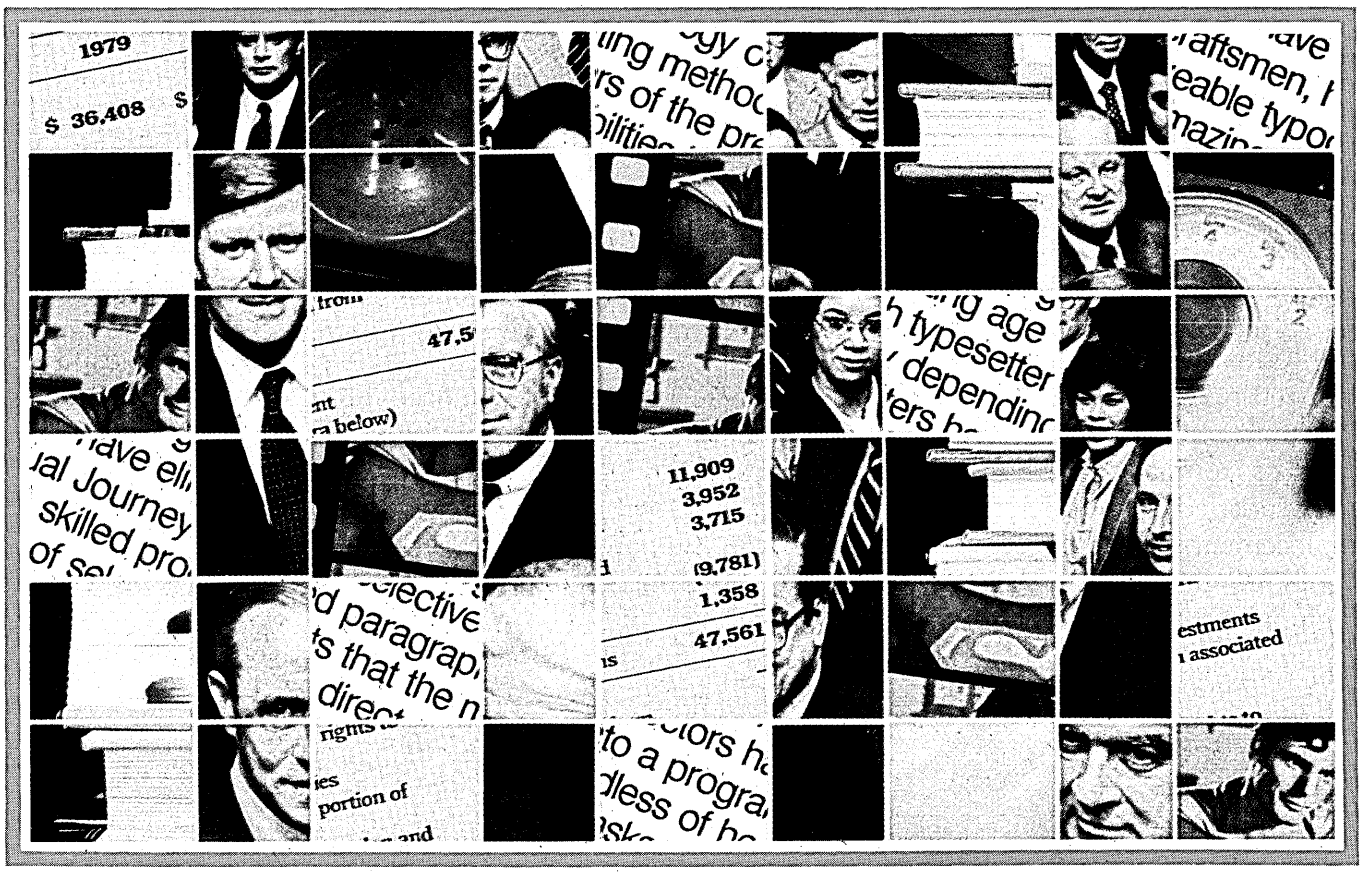
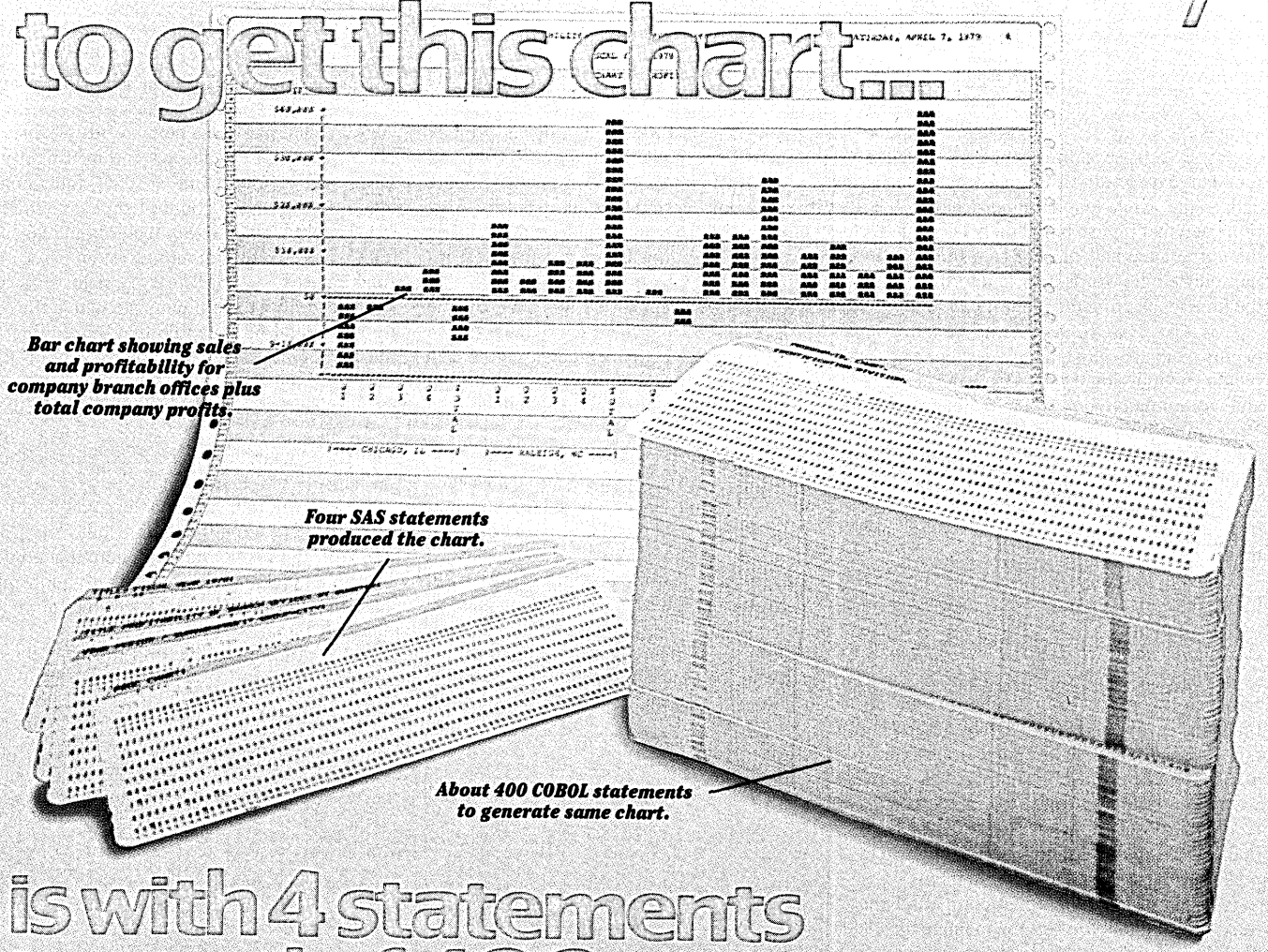


ILLUSTRATION BY JANE STERRETT

The most efficient way to get this chart...



is with 4 statements instead of 400.

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With SAS handling all that, programmers are free to use SAS a second way – as a higher-level programming language. Unlike most other software systems, SAS is not limited to prewritten routines. A programmer can use SAS to eliminate the tedious steps in a complex task.

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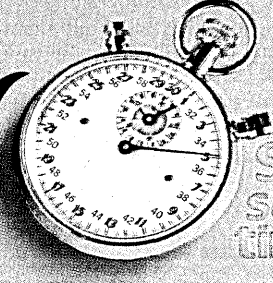


SAS saves time.

"One of the hardest things to do is break the mental set of the last 25 years."

high' level languages," Backus explains, dubbing today's so-called higher level languages "low level."

Backus sees three problems with current languages, all resulting from what he calls "the von Neumann bottleneck." He proposed that phrase based on his distaste for the current method of changing memory by pumping single words back and forth through the tube connecting the memory and the cpu.

The "word-at-a-time" problem occurs because most languages depend on picking up individual words from the memory and combining them by some expression. "It's incredibly clumsy," Backus insists, "because it doesn't permit you to look at the datas as a whole entity."

But that's a picnic compared to the difficulties he finds with composition and making specific programs into general ones. If you want to write a big program, you have to break it up into smaller ones. In today's high level world, Backus discerns no way to accomplish this.

"What you'd really like to do is to have a lot of useful programs sitting around that you can put together to build a bigger one," he says. "But composition won't allow that, because if I take two programs written without knowledge of each other the result is almost certain to be gibberish. And to make a specific program general you have to make all these complicated statements."

These two dilemmas compound the third difficulty of von Neumann languages—recursive definitions, in which a function is defined in terms of itself.

So what would Backus want? Basically, a brave new world which would be functional rather than nonprocedural. Backus defines the latter as languages which allow you to state the properties the desired program must have and which say what you'd like to do without saying how.

"The functional theory changes things because programming, in my language, doesn't use names," he explains. "You just give it the argument itself. Since it doesn't name anything, you can apply it to any function without changing it. You just have to physically wheel up the thing you're going to do it to and then it can do it. You can be applying three functions at once. It doesn't care.

"The problem with the old styles comes from the fact every program is working on the store, so in that world of programming it changes one store into another store. And that's all it can do. Whereas in my world, programs do not map stores into stores. They map things into things. Conventional programming tells you how to combine objects to get new objects. Mine tells you how to take two programs and get a new program."

The industry, however, has been reluctant to get with Backus' program. It is having mental and physical problems.

"One of the hardest things is to break the mental set of the last 25 years," the 55 year old Backus sighs. "Writing a program in my style requires you to think in entirely different ways than you're accustomed to. It's very mind-boggling. It violates the most ingrained mental practice of all.

"I find every time I'm trying to write a program I tend to write it so it will do things serially, whereas in my language I can write a lot of things in parallel. It just takes a long time to retrain yourself. But I'm gradually debrainwashing myself."

Slowly, he's doing likewise to the doubters and resisters. If he could just produce a working system based on his language, the physical problem would be solved as well. Since his language doesn't have a memory, it's historically insensitive. But even Backus concedes the need to have a memory that will give users a different answer tomorrow than it did today. He is currently wrestling with those technical difficulties at the IBM laboratory in San Jose and at his home in San Francisco. In a year, possibly two, he expects success.

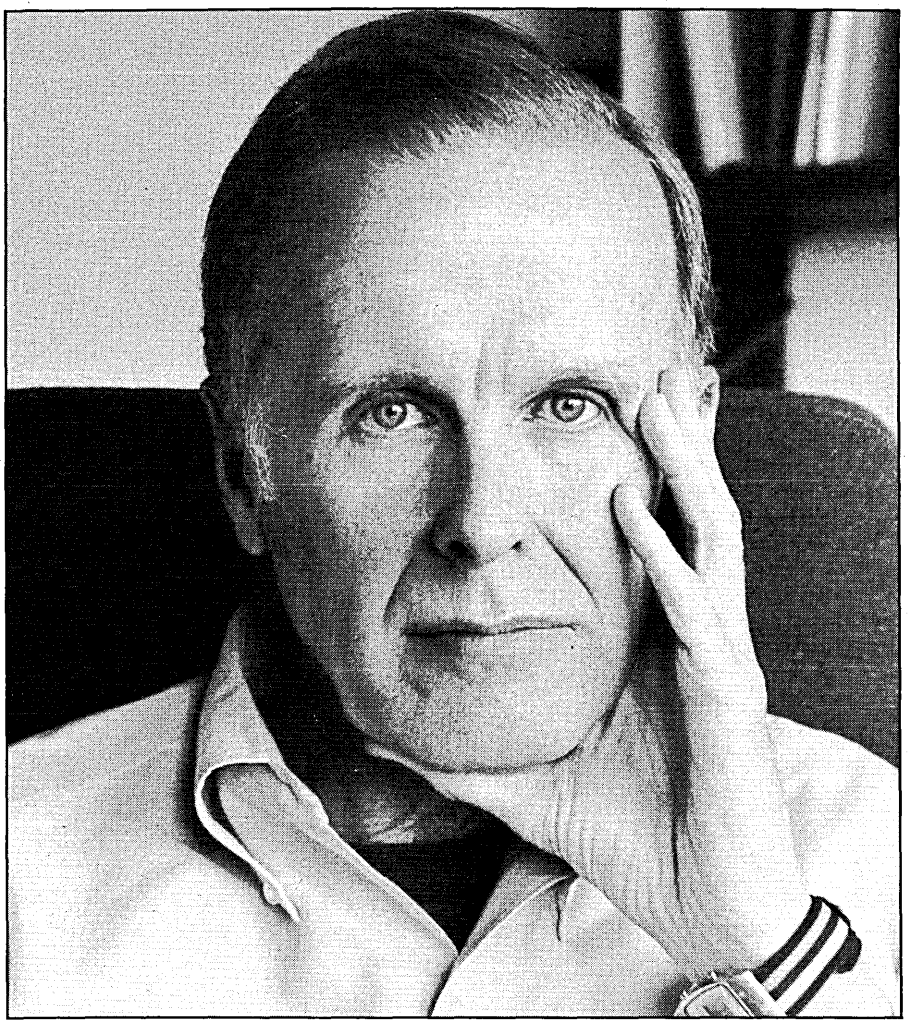
Then his brave new world is achievable? "Oh, yes," he says enthusiastically. "But you wouldn't like a 100% functional language because it couldn't say 'save this.' You would have to retain the old languages. You'd have a real computing system based on functional language. The system just has to have the ability to communicate with a file of information, and it can do that by sending a message created by the application of its function input."

He's not holding his breath for the day when it's as common as the telephone, though. Backus may be a theoretician, but he's also a pragmatist.

"I think this will be the next quantum leap," he grudgingly admits, "but I'm biased. Still, there's nothing out there that could be the next quantum leap. But don't quote me as saying I think it's the wave of the future. I don't. It remains to be seen."

"And, he adds stoically, "it's too early to tell."

—W.S.



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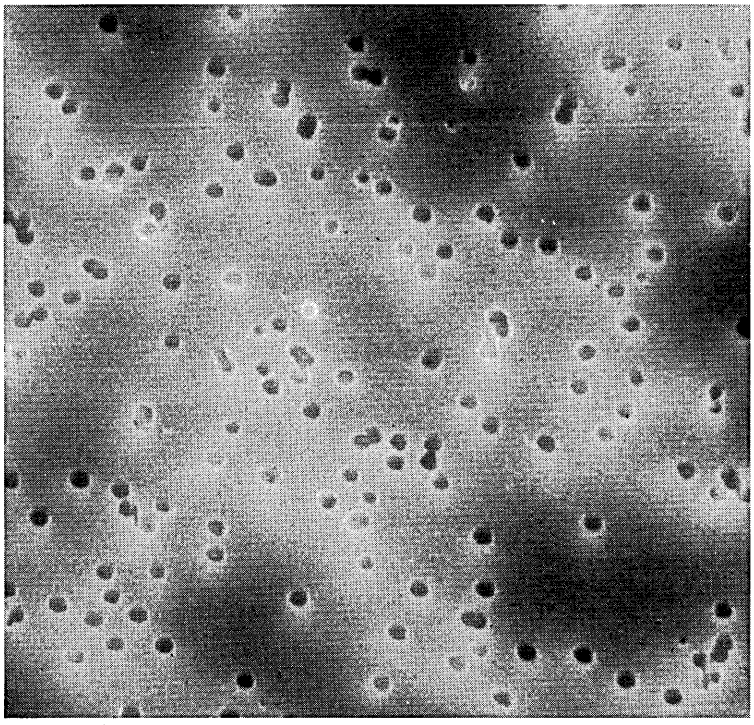

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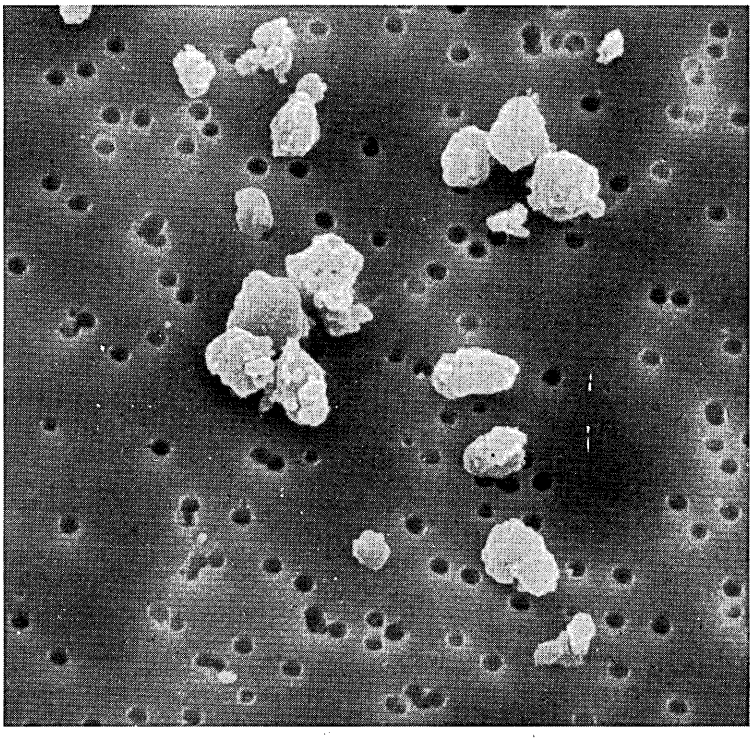

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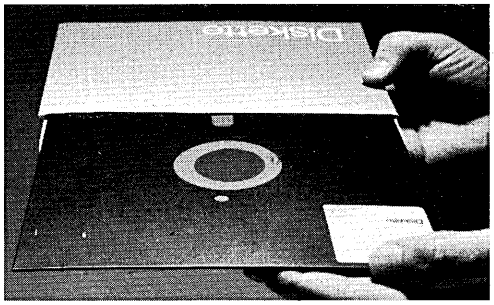

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CIRCLE 148 ON READER CARD

Maintaining the optimal environment means planning for the present with an eye toward the future.

HOT & COLD DATA CENTERS

by James E. Hassett

Like it or not, the dp manager is responsible for the entire operation of the data center. Unfortunately, responsibility for performance includes many specialized fields such as air conditioning, fire protection, and security. To assume that all the specialists in these fields will design and install the best systems is risky. This article focuses on the problems associated with maintaining an optimal thermal environment for your data center.

The proper environment for a data center is not comprehended by the term "air conditioning." Air conditioning connotes people comfort; "process cooling" is a better term because it indicates the difference in computer hardware cooling.

There are four considerations in establishing the design criteria for the selection of equipment:

1. *Specific hardware requirements:* Have a copy of the installation planning manual that is supplied by each hardware supplier. The designer needs this information; it is often found in the book with all of the specification sheets for the hardware. The specification sheets (Fig. 1) indicate wide ranges of temperature and relative humidity for all the hardware. However, each manufacturer has a recommended temperature and humidity for maximum up-time. In addition to temperature and humidity, most manufacturers identify the maximum permissible humidity of air under the floor and coming up into the equipment. Parameters of thermal shock are also identified. These last two items are most often missed and are the major causes of computer down time.

2. *Cooling load of the room:* Fig. 2 shows a simple cooling load calculation form which will help in identifying the capacity of the required cooling equipment. The example shows a data center of 2,000 square feet located, for security purposes, in the center of a subbasement. This load calculation form will be filled out by the designer, combining the details of hardware watts (or btus per hour) with the heat equivalent of lights, people, outside air, etc. As one might expect, the largest load comes from computer hardware.

Experience indicates that the minimum capacity of the process cooling equipment should allow for a 30% growth of computer hardware for that room.

3. *Redundancy:* The minimum capacity for the cooling equipment, in this example, would be 219,850 btus an hour. However, all the equipment will fail someday, and for that reason, the actual process cooling selection should include one more cooling system to serve as a redundant system.

4. *Heating needs of the building:* Another criterion which will affect the selection of a process cooling system is whether the heat from the data center can be used to heat another part of the building. We will discuss this option further.

When analyzing a data center's environmental requirements, a manager should consult these sources of free, competent advice: the professional designer retained for the project; the site preparation specialists representing the hardware manufacturer; the building's plant engineering and maintenance department (which can often help avoid unnecessary equipment duplication and mistakes); the local utility; user groups, many of which have published information on aspects of data center design and maintenance.

HOW TO CONSERVE ENERGY

1. Reduce the ventilation air quality. Outside air that is brought into the data center must be cooled and dehumidified during warm weather and heated and humidified during cool weather. While cool air would be a benefit in reducing the cooling load, the cost to humidify it outweighs the cooling gain.

By reducing the amount of outside air to about 1% of the air in circulation, rather than the 15% usually associated with comfort air conditioning, most of the energy used to heat and humidify the outside air is saved.

In a 5,000 sq. ft. data center, the air in circulation would be about 30,000 cubic feet per minute (cfm). Based on process cooling standards, there would be a maximum of 1% or 120 cfm. An air conditioning system would call for 2,000 cfm to meet most local ventilation codes.

2. Use a vapor barrier to minimize infiltration/exfiltration. Ceiling tile, for example, should be replaced with a tile designed for data centers. The back of the tile should be coated with a vapor barrier, a plastic sheeting that prevents the migration of moisture out of the data center. If the data center has a high moisture content in the summer and low moisture content in the winter, you have a "loose" room. Exterior walls, particularly, must prevent moisture entry into the room during the summer months as well as the moisture leaving during the winter months.

3. Minimize system dehumidifying. Almost all cooling systems take out moisture (dehumidify) while they are cooling the air. Very little moisture should be getting into the room at any time of the year, so any dehumidification being done by the cooling process will have to be put back by the humidifier. Limit the amount of dehumidification whenever possible.

The temperature of the chilled water in chilled water systems should be variable so that in the summer a water temperature of about 45°F will be needed for any dehumidifying. In the winter, the temperature should be raised to between 50°F and 52°F. Leaving the water temperature 45°F year 'round will result in excessive dehumidification and expensive rehumidification.

Almost all direct expansion (compressor) systems do some humidifying, particularly air-cooled systems operating during outdoor temperatures of between 75°F and 80°F. Direct expansion systems used in these process-cooling applications should be operated at higher condensing temperatures and pressures than normal air conditioning systems to minimize their dehumidifying effect.

4. Operate cooling systems at peak efficiency. Simple, normal maintenance will keep the operating costs down and minimize down time. Filters and humidifiers should be inspected regularly and cleaned or changed as needed.

5. Reduce the cost of humidifying. Humidification is required most of the year to replace moisture that migrates out of the room as well as moisture removed by the cooling process. Winter ventilation must also be humidified.

Two common ways to humidify air are by flashing water into steam by electricity, and evaporating water from a special dispensing surface.

The electric humidifier requires about 1,000 btus per pound of water while the evaporative panel type needs only 80 btus per

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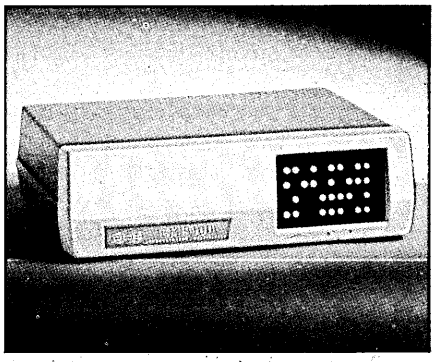

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- Wash. DC (301)-428-5600

CIRCLE 149 ON READER CARD

Simple, normal maintenance will keep cooling systems at peak efficiency, will keep the operating costs down and minimize down time.

pound. In addition, the electric humidifier heats the same air stream that needs to be cooled.

On the other hand, the evaporative panel humidifier contributes to the cooling of the system by cooling the air stream.

Since there is no electric service to the humidifier, installation costs are lower and the costs associated with electrical maintenance are saved. Evaporative humidifiers are also fail-safe in that they cannot overhumidify. The electric humidifier will continue to generate steam as long as the humidistat calls for moisture. If the humidistat sticks "shut," excessive moisture will adversely affect the hardware, cause corrosion, tape-stick and card-feed failure.

6. Reduce the cost of "reheating." There are times during the operation of small data centers when the room temperature is satisfactory but the moisture content is too high. In order to wring the moisture out, the air temperature is reduced. This air must be reheated during this "dehumidification only" period.

In the past, this reheating was done with an electric coil. However, the waste heat from the compressor that is running to provide the cooling can be used to provide all the needed reheat.

7. Reduce the cost of providing cooling. When the outdoor temperature is 55° F or below, it is possible to cool the data center by using the naturally chilled coolant instead of by running the compressors.

The savings are impressive. For instance, in a 5,000 sq. ft. computer room located along a weather belt which includes New York, Indianapolis, and Kansas City, the 10-year savings would be approximately $200,000.

8. Use rejected heat for the building heating needs. In the previous example, the heat of rejection from the compressors and condensers in the process coolers heated the coolant to about 110°F to 115°F. This warm coolant would normally be pumped to the dry coolers, where it would be reduced in temperature and sent back to the process coolers.

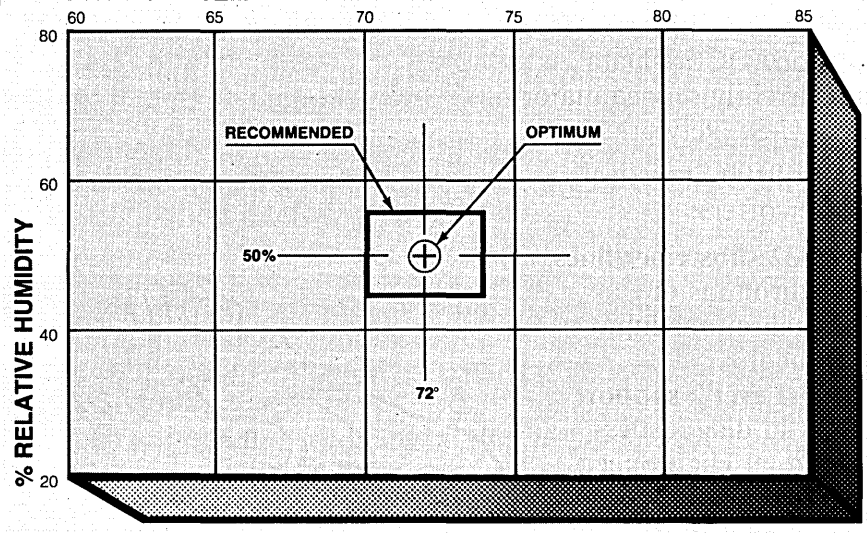
TROUBLE-SHOOTING PROBLEMS

A variety of problems may confront existing data centers. Here are half a dozen common difficulties and the methods that can be used to cope with them.

1. *Room will not hold temperature and humidity:* This is usually the result of having too much outside air coming into the room. You can be sure this is the cause when the humidity increases when it rains and decreases when the cold weather comes. If it isn't obviously an oversized outside air system, then look for (a) little or no vapor barrier used during construction; (b) air passing into the hung

FIG. 1

ROOM DESIGN CRITERIA
MAXIMUM OPERATING LIMITS
72° ± 2° F. & 50% ± 5% RH



COOLING LOAD CALCULATION FOR DATA CENTERS

Project Name		Room DB Temp.	Max RH Underfloor	Floor Area
A. BACUS COMPUTER CENTER		*72°F*	*80%*	*2,000 Sq. Ft.*
Location		**Room WG Temp.**	**Outside DB Temp.**	**Mainframe**
240 "K" ST. WASHINGTON, D.C.		*60°F*	*95°F*	*IBM 3033*
Prepared By	**Date**	**Room R.H.**	**Outside WB Temp.**	
R.A.M.	*Sept. 10, 1980*	*50%*	*78°F*	

LOAD CALCULATIONS (SENSIBLE)

	ITEM				FACTOR	BTU/HOUR
1	Computer Hardware	*37,058*	Watts	x	3.4	*126,000*
2	Lights	*6,000*	Watts	x	3.4	*20,400*
3	People	*6*	People	x	250	*1,500*
4	Ventilation 5 CFM/Person x	*6*	People	x	25	*750*
5	Windows: Sunlit	*0*	Sq. Ft.	x	50	—
"	Windows: Shaded	*0*	Sq. Ft.	x	25	—
6	Walls, Net: Sunlit	*0*	Sq. Ft.	x	10	—
"	Walls, Net: Shaded	*0*	Sq. Ft.	x	5	—
"	Walls, Net: Interior	*1,800*	Sq. Ft.	x	3	*5,400*
7	Roof or Ceiling (4" insulation, ceiling under)		Sq. Ft.	x	5	
"	Roof or Ceiling (under unconditioned space)	*2,000*	Sq. Ft.	x	4	*8,000*
8	Floor (if over unconditioned space)	*0*	Sq. Ft.	x	3	—
9	Fans in Cooling Equipment	*2,000*	Sq. Ft.	x	10	*20,000*
10	Total Sensible Cooling Load					*182,050*
11	Allowance For Growth 30% of Item 1					*37,800*
12	Minimum Sensible Cooling Load					*219,850*

NOTES: Equipment selected should have a capacity in excess of the minimum sensible load as shown on line 12. In addition, one extra cooling module should be included to provide redundancy.

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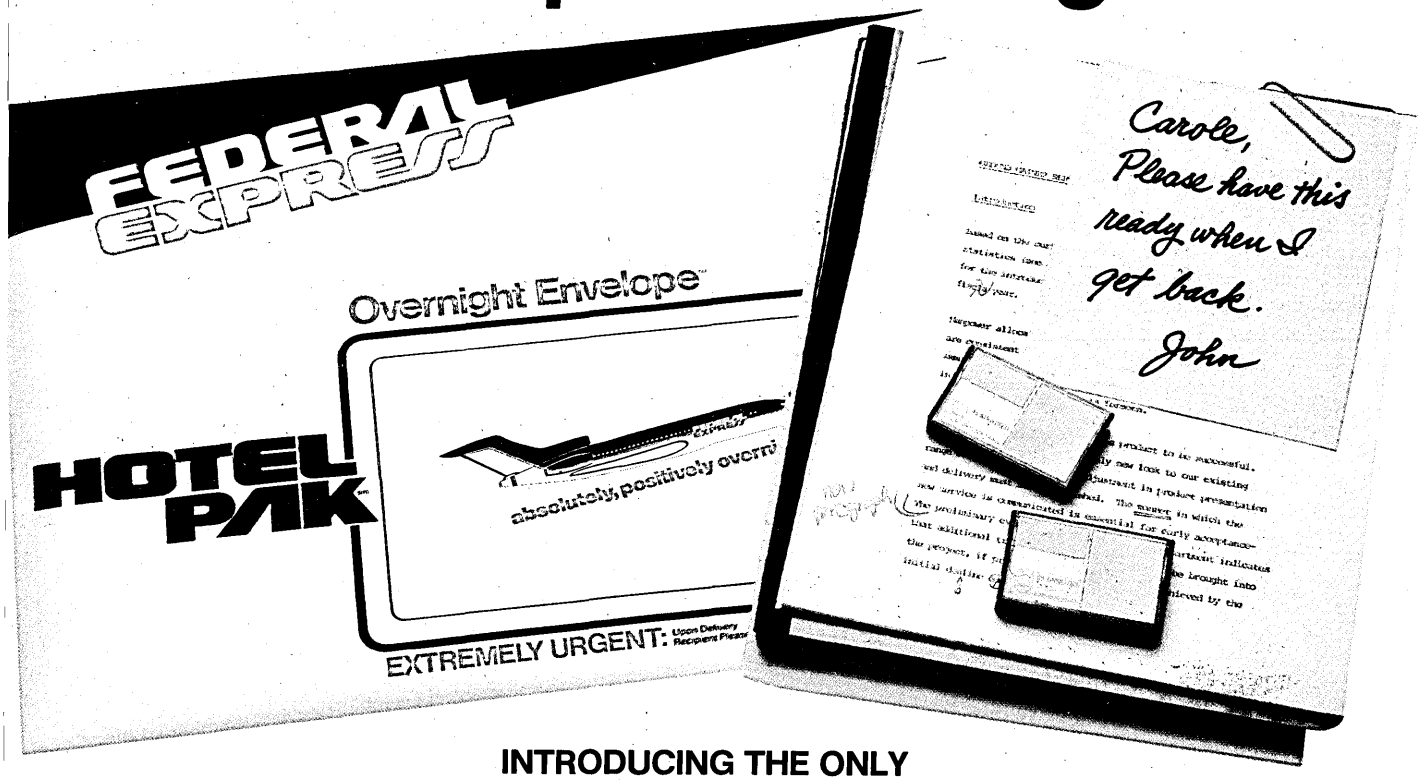

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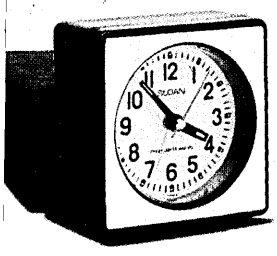

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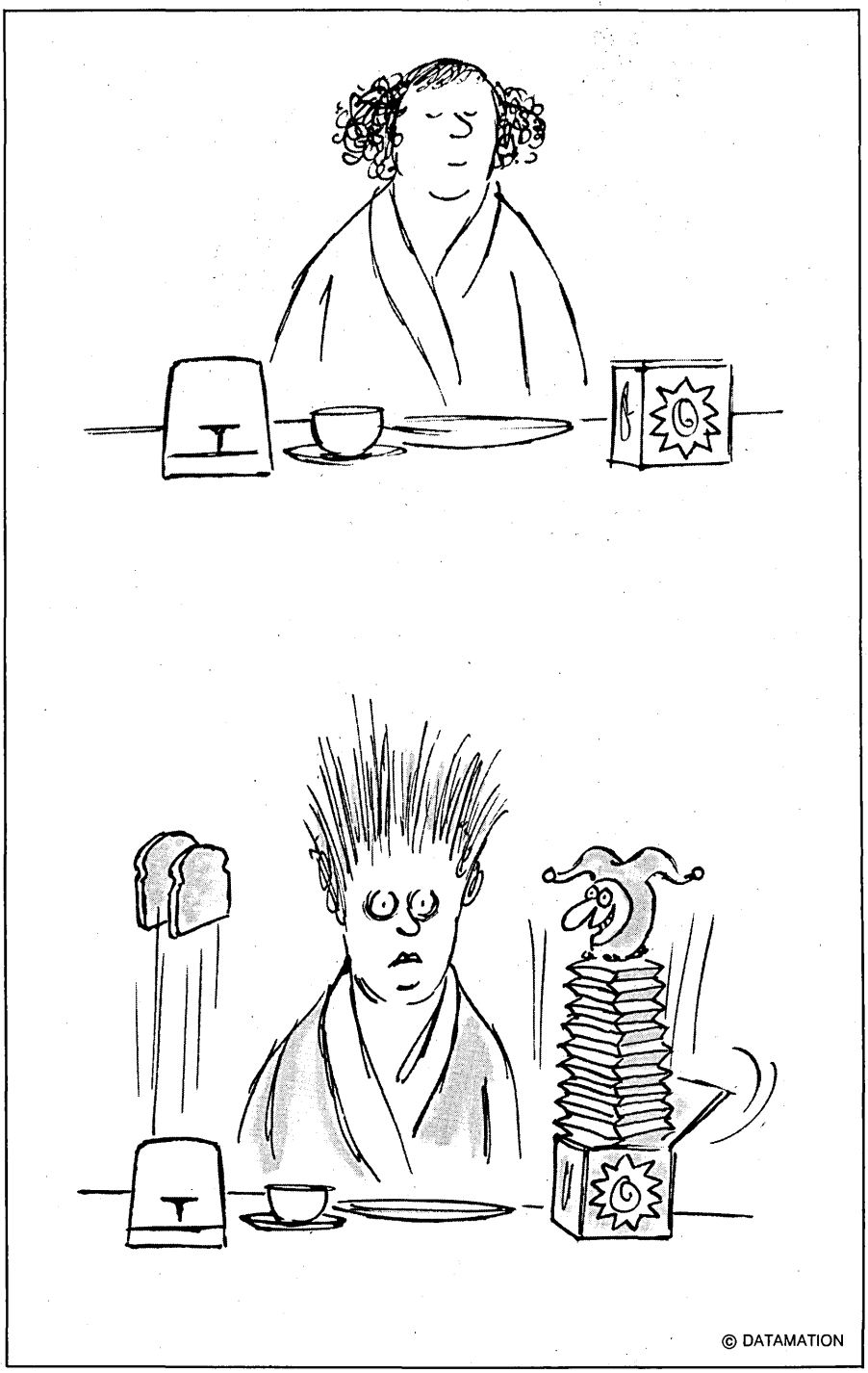
When a room will not hold temperature and humidity, it is probably the result of too much outside air coming in.

ceiling and into the chamber where it is being dissipated; (c) holes through the walls or floors, such as unsealed cable entry, exhaust fans, etc. Using air from the building's central air conditioning is often a problem because of its improper moisture content—too low or too high.

2. *Room temperature has been rising steadily with time:* In most cases it is because additional equipment has been purchased and installed, thus adding an increased sensible cooling load which the cooling equipment cannot satisfy. Not only must more cooling be supplied, but this means there is not enough cooling equipment to provide backup in the event of failure.

3. *Humidity too low:* The humidifiers may not have been maintained, resulting in malfunctioning floats, burned out heaters, dirty evaporative media, etc. This happens frequently because of the inactivity of the humidifier during the summer.



CARTOON BY HENRY MARTIN

If the humidity is too low at the time, it is possible that the humidifier needs maintenance, or that the cooling coil is taking out more moisture than the humidifier can handle. As more equipment is added to the data center, the cooling equipment is working at full capacity more often and the humidifier never has a chance to catch up. Additional process cooling is then required.

4. *Humidity too high:* This happens when the humidistat malfunctions and keeps the humidifier on all the time. The steam grid or heated pan humidifiers can cause this problem. The evaporative panel cannot over-humidify.

5. *Temperatures constantly too low:* Some rooms are controlled using wall-mounted thermostats. Look for heat producing hardware that has been moved under the thermostat recently. The thermostat continuously calls for cooling and lowers the temperature of the entire room. Either change the stat location or move the hardware. Check the setting of the thermostat.

6. *Room has hot spots and cold spots:* Some air rebalancing is necessary to provide air outlets at the heat-producing equipment. Usually relocation of floor grilles or perforated tiles will solve the problem. If overhead distribution is being used, the outlets cannot easily be relocated; a change in the air outlet quality may be accomplished.

The designer has many opportunities for energy conservation at his disposal: reducing ventilation air quantity, using a vapor barrier, minimizing dehumidifying, maintaining performance at peak efficiency, using evaporative panel humidifiers with hot-gas water heating, using glycol cooling at low outdoor temperatures, and using rejected heat for other building needs.

Suppliers of process-cooling equipment will prepare an energy analysis of various types of systems (air cooled, water cooled, glycol cooled, chilled water). ✲

JAMES E. HASSETT

Mr. Hassett is vice president, planning, with AC Manufacturing Co., Cherry Hill, N.J. He has served as an energy consultant in the dp and educational industries. Hassett is the author of *Process Cooling for the Data Center Environment*, and has been in international marketing and management in the commercial and industrial heating and air conditioning business for 25 years.

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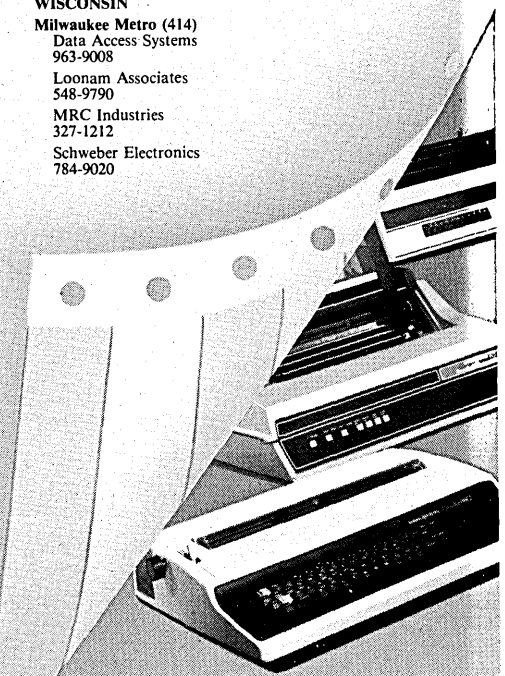

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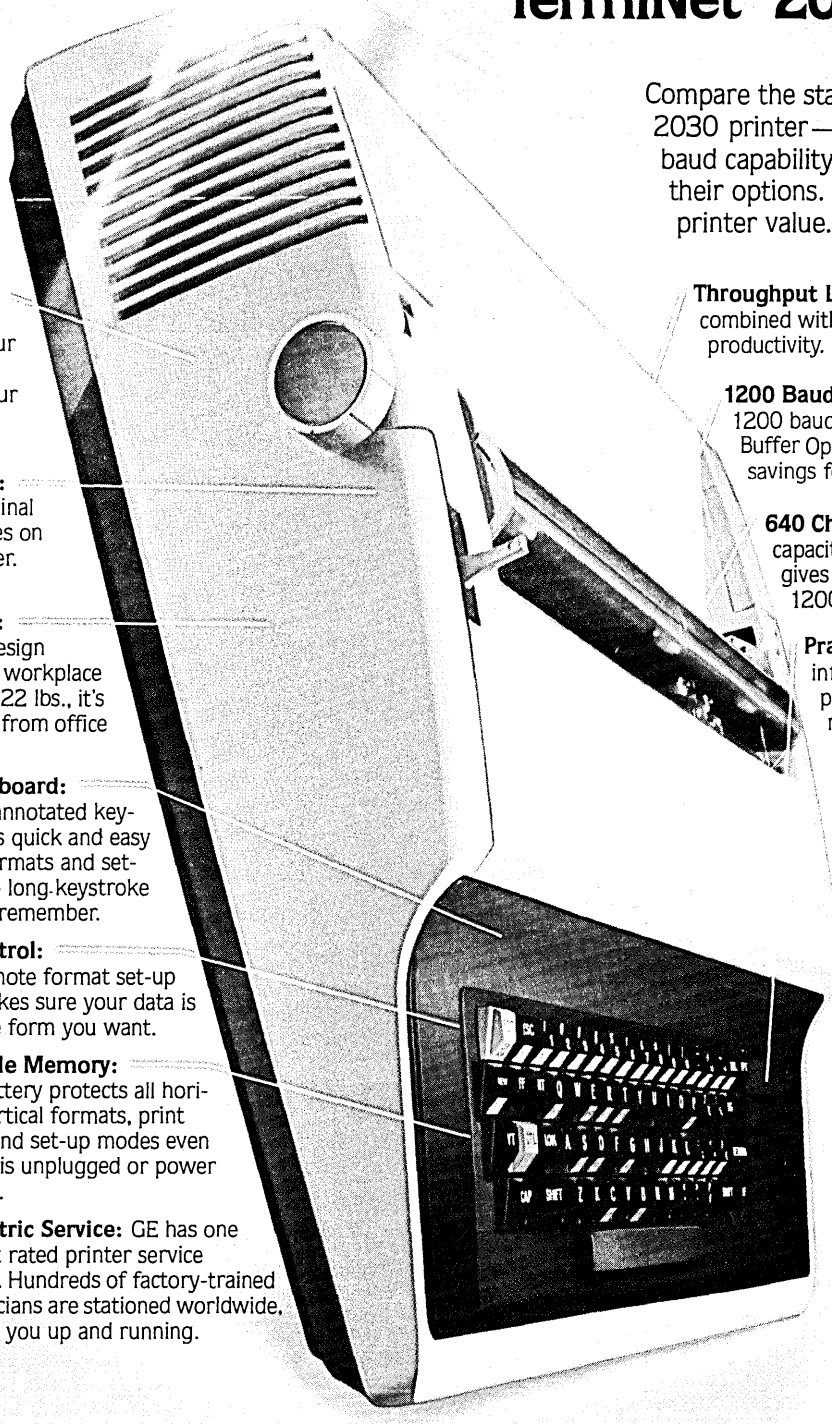

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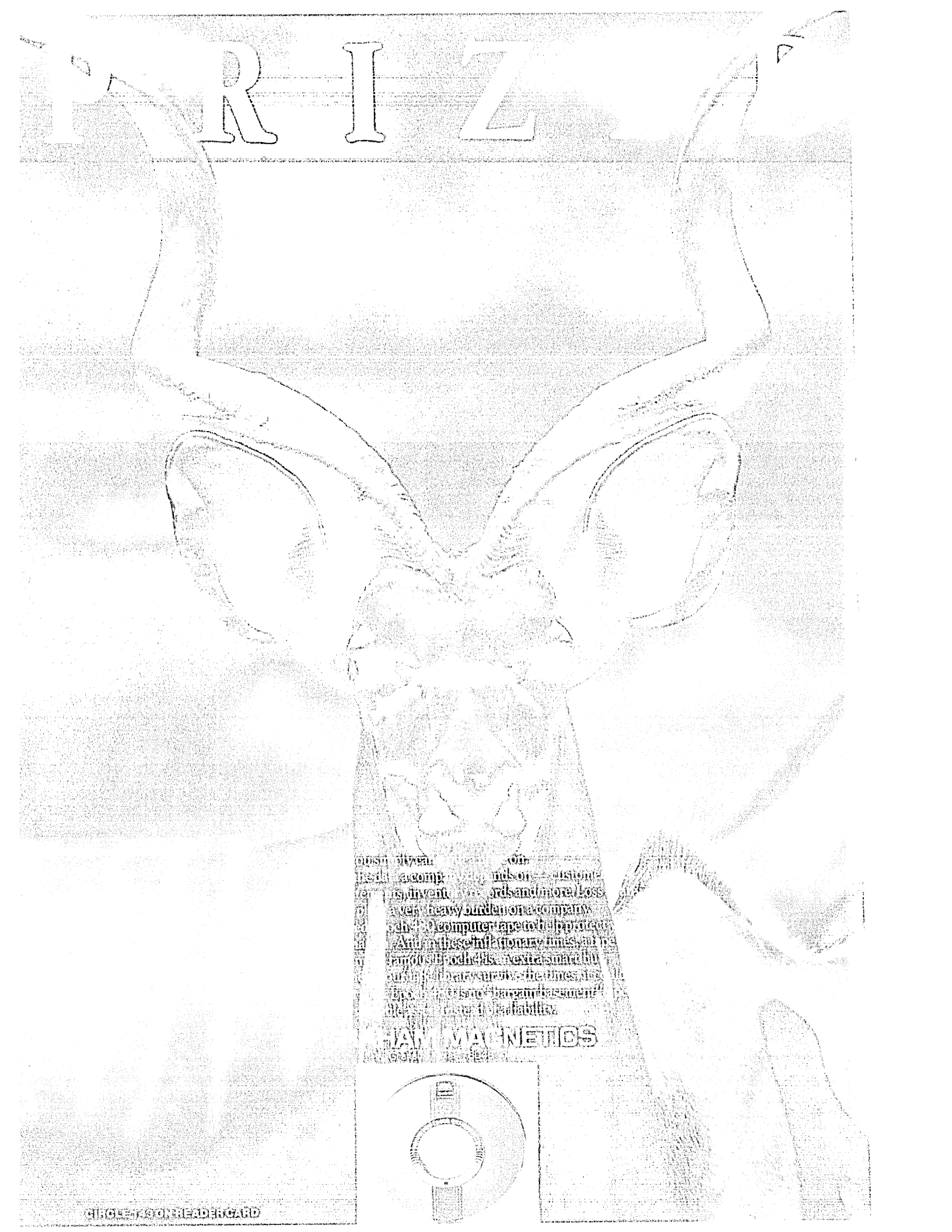
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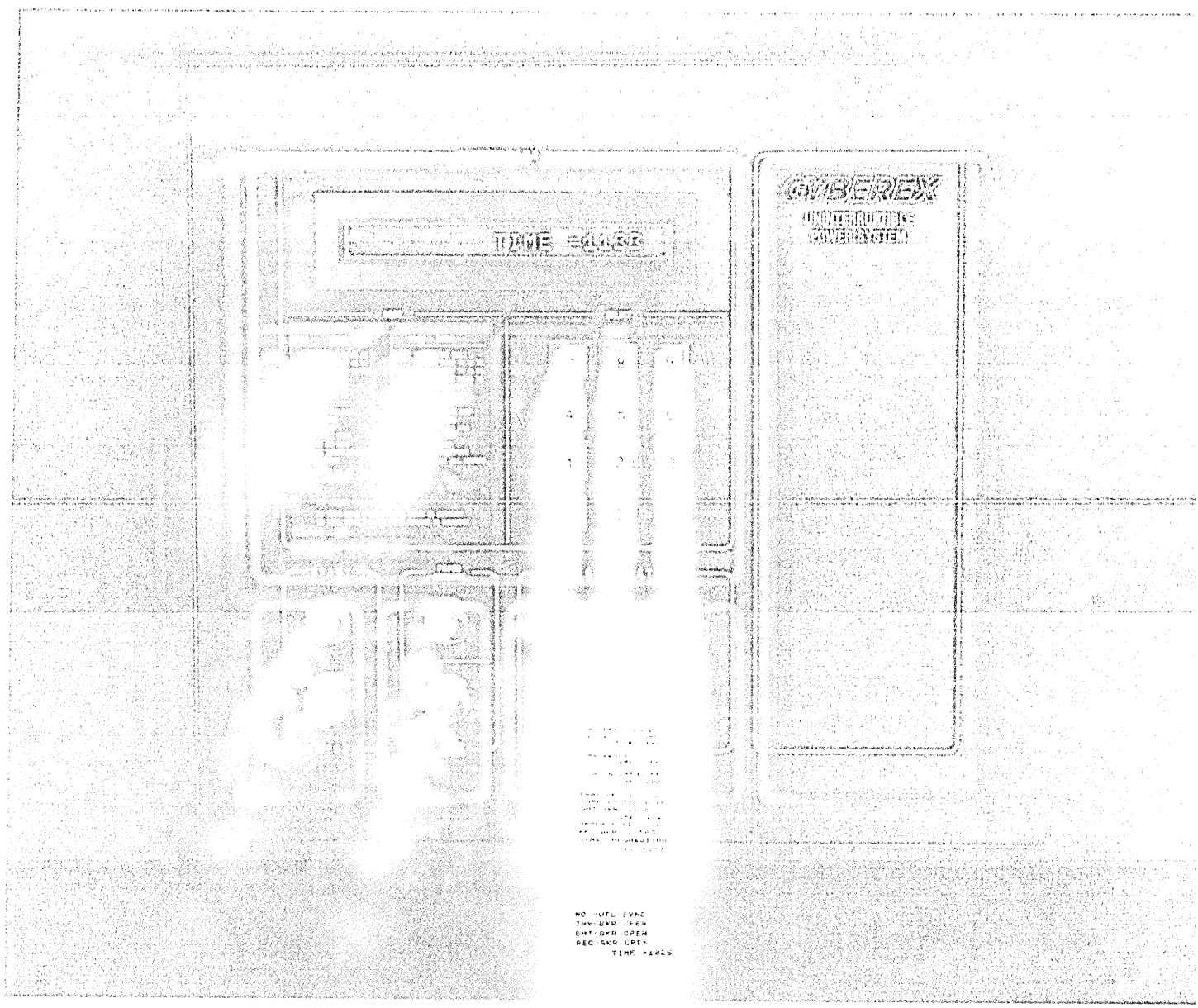

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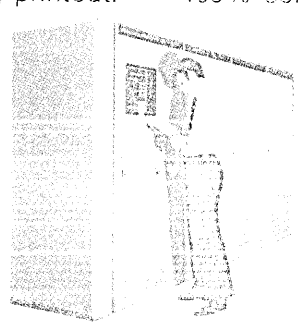

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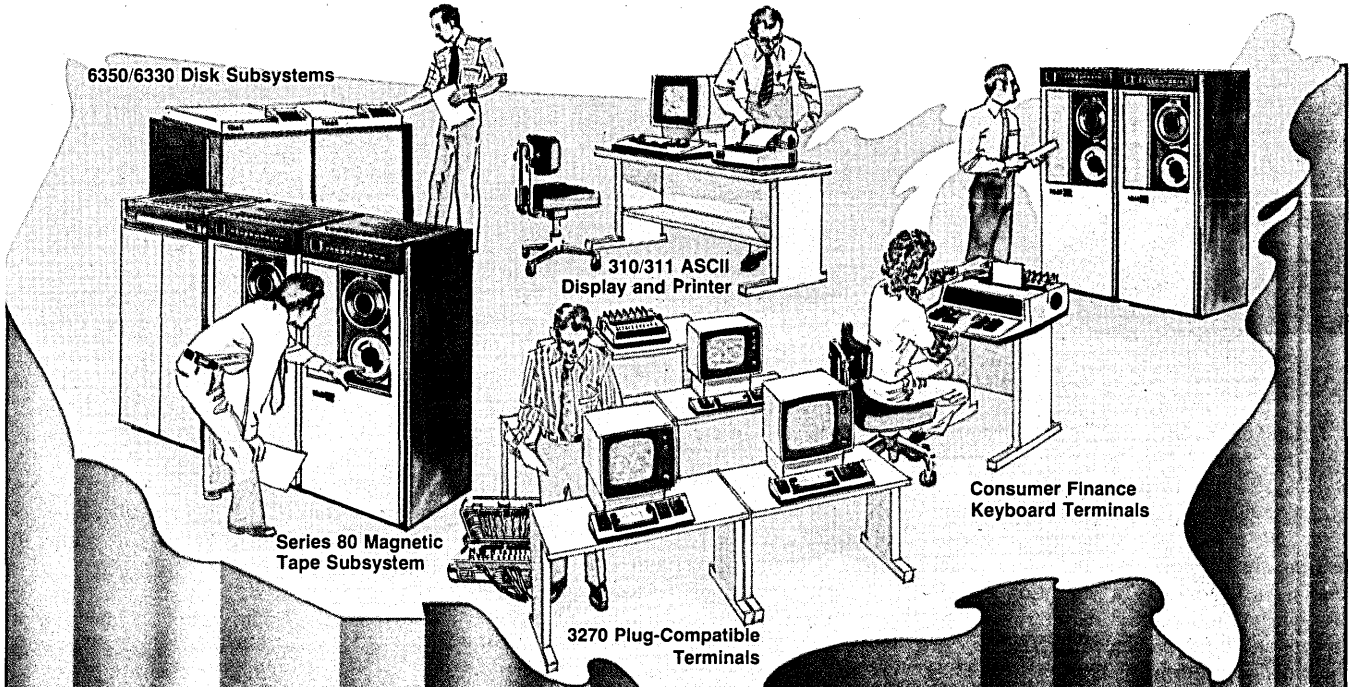

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CIRCLE 153 ON READER CARD

With low initial costs for micros, local school districts and even small groups of teachers are now buying them for use in classrooms.

CAI CATCHES ON

by Deborah Sojka

"CAI is not just another computer application; it has the potential to shake up the entire school system and revolutionize education."

At least that's the opinion of David Moursund, a professor at the University of Oregon and president of the International Council for Computers in Education (ICCE), an organization that provides information to teachers and other persons interested in CAI (computer-assisted instruction).

Although CAI has been on the computing scene for the past 20 years, most people remember it as a broken dream. Today, CAI advocates such as Moursund are working to mend the dream—and succeeding. According to current research, approximately 15% of all U.S. public schools are using computers in applications directly involving students. In 1979, nearly 6% of all U.S. public schools were using either CAI or CMI; grades 1 through 12 spent about $70 million on micros and related equipment, and higher education spent over $40 million. This year, the figure for primary and secondary education is expected to top $150 million.

It is not surprising, therefore, that more hardware manufacturers are beginning to view the CAI market as a profitable one. In the '78-'79 academic year, six manufacturers aimed micros at the education market. In the '79-'80 academic year, there were 25 companies; this year will see over 100 competing vendors. The entrants include Commodore, Control Data (with Micro-Plato), Apple, Radio Shack, Texas Instruments, DEC, Honeywell, NCR, Burroughs, Wang, 3M, Siemens, Sinclair, and Ontel.

While minis are still abundant in CAI, the availability of micros has accelerated market interest, primarily because the cost per student hour has decreased to $1.50 (traditional education costs about $2 per student hour).

In the '60s and '70s, although CAI was heralded as the "savior" of education, it was an idea whose time had not yet come, primarily because of the high cost. In 1965, the cost per workstation was about $50,000; in 1975, the price dropped to $5,000; by 1985, it will be about $1,000. In the early years, therefore, it was difficult, if not impossible, for an educational institution to implement CAI without additional financial aid.[1]

In 1972, after publishing a report entitled "Factors Inhibiting the Use of Computers in Instruction," the National Science Foundation (NSF) awarded $16 million in development money to the two most promising CAI programs. The grantees were Control Data's Plato system at the University of Illinois ($10 million) and the MITRE Corp.'s TICCIT (Time-Shared Interactive Computer-Controlled Instruction Television) at Brigham Young Univ. ($6 million). NSF also funded smaller programs, and continues to do so, mostly at the university level.

Today, with the low initial costs, local school districts and even small groups of teachers within a school or within a discipline are buying micros for use in classrooms. Moreover, experience has proved that computers in the classroom are quite successful in inspiring high motivational levels in the students. The Irving Elementary School in Highland Park, N.J., purchased an Apple in December '79, and a second one in March '80. Ronald Erikson, the principal, said, "We can't keep the kids away from the computers. They are far more interested in learning than ever before." Erikson predicted that students at Irving who are using CAI will be able to learn two years' worth of curriculum in one year.

Erikson also spoke of an elementary school in nearby Newark, N.J., where, if students miss a certain number of school days, they forfeit their time on the computer. Not only has this urban school experienced improved attendance levels, but students are coming to school *early* to get machine time.

It is interesting that these two examples are elementary schools. Traditionally, universities are easily sold on the advantages of CAI, secondary schools are where the action is, but elementary schools are harder to convince.

FEAR OF BEING REPLACED

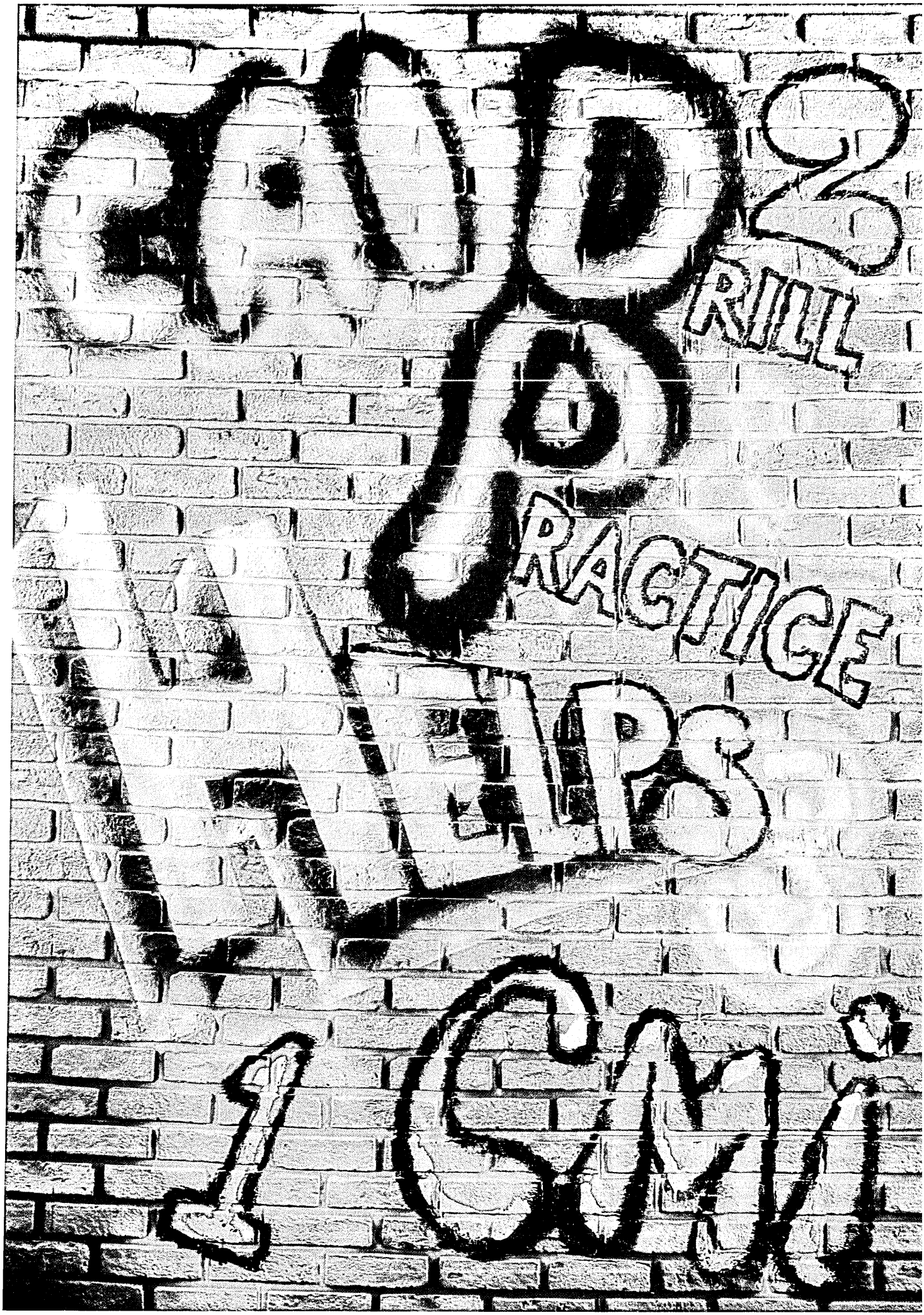
This is not only because of cost. Early CAI advocates, in their zealotry, presented the computer-assisted instruction concept to the prospective faculties in a manner that confirmed the fears of teachers—that computers were going to replace, not assist, them. Compounding this inherent resentment, most teachers were not sufficiently oriented to or trained on computers—an oversight that, if rectified, might have alleviated apprehension. Computer "illiteracy" among teachers, administrators, and students is still an obstacle, but one that many vendors are confronting directly. For example, the latest Apple promotion effort includes a computer literacy training package with the first micro purchased by a school.

One other approach to easing the entry of computers into the classroom is the work of organizations such as MECC (Minnesota Educational Computing Consortium). MECC was created in 1973 as a statewide computer service organization to plan, coordinate, and deliver all computer services to its members. MECC members are the public school systems of Minnesota, the University of Minnesota, the state university system, the state community colleges, and the State Department of Education.

MECC has a time-sharing system that services over 2,000 terminals, linking 90% of all Minnesota schools. At any given time, about 350 terminals are active. Time-sharing services are purchased by MECC members; coordinators or consultants are available at no cost to assist in workshops, conversion, and

PHOTOGRAPH BY STEVE COOPER

1. HJB Enterprises reports for National Institute of Education.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Acceptance of CAI by educators and the development of good courseware are inextricably mixed.

development. MECC purchases hardware in large quantities to get lower prices for its members.

An interesting aspect of MECC is that its communications network costs are met by a direct appropriation from the state legislature. MECC also offers a library of over 950 micro programs for elementary through college levels.

Charles Lund of the St. Paul Public School System was on the original team that created MECC, and is a firm believer in the success of such organizations. "My job is to manage the time-sharing and microcomputer services to the district. For us, MECC operates essentially as a contact point and a service agent. If we need something, we just call and ask for it." Lund's district uses programs in all of the seven CAI levels.

Another major obstacle to the success of CAI in the early days was the software, or "courseware." Again, because of the expense of development, high-quality courseware was, and is, scarce.

Acceptance of CAI by educators and the development of good courseware are inextricably mixed, as the following "myth" by Alfred Bork, University of California at Irvine, illustrates.

"Myth—Valid educational material can be developed without involving experienced teachers." Bork continues, "Teaching is teaching whether it is done by computer or any other device. My experience shows that the really effective educational materials are still coming, almost entirely from those who are very much involved in the teaching process. The intellectual structure of every discipline is different, and the tough question of *fundamental* goals cannot be resolved in any simple, quick way. While computer scientists and educational psychologists can help develop learning material, I do not believe they can do it alone."[2]

The courseware developing mania has now spread to publishing houses and dozens of garage outfits. Many of these small companies consist of one person who owns a micro and is developing programs—a professor, engineer, computer hobbyist, or computer professional.

A number of older courseware firms, such as Science Research Associates (SRA), Chicago, Ill. (an IBM subsidiary, purchased in 1964) are still heavily involved in courseware development. SRA and Atari have entered into an agreement in which SRA will develop the courseware. Apple Computer Corp. is arranging a special agreement with Bell & Howell Co.—the first major package they're producing is GENIS, a combination student/teacher package.

SRA is also developing computer literacy programs to run on Apples, and Tandy/Radio Shack is working on courseware for its TRS-80s. McGraw-Hill's Edutronics and Osborne Book Co. subsidiaries will soon begin marketing packages at the advanced Simulations and Games and Learner Profile levels. Not to be outdone, Houghton Mifflin has introduced "The Answer," a system operating at the Helps level of CAI.

One publishing-house-turned-courseware-developer believes that within five years, computer-related sales to primary and secondary schools will equal one-third of its sales at those education levels.

FUNDING STILL HARD

Funding courseware development is still difficult, except in commercial cases, where industry can examine the issues, then make appropriate financial decisions. Presently, funding for courseware development programs originates 70% from local districts, 20% from federal grants, and about 10% from state governments. Some statewide leaders are Minnesota, Oregon, and Michigan.

Organizations such as Micro Sift, in Portland, Oregon may be able to improve courseware quality. Micro Sift is sponsored by the National Institute of Education, and is a project of the Computer Technology Program section of the Northwest Regional Educational Laboratory. It is a clearinghouse for micro courseware at the elementary and secondary school levels. Micro Sift also develops applications for micros in the classroom; collects, distributes, and evaluates courseware from the educational standpoint; and provides its findings to publishers and other developers.

The Micro Sift project began in December '79, and will run until December '82, upon reapproval of funding by the National Institute of Education. During its first year, Micro Sift's major efforts were to design field tests and evaluators' guides for micro courseware. Its next major project will be to establish a nationwide network of centers of education instructional facilities to support evaluation work.

Micro Sift will evaluate any package that is offered on the market. Typical evaluation consists of submitting the package to a regional CAI specialist, who evaluates it and selects two or more teachers in the grade level of the package who will also evaluate the package. Micro Sift provides an Evaluators' Guide and the related instruments; a Developers' Guide, for standards of micro-based materials; a quarterly newsletter containing assorted general information of events in the field; a quarterly publication of the courseware evaluations that have taken place; and a quarterly *Developers' Advisory*, a newsletter that discusses micro courseware developments and needs.

So much for the broken dream. The only *caveat* is to remember our recent past. Yes, CAI represents a fast marketplace for hardware vendors, particularly micros; yes, it is a powerful, proven educational tool; yes, cost is no longer an obstacle. But the old bugaboos—public understanding (computer "literacy") and good software (or "courseware")—still, as usual for most computer applications, lag at least two years behind the capabilities of the machines. *

THE SEVEN LEVELS OF CAI

We are grateful to Dustin Heuston, chairman of the board of WICAT Systems, Inc., a CAI systems house in Orem, Utah, for giving us background for these definitions:

Computer Managed Instruction (CMI). Developed in the '60s by Harvey Brudner at the New York Institute of Technology to test students. The computer then presents the results to the teacher.

Drill & Practice. The project of Patrick Suppes, Stanford Univ., provides immediate feedback on work the student has accomplished and eliminates the problems of working alone without correction and reinforcement.

Helps. The third level, gives students problems to solve. If they discover the answer is incorrect, they hit a question mark on the keyboard and the problem is solved sequentially on the screen.

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Cognitive Diagnostics. Developed by John Sealy Brown, Xerox's Palo Alto Research Center. Brown's work showed the existence of at least 50 "bugs," or cognitive errors, that students may have while learning the fundamentals of a subject. Computers are used to conduct individual testing and diagnostics.

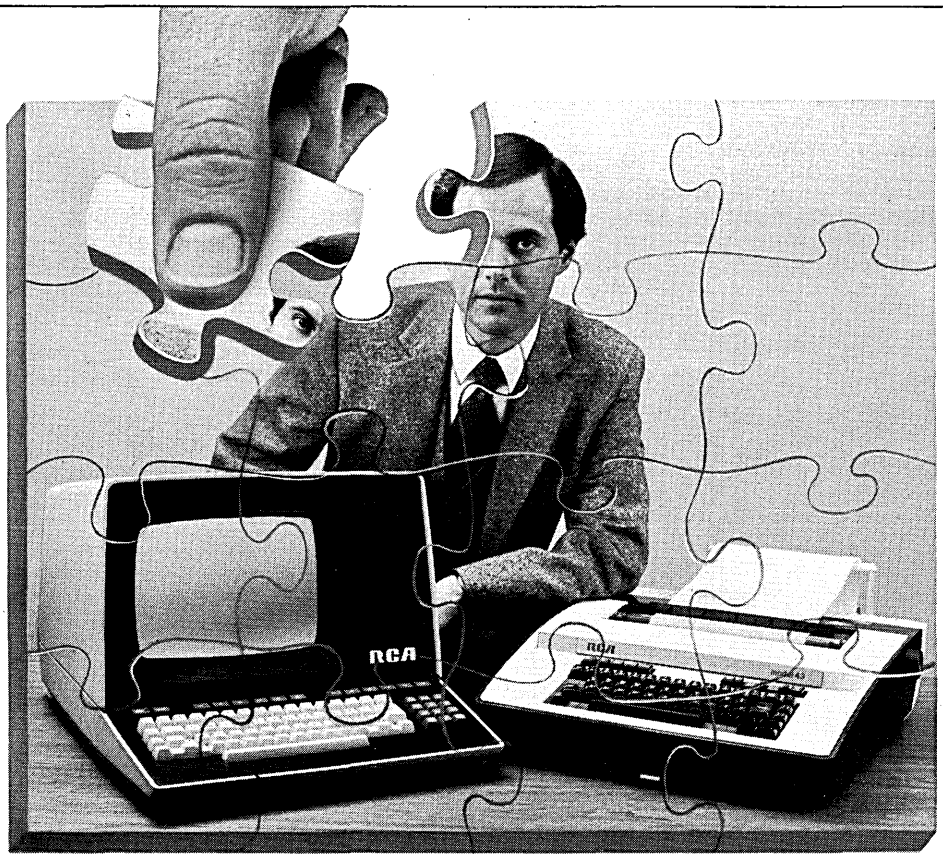
Simulations and Games. A popular market for computer toy manufacturers. A computer is programmed with multiple variables from which the students makes choices; the computer then calculates the implications of each choice.

Learner Profiles. Finally getting beyond the experimental stage, profiles will be on the market this year. Testing to discover how an individual learns; testing reveals such variants as right or left brain dominance, dyslexia, and other individual learning patterns.

—D.S.

2. ACM SIGCUE. vol. 7 no. 4, 1973.

Deborah Sojka is a member of the articles staff at DATAMATION.



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

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

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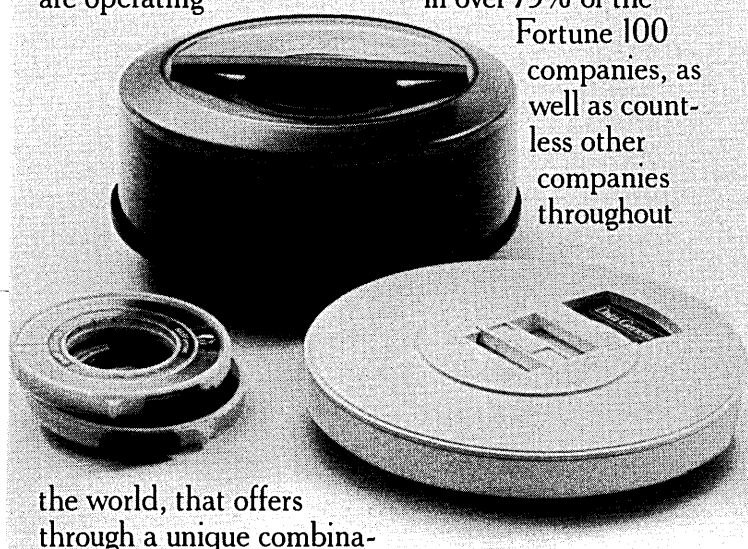

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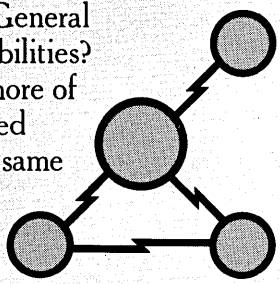

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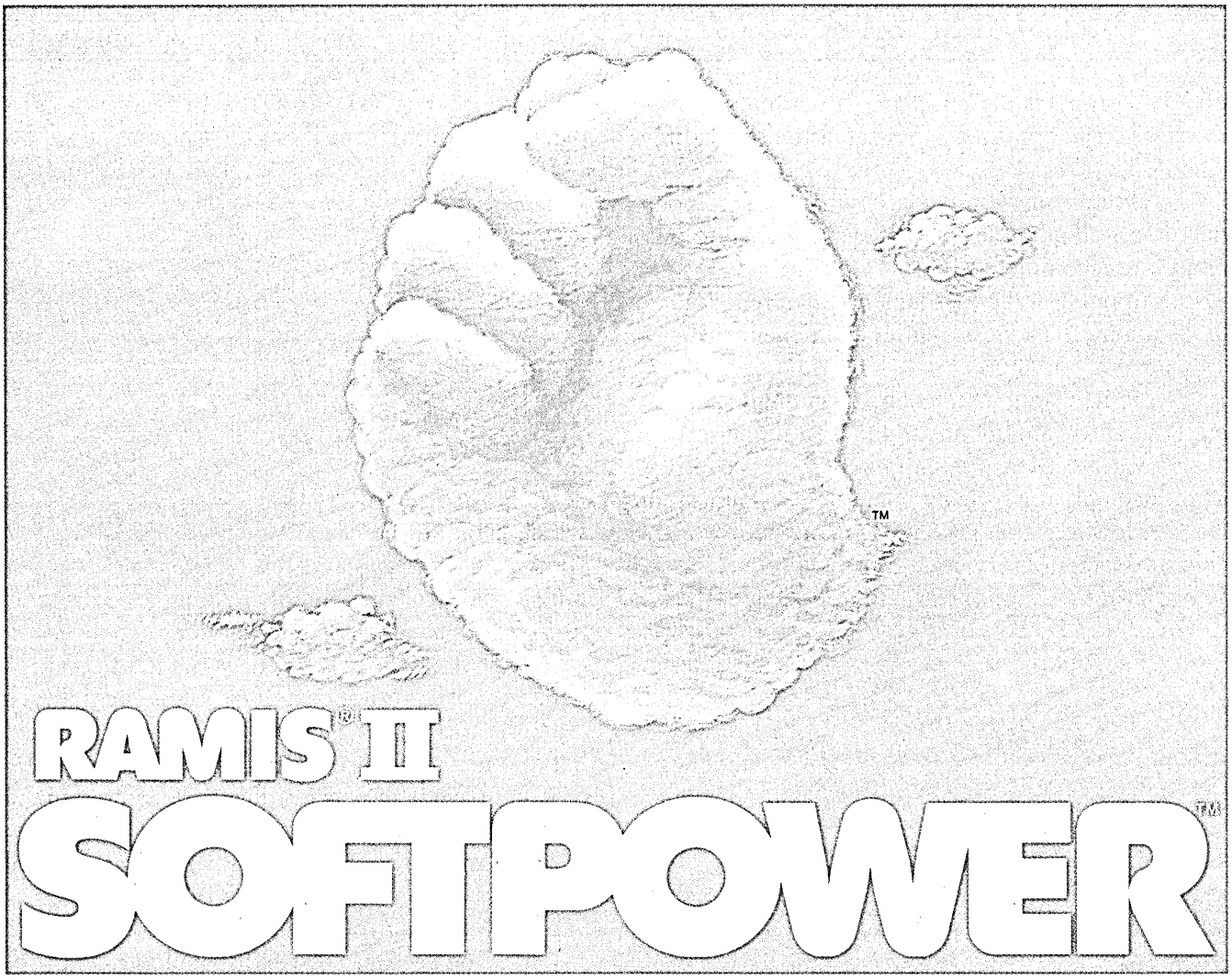

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CIRCLE 170 ON READER CARD

ASSURING QUALITY QUALITY ASSURANCE

by Stephen L. Stamm

The concept of software quality assurance (SQA) has reached maturity over the past decade, although not without difficulty. There is a widespread opinion that the payoff on most SQA programs is marginal at best and that quality assurance is really a form of "show biz," and certainly not worth much of an investment.

Since 1978, the software quality assurance program outlined here has been in active use for military programs at GE's Space Div. The principles of SQA, however, are broadly applicable, and an SQA program drawn up for the commercial sector or for dealing with small projects would have functional similarities throughout. In the past, SQA programs have been accepted only because they were part of the contract. Also, with the science of measuring software still in its infancy, it is sometimes difficult to determine the effectiveness of an SQA program. The guidelines and philosophy expressed in this article show a user how to get something for his money without going over the funding estimates given.

The primary purpose of the SQA program is to assure that the delivered software meets all the requirements of the contract or end user. And, to help secure contracts, its secondary purpose is to define and implement specific measures which will assure that the delivered software is a high quality product; e.g., that it incorporates the features necessary to achieve testability, maintainability, reliability, etc. In the typical organization, this responsibility is given to an SQA group which, working with 3% to 5% of the project funding, is expected to perform independently. It is unrealistic to expect anything other than superficial results from this approach.

An independent audit of the software at any point in the development cycle must be conducted in depth. But this capability requires a resource which is a significant fraction of the development effort itself. No project can afford this either in the expenditure of funds or in the utilization of technical personnel. A person who is capable of performing a good in-depth audit is willing to do this occasionally, but doesn't want to make a career of it—he'd rather be developing his own software. Another negative aspect of an SQA group working on a project as an independent entity is that it is likely to suffer from an outsider image and be viewed as an enemy that doesn't really understand the problem. The atmosphere created is hardly conducive to achieving an effective SQA program.

The practical approach to achieving viable SQA is to make it a part of everybody's job. Each element of the software development process involves QA aspects with which each member of the development team must identify to obtain the desired high quality product. Quality can't get added to the "recipe" by someone else later on in the process; it has to be included at each step. In this approach, the primary job of the SQA group is to produce the SQA plan and then to manage it. Managing does not require high level software developmen expertise, and becomes far less difficult and costly to staff properly than previously described methods. The typical elements of the "SQA is Everybody's Job" approach are shown in the table, which presents the specific SQA roles of each of the generic performing organizations spread over the duration of the project in terms of the development cycle phases.

THE SQA PLAN

The first order of business is for the SQA group to define its requirements by preparing the project SQA plan. The presentation of all QA aspects of the development process in a single plan assures an integrated approach (e.g., design practices) and complementary rather than conflicting QA features in the test program and the configuration management system. The SQA plan must include at least the following topics:

- *Organization*: the organizational approach to implementing the SQA program includes the definition of the roles and responsibilities of each group in the project organization. The independence of the SQA group must be clearly established.
- *Requirement Traceability*: this defines the methodology to assure that all requirements in top level specifications are satisfied in the lower-tier specifications, and sets up the verification of all requirements through traceability to test plans.
- *Documentation*: the documentation to be produced must be defined to assure formal, controlled communication among the project organizational elements; standards for the preparation of the documentation; and the measures to be applied to assure compliance with the standards.
- *Software Engineering Methodology*: the application of the quality-related software engineering methodology on the project must be defined (e.g., structured walk-throughs, software development folders), and provisions for monitoring compliance must be set forth.
- *Training*: the requirements for certifying the software development personnel's knowledge of the QA measures to be applied to the project must be defined.
- *Formal Reviews*: a definition of the reviews to be conducted and the methodology to be applied must be made to assure readiness, smooth interface with the customer, and maximization of the benefits to be derived from each review.
- *Test Program*: as the keystone of SQA, the SQA plan must specifically define the measures for technical review of the test plan/procedures and compliance with prescribed testing standards; the role of the SQA group in conducting the tests and certification of the results; the system for reporting test discrepancies; the "requirement for retest" decision process; measures to assure control of special test software; and measures to assure control of hardware used to test the software.
- *Configuration Management*: the QA considerations that place requirements on the project configuration management system include a software library with control procedures to assure unambiguous identification of the products and prevention of unauthorized modifications; definition of procedures for the generation, disposition, tracking and closeout of design and test discrepancies; and a configuration audit prior to delivery of the products.

The practical approach to achieving viable software quality assurance is to make it part of everybody's job.

THE PROJECT ORGANIZATIONS' ROLES IN THE SOFTWARE QUALITY ASSURANCE PROGRAM

DEVELOPMENT CYCLE PHASE	PROJECT ORGANIZATION — SYSTEM ENGINEERING	SOFTWARE DEVELOPMENT	TEST AND INTEGRATION
Requirements Definition	• Requirements traceability • Technical review of specs	• Prepare Programming Standard Document (PSD) • Develop/Implement Programmer Training Plan	
	• Prepare SW Rqt's Rev. (SRR)		
Preliminary Design	• Requirements traceability analysis • Technical review of specs and Interface Control Documents (ICD)	• Complete PSD	
		• Initiate SW Development Folders (SDF)	• Trace test requirements to test plans
	• Technical Review of PDR material	• Prepare Prelim. Design Review (PDR)	
Detail Design and Code		• Trace requirements to design implementation	
	• Technical review of specs and ICDs		
		• Conduct structured walk-throughs	
	• Technical review of test plans		
	• Tech. Rev. of CDR Mat'l	• Prepare Critical Design Review (CDR) • Maintain SDFs	
Test and Operations			• Trace test plans to test procedures • Conduct test readiness meetings
	• Technical review of test procedures	• Technical review of test procedures	
			• Conduct post-test meetings
		• Prepare DRs	
	• Prepare Discrepancy Reports (DR)		• Prepare DRs

Production of a high quality product must start at the front end of the development process. The precise definition of the software system requirements in terms of the functions to be provided, together with related performance parameters (e.g., timing and sizing), is absolutely essential. Quality will be judged by the user after delivery, so there must be no uncertainty or ambiguity about what he will get: user disappointment is tantamount to poor quality. During the requirement definition phase, the primary contribution to producing a high quality product is a strong system engineering group. It must work with less easily defined requirements, such as portability and reliability, which might subsequently result in specific design standards.

The quality mechanism used to assure that the requirements have been met is a formal software requirements review (SRR). This mechanism is especially rewarding because it is self-stimulating and self-motivating. Few people want to make fools of themselves in public. However, the review can be no better than the capabilities of the reviewers, and the SQA group must assure adequate participation in and preparation for the review. It is especially important that the eventual operators of the system participate in all such reviews and that appropriate action items are formulated during the presentation.

During the requirement definition phase, it is important to put into place the means for producing the high quality product (code, database, and documentation). Primarily, this requires two things: the definition of what high product quality is, and programmers who understand and are capable of working to these definitions. Each programmer must be provided with a copy of a programming standards document (PSD). But then, with strong management support, the software development group must run training sessions on the content and application of the PSD. The SQA group, for its part, must certify that each programmer participates in this training activity.

As the project moves on to product design, a large contribution to assuring the quality of the end product is made during the preliminary design phase. Before the detail design of a software module is begun, each programmer must have a precise and detailed

PROJECT MANAGEMENT	QUALITY ASSURANCE
	• Prepare Project SCA Plan • Audit traceability analysis accomplishment • Audit spec review accomplishment • Review spec compliance to documentation standards • Review PSD scope for completeness • Review training plan for scope • Audit training attendance • Assure SRR action item closure
• Conduct SRR • Prepare Configuration Management Plan (CMP)	• Assure proper participation • Review for compliance with SQA plan
	• Audit traceability analysis accomplishment • Audit spec and ICD review accomplishment • Review compliance to documentation standards • Review PSD for completion
• Establish engineering review/ change control board	• Audit Implementation of board • Audit existence/completeness of SDFs • Audit traceability analysis accomplishment
• Conduct PDR	• Assure PDR action item closure
	• Audit traceability analysis accomplishment • Audit spec and ICD review accomplishment • Review compliance to documentation standards • Audit walk-through accomplishment • Audit Test Plan review accomplishment
• Conduct CDR	• Assure CDR action item closure • Audit SDF's maintenance
	• Audit traceability analysis accomplishment • Audit meeting accomplishment and procedures • Audit test proc review accomplishment • Review compliance to documentation stds. • Certify test results and reports
• Prepare preship audit • ERB/CCB DR disposition	• Conduct preship audit • Monitor/expedite DR closure • Prepare statistical report on DR activity

definition of what the module is to do, how well it must perform, the environment in which it must operate, and its external interfaces. During the preliminary design phase, the focus of the SQA program is to assure that this will happen.

The detail requirements/environment/interface definition is performed by the software development group. To evaluate the quality of this activity, considerable technical expertise and an intimate understanding of the system level requirements are needed. The only practical approach is to apply the system engineering group to this task. It has defined the top level requirements and must now evaluate the software development group's response to these requirements, resolving any difficulties arising from interpretation and intent.

The quality of the software product is strongly dependent on the ability to test it, and during the development process it is necessary to look ahead a bit and assure testability. The test group must trace the module requirements into the preliminary test plans it is preparing, and then feed back any special design requirements needed to implement the test plan. Its contribution to product quality starts much earlier in the development cycle than is commonly acknowledged.

We have found that an effective mechanism to establish the desired clear communication with the programmer is the software development folder (SDF). The SDF documents the life history of a module from the time its requirements are defined until it is released to the test group. It is initiated in this phase by the cognizant programmer, and one of the first things to be included are the module requirements/environment/interfaces. So, the SDF provides a specific mechanism to assure that the required communcation has been achieved at this very personal level. The SQA group audits the SDF initiation when it actually occurs.

At the start of the preliminary design phase, the top-level specs assume a degree of sacredness, and a formal change control procedure must be established. This is done best by having program management create a board to rule on changes, called either the engineering review board (ERB) or the change control board (CCB). The board must provide the means for making rational and integrated change decisions and not degenerate into an administrative function—a change-processing paper mill. Quality objectives will be met only if program management creates a real working board consisting of top-level organizational representation, a board that actually makes changes rather than just record decisions made elsewhere in an undisciplined and invisible fashion.

The preliminary design phase ends with another formal review, the preliminary design review (PDR), which has the same objectives as the software requirements review described previously.

"Quality must be built in; it can't be tested in" is an overworked cliché but nonetheless true. This next phase is a critical period in the development cycle, yet it is the most difficult time to apply specific quality measures. The detail design and code phase should be met with the application of a combination of quality-oriented mechanisms.

Because they are so complex, we have learned that special attention must be given to the development of software interfaces. The bulk of this work must be done by the software development group, but to assure a sharp focus on this activity, the responsibility for the interface control documents (ICD) is placed in the system engineering group. In this way, at least two people are working toward the timely and complete definition of the interface details with the system engineers and are providing an in-depth review function on a continual basis.

When the software design is complete, another formal review must be conducted and successfully completed before huge amounts of resources are committed to the subsequent coding and testing efforts—the critical design review (CDR). This review assures that there is a well-defined design in place, with a minimum risk of subsequent redesign or inefficient application of the expanding programming team. The CDR achieves a top-level review of the product's quality at this point in the development cycle, e.g., the completeness of the documentation,

The quality of the software product is strongly dependent on the ability to test it.

adherence to the more easily audited standards, and traceability of functional requirements to the design implementation. The CDR, however, is not a suitable mechanism for reviewing the lowest-level detail of the design, which is where the quality must be built in. To achieve this, the structured walk-through has been found to be very effective. In this informal (typically around a table) minireview setting, the programmer can lead several reviewers through the complete design, making it possible to evaluate testability, operability, maintainability, transportability, etc. The vital task of the SQA group is to prepare the plan for this activity (module, date, participants) and to make sure that it is performed. Otherwise, the informality of the process can slip into lip service exercises or into continual rescheduling—finally past the date of product delivery.

The process of code-and-debug is not usually amenable to close scrutiny or audit. Because of the softness of the software, management visibility can become completely lost and product quality can suffer. Special measures must be employed to avert this situation and to assure that the programmer does not work in isolation. The structured walk-through technique is employed again after successful compilation has been achieved. This means a line-by-line review, the only way to check for adherence to coding and code documentation standards. The experience of senior people and the fresh approach and more recent academic training of the junior staff members can be used very profitably at this point.

During this code-and-debug period the software development folder (SDF) should also be maintained, even if it is a very difficult discipline to impose on the typical programmer. But the SDF is the best management defense against the "trust me" syndrome and forms the basis for the subsequent preparation of the formal test procedures and users' manuals. Without good source material in the SDF, there is seldom the time or the inclination for high quality in subsequent documentation.

COMPLETE REVIEW OF SDF

The SDF must always be available for review and audit. Prior to turnover of a module to the test group for formal testing, a complete review of the SDF is conducted by the software development group supervisor and the SQA representative. The goal here is to provide documented evidence that the module is adequately debugged before the turnover occurs. After the SDF is certified complete, it is placed in the software library.

The design of the test program is finalized during this phase. The system engineering group has the responsibility of reviewing these plans and assuring that the test program will indeed verify all the software functional and performance requirements. The SQA group audits this review and any discrepancies that are to be resolved.

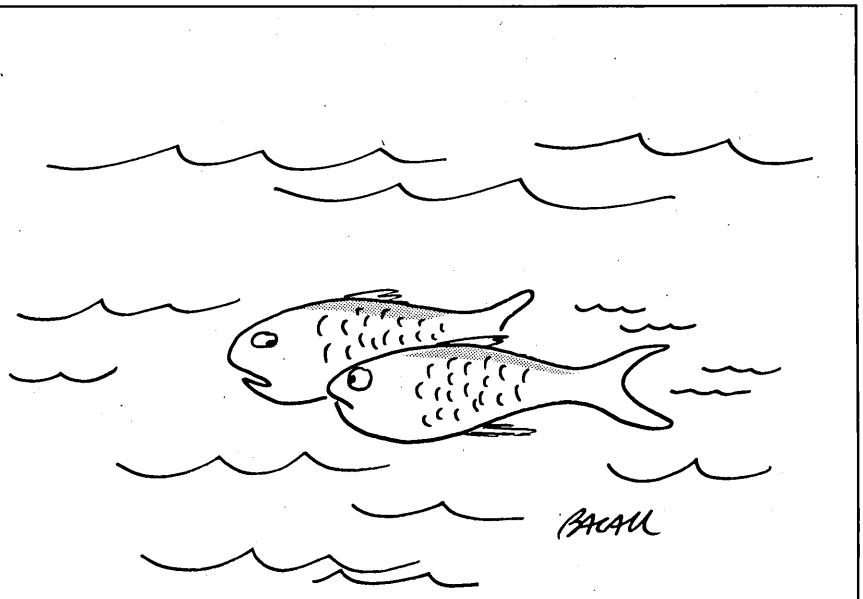
Software quality assurance must involve, of course, much more than testing, and the SQA group must not be a part of the test group, which is a separate organizational entity. As we now describe the elements of the SQA program used during the test phase of the development cycle, we will further note that the SQA role in actual testing is minor. This arises again from the fundamental differences between hardware and software, i.e., the "softness" of test items. In software testing there are no gauges to monitor or traces on a scope to analyze; there isn't even any noise! The quiescent atmosphere of the software test is not the place to expect much in the way of SQA activity. The significant SQA tasks are performed before and after the test is run. This realization, that SQA has very little to do with the actual testing of the product, is fundamental to implementing an SQA program that really works. Unlike hardware QA, a successful software QA program must focus on methods and techniques that contribute to the software quality rather than on conducting the test.

The first important SQA measure in the test process is to identify what is being tested and to define precisely the test environment. These are configuration management (CM) functions. The project management must include these SQA requirements in the CM system. This is usually achieved by establishing a controlled software library, and all software test articles (code and database) with appropriate version identification are drawn from this library. Formal testing of other than controlled software is meaningless.

The next SQA measure is to define the test precisely before it is run, especially the success/failure criteria, and to achieve a prior agreement by all interested parties, including the end user. This is done by having the test director from the test and evaluation group conduct a pretest readiness meeting, at which the test procedures are modified to become the agreed-upon procedures that will be used in the test, and subsequently controlled as a part of the CM system.

The SQA function during the test is to make sure the procedure is being followed precisely or that changes are documented properly. After completion of the test, the test director conducts a post-test meeting and the SQA representative assigned to the test certifies the correctness of the test report, which includes the discrepancy reports (DRs) resulting from the test. At this meeting, each DR is assigned to the proper individual for resolution and subsequent reports to the ERB/CCB. The SQA representative monitors DR closure activity.

The discrepancy reports provide one excellent measure of the product quality, and it is the responsibility of the SQA group to analyze this data and prepare statistical reports. Examples of product quality data that might be used by management to identify weak



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CARTOON BY A. BACALL

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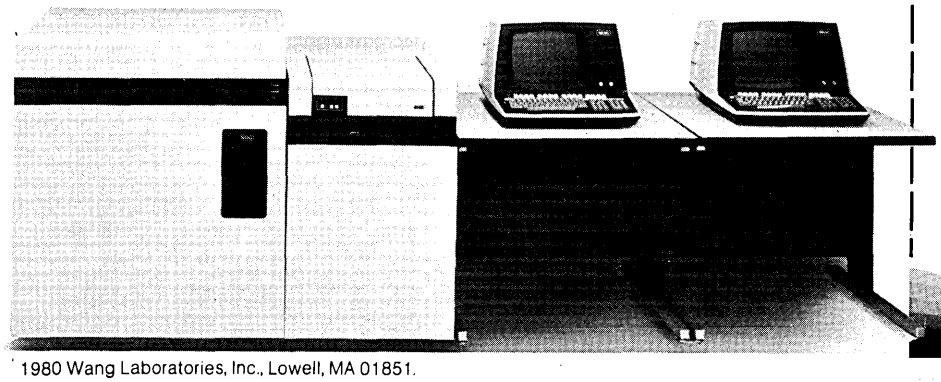

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CIRCLE 157 ON READER CARD

The key to a successful software quality assurance program is to assign a realistic role to the SQA group.

spots in the software implementation process are the number of DRs, the frequency distribution of DRs by type, the mean time of closure, and the DR rate as a function of product life. The analysis of DRs continues while the product is being used in its operational environment. This information is especially useful for the definition of subsequent product improvements or the design of new products.

A further measure of product quality is simply the extent to which specific code has been exercised. Tools are available to analyze the frequency with which paths are executed. The most important result of these analyses is to uncover code in the final product that has never been executed in the formal test program. It must then be determined if there is a hole in the test program, a flaw in the design, or simply some superfluous code that is about to be delivered. The SQA program should require the application of code analysis tools which support the measurement of the software quality as part of the test program.

The major SQA milestone during the test phase is a configuration audit conducted by the SQA group prior to shipment of the product from the factory. Through this audit, the company management and the customer are provided data to decide if the software is of sufficient quality to ship to the operational site. Specifically, the configuration audit accomplishes the following: 1) the product to be shipped is compared with the documented configuration identification represented by the applicable specifications and manuals; 2) the test results and DR dispositions are reviewed to verify that the product meets its specified performance requirements; 3) the product to be shipped is compared with the tested configuration; 4) any requirement not verified by testing is verified by comparison with appropriate detail/design documentation; and 5) all open items that are to be resolved after field installation are identified.

WINNING SQA PROGRAM

Software quality assurance can be made a useful ingredient of a software development project. The elements needed to achieve a successful SQA program must include the following:

- An SQA plan that has high project visibility, that specifically defines the SQA program at a level of detail suitable for implementation, and that has the wholehearted support of project and company management.
- A project organization that distributes the SQA program responsibility, placing the SQA tasks where the capability really exists.
- The application by the programming staff of special software engineering techniques specifically targeted at enhancing product quality.
- Measurement of the effectiveness of the SQA program and, if possible, of the quality of the product.
- Finally, SQA personnel as an integral part of the project team (dispel the "outsider" image). Even if they are assigned to the project by a boss who has an independent line of communication to top-level company management, quality compromises can be resolved prudently.

The key to a successful SQA program is to assign a realistic role to the SQA group. They first define the project's SQA program and then they manage its implementation. But they do not create quality in the product —that's a part of everybody's job. ✲

Stephen L. Stamm is manager of software productivity programs at GE's Space Div. in King of Prussia, Pa.

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Jim Orgill, Director of Data Processing

ADR's integrated software expands productivity and progress at Wright Schuchart, Inc.

PROGRESS

ADR's Integrated software improved DP services.

According to Jim Orgill, Director of Data Processing, "We've been on a fast track for the last year-and-a-half in improving our DP services. We've been able to accomplish with a very small systems development staff what other companies might require 30 or 40 people to achieve. We couldn't have come so far so quickly if it weren't for ADR software. We have DATACOM/DB and DC, DATADICTIONARY, DATAQUERY, ROSCOE and The LIBRARIAN and plan to add other ADR products in the near future."

ROSCOE reduced turnaround time from two days to 12 minutes.

According to Ron Higgins, Manager of Technical Services, Wright Schuchart had been experiencing two-day turnaround in testing. "A programmer would keypunch his deck, submit it to operations and wait for a printout. After we installed ROSCOE, turnaround time went down to 12 minutes."

ADR product integration made job 10 times easier.

"We brought in ROSCOE and The LIBRARIAN about a year ago," Mr. Higgins went on. "They worked so well together that when we looked into a DBMS we asked ADR to be part of that review. One of the vital reasons for choosing ADR was the fact that they build integrated products. It didn't make sense to us to get a data dictionary from one supplier and a data query from another. We wanted software designed to work together, a good example being DATADICTIONARY's integration with The LIBRARIAN. I honestly feel that ADR's integrated products made our job at least 10 times easier."

Better support from ADR than any other vendor.

"After ADR installed the initial products," Mr. Higgins continued, "everything worked fine. Then we accidentally clobbered the system. ADR could have told us it was our problem, not theirs. Instead, they came back, reinstalled the software and re-educated us. We've received better support from ADR than any vendor I've ever dealt with."

Instant information with ADR Data Base Management software.

"We're now beginning to make effective use of DATACOM/DB and DC, DATADICTIONARY and DATAQUERY," Mr. Orgill stated. "For example, when the payroll clerks want to find out what construction job one of our thousands of workers is on, they just use DATAQUERY to get the information from DB. Before they'd have had to go through stacks of old reports which could take forever."

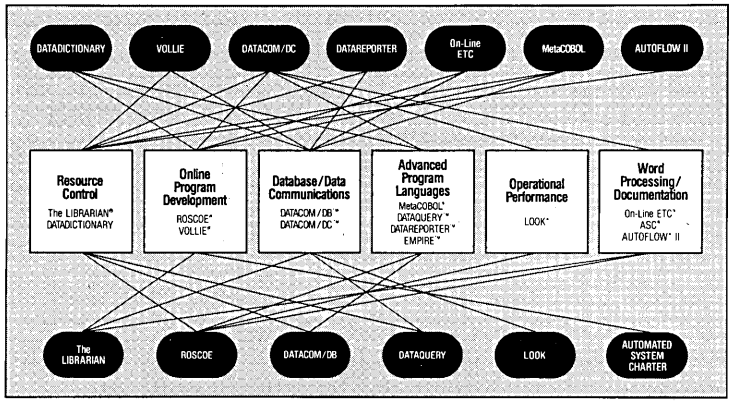
Ron Higgins, Manager of Technical Services (right) and Carl Brockman, Systems Programmer

Productivity climbing.

"Productivity is increasing tremendously," Mr. Orgill concluded. "I give the credit to my staff and to ADR products."

95-year old Wright Schuchart, Inc., is as much a Seattle landmark as the city's famous space needle, which the company built. The 50th largest U.S. contractor is a leading builder of high-rise office buildings, paper mills, and nuclear energy facilities. The company's DP department employs 21 people, operates an Itel AS4, 3330 Model 11 disk drives, has eight terminals inhouse and three at remote construction sites.

ADR. The leader in Datapro Software Awards 1977, 1978 & 1979 for IBM 370/30xx/4300 products. Over 12,000 products installed.



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CIRCLE 160 ON READER CARD

During the 370 generation, Lloyd's made what could be the most interesting and tragic bet in its history.

THE LOSS GENERATION

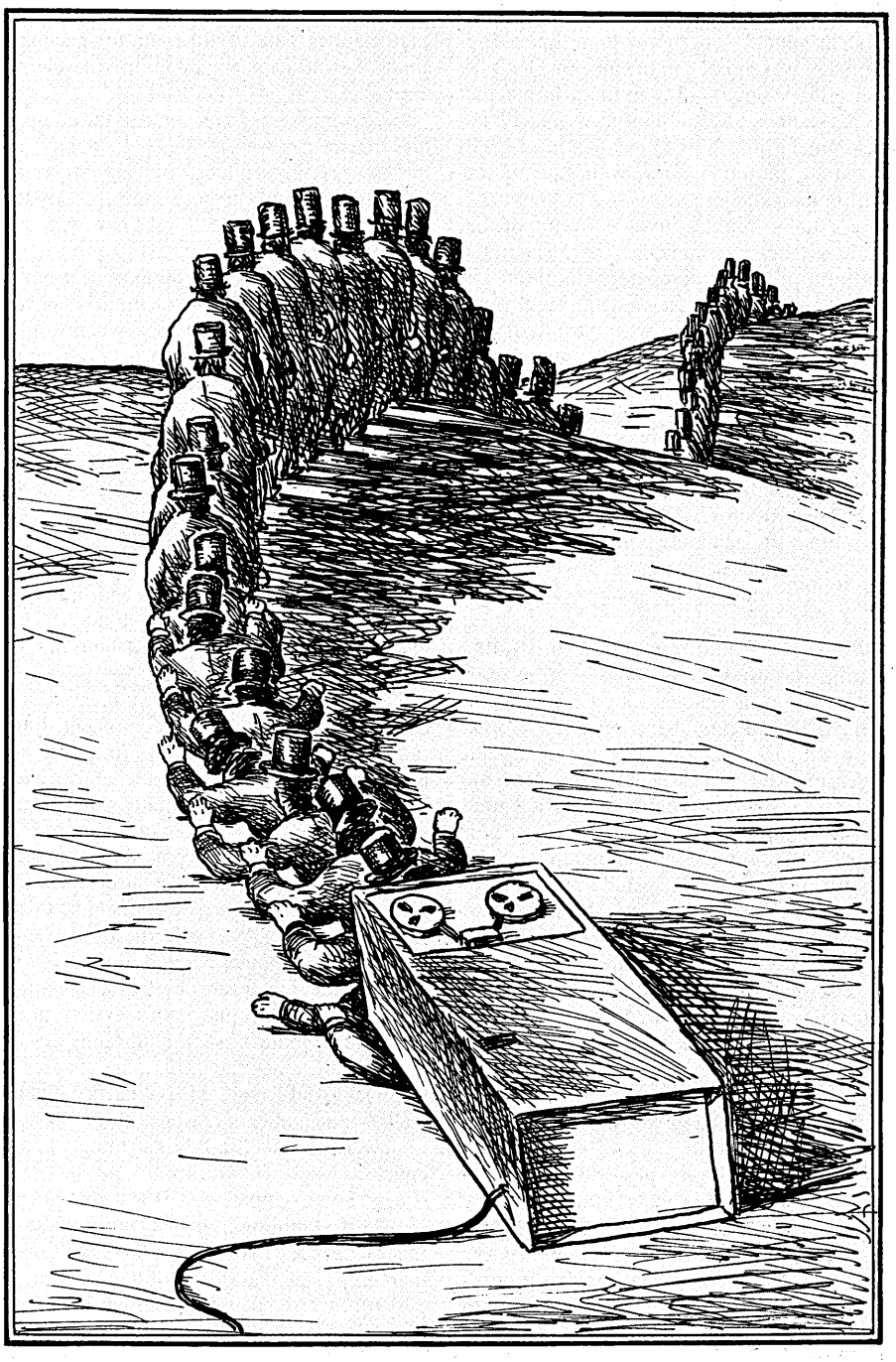
by Hesh Wiener

Whatever else might be said about the IBM 370 generation, one thing stands out as true: more money was lost on leasing these machines than on any other computers in history. The losses were not only those of leasing companies. Lenders, insurers, investors, and users shared in the problems. All of the parties were surprised by the disaster.

Although part of this story begins in July 1970, when IBM introduced the first large mainframes in its 370 series, the roots of the leasing debacle that was to occur some 10 years later reach all the way back to 1688, when Lloyd's Coffee House opened in London. Some might argue that the 17th century is too recent a time to begin unfolding this story, because it has to do with people who want something for nothing, who want to make wealth materialize out of thin air. If this is so, the story is as old as humanity.

It's not the kind of story that ends with a happily ever after, because for some of the individuals and some of the organizations embroiled in the 370 leasing mess, the foreseeable future includes adjustments to substantial monetary losses and, possibly, bankruptcies. It also includes scores of lawsuits, and some smugness and snickering from the fortunate, who now claim their safe situations are the result of foresight and wisdom.

There are as many questions as there are answers in this story, as well as a few tentative conclusions and bits of information that might help computer users, leasing companies, banks, and so forth. But the main lesson from the experiences of those involved in the financing of IBM 370s is that a lot can go wrong with seemingly sound business arrangements, and a lot can happen that ought not to happen: when big money deals blow up, you have to be pretty far away to escape unharmed.



ILLUSTRATIONS BY PHILIPPE WEISBECKER

Into the valley of death rode the Fortune 500

For all practical purposes, Itel is dead. Oh, it's possible the San Francisco leasing company will come back to life, after spend-

Right up until the 4300 announcement, computer leasing seemed to be a gold mine.

ing some time in the limbo of bankruptcy. But if you want to lease a computer, Itel is not going to come into your office and make the slickest pitch in the world, the way it did 10 years ago, the way it did until recently. Now, things are different. The company's 1979 annual report leads off with a letter to shareholders from chairman of the board James H. Maloon:

"1979 was a year of immense and tragic change for Itel. The effects of that disruption continued into 1980. A myriad of problems arose from the collapse of the company's computer-related business. . . ."

Stockholders reading the letter are brought quickly to the bottom line. The company was in hock to the tune of $1.2 billion after losing $443.3 million during the year. Another $50 million-plus went down the drain during the first nine months of 1980 —and so the report goes, with parentheses and footnotes galore.

Itel's troubles involve dozens of the world's leading companies, because Itel's portfolio of leased computers sits in an archipelago of high class data processing shops, the very places where a lot of the world's big money is collected, counted, and disbursed. Itel's debts were incurred with some of the biggest and smartest banks in the industrial West. Itel's shares, both common and preferred stocks, have been held by investors—individuals and institutions—whose records on Wall Street otherwise stand as testimony to generally prudent investment.

So what happened?

The money went away.

Ask not for whom the Lutine bell tolls, it tolls for thee

Everyone knows Lloyd's of London is the most prestigious insurer in the world. Why, Lloyd's is practically synonymous with big insurance. For nearly 300 years, from the time of its humble beginnings as a coffee house to its present situation in imposing quarters at a Lime Street, London address, the organization has prospered by taking risks that no other organization would take. More importantly, Lloyd's has grown great and famous by transforming risks into probabilities, by assessing the chance that the unforeseen might or might not occur. When it comes to guessing about the future, Lloyd's lays it on the line—for a price.

During the 370 generation, Lloyd's made what could be the most interesting and tragic bet in its history: Lloyd's set odds on the rate of technological progress. Specifically, Lloyd's set a price on its assuming the key risk in computer equipment leasing: the chance that some machinery would bring in rents greater than the cost of buying, financing, and placing the gear in the hands of users. It was an enormous bet; Lloyd's accepted millions in premiums against a chance that hundreds of millions might be paid out. Lloyd's lost.

Currently, Lloyd's says computer equipment lease insurance will cost it about $400 million. This is the third upward revision of its loss estimates and, the insurer says, very possibly the last. On the other hand, Itel, the largest single claimant under the policies, figures it will be asking Lloyd's for some $310 million. Both Lloyd's and Itel think that Itel's problem will represent something like half the total loss. So, depending on the accuracy of various estimates of Itel's share of the red ink and the total value of Itel's valid insurance claims, there is still room to speculate about the ultimate magnitude of the catastrophe.

At the same time, some of the companies that insured transactions will not have to make any claims at all, or will make only relatively tiny claims. On these policies, Lloyd's stands to come out ahead, just the way it had hoped all along.

Nonetheless, the problems of insured leases are only part of the picture. Whoever invested in IBM 370 equipment, whether as a purchaser, lessor, lessee, banker, or insurer, stands to lose big if it did one thing—got in late in the generation.

Values in wonderland

The losses accrued in 370 generation computer deals stem, in large measure, from the precipitous decline in used equipment values. The gap between what people expected machinery to be worth and the price placed on that equipment by the market has grown very wide; it has engulfed thousands of mainframes.

Losses have also been incurred on certain leases of peripheral equipment, both IBM and non-IBM. These losses have been markedly less, because the worth of peripherals has not fallen, relative to expectations, nearly as much as that of mainframes.

Used computers come down in price whenever new computers offer users more for their money. There are other factors, to be sure, but the biggie is price/performance—the cost of a computer per unit of work it will do. The other factors are chiefly those that affect the price/performance of a system in an operational context, such as the amount of power it consumes and the amount of space it occupies. And the attitudes of users count as well. For a number of reasons, users will take a newer machine, all other things being equal.

For example, a 370/168 that might have cost $4 million from IBM in the middle of the last decade can be bought on today's used market for well under 10% of that amount. A 370/148, worth about $750,000 in 1977, can be had right now for under $35,000, less than 5% of its original cost. Anybody who thought that computers ought to be written off over, say, seven years, and who had figured depreciation in a straight line will find that the market for used computers disagrees sharply and painfully with the accounting figures.

A similar situation exists for lease rates, which do not track sales prices exactly but tend to relate over the long haul to sales prices. That 370/168, once commanding a monthly rent well over $80,000 (and that with the user making a four-year commitment) can be had on a short lease for less than $20,000 a month. A 148, once $12,000 a month, might now bring a lucky lessor a couple of grand.

The 370/168 has been succeeded by the 3032 and 3033, the 3032 by the 3033-N, and the 3033 by the 3081. Each new machine has been a better value than the one it replaced. Similarly, the 148 has given way to the 4341s, cheaper by a long shot than the computers of the last decade.

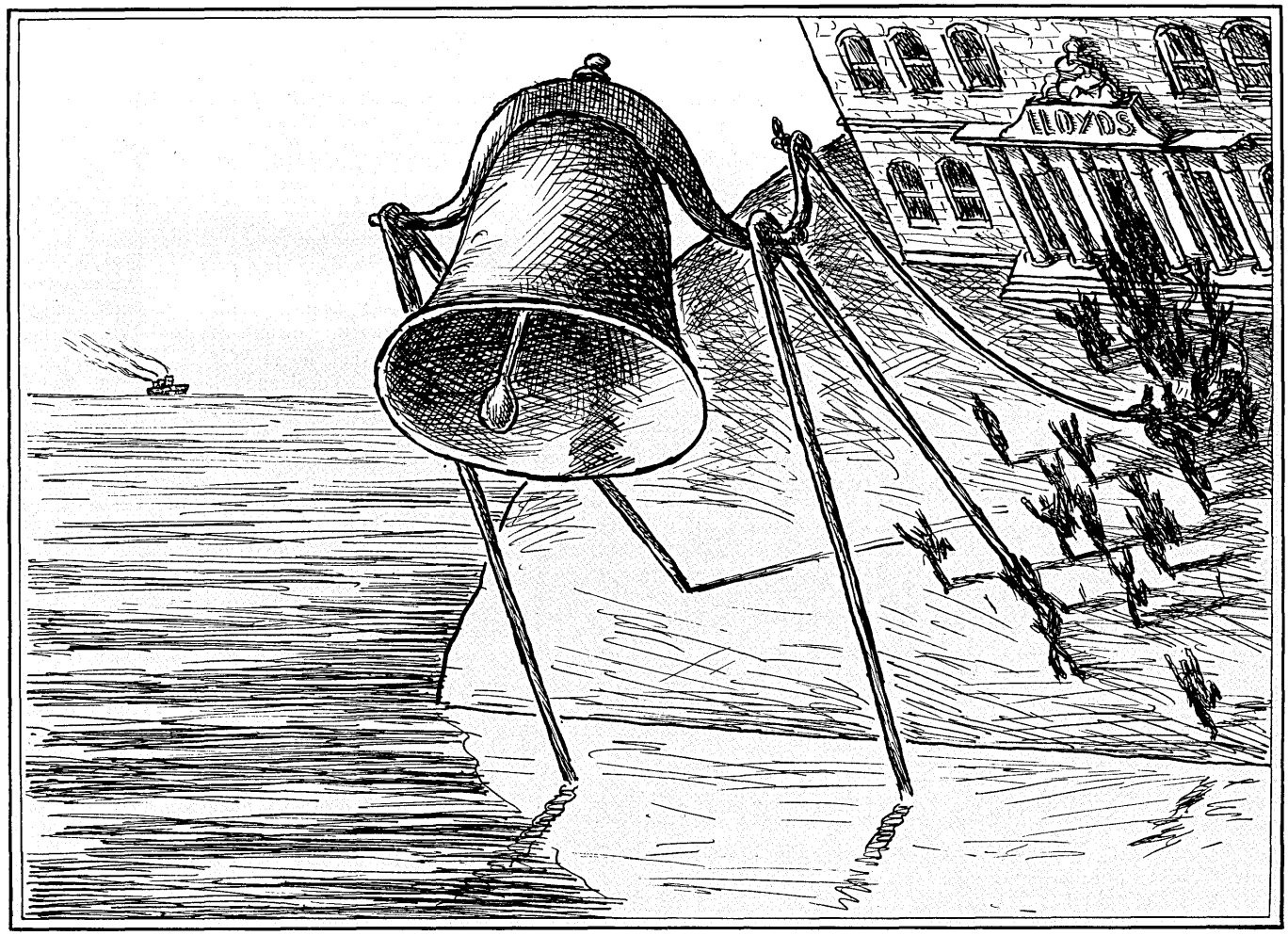
Today's problems are in marked contrast to the situation among lessors, users, and financiers a few years ago. In the second half of the 1970s, right up until the 4300 announcement, computer leasing seemed to be a gold mine. Fortunes were made, and some of the companies that made them actually got to keep the money. Even today, after some hard times, you won't have much trouble finding success stories in the third-party leasing business. And it's a safe bet that the next generation of computers will make some new people rich, although there will doubtless be

THE LUTINE BELL

The Lutine Bell hangs in the Great Hall at Lloyd's, the Underwriting Room. It's been there for a long time, about 80 years. When there is momentous bad news to be announced to the underwriters, the bell is struck once. When there is some very important good news, the bell is struck twice.

The bell was originally the ship's bell of the French frigate *La Lutine*, which was captured by the English navy at Toulon in 1793 and thereafter renamed the *HMS Lutine*. The *Lutine* served as a cargo ship, hauling gold and silver, among other goods. And it was a cargo of precious metal that filled the *Lutine* when, on Oct. 10, 1799, it sank in a storm off Terschelling while attempting to make its Yarmouth-Hamburg run. All hands were lost. Lloyd's, which had insured the ship, paid in full for its cargo.

Several salvage operations took place after the sinking, and in 1859 the bell itself was raised from the bottom of the sea. Some time later, the bell was installed at Lloyd's.



failures. To understand how all this can happen, you've got to understand a little about the way leasing is done.

The loan arranger

Most computer leases involve a financing method called tax leveraging. This means that the lease includes a party who nominally holds title to the machinery or gets the benefits of title, but who does not actually put up anything like the total cost of the gear. The difference between the amount contributed by this so-called equity owner and the actual cost of buying the equipment is borrowed from a bank or other lending institution. The way debt is used to increase the financial power of the equity owner's investment is called leveraging, just the way a company borrowing money to supplement its shareholders' equity is said to be leveraged. The purpose of leverage in a computer lease is to increase the tax benefits available to the equity investor; tax breaks are the equity partner's payoff, hence the term "tax leveraged lease."

In addition to the equity partner and the lender, a leveraged lease involves a so-called packager, the party that sets up everything and goes to the user. Itel was a packager. The packager's profit is a fee for making all the arrangements, plus, after the parties that put up the money get theirs back, a share in any extra revenues the equipment might bring in.

The user gets cheap financing. This is because the equity partner doesn't get interest, only tax benefits and a share in the value of the equipment at the end of the term of the deal. The only interest the user has to pay is the interest on the loan. Typically, the equity partner will put up from 20% to 25% of the price of new equipment that is to be leased, meaning the user has to incur interest charges only on a portion of the price of the gear. Interest is only paid on 75% to 80% of the cost of the deal, which becomes a big discount.

Tax leveraged leasing was the name of the game, and the leasing companies were able to do pretty well in the business. But they wanted more.

The grow-grow years

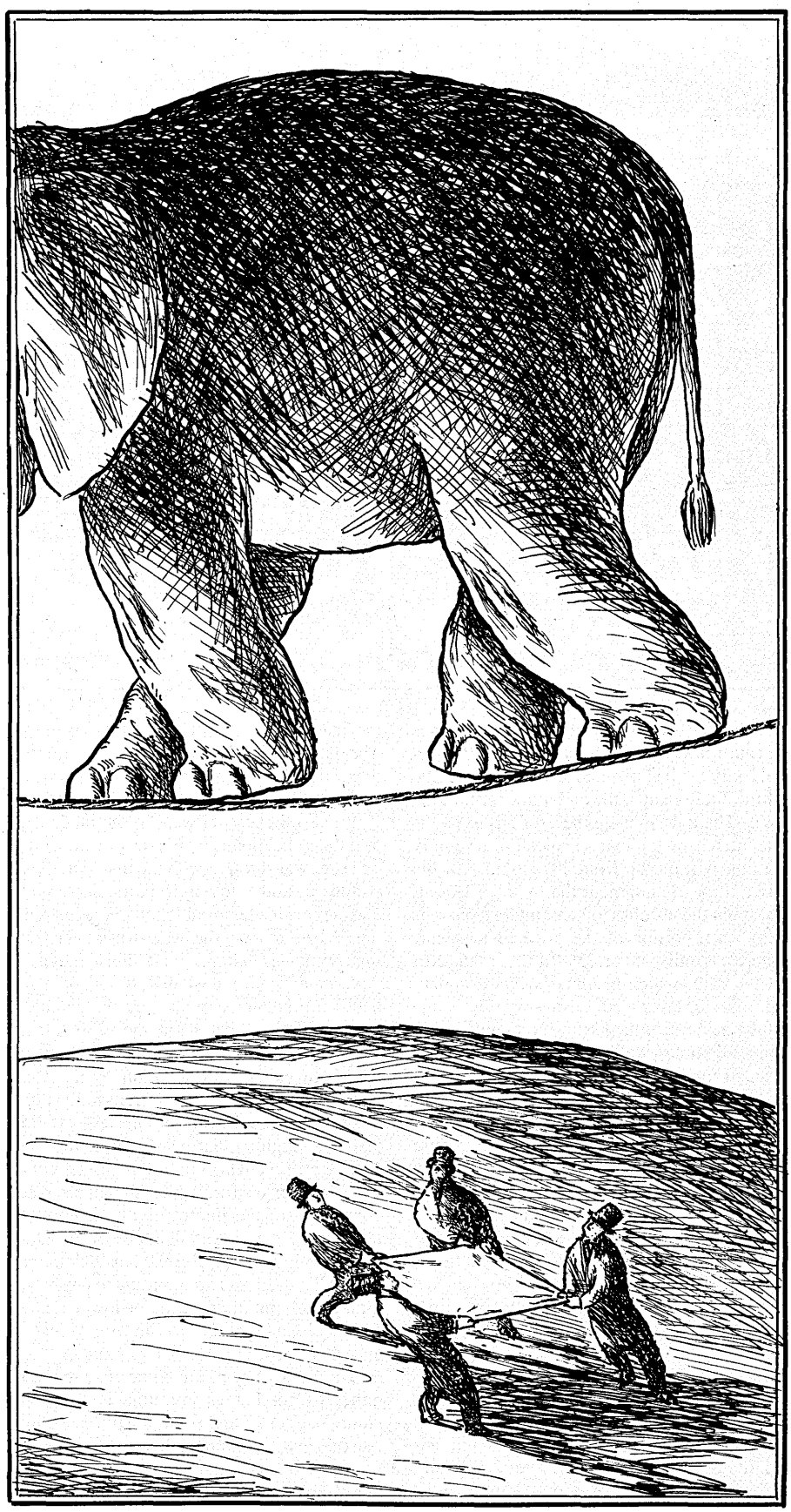
Back in the mid-1970s, the leasing companies felt they could grow to be very large financial institutions. This involved getting lots of equity investors and borrowing lots of money. And it also meant that the leasing companies had to find lots of customers. There was no shortage of users who wanted a discount on the IBM equipment they needed, but there was a little catch.

Users didn't want to take really long leases. They didn't want to be locked in with a machine for, say, seven years, but the leasing companies were able to set up inexpensive deals only if users would sign for relatively long lease terms. IBM was giving customers a break on terms of only four years; the leasing companies wanted to compete. The answer was obvious: the leasing companies would have to offer users four-year deals at favorable rates.

So the lessors went to the banks and told them their loans would be safe, that once one user was through with the machine, there would be another to rent it, particularly at the cheap rates made possible by leveraged leasing. Whether or not the banks trusted the leasing companies to make good didn't matter. A government rule, designed to prevent the banks from taking certain financial gambles, prohibited loans based on the faith lessors asked for. The rule is called Regulation Y.

In essence, Regulation Y says that banks can put up money for transactions like leveraged leases, but the lessors have to agree to pay enough so that nearly all of the loan will be cleared. The amount the users would have to sign up for, when all rentals were counted up and interest was figured in, amounted to something like 80% of the value of the deal. This stopped the leasing companies cold. Users were not willing to pay either high rentals for short terms or lower rentals for very long terms. Users wanted low rentals and short terms.

Somebody had to come up with a way either to get bigger investments from the equity partners—thus lowering the size of the bank loans—to change the attitudes of the users, or to enable the banks to finance short leases and still get around Regulation Y.



Up the rental stream without a paddle

Imagine this: the risk involved in leasing computers might be explained in a way that could be insured. The insurance would protect against problems the banks might have getting their loans repaid. With the risks removed, the banks could lend money on computer deals and still satisfy Regulation Y. The leasing companies, with credit assured, could compete and grow. This is what happened.

While the most visible organizations involved in the leasing of 370 generation equipment were big-name financial organizations, such as Itel and Decimus, the first insurance policy from Lloyd's was issued to a smallish peripheral equipment lessor in Dallas, Surety Industries.

Charles (Chris) Christopher, according to an account published in the *Washington Post*, started Surety in 1971 after having worked as an encyclopedia salesman and as a representative of Combined Insurance Company of America. Somehow, in 1973, Christopher got in touch with Lloyd's of London, or, more accurately, with a Lloyd's broker, Peter Nottage. From this meeting came an insurance policy that was to define the financial practices of computer equipment leasing during the 370 generation.

Christopher's career has had its ups and downs. In the early leasing days he was caught bugging a meeting held by Peter Nottage with some of Christopher's potential competitors. But whatever the merits of Christopher's character, one thing is clear: he has to be counted among the most creative thinkers ever to play a role in computer finance.

Peter Nottage is also an independent thinker. The firm in which he is a partner, Adam Brothers Contingency Ltd., is an insurance specialist dealing in policies that provide protection under unusual circumstances. If you wanted insurance against rain on the first day of the PGA tournament, for instance, you might well end up in the offices of Adam Brothers, in London's St. Helen's Place, across a desk from Nottage. If he could properly define the risk you proposed, it would very likely be insured by Lloyd's.

Rings of the Lloyd's

Everybody knows you get unusual insurance at Lloyd's. Some people know that most of Lloyd's business is routine—policies covering ships, airplanes, cars, and the problems common to business. Few people know that you can't simply approach Lloyd's for insurance. It takes connections.

For insurance to be underwritten at Lloyd's, it must first pass through a number of agents or brokers. Typically, you or your company will obtain insurance by going to your nearby agent. Then the agent will go to a

Tax leveraged leasing was the name of the game, and the leasing companies were able to do pretty well in the business. But they wanted more.

Lloyd's broker, who represents Lloyd's the way your agent represents you. Lloyd's broker then presents the policy to the underwriters on the floor of Lloyd's, where it is accepted, rejected, or returned for some changes.

Lloyd's is not really an insurance company; it is an association of insurers grouped into syndicates: wheels within wheels. The risks at Lloyd's are ultimately borne by individuals who have agreed to accept unlimited personal liability for risks they undertake. This means that the people who are members of Lloyd's—they are known as "names"—can go flat broke. There are hundreds of these names, and each name can join one or more syndicates. The syndicates often specialize in one type of insurance. Each syndicate elects a leader with the authority to make commitments for the syndicate's names. The leaders have enough experience and wisdom to justify the names' placing their personal fortunes at risk. When an insurance risk is presented to Lloyd's, syndicate leaders decide whether or not to sign up their groups for a portion of the risk. The presentation to syndicates is handled by Lloyd's brokers, people like Peter Nottage.

All of this can become very complicated, but it has worked remarkably well for 300 years. The unique arrangement at Lloyd's has made it the premier insurance market in the world, but premier does not mean perfect.

In any event, Chris Christopher was able to get over the hurdles and work out with Peter Nottage, and therefore with Lloyd's, an amazing insurance policy.

Slapping on the risks

In late 1973, Peter Nottage stated, in simple form, the nature of the risks involved in computer leasing. That statement boils down to an insurance policy that says underwriters agree to "indemnify the Assured for their loss sustained in respect of their said obligations assumed . . . in consequence of the termination or nonrenewal of any declared Lease Agreement. . . ."

The initial policy filled only a couple of pages of what is called a "J" form at Lloyd's; it was quickly nicknamed the "J" policy. The underwriters viewed the situation of the lessors as requiring insurance against what is called a contingency. In this case, the contingency was the event of lease cancellation. If a computer were leased for seven years under terms that permitted the user to return the machine after, say, four years, the policy served to protect the leasing company and its financial backers from possible losses. The policy wasn't quite that simple, of course, and it grew more lengthy as time passed.

Among the key terms in the insurance agreement was a provision requiring that the assured observe "due diligence" with respect to the leasing arrangements made and in regard to remarketing equipment that might be returned by an initial lessee. While due diligence in the "J" policy matter may be defined very clearly by the courts if disputes go that far, a crude, common-sense definition must suffice at this point. Lloyd's expected its assured to treat Lloyd's money and the funds of lenders and investors as if it was their own. In practice, each of the assured interpreted due diligence in its own way.

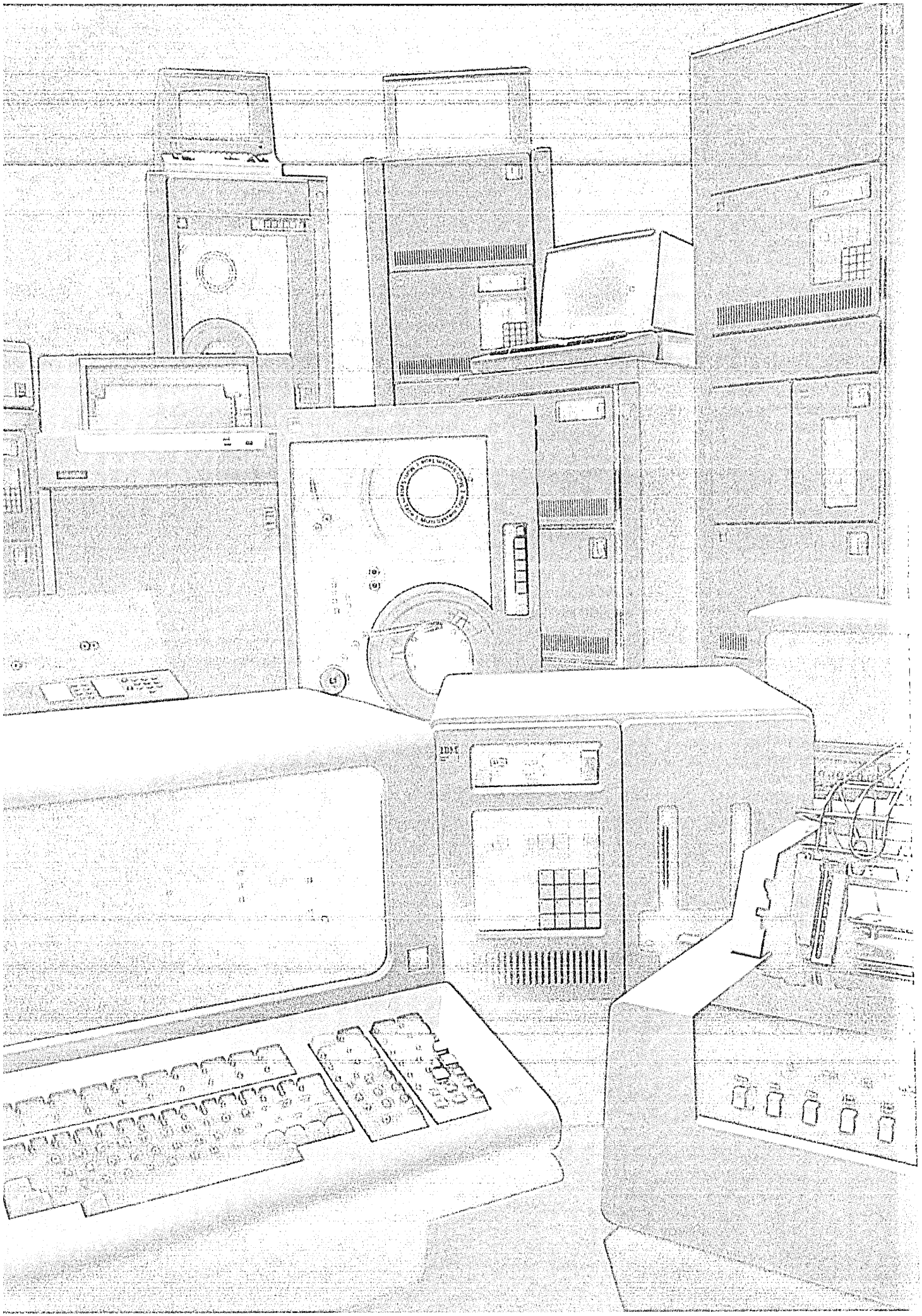
When the policy was first issued in 1974, the event might not have seemed that important. The "J" policy enabled Surety to obtain long-term debt financing for short-term leases, thus giving the young company a leg up on its competitors. Surety had no problems finding users to take machinery under the terms it was able to offer with Lloyd's help.

In 1975, Surety, in its efforts to grow bigger, made a written presentation to lending institutions. At that time, Chris Christopher said that his company was involved in $36 million worth of transactions set up during 1974 and that it had committed to $120 million more in gear for 1975. In Christopher's words, "Surety Industries [had] developed a unique method of securing the lending institutions involved in funding its acquisitions through what is referred to as a lease indemnity insurance policy."

The lease insurance offered by Lloyd's to Surety could not be kept a secret; other leasing companies soon applied for coverage. Some of the outfits that got "J" policies were the big names of leasing: Itel, Decimus, Finalco, DPF, Comdisco, Lease Financing Corp., Alanthus, Federal Leasing, Commonwealth, and a few European lessors. These companies wrote leases on IBM mainframes, IBM and non-IBM peripherals, and other equipment. Lease terms became more competitive; investors and lenders flocked to fund the seemingly unsinkable deals. The race was on.

The nature of the bets

Insurance seeks to protect the assured against the possibility of some unforeseen event, and to do it profitably. The insurer's estimate of the odds against the event is translated into a premium. For example, the annual premium on a simple life insurance policy is based on a study of human mortality. While it is certain that some of the assured will die each year, the only measure of the odds of a given individual collecting on life insurance is the premium rate and how it compares to the face value of the policy. In order to discourage the desperate or insane from bilking underwriters, life insurance almost always will not pay off in the event of suicide. Another common method of reducing unscrupulous claims on insurance is called coinsurance. In a fire policy, for example, the assured might



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The Soft Facts

Series/1's software advances make it ideal for tying together your information systems into a low-cost, flexible network.

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CIRCLE 161 ON READER CARD

Had Lloyd's viewed the computer leasing risks as some sort of financial guarantee, the insurer would have been prohibited from getting involved.

be required to bear a portion of the loss through a deductible or through an agreement that has limited the insurer's liability to only a portion of the loss.

The situation becomes more difficult when it comes to insurance against business problems. Lloyd's, in insuring against the contingency that computer leases might be canceled, had to work things so that the assured or the loss payees would not be tempted to let things fall apart. That's where the due diligence clause comes in.

When insurance relates to business matters, it may not always be insurance in the strictest definition. There is a related business called the writing of financial guarantees; Lloyd's is not in that business. A financial guarantee might be a policy supporting some specific future price for a commodity, an agreement that works the way an option does. If you want to keep a lid on the price you have to pay for cocoa at some future date, you buy a purchase option. It entitles you to acquire the foodstuff at a specified price and at a specified time. If, when you need cocoa, it is more costly than your optioned level, you exercise the option. If not, you let the option lapse. The cost of the option is your premium.

Had Lloyd's viewed the computer leasing risks as some sort of financial guarantee, the insurer would have been prohibited from getting involved. There is a rule at Lloyd's dating back to Nov. 25, 1936. It says Lloyd's can't make bets that fail a certain test.

"The test to be applied by the Financial Guarantee Board in deciding whether an insurance is a violation of the Financial Guarantee Agreement is whether the happening of any one or more of the following events, viz:-
a) the financial default or insolvency of any party;
b) the financial failure of any venture;
c) the shortage of receipts, sales or profits of any venture;
d) lack of support
will cause a loss to become payable under the insurance, or brings into operation a peril or contingency insured against which will cause a loss under the Policy, unless it is a condition of the insurance that any loss recoverable must be a direct result of a specified contingency, which is not precluded under the term of the agreement."

In other words, Lloyd's can only insure against specific possibilities, and it cannot insure against bad business practices. Under the "J" policies, if an insured company goes bankrupt, or if a key party in the lease goes under, Lloyd's may be off the hook. Some press accounts of the Lloyd's "J" policy matter, including the one in the *Washington Post*, imply that coverage of computer leasing risks was really a financial guarantee, that the situation insured against was a decline in computer values, a general business situation, not the ability of the leasing companies to recover the funds of investors. The fact is that the policy was carefully reviewed by insurance experts at Lloyd's; it was accepted as a legitimate contingency risk. Losses at Lloyd's and the unhappiness of individuals who may have had to take the losses has raised some questions that might never have surfaced if Lloyd's had come out ahead.

A LEGENDARY TALE OF LLOYD'S

One unrecorded day, an underwriter whose pipe had become gummy and charred from excessive use during the tense activities that occur daily at Lloyd's attempted to clear his smoking apparatus by knocking it a couple of times on his heavy ceramic ashtray.

On hearing the two claps of pipe on porcelain, all the underwriters in the Great Hall ceased working, stood up, and applauded.

Limehouse views

In the Lime Street offices of Lloyd's, the opinions of Peter Nottage regarding the "J" policy were accepted by underwriters with great enthusiasm back in 1974, if the amount of risk taken and the level of premiums can be said to mirror the underwriters' assessments. All told, the various policies issued by Lloyd's covered equipment that when new cost well over a billion dollars. And the odds placed on the contingency covered by the policy, the odds Lloyd's set on the lessors' deals failing to work out, were very long. Lloyd's had figured that the leases were safe.

In one policy issued to Surety in 1974, Lloyd's placed a $6 million limit on its liability; the premium paid for this coverage, which was to be in force for a five-year period, was $120,000, or 2% of the maximum risk. Itel, which had insured risks of nearly $380 million, paid Lloyd's premiums of about $8.6 million, or 2¼%. Other policies bore higher premiums and had other conditions to limit Lloyd's possible losses, but the premiums peaked in the range of 5% to 6%. In other words, Lloyd's considered the odds against losing as anywhere from 20:1 to 50:1.

Lloyd's did realize that the risks on leases get worse as a generation gets older. By 1977, Lloyd's felt the situation was getting too chancy. Certain "J" policies were no longer written; the following year, Lloyd's stopped accepting the rest of these agreements. By this time, problems had begun to show up, but the eventual magnitude of the leasing industry rout was not yet apparent.

The rate at which mainframes have sunk in price during the past few years seem to be much faster than the rate of declining IBM 360 values. Today, it seems obvious that computers, like other electronic gadgets, are part of a trend toward much more for much less. And competition in the industry, which helps drive prices down, appears to be stronger than ever, with IBM-compatible companies in the fray, along with IBM's older adversaries and IBM itself. Computer rentals can't buck the trend.

This was not so obvious in the middle of the last decade. So Lloyd's acted in ways that implied the bankers and leasing companies knew what they were doing and all the insurer had to do to make out was to underwrite the aggregated risks. Simultaneously, the bankers and investors and lessors behaved as if they all thought Lloyd's understood the situation. In the 370 generation, the leasing business was saying that its portfolios of equipment could be managed for the duration of the financing agreements, past the termination point and on into the 1980s.

Most of the leases written in 1975, 1976, and 1977 under "J" policies have reached their four-year walk points. The rentals the 370 machines can bring in are a lot lower than they were when the computers were new. They are much less than any of the parties to the leases had figured on. Even if a lessee is happy keeping his rented machine, he is going to offer a very low amount each month for that privilege. If the initial lessor won't take the offer, there are plenty of competitors around who will. The game, these days, is nearly over.

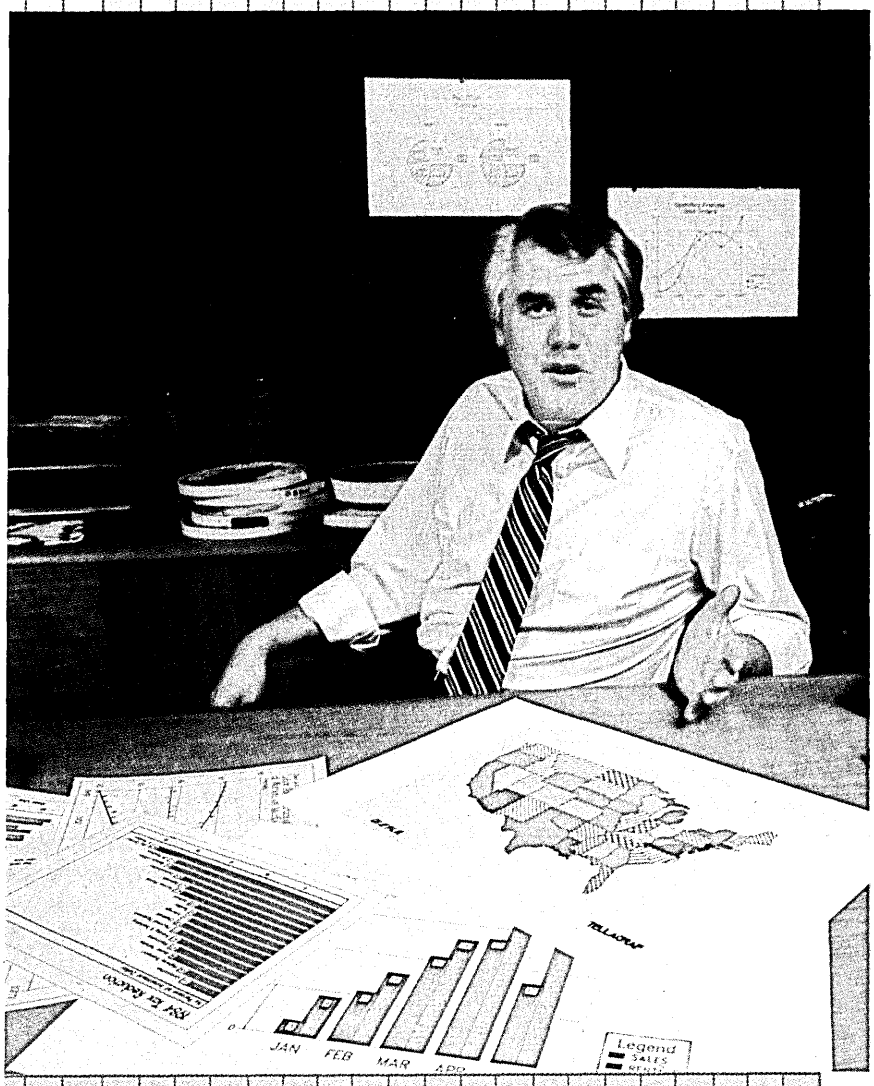
Lloyd's had taken most of its risks on 370 models 158 and 168. Users of 158s have a lot of alternatives, including 168s, 3031s, 4341s, and IBM-compatible systems. Owners of 168s also have choices, like 3032s, 3033s, Amdahl machines, and so forth.

Lloyd's also insured peripherals, and the considerations here are similar. But the values of disks and tapes have held up well compared to the prices of mainframes.

They do things different in taxes

The IBM 360 generation declined in value, too, although the 360 leasing companies did not suffer the way 370 lessors did. The history of the IBM 360 was reviewed by Lloyd's before the 370 insurance was written, and it was implicit in any advice Lloyd's might have received. If events had gone as well with the 370s as they had with the 360s, Lloyd's would not have been burned so badly, nor would any of the assured. They might have emerged in good shape. But that's not the way it happened.

For one thing, the 370s were financed in a very different way from the 360s. A big part of 360 financing was in the form of equity, sold to investors as shares in leasing companies. The equity in the 370 deals was related to machines, not companies. Equity



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was a much greater portion of the 360 purchase funds than it was for the 370s, which means that the debt on the 370s was proportionally a lot higher.

Tax leveraged leasing is really a technique of the 370 generation, much as high-flying leasing company stock was a financial style of the 360 era. When 360 deals—or leasing companies—went awry, the machines themselves could be sold. When 370 deals got shaky, the nature of the tax laws made it impossible to liquidate the machines. Investment tax credit on the new 370s bought by leasing companies was the biggest incentive to investors. In order to realize the full benefit, the machines have to be held by the owner for seven years.

By the time the deals turned sour, the equity investors were in too deep to back out. The possible losses of tax benefits offset any strategy involving cutting losses by liquidation. The equity partners had to ride their computers on down, which they did.

It is unclear whether this really affected lease rates. The link between resale prices and rentals was stronger in the 360 era than in the 370 generation, and Lloyd's strategy might have contributed to some of the temporary dislocations in the market.

In order to comply with the due diligence clause in the "J" policy, lessors felt they had to keep machines out on lease. During the 360 era, when prices dropped quite low, machines were taken off rent and put in warehouses. Was this diligent? Nobody can say, but it was done nevertheless. In the 370 generation, lessors kept lowering rents until the machines moved, which might have created some kind of 370 glut on the market. Again, nobody knows. If Lloyd's did contribute to the weak leasing market for 370s in 1978 and 1979, it did so inadvertently. The business of leasing did become cutthroat; but, again, leasing has always been a game that is played hard.

ITEL AT A GLANCE

(IN MILLIONS OF $)

YEAR	REVENUES	INCOME (LOSS)
1974	144	9.7
1975	204	10.7
1976	260	16.1
1977	402	30.7
1978 (originally reported)	689	47.2
1978 (restated)	683	21.5
1979	643	(443.6)

ITEL'S NET WORTH ON DEC. 31, 1980 WAS NEGATIVE $260 MILLION.

ITEL TELLS ABOUT ITEL

1978 Form 10-K

Although the [IBM 4300] announcement appears to have had an adverse impact in the first quarter of 1979 on profits from sales of Advanced System computer and from computer lease underwriting of IBM computers, no conclusive assessment of the impact of the announcement for the full year of 1979 on Itel's computer sales and financing operations can be made at this time.

In 1975, Itel introduced a marketing program for IBM System 370 computer equipment under which Itel could be required in certain circumstances to assume certain financial obligations relating to the lease. Itel is insured against resulting loss in the event it is unable to re-lease or sell the equipment at rates sufficient to cover such obligations and related expenses.

1979 Form 10-K

The causes of the 1979 loss are varied and complex and involve many aspects of the company's business. The loss was exacerbated by the company's inability adequately to anticipate and react to developments in the computer equipment market. . . . Among the significant causes of the loss was an announcement by IBM, early in 1979, of a new series of computer products.

THEY ALL TELL ABOUT ITEL

1974:
Value Line

Financial expertise is Itel's middle name. The company's real strength lies in its ability to create, structure and market complex financial transactions. The high level of activity in the capital equipment markets has increased the demand for Itel's services as companies seek the most advantageous method of financing, especially in times of high interest rates.

Business Week:

Itel's portfolio includes some $300 million worth of IBM 370 computers, but Itel only manages the machines. They are owned by individual and institutional investors. Financing for such deals is arranged by Itel's financial services group, a lease underwriter that brought in about a third of last year's earnings and has become a cornerstone of the restructured company.

1980:
The Economist

Itel, a one-time glamour stock, has been losing money hand over fist and wants its bankers to restructure some $1.2 billion of debt (by lowering the interest payable and extending the repayment time). Its problems stem from its computer business.

If Lloyd's did realize it was making a strategic error in playing off leasing companies on the due diligence clause, that realization must have come late. Then, too, Lloyd's could have been influenced in the direction of false confidence by the way the financial world was treating its biggest insurance risk, Itel.

Events and price

Right through 1978, Itel and the other leasing companies seemed to be doing well, at least in the eyes of the financial institutions. Remember, most people had no idea that the IBM 4300 series was going to be announced in January 1979, setting new price/performance levels for mainframes and drastically reducing the cost of power, air conditioning, and support.

Itel, the king of the lessors, was going at IBM from two directions—pushing IBM's own 370s against the 303X line at the high end, selling compatible machines under its Advanced Systems label at the low end. Itel's behavior, however, indicates that it might have begun to suspect that a test of its strengths was coming. For, while the picture was still rosy, the company went to its lead banker, Manufacturers Hanover Trust, and worked out a credit agreement that would prove to be as big a mess as the Lloyd's insurance.

In 1977, Manny Hanny had lined up a handful of banks to pump $82.5 million of unsecured credit into Itel. Itel, in turn, had taken down a chunk of the money and made more money with it. The next year, Itel was back at the trough.

The managers of the San Francisco lessor had told the bankers most of what was going on, citing the leases insured by Lloyd's and its commitments to buy more IBM-compatible mainframes. As of June 1978, when Itel got more credit, the company had on order $47 million in Hitachi AS-6 large systems and $26 million in National Semiconductor AS-4 and AS-5 medium-size mainframes. Coming in, and in need of financing, was another $21 million in disk drives and other related gear, plus $180 million in rail cars, $102 million in marine vessels, and $207 million worth of big jet planes.

Itel was making money, but not enough to fuel the growth it felt it could achieve. In 1974, when Surety got its "J" policy, Itel had earned $9.7 million on revenues of $144 million. By 1978 the company reported earnings of $47.2 million (which was later adjusted downward) on a gross of $689 million. Itel had $1.3 billion in assets under its control. Reported earnings per share had jumped from $1.28 to $3.86.

This must have impressed the bankers. On July 15, 1978, Itel got an unsecured credit line of $500 million, with Manny Hanny taking the biggest share, $55 million. Chemical and Citibank took $45.5 million each. The complete list included banks like Bank of America, Bank of Montreal, Crocker, Chase, Security Pacific, Bankers Trust, Mellon, Marine Midland, First Pennsy, Girard, Bank of California, Northern Trust, Na-

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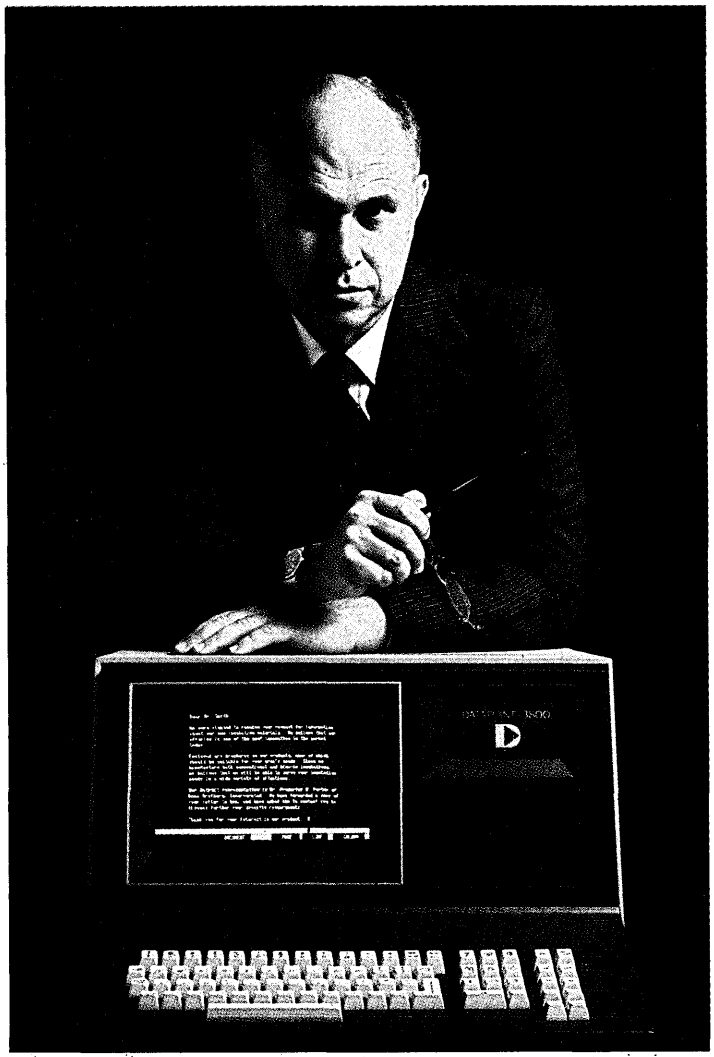

Vic Poor is Executive Vice President of Research and Development at Datapoint. He pioneered dispersed data processing, designed the first computer-on-a-chip, and developed ARC™— the most widely used coaxial network for linking business machines. Now, as architect of Datapoint's Integrated Electronic Office, he discusses the new realities of office automation.

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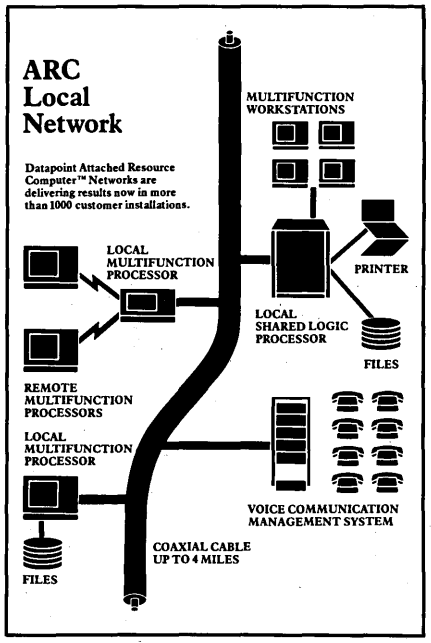


ARC networks enable workstations, processors, printers, and files to be linked together so that all resources are available to all users. Shared access brings significant economies while uniting all members of an organization with a high-speed artery for information exchange.

But ARC goes well beyond conventional cable networks. Users may access physically distributed files as a common information base containing both words and data. And this information base may be organized to match a company's structure with comprehensive security controls at all levels.

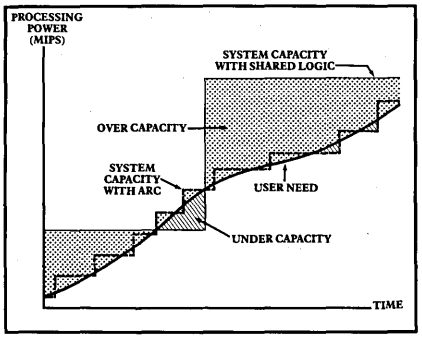
You decide what to start with, what to add next.

Start with a single workstation or a small cluster. Order data processing and word processing to begin. Graduate to communications management and electronic mail as you go along. Or vice versa.

A choice of compatible processors and a broad range of peripherals allow you to match capacity precisely to the job.

Stop replacing hardware. Stop rewriting programs.

Many computers bog down trying to provide more and more functions to more and more users. This one won't.



With conventional computers you can only add processing power in large, expensive steps. With ARC, you can add power in small increments, closely matching capacity to user needs.

With ARC you add processing power, workstations, storage, and peripherals as your needs require *without constant reprogramming.* And no matter how large the system grows, you'll still get responsive performance at each workstation.

Word processing with new search power.

Add word processing to existing workstations whenever you're ready. Because WP and DP are truly integrated, you can retrieve information from DP files and incorporate it into WP documents.

And Datapoint word processing offers you a productivity tool no one else can. It's AIM™, Datapoint's Associative Index Method™. It brings automation to the filing cabinet at last.

With AIM you can search files and documents by their content. You don't need to know the document number or title. Search by subject or a remembered phrase. AIM will find every document or data file in which the key words occur.

Electronic message capability allows completed documents to be transmitted to other Datapoint workstations, cutting paper work and speeding communications. You can even use it to send file updates and new application programs to your geographically dispersed processors.

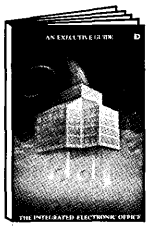
Cut long distance telephone costs up to 40 percent.

Your telephone expense may be rivaling your data processing costs. We can help there, too.

The Datapoint Long Distance Control System operates with your existing PBX or CENTREX and automatically routes each long distance call over the least-cost line. It can hold specified calls until a low-cost line becomes available. And it prints out information on phone costs and traffic to let you optimize and control your telephone usage.

You get an immediate reduction in telephone charges, plus the ability to interleave voice, message, and data traffic through integration with ARC.

Begin now. We're ready with service and support.



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For more information, send for "The Executive Guide to the Integrated Electronic Office." Write: Datapoint Corporation, Corporate Communications T-41DM, 9725 Datapoint Drive, San Antonio, TX 78284. Or call (512)-699-7059.

DATAPOINT

CIRCLE 164 ON READER CARD

Itel became a monument: it had the largest negative net worth of any company in American history before it went bankrupt.

tional of Westchester, Morgan Guaranty, National of North America, United Cal, Seattle First, Sanwa, Wells Fargo, Pittsburgh National, Hartford National, First of St. Louis, Midlantic, Mercantile of Dallas, Credit Lyonnais, Banque National de Paris, Credit Suisse, Swiss Bank Corp., and Banco di Roma—an awful lot of very good bankers putting a huge sum into Itel's open hands. Itel is now in Chapter XI bankruptcy. On Sept. 30, 1980, it reported a negative net worth exceeding $250 million, so much of that borrowed money, some $362 million, is in jeopardy.

When Itel began to drown in debt during 1979, the bankers tried to devise a way to fish the company out, but the empire in Embarcadero Center went down even faster than it had previously gone up. Itel became a monument: it had the largest negative net worth of any company in American history before it went bankrupt. For months, the banks worked with Itel, trying to avoid pulling the plug. At the same time, the lenders were aware that the red ink Itel had reported did not include possible losses on Lloyd's claims that might turn out to be invalid; those could double the depth of the water Itel is under.

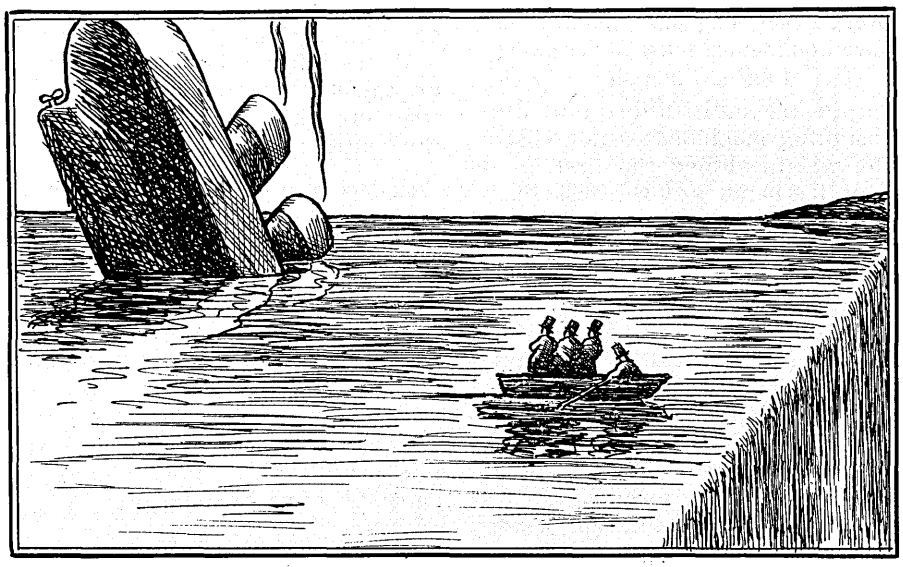
I'm looking through you

Many of the lease insurance claims at Itel and the other assured do not immediately involve the lessors. Policies and leases were written so that certain disputes could end up being fought by users and lenders, then by Lloyd's, before the lessors were dragged in. In other instances, lenders look to the lessor first, then to Lloyd's. In general, if the insurance does not pay, the liability of a user that signed a complex lease remains an issue of debate. But no matter how the deals look on paper, the leasing companies will get dragged into all arguments.

Once the leasing liabilities move past calm discussion, they are going to burn up a lot of billable hours at law firms. Suits have already been filed; more will likely come. Federal Leasing has gone to the courts for relief and was granted temporary mercy. Commonwealth Leasing worked out a compromise with Lloyd's. Others are alternately making threats and trying to achieve compromise. Itel is one of these. There is little Lloyd's can do but try to handle the claims carefully, a process that has taken a great deal of time and effort.

It also takes a lot of advice, and in the advice department, Lloyd's does not seem entirely happy.

The first assessment of the computer lease problem was prepared by insurance adjusters Toplis & Harding, which later got out or was removed from the situation. Toplis said Lloyd's would lose $225 million. This



prompted the insurer to engage special talent.

In 1979, Lloyd's brought in the First National Bank of Boston to help process the insurance claims. The bank worked with information coming from the assured, from accountants Coopers & Lybrand, and from a consultant's forecast of future computer values. The bank encouraged Lloyd's to prepare for bigger losses, so Lloyd's raised its loss estimate to about $340 million. Then the estimate rose again, to $400 million. Along the way, the claims evaluation moved from Boston to New York, and was placed in the hands of Lloyd's litigation counsel, Lord, Day & Lord.

The decline in the Boston bank's responsibility might be tied in with an insurance loss under a "J" policy. Lloyd's was aware that First of Boston was the lead banker for DPF, which had made some big deals on 138s and 148s. Lately, it seems as if a large part of the insured value will be lost, making the relationship between Lloyd's and Boston an awkward one. Nobody is talking much about the DPF deal, which could lead to claims in the $20 million range, according to various leasing industry estimates. Of all the 370s, the 138 and 148 models were hit the hardest by newer systems.

The loan star state

In the meantime, insured peripheral deals, believed to be nearly half of the more than $1 billion covered by "J" policies, have fared relatively well. One sore spot involves Surety Industries, the original "J" policy holder, because a lessee, Southwestern Bell, had an unscrupulous fellow handling some of its computer equipment leases. Lloyd's says the rotten aspects of the leasing deal should take it off the hook, and it's willing to return the premiums it has received. Southwestern Bell is holding out for more than that.

The largest insured peripheral lessor, Lease Financing Co., seems to be doing pretty well and probably won't be much of a headache for Lloyd's. Other peripheral lessors have kept out of the courts so far.

The ghost of Chris must pass

With new IBM machines coming out and new leases on the computers being written all the time, it would seem that the recent disasters would lead to cleaner arrangements and smarter deals. Users have certainly become aware of the potential threats posed by indemnity leases and walk clauses, but they are still under pressure to find bargains. Leasing companies have learned to sell deals at more realistic rates, but there seems to be no shortage of hungry leasing salespeople, willing to low-ball a deal and worry later.

As for Lloyd's, well, it isn't back in the business, although there are policies guaranteeing residual values on some computing equipment. These policies guarantee less and cost more than the old "J" arrangements, but in many cases they're good enough to enable banks to get around Regulation Y. The company leading the market is Chicago's International Capital Equipment, and its stock, which has recently gone public, is doing well.

The echoes of the Lutine bell, had it been rung to signal the sinking of a billion dollars' worth of computer deals, would have faded out of the Great Hall at Lloyd's by now. The 370s are fading away, too.

Sometime during this new decade we'll find out if anybody learned enough from the old generation's leasing debacle. Put another way, we'll surely find out if nobody learned about the risks of leasing. ✻

Mr. Wiener publishes *Computer and Communications Buyer* and *Mainstream* newsletters and *Technology News of America* news service.

Another Able First

Paydirt for VAX and PDP-11 users

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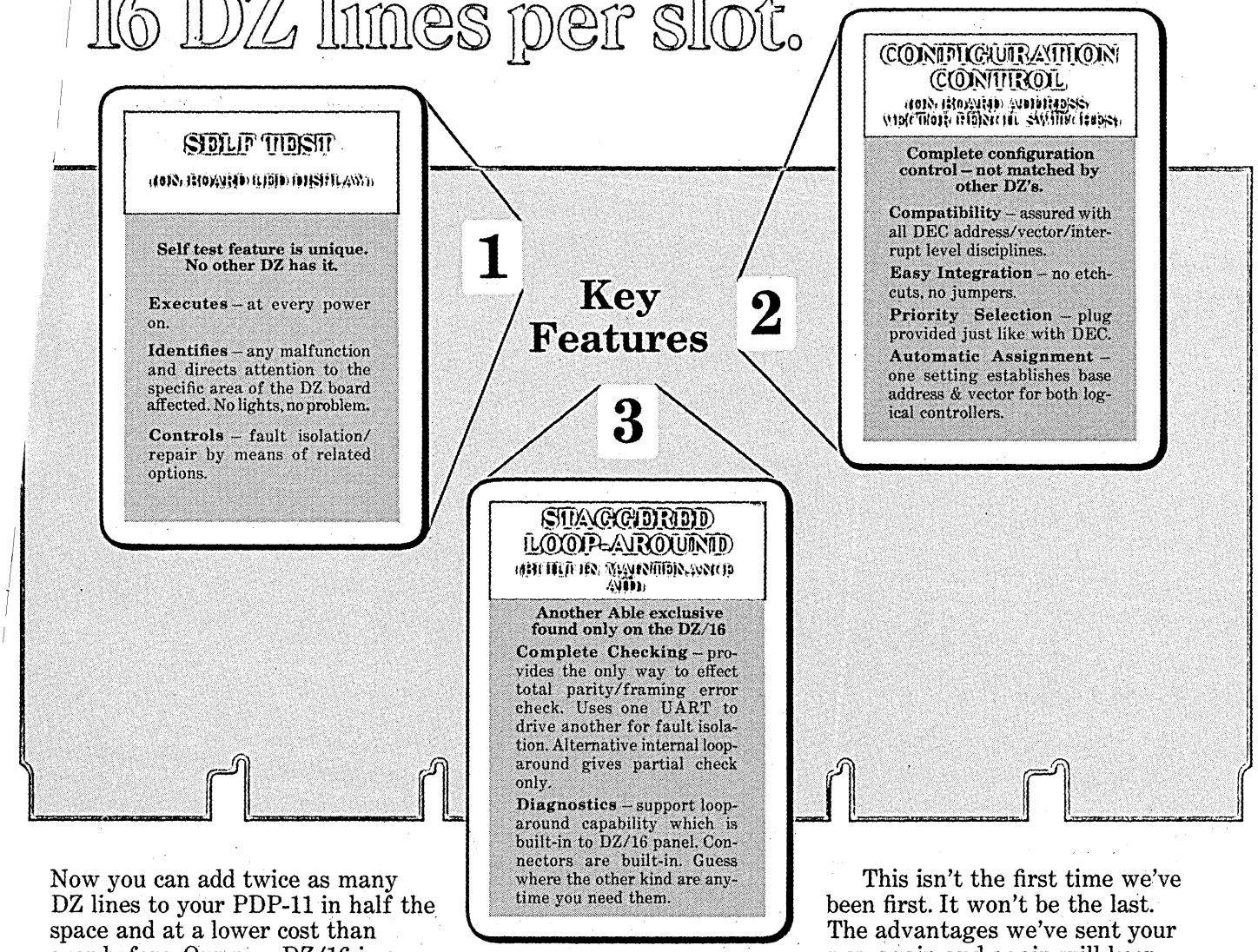

Now you can add twice as many DZ lines to your PDP-11 in half the space and at a lower cost than ever before. Our new DZ/16 is a microprocessor-based controller which fits 16 asynchronous communications channels into a single board but sells for much less than the two-board DZ11-E it replaces. There's no waiting either. You'll probably have your card plugged in and running less than 30 days after we get your order.

The unique multiplexer installs in any standard hex-width slot and presents only one load to the Unibus. It supports all DZ11 baud rates, provides modem control on all lines and is compatible with DEC diagnostic and operating system software. The data format is program-selectable for each channel.

This isn't the first time we've been first. It won't be the last. The advantages we've sent your way again and again will keep coming. Get the most out of your VAX or PDP-11. Write today for details on our remarkable line of memory, communications and general-purpose cards for use in the PDP-11 family.

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FEATURE COMPARISON CHART

FEATURE	Visual 400	Lear Seigler ADM-42	Perkin Elmer 1251	ADDS Regent 60	Hazeltine Executive 80, Model 30	Beehive DM30
ANSI X3.64 Specified	STD	**NO**	**NO**	**NO**	STD	**NO**
Set-up Modes Eliminate External Switches	STD	**NO**	STD	**NO**	**NO**	**NO**
Typomatic Solid State Keyboard	STD	**NO**	**NO**	**NO**	STD	**NO**
Detached Keyboard	STD	STD	**OPT**	**NO**	STD	STD
CRT Saver	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Block or Underline Cursor	STD	**NO**	STD	STD	STD	**NO**
80 and 132 Columns	STD	**NO**	**NO**	**NO**	**OPT**	**NO**
Double Size Characters	STD	**NO**	**NO**	**NO**	**OPT**	**NO**
Smooth Scrolling	STD	**NO**	**NO**	**NO**	**OPT**	**NO**
Horizontal Split Screen	STD	**NO**	**NO**	**NO**	STD	**NO**
Video Attributes Require No Display Space	STD	**NO**	**NO**	**NO**	STD	STD
8 Area Qualifications	STD	**NO**	**NO**	**NO**	**NO**	**NO**
8 Resident Nat'l Char. Sets Including Line Drawing	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Programmable Non-volatile Function Keys	STD	**OPT**	STD	**NO**	**NO**	**NO**
Display of ALL Control Codes	STD	STD	STD	STD	**NO**	STD
Insert Delete Line with Push Up or Down	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Insert Delete Character with Push Right or Left	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Select Editing Extent to Field, Area, Line, Page	STD	**NO**	**NO**	**NO**	**NO**	**NO**
20 mA Current Loop	STD	STD	**OPT**	**OPT**	**OPT**	STD
Programmable Message Framing (non-volatile)	STD	**NO**	STD	**NO**	**NO**	**NO**
Programmable Answerback	STD	**NO**	STD	**NO**	**NO**	**NO**
Baud Rates to 19200 BPS	STD	**NO**	**NO**	**NO**	STD	STD
Independent Xmit/Receive Rates	STD	**NO**	**NO**	**NO**	**NO**	**NO**
Printer Port Independent of Communication Interface	**OPT**	**OPT**	STD	STD	**OPT**	STD
Paging	**OPT**	STD	**NO**	**NO**	STD	STD

VISUAL 400

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And Technical's understanding of the EDP market helps us to be responsive to the needs of the marketplace. We have published *Datamation* magazine since 1957. Then, in March of 1980, we introduced *Output* magazine to serve the needs of the managerial user. Now, we see a strong need for the software industry to have its own publication—and we are responding by creating the first newspaper devoted to the software industry, *Software News*. The premier issue of *Software News* will debut just prior to the 1981 National Computer Conference, May 4-7 in Chicago.

Other Technical magazines that serve the fast-growing information processing market are:

Datamation, the monthly information source reaching 130,093 EDP professionals.

Dataguide, the semi-annual buyers' guide and directory of OEM computer products, with a circulation of 20,000.

Directory of Systems Houses and Minicomputer OEM's, an annual directory listing sources.

Output, the monthly information systems magazine bought by 60,000 general management users.

Control Engineering covers 75,000 engineers engaged in design and development of computer-based control systems.

Industrial Research & Development delivers 104,000 professionals in the scientific market who specify computer hardware and software.

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Some straight talk about computer terminals

The last official count identified 256 companies marketing display terminals. One of every four terminals brought to market in the past ten years has been discontinued. Makes it pretty tough on someone who's responsible for making the company's terminal buying decisions. Like, whom do you believe and who will be around tomorrow to talk to?

Direct, Inc., waited 2 years before introducing our products. We knew all about this volatile market before we entered it. We knew that to succeed we had to market the finest terminal possible... but more important, we knew that we had to back it up with honesty, integrity and good service. We're not perfect yet, but we're close. And we'd like the chance to tell you about how we can fill your terminal needs. And if we can't, we'll tell you.

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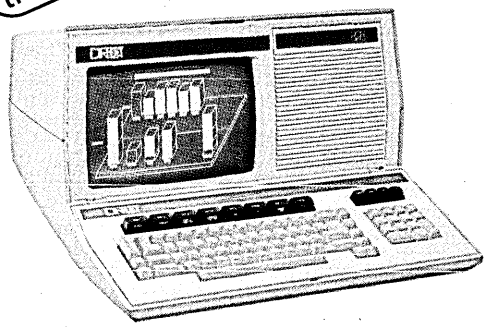

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CIRCLE 168 ON READER CARD

PEOPLE

HE MAKES IT HAPPEN

If someone's looking to sell, rest assured Ken Miller knows it. You won't have to call him. He'll find you.

The 59-year-old electronics engineer's aggressive acquisition strategy has transformed Penril Corp., Rockville, Md., from dirt to diamond in 7½ years. When Miller took command as president of the small electronics firm in March 1973, it was sporting a $337,000 deficit on sales of $1.7 million. Since May of that year, every division has made a profit every month. Sales for the fiscal year ending last July 31 were $33 million, and profits were expected to exceed $1.5 million. Penril is now one of the top 10 independent manufacturers of modems in the U.S.

What hath this man wrought?

"It's a little bit knowing the data communications field and a lot through acquisitions of unrelated areas," Miller says. "It's been fairly successful because we did it all with a combination of internally generated cash and loans."

The task was hardly that simple. Miller arrived at Penril with an extensive computer and electronics background, including two stints at Lear Jet Corp., where he helped develop the Lear Jet and, to the undying gratitude of music freaks, the world's first eight-track stereo tape system. He got the call to rescue Penril while at Wilcox Electric, a subsidiary of American Standard. Many an eyebrow was raised when he left Kansas City for Rockville.

"Yes and no," he answered when asked if he had been scanning the employment sections. "My operation with Standard Brands was comfortable and profitable. But in a corporation that big, your earnings often get lost. What's $100 million in a $1 billion company? About 10%, and that's it.

"From the point of view of career advancement, visibility, and seeing the results of your personal decisions that affect a lot of people, you can't beat running your own show. American Standard failed to fulfill what I wanted, which was to be in an environment where I could react fast and move rapidly."

KENNETH M. MILLER: "We take the position that cash talks the loudest, and we're pretty hard-nosed about it."

Hello, paradise. Penril, begun in 1968, was originally planned as the first and foremost in an expected wave of credit terminal companies. By the time a machine was developed, it was too fancy and costly even for the tastes of such backers as Burroughs and American Express. The fledgling had moved into a nest suitable to its sales but not its revenues, and was shelling out more than it was raking in.

Enter Miller, though hardly on a white horse. First, he had to cope with the political sensitivity of succeeding the firm's founder. Second, he had to borrow $75,000 to meet a payroll. He went to Riggs Bank, the Washington area's largest. They showed him the door. But he met that obligation and several others during those first tense months, and after that it was up, up, and away. The red ink quickly turned black and has not yet stopped flowing.

"The main thing we had to do was restructure," Miller says. "It's textbook, but it works. We had to restructure the spending in line with the revenue. Everything was out of whack. We had to reapportion it, then at the same time do things to jack up the revenue."

The first of those was to devote attention to the modems, then the company's sole source of support. Once that was accomplished, and the oem modems developed, Miller began searching for bargains. He found them in manufacturers of test instruments, digital panel meters, high-performance power supplies, and stereo systems. All but one were bought for book value or less, and each was strictly cash. No plastic, thank you.

"We try to find businesses that have some uniqueness about them, that will give us some niche in the industry, and will add to our earnings per share, which is the whole game plan for us," Miller explains. "We take the position that cash talks the loudest, and we're pretty hard-nosed about it. We're able to make acquisitions partly because we have cash and partly because we're able to get in and out while someone's still making up his mind at the first-level decision in a large corporation. We can do a deal in a third the time they can."

So when Miller talks about $100 million in sales for a 10-year anniversary present, people listen.

"I think we'll do it," he says emphatically. "During our first 18 months, it wasn't that clear we'd make it. Our first objective was to get the business into the black rapidly. Then we decided if we made it to $10 million it'd be a hell of a milestone.

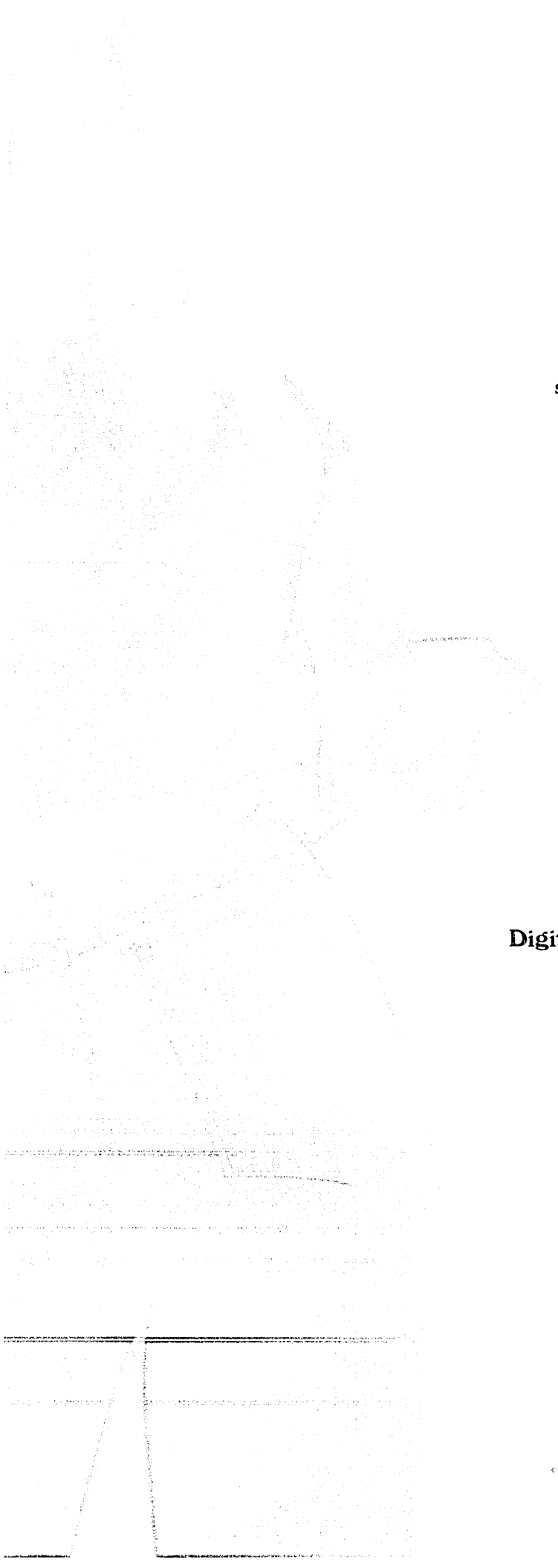
"But once you get the momentum going, get a taste that you can do it, and get acceptance in a number of areas, you can truly set your goals higher. Our next goal is to double our business after we reach $100 million. Of course, we can't do that forever or we'll have the whole GNP. But it's a hell of a lot easier than going from ground zero to the first $1 million."

It's much simpler to get money, too. Last time Miller visited the folks at Riggs, they gave him $15 million. Unsecured. And they felt so good about it they took a quarter-page ad in a local paper to tell everyone what they'd done.

"I felt very proud of that," Miller admits, "especially after what happened in '73. But I can understand why they did it. I wouldn't have loaned the money to me either, then.

"It's a long way between then and now."

—Willie Schatz



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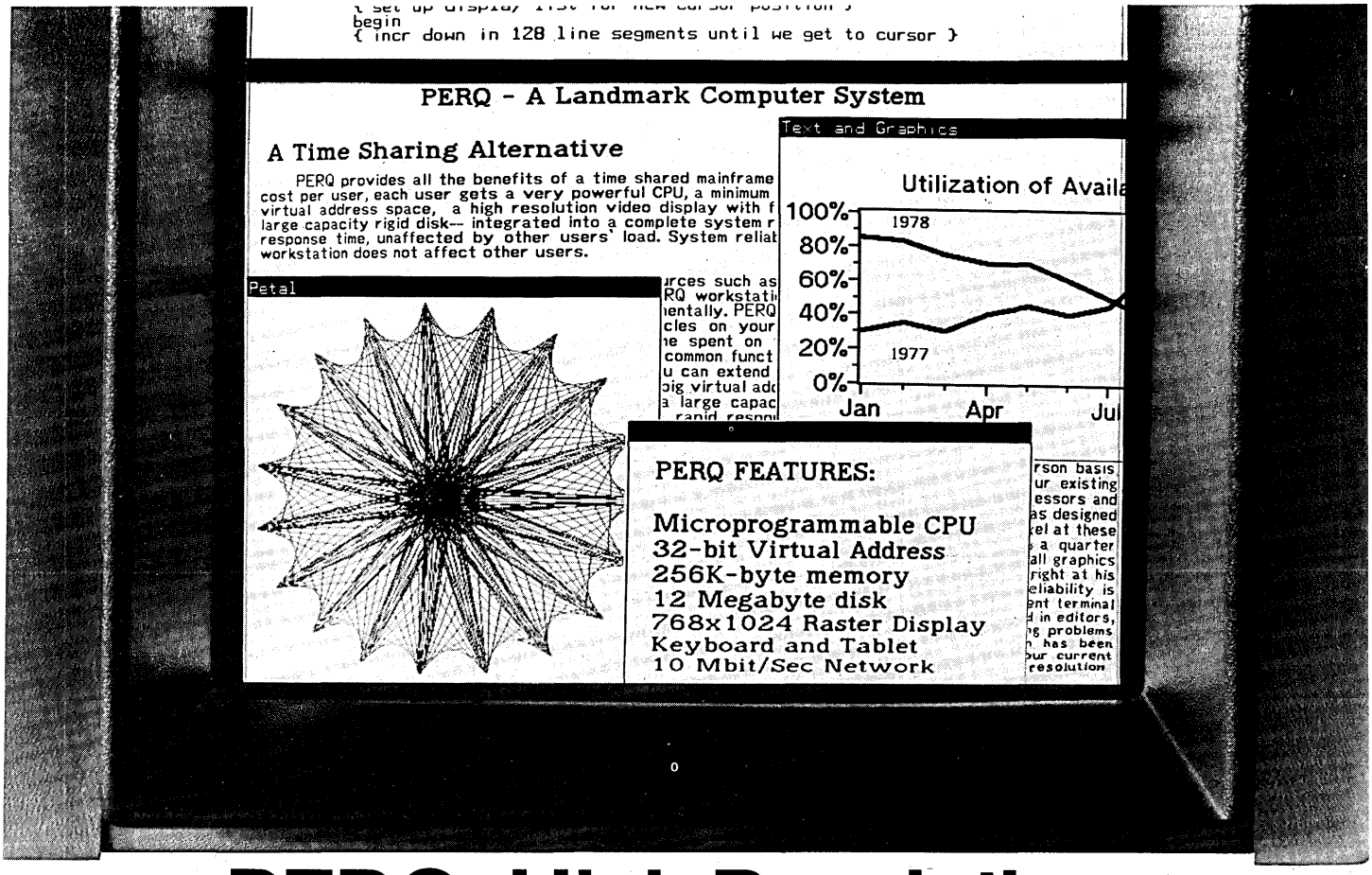
CIRCLE 144 ON READER CARD



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PERQ is all the power you need.

PERQ provides you with a complete single-user system — all the processor, display, disk and memory one person needs, sitting right at his desk. And because PERQ workstations provide complete computing resources on a per-person basis, installations can be expanded incrementally. PERQ's Packet Stream Local Network interconnects PERQ systems in a distributed processing environment, allowing processor-to-processor communication at 10 megabits per second over a single coaxial cable.

PERQ is more powerful than any current microprocessor-based system

PERQ's CPU is a Three Rivers-designed, sophisticated, microprogrammed minicomputer which directly executes Pascal P-Code at up to 1 million P-Codes per second. A 32-bit virtual address means that very large programs can execute with ease. Even PERQ's operating system is written in Pascal, the front-runner in high-level languages for structured programming.

PERQ is leading the revolution against the mainframe.

Across America, PERQ is revolutionizing the way work gets done — because it provides all the benefits of a time-shared mainframe without any of the drawbacks.

OEMs who need low-cost, highly flexible computing systems are choosing PERQ for CAD/CAM workstations, phototypeset applications, business systems and office automation applications.

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CIRCLE 134 ON READER CARD

HARDWARE

OFF-LINE

Texas Instruments now offers a line of master slice logic arrays -- and, quite importantly, supporting design software -- using Schottky transistor logic (STL). Two members of the STL family currently are in production: the TAT008, a 1,008-gate master logic array, and the TAT004, with 540 gates. Nominal internal-array gate performance is given as 2.5-nsec at 600 microwatts. Maximum flip-flop clock frequency is 80MHz. I/O is compatible with low-power Schottky TTL devices. The TAT008 has 108 I/Os, and the TAT004 has 84. Packaging options include DIP, chip-carriers, and 100 mil array of pins. I/O operates at 5 volts, with internal logic operating at 2 volts.

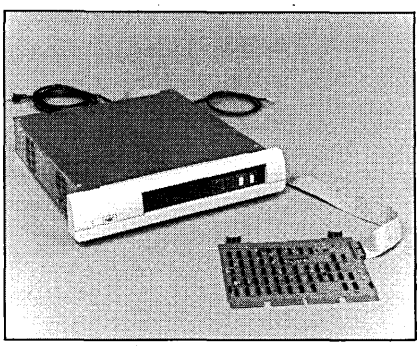
The VLSI components are supported by software that lets the user specify his requirements in two high-level languages provided by TI. Hardware Description Language (HDL) allows description of behavioral and structural information typically found in the function table and logic diagram supplied with common LSI data sheets. A second language, Test Description Language (TDL), describes required inputs and output response characteristics for the desired design. Support is available for TI's Houston facility, and will become available at three Regional Technology Centers (RTCs) this year. The three RTCs will be located in Boston, Chicago, and Los Angeles.

MIT has come up with a three-dimensional display system using a rotating array of LEDs. As the array rotates, different cross sections of the image are displayed in rapid sequence. Tri-Vi Corp., of Flint, Michigan., supported the development of the MIT prototype.

HIGH-SPEED NETWORKING

Last fall, while assembling our special issue for 1980, we learned of Sytek, and its LocalNet data communications system that uses the same co-ax cable as cable television franchisees (and, indeed, can coexist with cable tv programming). The firm was, at that time, introducing its System 20, which can multiplex thousands of 9600bps data streams onto a co-ax link.

Of course, the number of channels on the co-ax is dependent on how you slice



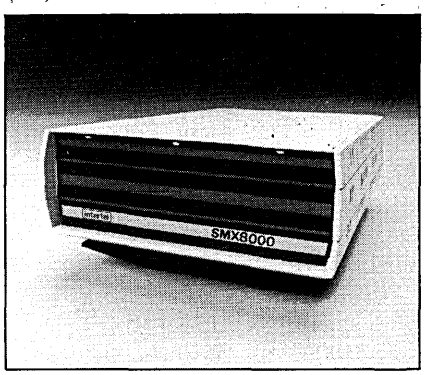
up the bandwidth, and Sytek is back with its System 40, offering higher-speed (1Mbps) channels. Intended primarily to link computers to other computers, the initial System 40 offerings interface to the Unibus used in DEC's 32-bit VAX line and the PDP-11. Standard Network Adapter Units will be compatible with Intel's Multibus.

The System 40 LocalNet can support high-speed packet communications on up to five logical channels. Additionally, it can coexist with System 20 and other transmissions on the same cable. A System 40 bridge can logically connect up to four channels, while the System 40/20 bridge performs speed matching and multiplexing functions linking System 20 and System 40 nodes on the same co-ax. Gateways are offered to other LocalNets as well as external nets, including those adhering to CCITT Recommendation X.25. A System 40 Network Adaptor Unit sells for $8,515 with Multibus compatibility; the VAX/PDP-11 interface is an additional $1,500. The System 40/20 Bridge is $5,800, while the System 40 Bridge has yet to be priced. System 40 uses the same head-end T-Verter as System 20; it is priced at $3,500. SYTEK, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 300 ON READER CARD

STATISTICAL MULTIPLEXOR

Intertel's SMX8000 statistical multiplexor—offered in four- and eight-channel versions—reportedly can multiplex a group of asynchronous devices (having an aggregate data rate of as much as four times the output channel) onto a single high-speed synchronous line. The microprocessor-controlled mux uses an error-correcting full-duplex protocol on the high-speed line, protecting the user against transmission errors. A built-in test pattern generator and a loop-back feature facilitates troubleshooting the complete link, including the high-speed line, local and remote SMX8000s and their



associated asynchronous devices, and the modems. An eight-channel standalone SMX8000 sells for $2,675; the rack-mount version sells for $2,475. INTERTEL, Andover, Mass.

FOR DATA CIRCLE 302 ON READER CARD

MINICOMPUTERS

The Sperry Univac minicomputer family has two new members, the V77-500 and V77-700, augmenting the midrange of the V77 line. The 16-bit microprogrammable minis will be marketed to both end users and oems. Compatible with the remainder of the V77 series made by Sperry Univac's Minicomputer Operations (née Varian Data Machines), both provide software

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CIRCLE 156 ON READER CARD

compatibility with other V77 models as well as field upgradeability. A basic cpu configuration of the V77-500 sells for $29,500, while a basic V77-700 goes for $36,100. Both can be used as nodes in distributed processing networks, where they can function within Sperry Univac's Distributed Communications Architecture (DCA). Operating with a remote IBM host, the minis can support 3270s.

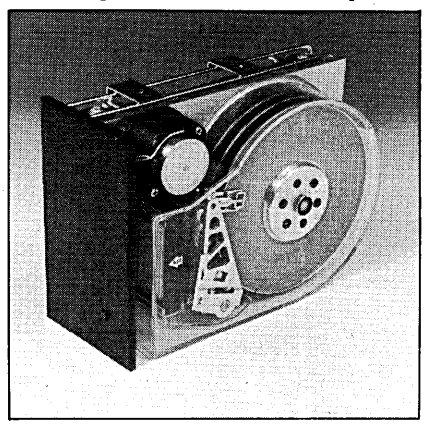
Both processors sport hardware multiply and divide, memory mapping and control, and error detecting and correcting memory—up to 1MB on the V77-500 and 2MB on the V77-700. Optional writable control store (2K 48-bit words) can be added to either processor. The V77-700 also supports an optional floating point processor to speed execution of FORTRAN programs.

As with other members of the V77 family, the two new machines run under the VORTEX II operating system. Programming languages offered include FORTRAN IV, COBOL, RPG II, and both micro and macro assemblers. Shipments are to begin this month. SPERRY UNIVAC MINICOMPUTER OPERATIONS, Irvine, Calif.

FOR DATA CIRCLE 304 ON READER CARD

5¼ INCH WINCHESTER

Shugart Associates has entered the 5.25 inch Winchester disk drive market with a family of three drives with formatted capacities ranging from 2.6MB to 7.8MB. The SA600 family has the same physical mounting and DC power requirements as Shugart's existing Minifloppy line, and it offers two interfacing choices. One choice is pin-out



compatible with the Minifloppy line, allowing both rigid and floppy drives to interface via the same control lines. The other interfacing choice is said to be compatible with other 5.25 inch Winchesters already on the market.

The three drives differ in capacity and in the number of platters they contain: the SA602 has a single platter and a capacity of 2.6MB formatted (3.33MB unformatted), the dual-platter SA604 has a formatted capacity of 5.2MB (6.66MB unformatted), and the SA606 uses three platters for a formatted capacity of 7.8MB (10MB unformatted). All three drives have an average access time of 75msec (160msec maximum), transfer rates of 4.34Mbps (the same as Shugart's SA1000 8 inch Winchester), and a track-to-track access time of 18msec. Deliveries are slated to begin in the third quarter, with prices starting at $760 a unit in lots of 500 or more. SHUGART ASSOCIATES, Sunnyvale, Calif.

FOR DATA CIRCLE 320 ON READER CARD

TOUCH-SENSITIVE DISPLAY

The VuePoint is a touch-sensitive plasma display terminal with a microprocessor-based controller. The display's format is 12 lines of 40 characters, with 240 touch-sensitive points on the screen. The controller can store up to 51 pages of data; it communicates with a computer via an RS232 interface at data rates ranging from 300bps to 19.2Kbps. Options include a 40 character per line printer and a 128 character ASCII keyboard. Pricing starts at $3,500 with quantity discounts available for orders of 10 or more units. GENERAL DIGITAL CORP., East Hartford, Conn.

FOR DATA CIRCLE 305 ON READER CARD

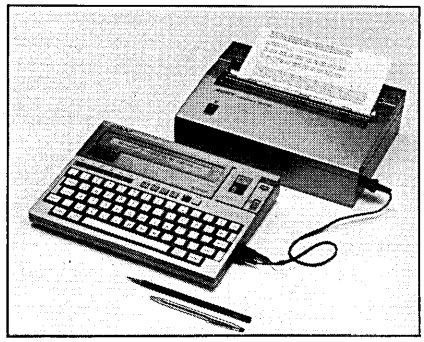
INSTANT COLOR FILM

For computer imaging (not to mention professional photography, Polaroid Corp. has come up with an extended range color instant print film called Polacolor ER. Available in two formats, 8 × 10 and 5 × 4, the film uses new chemistry and a new magenta dye that are said to provide increased exposure latitude and improved color rendition. The film produces prints in as little as 60 seconds, and can handle image brightness contrast ranges of roughly 5.5 f-stops (1:48). Developing at room temperature for 60 seconds produces an image of low contrast with color curves closely matching professional studio photographer

HARDWARE SPOTLIGHT

WORD PROCESSING

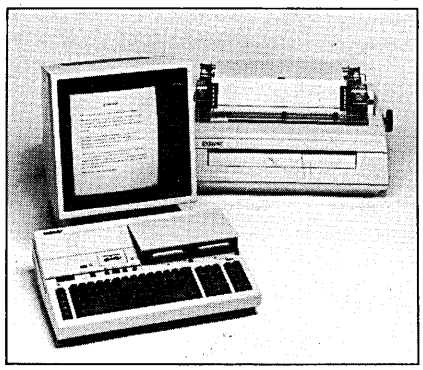
Sony—probably best known for its consumer electronics—recently made its entry into the word processing market with standalone word processor and a radical enhancement to the current state of the art in source document creation. The Sony Typecorder can perhaps best be compared to the old IBM MTST (magnetic tape Selectric typewriter), dating back to the summer of 1964. Not in size or technology, but it's not at all un-



reasonable to suspect that the Typecorder of today—a three-pound, self-contained, electronic editing typewriter (using a 40 character LCD instead of paper), with magnetic tape for storing documents—will evolve into an entirely new generation of high-technology smart typewriter-equivalents. The size of a standard piece of typing paper and only 1.5 inches deep, the Typecorder has a full-size keyboard, 2KB of internal buffer memory, microprocessor-controlled editing functions, and a dual-function microcassette recorder that can be used for dictation and transcription (voice) or storing up to 120 pages of text. Because of the sequential nature of tape, the unit lacks fancy text processing functions such as block moves. It can operate on either batteries or house current. The basic unit sells for roughly $1,400. An RS232 interface is optional.

To get hardcopy from the Typecorder, Sony also introduced an Actuator Unit that fits over the keyboard of a standard electric typewriter, punching keys in tune to the tape ($700). The Japanese giant also introduced its portable Silent Compact Printer ($800), which uses a thermal print head. This printer can use thermal paper or, with a special film ribbon, plain paper.

Tapes of text created on the Typecorder can be read into the Sony Series 35 word processing system. The standalone word processor has a full-page display (said to have the highest resolution of any available on the market today), and two Sony-developed 3.5 inch microfloppy disk units (each capable of storing 437.5KB—that's not a typo; it really is close to half a meg).



The unit also can be had with a 40 character LCD in place of the full-page display. The software-based system boots itself from diskette at power-up. With a 55cps letter quality printer and dual disk drives, the unit's pricing starts around $9,000.

Sony also plans to oem the microfloppy drives, although pricing has yet to be determined. A company spokesman said they will be competitive with currently available diskette drives. SONY CORP. OF AMERICA, New York, N.Y.

FOR DATA CIRCLE 301 ON READER CARD

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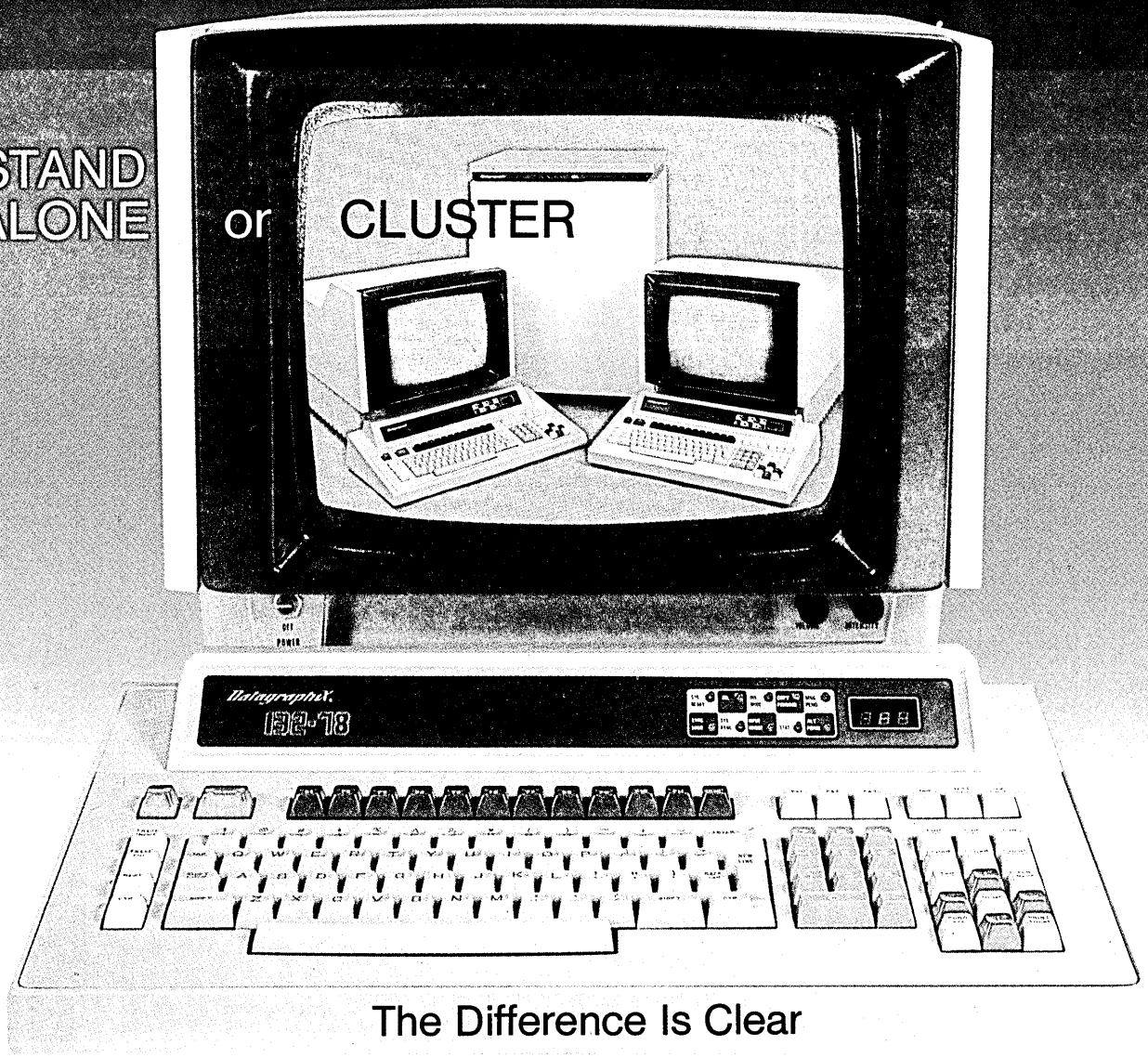

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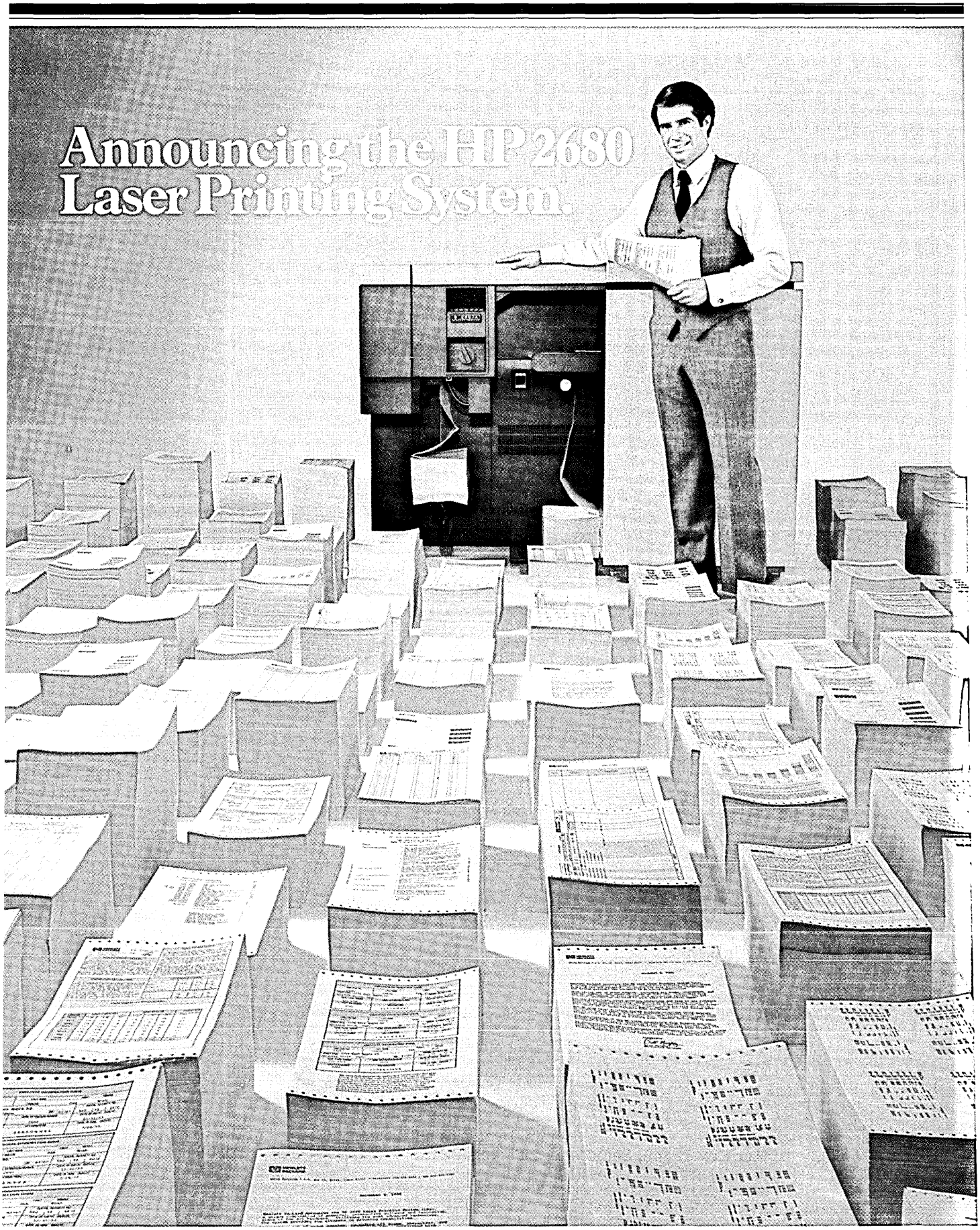

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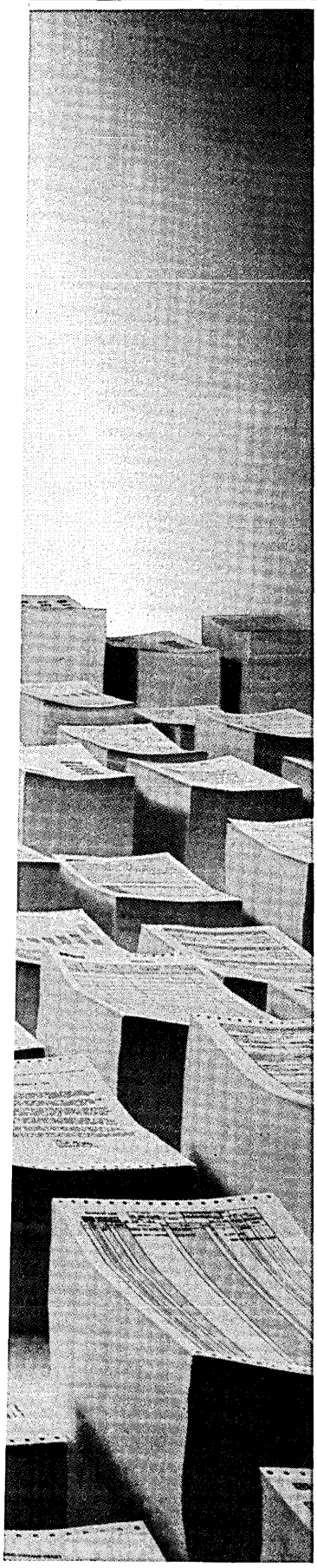

With its own intelligence and our HP 3000 computer behind it (including the powerful new Series 44), our new Laser Printing System takes information directly from your data base, formats it exactly the way your users want, and prints it out on manageable, "people-sized" paper. Reports. Letters. Documents. And every one an original.

Software for creative writing.

The 2680's two interactive software packages let you design your own characters, symbols and logos, and format them any way you like on a familiar 8½" x 11" page: with windowing, scaling, shading and zooming. You can even reduce the print size to get four logical pages on a single sheet. Or rotate the forms 90° so your Z-fold output reads like a book. Then, simply tell the computer what data you want on the forms, and the 2680 does the rest—including monitoring and correcting its own print quality!

Handle less paper. Handle more information.

Think of it—with fewer pre-printed forms to stock, the 2680 dramatically reduces purchasing and inventory expenses (and the paperwork that goes with them!). And that means fewer chances for costly printing or delivery delays when you want to change the forms you're using. Add to that what you'll save on copying and reducing costs, and you'll find that the system pays for itself before you know it.

When you're ready to expand, our advanced networking software lets you send information to an HP 3000 anywhere in the world, where a local 2680 can print out your data. (As originals, of course.) And with data base management and other software features, the 2680/3000 can be a powerful part of your entire information processing system, including connections to your mainframe.

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CIRCLE 173 ON READER CARD

46001HPB5

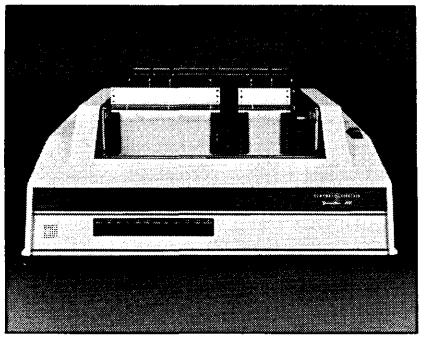
HARDWARE

films; allowing the film to develop for 75 seconds yields a slightly higher density. Polacolor ER Type 809 (8 × 10) comes in boxes of 10 exposures and carries a suggested list price of $71 per box. Four-by-five format Type 59 comes in 20 exposure boxes, listing at $42.75 per box. POLAROID CORP., Cambridge, Mass.

FOR DATA CIRCLE 307 ON READER CARD

PRINTER

General Electric has added a split-platen printer to its TermiNet 200 series of dot matrix impact printers. The printer can operate at up to 200cps, accepting data at strap-se-



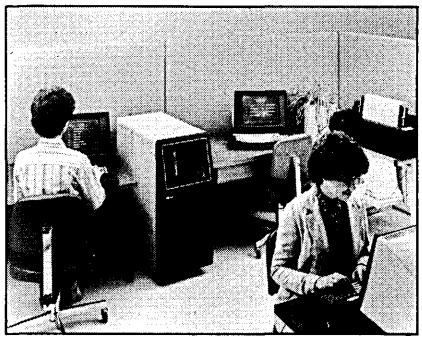
lected data rates ranging from 110bps to 9600/bps; a 2KB input buffer is available as an option. Interfacing is RS232. The printer's split platen uses a pair of independent tractors, each with its own servomotor, allowing different forms lengths of from one to 199 lines. Up to nine-part forms can be accommodated. The left platen accepts forms ranging in width from two inches to 8½ inches; the right handles those from two inches to 4½ inches. End user quantity one pricing for the split platen TermiNet 200 is $3,895, with deliveries ranging from eight to 10 weeks ARO. The terminals will be built to order, according to a GE spokesman, not warehoused. GENERAL ELECTRIC CO., Data Communications Products Business Dept., Waynesboro, Va.

FOR DATA CIRCLE 306 ON READER CARD

DISTRIBUTED PROCESSING SYSTEM

Seeing two-thirds of the distributed processing market—by units—going to systems with fewer than 12 terminals, Northern Telecom has developed its largest system to date, the Model 585, which the firm targets directly at the segment with seven to 11 terminals per system. The 585, which can handle up to 16 workstations and printers, extends the company's potential market and brings it into direct competition with smaller HP 3000s and IBM 8100s, as well as members of Texas Instrument's 990 series and potentially some offerings from Datapoint and Four Phase, according to Northern Telecom's analysis of the market.

The 585 uses a new processor that can support from 128KB to 512KB of main memory and a maximum of 342MB of disk. Compared to the company's previous top-of-the-line Model 445, the 585 is said to have twice the throughput (and twice the memory capacity). After going through a



lengthy make/buy study, Northern Telecom went ahead and developed its own eight-inch Winchester disk for the 585. The disk is made in 11MB and 22MB (formatted) capacities, and includes an itegral 15MB cartridge tape for backup.

In addition to the main processor, the 585 off-loads I/O functions into separate processors in each peripheral controller. The 585 can use peripherals and software originally developed for the smaller 405, 435, and 445 systems, and it can be connected via the coaxial cable Omnilink to other 585s or to the smaller systems. Up to

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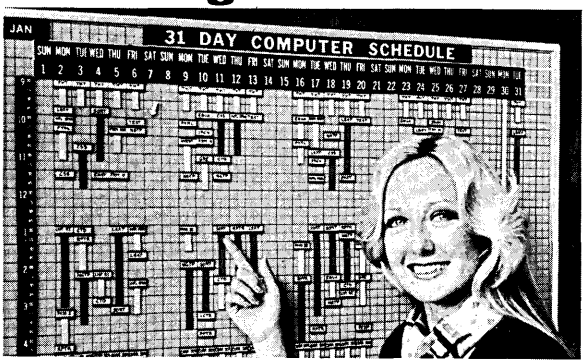

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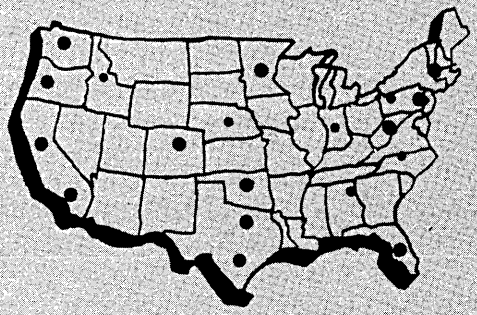

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TEC also offers an array of options to make the 630 even more attractive to you, some of which are tilt/swivel terminal base, 96 character limited graphics set, composite video output, 2, 4, or 8 pages of memory with paging or scrolling.

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nine systems can participate in a local Omnilink network, sharing files and peripherals. Omnilink reportedly is being enhanced to allow 3270 access. The 585 also supports 3270 pass-through applications. A variety of communications protocols are supported by the 585, including async, bisync, and SDLC. Emulators allow communications with machines from IBM, CDC, and Burroughs.

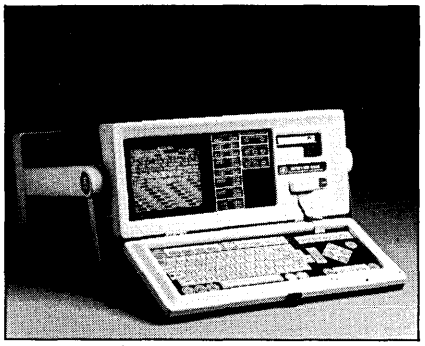
The 585 can be programmed in Northern Telecom's proprietary TAL 2000 language or in COBOL. Its operating system can handle up to 32 concurrent tasks. For word processing, the firm offers its Omniword software package.

A Model 585, with 11MB of disk, cartridge tape, 256KB of main memory, four workstations, a printer, and a communications adaptor, sells for $49,600. The same system can be leased for $1,966 per month for one year or $1,573 per month for three years. Deliveries are to begin in May. NORTHERN TELECOM, INC., Electronic Office Systems, Nashville, Tenn.

FOR DATA CIRCLE 308 ON READER CARD

COMMUNICATIONS TESTER

Atlantic Research Corp.'s Interview 4500 is that firm's latest test system for data communications protocol diagnostics. The 4500 can check out packet protocols and SNA, and includes capabilities for detailed frame analysis of SDLC and HDLC traffic. The standard tester also works with BSC and asynchronous protocols, and handles a variety of character codes, including EBCDIC and ASCII. An integral cartridge tape drive is



used to store and load test programs as well as capture data traffic frome the line under test.

Interview 4500 uses a "simultaneous trigger technique," allowing the user to specify up to eight conditions (e.g., timeouts, receiving a specified character string) and actions, such as sending a message, controlling timers or counters, sounding an alarm, or reformatting the display to enhance or suppress data.

The tester can be used to emulate hosts, terminals, and nodes as well as monitoring network performance. Up to 600KB of traffic can be captured and stored on a single data cartridge. An option 1 megabit capture memory is available for recording high-speed data streams (up to 72 Kbps). The Interview 4500 can be rack-mounted or purchased as a portable unit. It sells for $14,500. Existing Interview 3500s can be upgraded for $5,000. ATLANTIC RESEARCH CORP., Alexandria, Va.

FOR DATA CIRCLE 309 ON READER CARD

PERSONAL COMPUTING

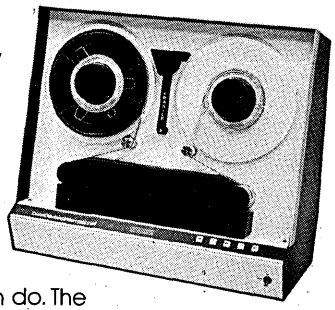
Additional peripheral support, more memory for its top-of-the-line pocket programmable calculator, and a new entry-level configuration of its personal professional computer were all announced by Hewlett-Packard's Corvallis Div. at the recent Consumer Electronics Show in Las Vegas. More software offerings and a "custom calculator" marketing effort put the icing on the cake.

Users of the Desktop Series 80 personal computers now can enter graphics via the HP 9111A Graphics Tablet. The digitizer transfers pen tracings from the tablet's surface onto the computer's screen and into its memory. The tablet lists for $1,950.

A parallel Printer Interface, also for the Series 80, allows connection of low-cost printers. The interface sells for $295.

The new top of the line in HP's programmable pocket calculator family is the HP-41CV. That "V" suffix is a Roman

In by 8:00:00 Out by 8:02:40.



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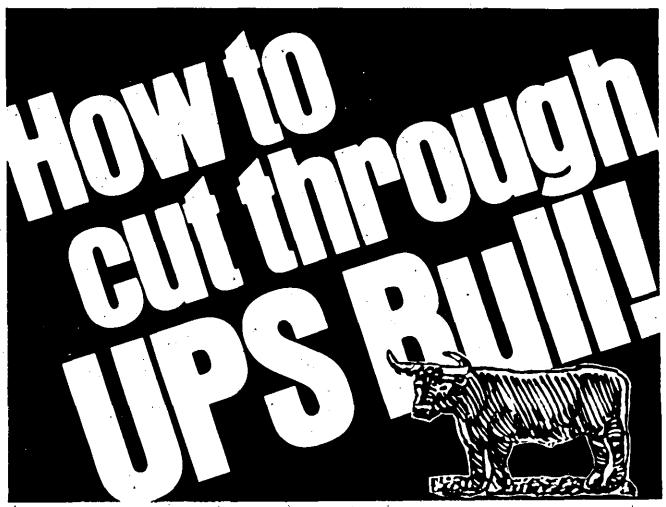

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The IBM 6670 Information Distributor takes the leg work out of paper work.

Instead of running from the printer to the copier, now word processing operators can save time and make prints without ever leaving their desk.

That's because the IBM 6670 has communications capabilities which can connect with many word processors.

So, not only does our system eliminate a lot of walking, but it also eliminates the need for individual printers.

And since the IBM 6670 prints with a laser, each copy is of original typewriter-like quality.

It can print on one or both sides of your paper. As well as collate your work—electronically.

For special emphasis, it can reformat your documents. And offers up to 4 type-styles per page.

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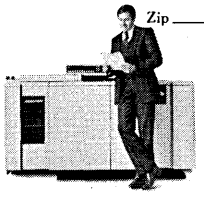

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REPRODUCTION SERVICES

CIRCLE 183 ON READER CARD

numeral, representing the fivefold memory increase over the existing HP-41C; the 41CV's memory can store up to 2,000 program lines or more than 300 pieces of data (or a combination of the two). The 41CV lists for $325. If you've already got a 41C, don't despair—HP also announced a "super memory module" that plugs into one of the four "ports" on the back of the calculator, providing a fourfold memory increment (over its internal memory), and thus the same total memory as the 41CV. This Quad Memory lists at $95, and the 41C's price has been reduced to $250. HP also announced reduced prices for its 32E and 32C calculators, and packaged prices for 41s and peripherals purchased at the same time.

HP's new entry-level personal computer, the HP-83, is identical to the HP-85 introduced little more than a year ago, except that it is configured sans integral thermal printer and cartridge tape drive. In dropping the two I/O DEVICES, HP also cut the price by $1,000: the HP-83 lists for $2,250. HP is aiming the 83 at those who want a disk-based system and their own choice of external printer—aside from lacking integrated peripherals, the HP-83 is the same BASIC-speaking personal computer with graphics capabilities as the HP-85.

HP has drawn a bead on the business market, offering the widely acclaimed VisiCalc developed by Personal Software (computer dealers have told us that package has been responsible for selling entire systems). HP's version, dubbed VisiCalc PLUS, is an enhanced implementation of the dynamic electronic spreadsheet package, with capabilities for producing four-color charts and graphs of VisiCalc tables. VisiCalc PLUS sells for $200.

An Information Management Pac, priced at $200, provides database management functions, including searching and sorting, as well as report and graphics generation. A Graphics Presentation Pac, also priced at $200, produces four-color charts for overhead projection or incorporation into reports. Bar, pie, and line charts can be created, and annotated with three different character sets. A Data Communications Pac, priced around $200, lets a Series 80 computer function as an intelligent asynchronous terminal operating over either a direct line or through a modem at transmission speeds ranging from 300bps to 9600bps.

For software developers—not end users—HP has released a System Monitor, allowing development and debugging of assembly language code. An Advanced Programming ROM containing additional BASIC commands and a plug-in drawer for EPROMs has also been released to software package developers.

The Custom Calculator marketing effort lets those with specific applications—such as aircraft navigation or investment analysis—buy HP-41s with their code burnt into the calculator. HP completes the customization with application-specific labeling of the keyboard, and the purchaser's logo. Beech Aircraft and International Diamond Corp. are two companies currently taking advantage of the program. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 310 ON READER CARD

GSD'S LATEST

IBM's General Systems Div. launched a raft of products and enhancements, including two new processors in the Series/1 family, a new communications controller that allows S/1 minis to participate in local ring networks, new printers, additional communications facilities for the System/38, and enhancements to the 5280 Distributed Data System.

The Series/1 now has both a new top-of-the-line processor and a new entry-level processor (with an integrated floppy disk drive). At the top, the IBM 4955 Model F supports twice as much main memory as any of its predecessors—512KB. The low-end 4952 Model C can accommodate up to

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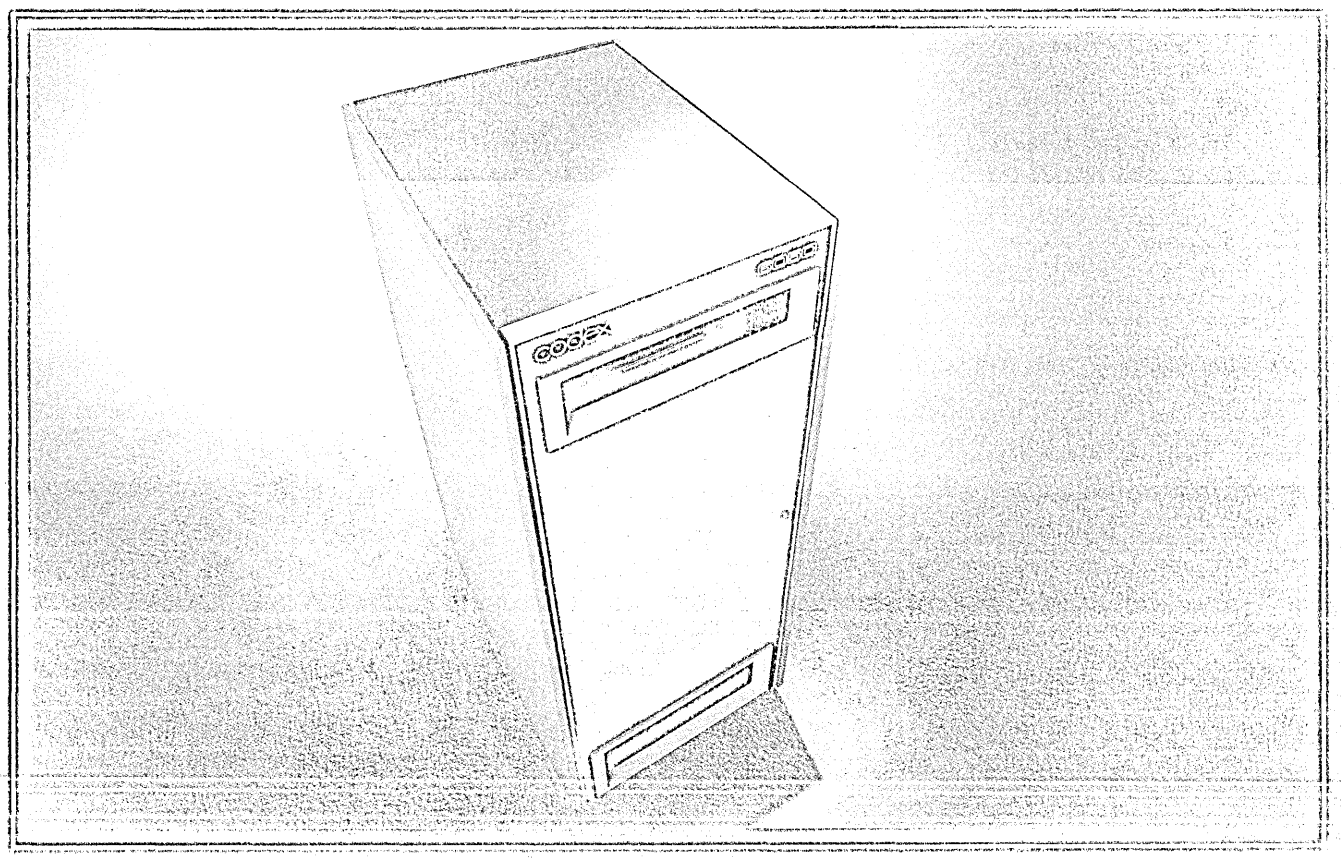

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CIRCLE 181 ON READER CARD

See us at Interface 181

128KB of main memory. An IBM spokesman says that, all things considered, the 4955 Model C has about a threefold processing advantage over the 4952 Model C. Prices range from $8,500 to $11,550. Four printers, the 4975 line, offer print speeds ranging from 40cps to 160cps. Models can be had for both local and remote attachment, and two of the printers are software-switchable from draft- to letter-quality printing. Prices range from $2,500 to $3,650.

FOR DATA CIRCLE 311 ON READER CARD

Equipping each S.1 with the Series/1 Local Communications Controller allows each to function as a node in a peer-to-peer local ring network. The network uses co-ax cable for links up to 2,000 feet, and twin-ax for links to 5,000 feet. Communications are full-duplex and allow the various nodes to access common files and resources. Each unit can send messages to any other unit on the ring, as well as being able to broadcast messages to any or all nodes (under user program control). The Local Communications Controller sells for $3,825.

New Communications Monitor software—carrying a one-time charge of $5,280—handles the flow of messages between devices and processors in an S/1-controlled network. An enhancement, the monitor reportedly provides all the functions of the earlier release and adds new device support, a high-level language interface, and other features. RPS/SNA Extended Support, a separate licensed program ($2,784 one-time fee) provides Series/1 applications with a GET/PUT level interface to IMS/VS and CICS/VS applications on the host. The RPS/Multiple Terminal Manager Version 2 adds 3270 emulation upstream to a host and terminal support for the 3270 and 3101 full screen terminals. For a development system, there is a one-time charge of $15,000. No additional license is needed for execution systems.

FOR DATA CIRCLE 312 ON READER CARD

COBOL for both EDX and RPS systems is now at Version 2, offering LINAGE support, logical connectives, and blocking of relative files, for a one-time charge of $4,512. RPS and EDX have a new (one-time charge of $1,440) Indexed Access Method, which adds multiple secondary index support, a data paging function, and enhanced utility functions to the capabilities of the earlier release.

FOR DATA CIRCLE 313 ON READER CARD

The IBM 5520 Administrative System got a new letter quality printer, the 5219. Two models are offered, with maximum burst speeds of 40cps and 60cps (printing at 10 pitch). The bidirectional impact printers can be fed continuous forms, or sheet paper with an optional dual-drawer feeder. Ten type wheels, packaged in drop-in cartridges, are offered. Proportional spacing as well as 10-, 12-, and 15-pitch horizontal spacing are features of the 5219. Prices range from $5,050 to $5,450.

FOR DATA CIRCLE 314 ON READER CARD

System/38 got its share of attention in the form of a new printer, additional communications support, and enhanced software offerings. The 3203 Model 5 prints up to 1,200 lpm, and features a power stacker. Two of these printers can be attached to a S/38. The printer, with attachment, leases for $1,545 per month, rents for $1,731 per month, and sells for $41,050.

FOR DATA CIRCLE 315 ON READER CARD

The S/38 also got a promise of bisync communications support, deliverable in February of next year. BSC support will allow COBOL and RPG III programs on a S/38 to send and receive data from a variety of terminals as well as other IBM computers (ranging from the aging System/3 through the 3081 mainframe).

BSC leases for $75 per month, rents for $86 a month, or can be purchased for $2,925. A second communications attachment and two more workstation controllers also were announced for the S/38. All double the number of devices previously attachable to an S/38: to eight lines from four on

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CIRCLE 179 ON READER CARD

the communications attachment, and up to 80 IBM 5250 Information Display System devices on the workstation controllers. Prices for the new equipment are the same as for their predecessors. The communications attachment sells for $780, and the workstation controller goes for $5,070.

FOR DATA CIRCLE 316 ON READER CARD

System/38 software also received enhancement. The Interactive Data Base Utilities (IDU) were upgraded. A new Source Entry Utility (SEU) user interface is said to have additional functions as well as being easier to use. The IDU also picked up a Screen Design Aid (SDA) for designing and maintaining screen layouts, application menus, and Control Language programs for executing the menus. A Log Recovery feature has been added to the S/38 Data Base Logging function, freeing users from the need to develop and implement their own logging and recovery procedures. Finally, the list of software offerings includes a System/34 to System/38 Conversion Aid, to help current S/34 users migrate applications to the S/38. The Conversion Aid carries a one-time charge of $1,300; the enhanced IDU goes for $65 a month, and the S/38 Log Recovery feature is $50 per month.

FOR DATA CIRCLE 317 ON READER CARD

In the 5280 Distributed Data System product line, IBM introduced a new printer, controllers with additional memory, and 3270 communications emulation. The 5224 impact matrix printer works with both 5280s and S/34s, providing standard 10cpi printing and compressed 15cpi operation. Two models are offered, one printing at 140 lpm and the other at 240 lpm (both measured at 10cpi). The 5224 Model 1 leases for $237 per month and sells for $6,150. The 5224 Model 2 goes for $270 a month on lease and $7,000 for purchase.

The 5285 Programmable Data Station and the 5286 Dual Programmable Data Station have had their maximum memory capacity increased by 50%, to 96KB from 64KB. The 5288 Programmable Control Unit—which had a maximum memory size of 160KB—can now be had with 224KB or slightly over 288KB. The 5285 is offered in five models ranging in price from $6,730 to $9,015. There are two models of the 5286, ranging in price from $8,620 to $9,870. Prices from $9,855 to $16,695 span the 28 models of the 5288.

The IBM 5280-3270 Emulation Licensed Program lets 5285 and 5286 terminals communicate as 3270s to a host under SNA or bisync protocols. The program carries a monthly charge of $35. INTERNATIONAL BUSINESS MACHINES CORP., General Systems Div., Atlanta, Ga.

FOR DATA CIRCLE 319 ON READER CARD

CRT TERMINAL

The TAB 132/15 seemingly derives its name from its ability to display 132-character lines on its 15 inch screen. The upper and lower case ASCII editing terminal, developed by Tab Products' Office Products Group, can operate in either 80 column or 132 column mode; screen-labeled softkeys and English language prompts help the operator set operating modes. Softkeys also can be programmed by the user.

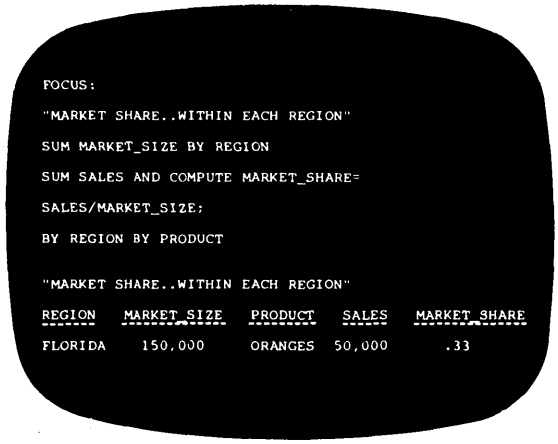
The terminal, which can display true descenders on lower case letters, can transmit a character at a time, line at a time, partial or full page, or all four pages of display memory provided in the standard unit. Protected fields can be transmitted, if desired. Character attributes are available, including bold, blinking, and reverse video. An RS232 interface is standard, supporting communications at speeds of up to 19.2Kbps. A printer port and a second RS232 interface are offered as options. The 132/15 also offers bidirection smooth or jump scrolling, horizontal panning, horizontal split-screen operation, and a status line. A basic 132/15 sells for $2,450, quantity one. TAB PRODUCTS CO., Electronic Office Products Group, Palo Alto, Calif.

FOR DATA CIRCLE 303 ON READER CARD

FOCUS: The English-language information control system.

FOCUS is a high-level, English-language software system for on-line report writing, applications development and data base management.

FOCUS can develop complete applications faster than any other system available. Non-programmers using FOCUS can learn to make basic queries within hours and write ad hoc or formatted reports in a day. Systems designers can write complex self-documenting applications in up to one-tenth the time required by procedural languages. Either way, FOCUS eliminates data production bottlenecks.



Using relational file structures to link individual data fields in separate files, FOCUS reduces data redundancy and data file dependence. Whether you use FOCUS data bases or your own existing files — such as IMS, IDMS, VSAM, and ISAM — the same English-language report writer is available. FOCUS operates in an interactive environment (CMS/TSO/CICS) on IBM 370, 4300, or equivalent mainframes.

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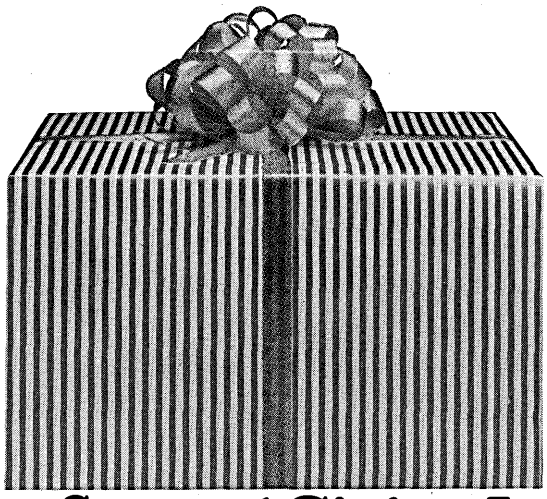

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SOFTWARE AND SERVICES

UPDATES

The System 2000/80 Multi-User database management system has completed a successful beta test under VM/370 CMS, reports Intel's Commercial Systems Div. (formerly MRI), developers of the database system. The test was completed at ECRI, a medical equipment research firm in Pennsylvania. Intel sees VM/CMS (Conversational Monitor System) gaining increased acceptance, particularly in the 4300 sector.

The SEED database management system user's group, called the Grange, held its first meeting in Philadelphia shortly before year's end. The organizational meeting drew more than 50 users. A group of four members was named as an interim committee of the Grange, with responsibilities of drafting working guidelines and objectives for presentation at the next users' meeting, slated for May on the West Coast.

Data General began shipping its AOS/VS software to users of its 32 bit Eclipse MV/8000 three months ahead of schedule. Encouraged by positive feedback from its five beta sites, DG began shipping the MV/8000 operating system, FORTRAN 77, PL/1, BASIC, Macro Assembler, and the SWAT source language debugger.

Thomson-CSF, the large, diversified French electronics manufacturer, has signed a distribution agreement with 3M, giving the Minnesota company distribution rights for a desktop facsimile machine developed by Thomson-CSF. The machine complies with CCITT recommendations for Group 2 and the recently finalized Group 3 specifications for high-speed digital facsimile communications.

OPERATING SYSTEM

Texas Instruments now offers a new operating system, DNOS, and an enhanced COBOL compiler for its DS990 series of computers. DNOS—the Distributed Network Operating System—reportedly combines the strengths of the existing DX10 operating system with a "flexible job architecture." TI says that DNOS will form the basis for networking support using bit-oriented protocols—an apparent allusion to SDLC and X.25. DNOS requires a DS990 Model 8, 20, or 30 with at least 256KB of memory. Users of these systems can get job accounting from DNOS plus improved use of system resources through such features as prioritized output spooling, multivolume files, interprocess communication, job and task synchronization, and increased terminal support for time-sharing. Upward compatible from DX10, DNOS error messages are stored in files, allowing the user to customize messages as appropriate for the application. Supplied on mag tape, DNOS is priced at $4,000, including the first year's support.

DNOS supports COBOL and Pascal; programs developed under DX10 require only relinking to run under DNOS. Data files are compatible between the two operating systems. COBOL Plus is a faster version of COBOL 3.3.0's run-time interpreter. It runs only under DNOS, and exploits the writable control store of the 990/12 processor to achieve a 10% to 20% average speed improvement. The language is identical to the existing COBOL, and existing object modules can link with COBOL Plus programs. COBOL Plus carries a $2,000 price tag. TEXAS INSTRUMENTS, INC., Austin, Texas.

FOR DATA CIRCLE 327 ON READER CARD

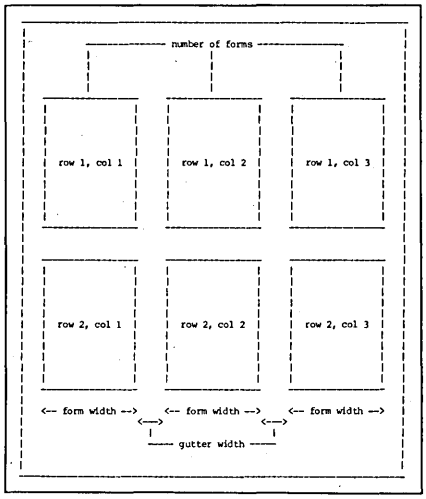
C CROSS-COMPILER

The C68 cross-compiler runs under the UNIX operating system on PDP-11s, producing object code for the 16 bit Motorola 68000 microprocessor. Comprising a preprocessor, compiler, relocatable assembler, linking loader, support library and utilities, the C68 package can produce object code that can execute standalone or under control of an operating system on the target 68000 system. The compiler generates assembly language code, which is then processed by the assembler, producing relocatable object code. The linking loader then combines object code files with any referenced library functions, creating an executable object file, including symbol table. Getting the executable file from the host PDP-11 to the 68000 is simplified through the use of a utility program that sends the object file over a serial communications line in a format acceptable by the MACSBUG loader. A single cpu binary license goes for $950. Standard distribution media for the C68 package is 9 track mag tape. ALCYON CORP., San Diego, Calif.

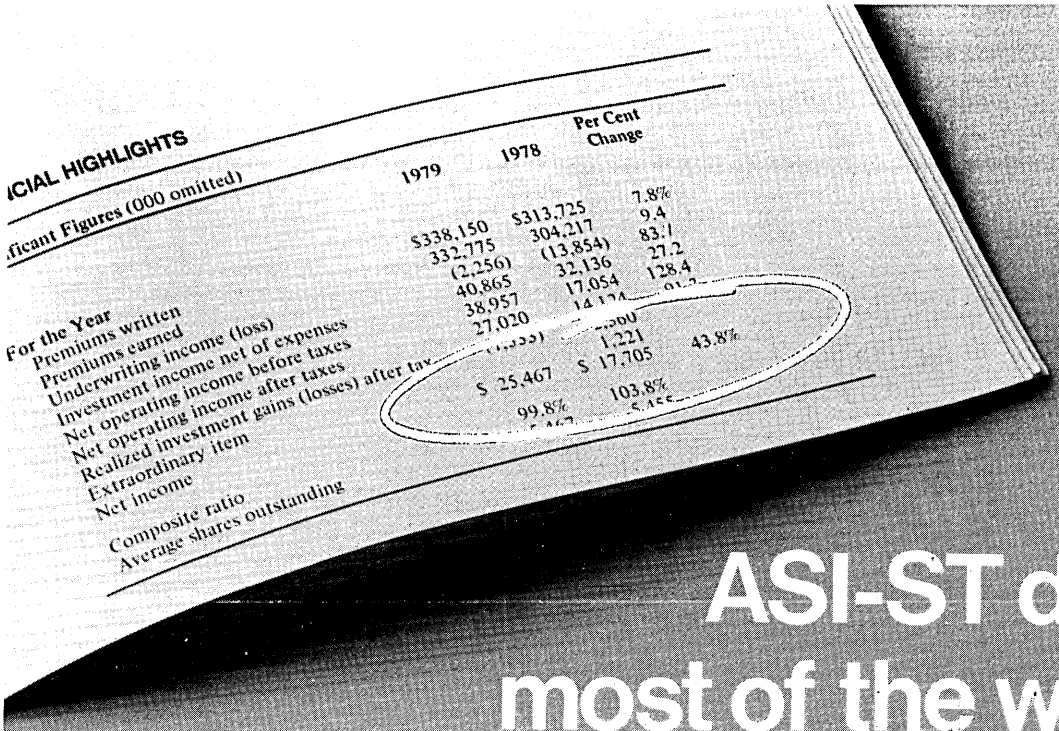
FOR DATA CIRCLE 328 ON READER CARD

OUTPUT FORMATTER

The n-Up Output Generator, which runs under OS or MVS, is such an elegant program that we're surprised we haven't seen something similar until now. Instead of requiring applications programmers to go through the



drudge work of formatting output for n-up printing (i.e., several forms horizontally spaced across the page), the n-Up Output Generator acts as a post-processor, reformatting output files from any application program. In addition to saving programmer



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CIRCLE 186 ON READER CARD

time, printing several forms side by side should reduce printing time. Printing parameters are set to default values for each installation, but can be altered when the n-Up Output Generator starts. Collating sequences can be protected by the program's ability to print the output in row or column sequence. It leases for $120 per month, including maintenance. Multiple processors at the same address are covered by a single license agreement, and a copyright release is granted so the documentation can be reproduced for internal use. APPLIED SOFTWARE, INC., Palm Beach Gardens, Fla.

FOR DATA CIRCLE 326 ON READER CARD

S/34 DOCUMENTATION

Mann Data Corp. does custom programming, much of it troubleshooting System/34 applications. In the course of this work, it developed a S/34 documentation package, which has been used internally for several years. Now, the firm has decided to offer the System/34 documentation package to others for $1,200.

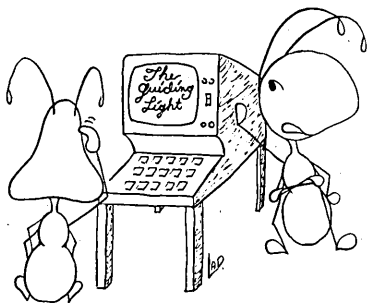
The package is inserted into the job stream along with the programs to be documented. It generates 12 reports, including a table of contents, descriptions of procedures, files, and programs, screen/program cross-reference, procedure/program cross-reference, "exploded" procedures showing the files used, and a report layout showing titles and format. And, of course, the package can be rerun whenever program modifications are made, keeping the documentation up-to-date. MANN DATA, INC., Newton Upper Falls, Mass.

FOR DATA CIRCLE 329 ON READER CARD

SCREEN FORMATTING

Sperry Univac has added the Display Processing System (DPS) to its software offerings for the 1100 series mainframes. DPS 1100 helps users interactively develop input and output screen formats, and provides a screen-handling interface to applications programs. Actual screen design is performed at the terminal, with the user entering formats and field attributes. A tutorial mode, for novice users, provides prompts and explanations on how to create or revise a screen. Application programs can use prestored screens created by DPS 1100 by calling the screen handler and providing the screen's identifier. The screen handler takes care of displaying the screen format, accepting and validating the input, and passing the resulting data back to the calling program. The DPS screen handler functions in a transaction system such as the Series 1100 Transaction Interface Package (TIP), or in interactive mode, using the Conversational Timesharing System (CTS). DPS 1100 supports additional features, such as password protection for screens and fields and the creation and controlled access to multipage screens. DPS 1100 carries a monthly fee of $250. SPERRY UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 330 ON READER CARD



"I think we're going to have problems sharing lines with CBS."

©DATAMATION

CARTOON BY TOPOLSKY

SOFTWARE SPOTLIGHT

APPLICATION DEVELOPMENT

Ever have one of those weeks (or months) when you wished the days had 48 hours, just so you could keep up with your workload? Yet the poor user departments can't understand why, if the computer is so fast, it takes so long for the dp department to bring up a new application. Even hiring more programmers, when you find them and find the money in the budget, doesn't seem to help all that much. In introducing its new application development system, Series 80 Mantis, Cincom president Thomas M. Nies drew an analogy between programming and manual labor—hiring more ditchdiggers may get the job done a bit faster, but buying a steam shovel will have far more impact.

Mantis is Cincom's "steam shovel" for program development. Here, Nies' analogy breaks down—a steam shovel requires a skilled operator, while Mantis is an attempt to simplify on-line program development, increase the productivity of professional programmers, and hopefully simplify the task so intelligent end users can build systems as needed. Mantis comprises capabilities for screen and file definition and interaction, processing, and generating batch or on-line hardcopy reports.

The menu-driven application development tool runs under OS or DOS, using either CICS or Cincom's Environ/1 teleprocessing monitor. Using a "paintbrush" approach, the user can lay out and edit a screen format; Mantis will prompt the user for the attributes of each user-specified field. Once the user is satisfied with the screen, Mantis can make it available immediately for use (there's no waiting for a systems programmer to update CICS tables).

Mantis also simplifies file definitions and the creation of subsequent maintenance programs. Records are defined with named fields and user-specified attributes, including field-by-field encryption for sensitive data. Each application sees the database through logical views. Mantis comes with the capability to interface automatically with Cincom's Series 80 TOTAL DBMS and standard file structures, such as VSAM. The interface between file or database management system and Mantis is implemented as an independent module, making it easier to adapt the system to work with other file and database systems.

Once the screens and files are defined, Mantis lets the user write the processing part of the application. Mantis has its own programming language that allows interaction with screens and files with a single statement. It seems straightforward enough and includes structured programming constructs. For those who don't want to learn another language, or want to include previously compiled modules written in COBOL or another language, the Mantis procedure definition language supports calls to external programs.

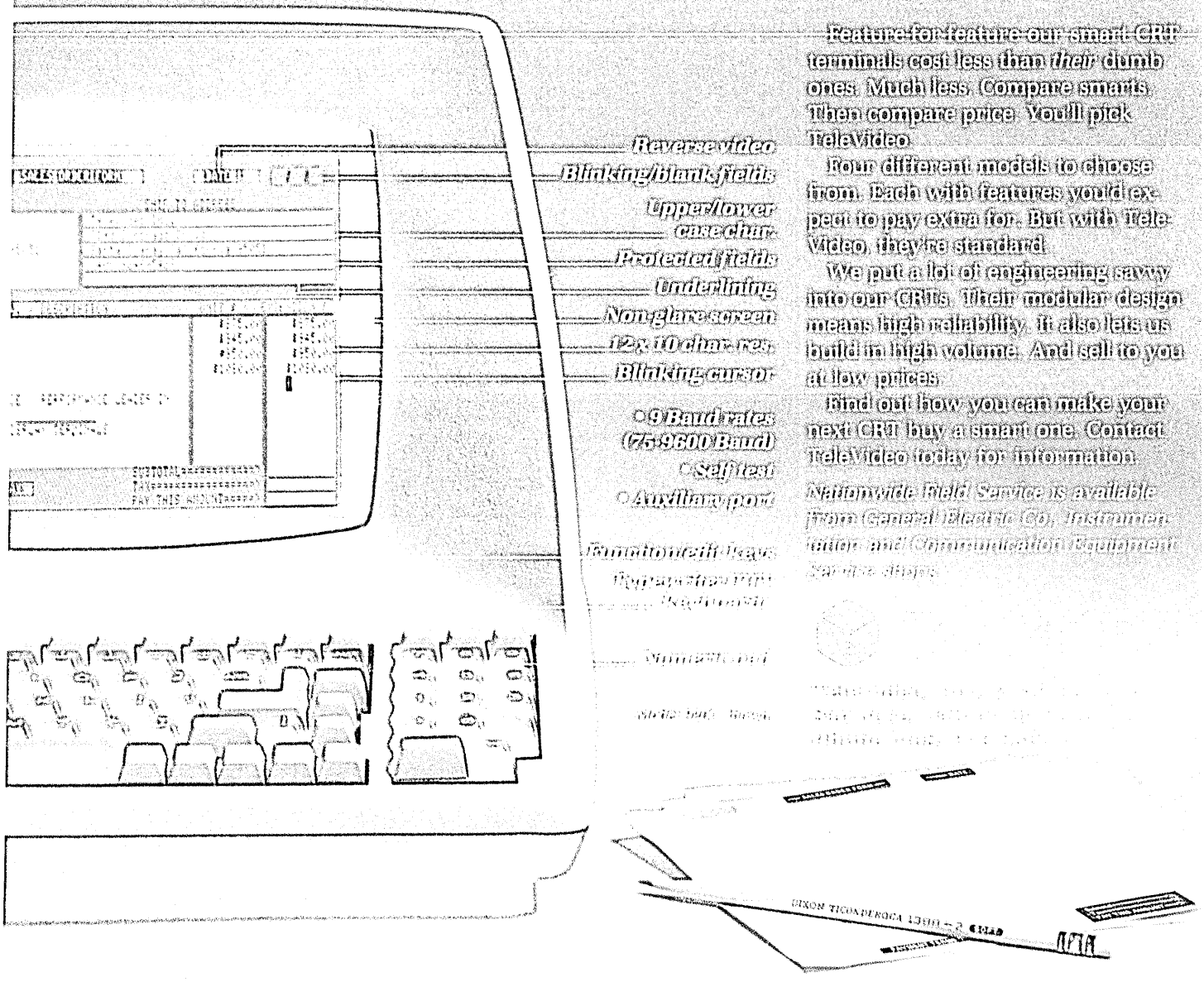
Mantis also offers security features, including multilevel passwords, restrictions on who can access what data through the use of logical views, and access restrictions for menus (thus limiting the functions available to any given user). To make applications easier to use, Mantis has a HELP facility that lets the user get short form instructions, or, upon request, more detailed directions. Help messages can be provided by the developer as the application is written, or edited into existing applications.

```
10  !MASTER RECORD UPDATE PROGRAM
20  !
30  SCREEN MAP ( EMPLOYEE MASTER )
40  FILE RECORD ( EMPLOYEE FILE  LEVEL 3 )
50  FILE INDEX ( NAME INDEX  UPDATE )
60  SHOW 'DO YOU WISH TO SEE RUN INSTRUCTIONS ?
70  IF ANSWER= YES
80    PROMPT 'MASTER INSTRUCTIONS
90  END
100 CONVERSE MAP
110 WHILE MAP NOT= CANCEL
120   WHEN MAP= PF3
130     DO EDIT NEW ENTRY
140     IF COUNTRY= 'USA' AND CURRENCY= DOLLARS
150       CALL CALCULATE FICA
160       DO CALCULATE SOC SEC
170     END
180     INSERT RECORD
190     CONVERSE MAP
200   END
```

Mantis has undergone beta-testing at a number of sites, and Cincom is quoting some dramatic comparisons, such as an application that took 80 hours of development time using COBOL (and 24 hours with IBM'S DMS) versus five hours with Mantis. Prices, as of Jan. 10, were quoted at $20,000 for an initial single-use license, plus $2,000 for installation. Under a one-year lease, the monthly charge would be $500. This price is for either OS or DOS and support for up to eight terminals. Support for each additional group of eight terminals (up to 32 terminals) goes for a $750 installation fee and either $150 per month for a one-year lease or $6,000 for a single-use license. The next step adds support for a group of 32 terminals, then 64 additional terminals; finally, all terminals beyond the 128th are included in the final support offering. CINCOM SYSTEMS, INC., Cincinnati, Ohio.

FOR DATA CIRCLE 325 ON READER CARD

COMPARE SMARTS.



Feature for feature our smart CRT terminals cost less than *their* dumb ones. Much less. Compare smarts. Then compare price. You'll pick TeleVideo.

Four different models to choose from. Each with features you'd expect to pay extra for. But with TeleVideo, they're standard.

We put a lot of engineering savvy into our CRTs. Their modular design means high reliability. It also lets us build in high volume. And sell to you at low prices.

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Nationwide Field Service is available from General Electric Co., Instrumentation and Communication Equipment Service Depts.

CIRCLE 187 ON READER CARD

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HOME COOKING.

Pillsbury's recipe calls for plants to do their *own* processing, with Level 6 computers and a dash of central control.

For Pillsbury, Level 6 computers were the yeast that made plant efficiency rise.

A Level 6 computer in each of 12 plants allows managers to do their cost accounting/general ledger work in-house.

Before they were installed, raw, end-of-month data had to be transmitted to headquarters for processing.

Each plant ran as many as a dozen jobs to get its final figures in. This took time and errors took longer to detect and correct.

As a result, plant managers had to wait for news of their precise financial condition.

Now, however, information flows smoothly and quickly.

Thanks to on-line editing, information going to headquarters is now error-free.

And this information can be sent in a *single* 10-minute job.

The main advantage of Pillsbury's move to distributed processing has been in giving plant management instant control of the data they need to run their operations.

There have been other benefits too.

Uniform hardware and software have gone a long way toward integrating the four organizations brought together in Pillsbury's Consumer Foods Division.

And, as you might expect, processing and communications costs have dropped.

Naturally, Pillsbury has more than cost accounting in mind for its Level 6 computers.

Right now, they are being used to maintain employee files locally.

In the near future, Pillsbury intends to institute automated office procedures, word processing, and electronic mail.

Here at Honeywell, we know these plans will come off without a hitch.

After all, distributed processing at Pillsbury is a piece of cake.

For more information on the family of Level 6 computers write Honeywell, 200 Smith Street (MS 487), Waltham, Massachusetts 02154.

Honeywell

CIRCLE 188 ON READER CARD

SOURCE DATA

BOOKS

MINDSTORMS by Seymour Papert

Mindstorms, subtitled *Children, Computers, and Powerful Ideas*, is based on a decade of Dr. Papert's work at the LOGO group in the Artificial Intelligence Laboratory at MIT. There, learning environments have been developed in which children communicate with computers in a relatively simple and natural way. This is primarily accomplished utilizing the Turtle, a floor robot which the children come to see as "an object to think with." The basic methodology is that of Jean Piaget, who felt that children learn fundamentals by building their own intellectual structures.

Mindstorms attempts to show how the fundamental concepts of mathematics can be comprehended by young children through the "discovery" method, which Papert outlines in considerable detail. He tells us how the system works, and gives us a "Piagetian learning" interpretation of the children's progress via intellectual "jumps and leaps". These intellectual experiences are then related to total cognitive development. The description of what takes place in Dr. Papert's laboratory is quite different from what occurs in the typical American classroom.

The "status quo" approach is also analyzed in a careful and systematic study, and Papert shows how our present approach turns off many of our children, burdening them with math-phobia.

Will the introduction of new educational technology make the situation better or worse? Papert argues that "all of us, professionals as well as laymen, must consciously break the habits we bring to thinking about the computer . . . It is hard to think about computers of the future without projecting onto them the properties and limitations of those we think we know today." Papert feels that this is especially true in the area of computer applications to the total learning process. He states that "It is not true to say that the image of a child's relationship with a computer . . . goes far beyond what is common in today's schools. My image does not go beyond: it goes in the opposite direction."

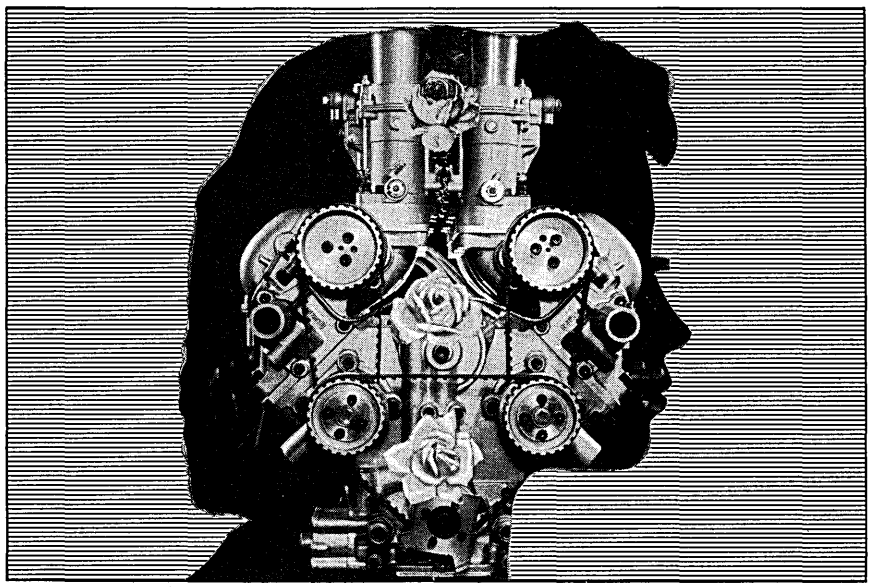


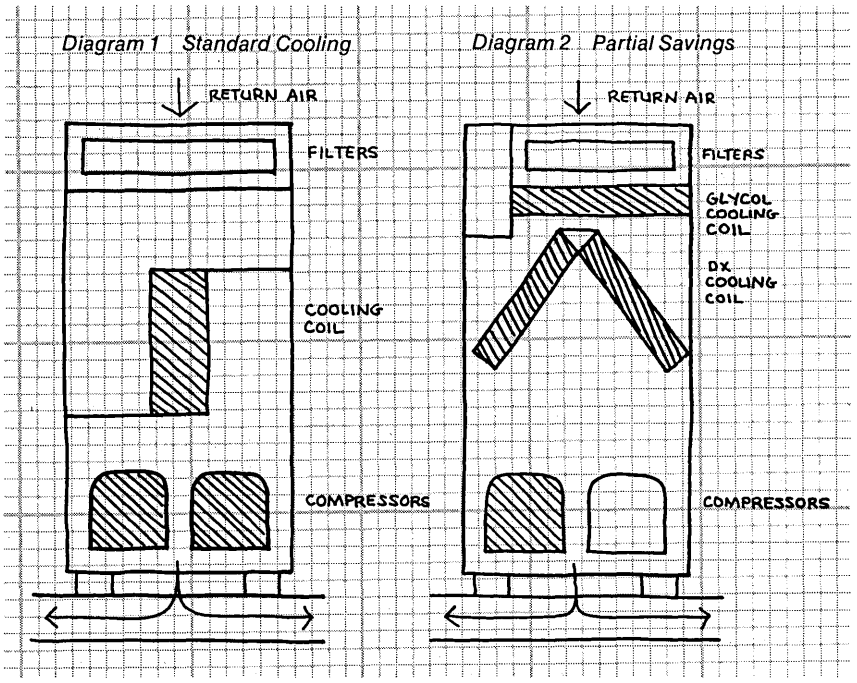
ILLUSTRATION BY CAROL WALD

And that, perhaps, is a weakness of Seymour Papert's book. It is not based on experience with teachers and educational administrators. Previous reform efforts based only on theoretical studies and carefully controlled laboratory settings have not done well. It was over 50 years ago that the Dalton Plan and other innovative quality systems for educational reform were introduced. They, too, initially went in "opposite direction" to the norm. Papert's weakness may be that he has limited himself to his own models, and has become "absolutist" in his own approaches.

The author shows his awareness of how thinking differently can separate a person from society in the opening passage, called "The Gears of My Childhood." He relates his early and intense involvement with automobiles and their gear systems: "One day I was surprised to discover that some adults—even most adults—did not understand or even care about the magic of the gears. I no longer think much about gears, but I have never turned away from the questions that started with that discovery: how could what was so simple for me be incomprehensible to other people? . . . A modern-day Montessori might propose, if convinced by my story, to create a gear set for children. Thus every child might have the experience I had. But to hope for this would be to miss the essence of the story. *I fell in love with the gears*. This is something that cannot be reduced to purely "cognitive" terms. Something very personal happened, and one cannot assume that it would be repeated for other children in exactly the same form . . . My thesis could be summarized as: 'What the gears cannot do the computer might.' "

Seymour Papert feels that the computer is the "Proteus of machines." Because it can take on "a thousand forms and serve a thousand functions, it can appeal to a thousand tastes." *Mindstorms* is the result of Papert's attempts to turn computers into instruments flexible enough so that children can create for themselves what

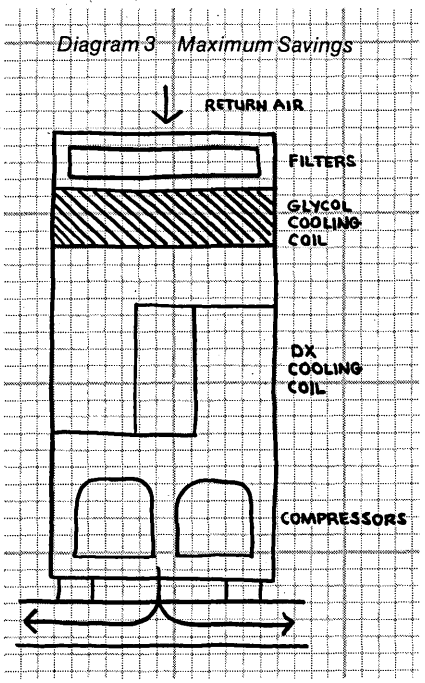
The 7 most common mistakes made in designing computer room environment.



Mistake No. 3 Using energy-wasting compressors for winter cooling.

It's a costly error to run compressors in the winter when using a standard or partial savings system (Diagrams 1 and 2). In the temperate zone, temperatures fall below 50°F for at least half the year. The elimination of compressor operation during this period can save thousands of dollars each year.

However, in a computer room, using outside air for cooling destroys critical humidity control. Closed-circuit glycol systems with an auxiliary coil avoid this problem. But, some of them are poorly designed (Diagram 2 shows restricted air flow and an undersized coil). These systems limit savings by requiring extended compressor operation.



The EDPAC Solution

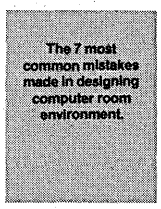
The EDPAC "ECX" System (Diagram 3) avoids these costly mistakes and offers maximum savings. "ECX" can *reduce energy use by as much as 60%.* It is available either as a standard option on *new EDPAC equipment* or as a *retrofit to existing systems.* In ten years *it can save $100,000* in a typical 3,000 sq. ft. computer room.*

To make this kind of savings possible we've made the "ECX" coil oversized (14 fins per inch, 6 rows deep, full face area) and made sure the airflow is unrestricted.

In fact, the "ECX" is so efficient that it provides 100% of the sensible capacity with glycol temperatures of 52°F or below.

And to make sure there is no sacrifice of reliability, automatic controls return the system to compressor operation whenever the room temperature doesn't hold.

For a brochure detailing the solutions to all seven "mistakes," contact your local EDPAC representative or write to the address below.



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CIRCLE 189 ON READER CARD

gears were to him.

To some extent, the author has fallen in love with his own creation, the Turtle, carefully showing the concepts that can be learned with it. But given the hundreds of thousands of Apples, PETs, TRS-80s, and TI 99/4s now entering schoolrooms, transition applications are conspicuous by their scarcity. (LOGO is a relatively sophisticated computer language, and such interface work is under way at the TERC group, and at Brookline, Mass., public schools.)

The headlong rush into the era of educational computers has now begun, and things will never be the same. Yesterday's theory and today's laboratory results may well be obsolete by tomorrow, as our learning-via-technology pace accelerates. Educational change will be everywhere, and every facet of society will feel its impact. Seymour Papert's book has only scratched the surface; but nothing to date, whether LOGO, 2001, or the FORBIN Project compares to what the future of computers in learning will actually be.

Because of this, *Mindstorms* is an important contribution. The book is an excellent starting point to meet this challenge of change: how we utilize educational computers, how we evaluate, interpret, and communicate these advances and all of their ramifications, and how we react to their effects will determine the shape of tomorrow's society.

Mindstorms is a thought-provoking presentation of the ideas of Prof. Seymour Papert and the LOGO group at MIT. While the reader may not agree with all of the content and approaches presented, it is an excellent entry into a series of issues that may well become a major concern of the last decades of this century. Basic Books, Inc., New York (1980, 230pp., $12.95).

—Dr. Harvey J. Brudner

VIDEOTEXT: THE COMING REVOLUTION IN HOME/OFFICE INFORMATION RETRIEVAL
edited by Efrem Sigel

The first book on using the television set as an information-retrieval tool is a slim volume bearing a hefty price. Hailed in jacket copy as a state-of-the-art report, *Videotext* is a collection of five essays on proposed and actual television set information systems and their technology, bracketed by brief introductory and concluding sections.

Take away the two appendices, 25 full pages of illustrations (mostly photos from Great Britain), and extraneous matter, and the 154-page volume shrinks to 104 pages of actual text. Whether *Videotext* is state of the art or already historical—having been overtaken by the rapid changes occuring in this field—is relatively unimportant. Whether it supplies enough information to justify its $24.95 price tag is something else.

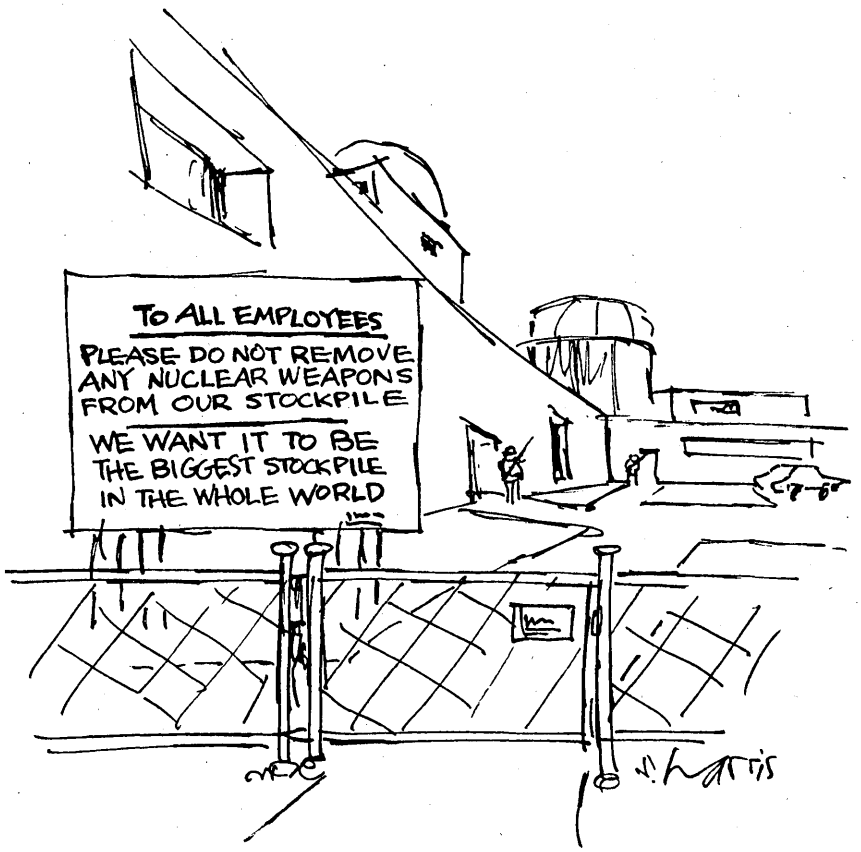
Efrem Sigel (editor-in-chief of Knowledge Industries Publications, publisher of this volume) prefers the word videotext as a general term for television information systems. Teletext is the one-way (noninteractive) transmission of "printed" information via the regular or cable tv broadcast signals; a control keypad allows the viewer to cut out the scheduled program and dial the teletext "pages."

The interactive system on the other hand,—viewdata—turns the television set into a computer by linking it to databases through phone or cable tv lines; a special decoder (built in or attached to the set) and a handheld control panel allow two-way communication.

The heart of the book—and more than half the text—is the 62 pages on Ceefax and Prestel, the British videotext systems. Colin McIntyre, editor of Ceefax (for "see facts"), the British Broadcasting Corporation's teletext operation, describes in detail the history, content, scheduling, and staffing of this news and information service. Ceefax draws its content from the BBC's worldwide news-gathering resources and gets its funding from the receiving license required of every television or radio set owner or renter. The Independent Broadcasting Authority—the commercial television in Britain—has its own teletext, called Oracle. One would have wished for more details on how this private system works and gets its revenues; it would better serve as a model for American teletext.

Prestel, the interactive viewdata system, is still in the startup stage, with numerous problems to be solved, not the least of which is how to attract enough subscribers to bring down the costs. Developed by the British Post Office in conjunction with tv set manufacturers and "information providers," Prestel uses telephone lines for communication with computers. The Post Office, which owns and operates the telephone system, has invested a lot of money and several years in Prestel, and success will depend on how quickly subscribers sign up. The chapter on Prestel, written by Max Wilkinson, electronics correspondent of the *Financial Times* of London, is of particular interest for its "Third Wave" visions of the future.

Videotext devotes a chapter to American viewdata experiments and teletext tests, written by Sigel. Here he discusses the test transmissions of teletext conducted by tv stations in the District of Columbia, Salt Lake City, and Philadelphia, and the interactive viewdata experiments planned or already launched by



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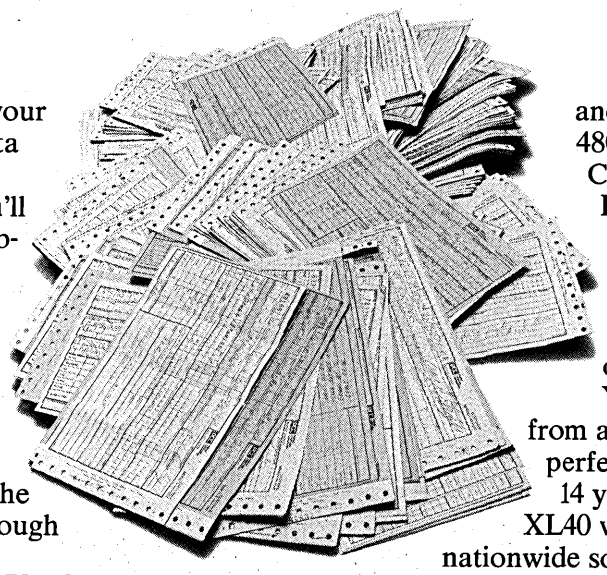
CARTOON BY SIDNEY HARRIS

OUR FREE DEMONSTRATION WON'T SOLVE EVERYBODY'S PROBLEMS... JUST YOURS.



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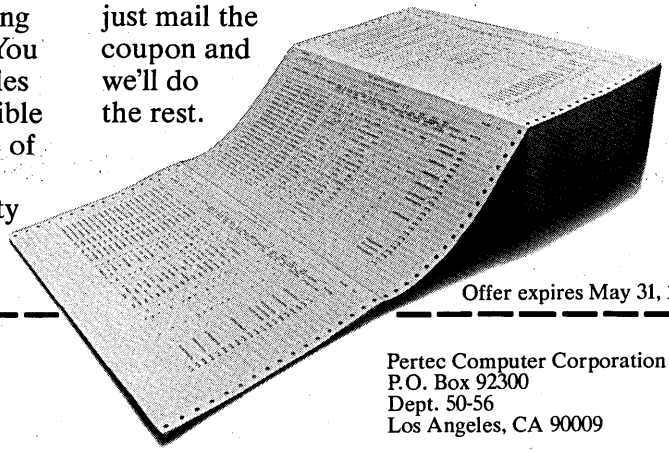

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SOURCE DATA

Telecomputing Corporation of America, GT&E, Knight-Ridder Newspapers, and Warner Cable. This is the section that suffers most from a lack of currency. By now, other experiments have been planned, those in the planning stage are under way, and those described as launched are bearing fruit.

Also discussed at length are the videotext operations and plans of such countries as France, Germany, Japan, and Canada. This section and the one on the technology of teletext and viewdata were written by Joseph Roizen, listed as president of Telegen. The technology chapter gives a good description for the nontechnical reader—informative, but not befuddling.

A six-page concluding section by Sigel raises for the first time the question of whether the videotext services are really all that useful. This is a somewhat sour note after all the enthusiasm of the preceeding chapters, but one that should have been developed further.

An index consisting mainly of the names mentioned in the text and two appendices round out the volume. One appendix lists U.S. videotext involvement, and the other lists British Prestel providers.

Is this book worth $24.95? The answer depends on your needs and resources. How much do you need to know of what is behind the development of the British videotext systems? The technology chapter is valuable for those who would like a fairly detailed description for the layman. If you can make do with less, for very much less you can get a pretty good picture of the videotext field in the February 1980 issue of *American Libraries*, the monthly magazine of the American Library Association. Knowledge Industries Publications, Inc. (1980, 154pp., $24.95).

—Harriet Rosenfeld

REPORTS AND REFERENCES

CIB 20

The Computer and Business Equipment Manufacturers Association (CBEMA) and the American National Standards Committee have announced a new COBOL Information Bulletin (CIB 20). The bulletin contains the latest information about X3.23-1974 (American National Standard Programming Language COBOL, or COBOL 74). This CIB was produced by the ANS Technical Committee X3J4, which is responsible for maintaining the COBOL standard. It is the third CIB published since the approval of X.3.23-1974; CIB 18 was issued in March '79 and CIB 19 came out in May '80. Numbers 18 and 19 can be purchased for $6 each, and the latest bulletin, No. 20, sells for $7. Send check and self-addressed mailing label to CIB 20, X3 Secretariat, CBEMA, 1828 L St. N.W., Suite 1200, Washington, DC 20036. Phone orders not accepted.

NIPPON FUTURE

An update of the 1975 report produced by the Japan Electronic Industry Development Assn. (JEIDA), "The Future of the Japanese Electronic Industry" is being distributed by Strategic Business Services, Inc. It presents data going back to 1968 and forecasting out to 1990, examining in detail the outlook for computers, peripherals, videodisks, lasers, optical fibers, as well as all types of general consumer goods. Information is included on Japanese exports and imports with the U.S., West Germany, France, Italy, and other countries. The 626-page report sells for $425 from Strategic Business Services, Inc., 4320 Stevens Creek Blvd., Suite 215, San Jose, CA 95129, (408) 243-8121.

MULTINATIONAL MARKETS

"The European Computer, Word Processing and Copier Markets: Opportunities and Challenges For the Major Multinational Companies" is an intensive analysis of developments in those industries in Western Europe. This report highlights the strategies of 15 multinational companies, including IBM, Cii Honeywell Bull, Sperry Univac, Amdahl, Nixdorf Computer, Wang Laboratories, Prime Computer, Intel, and Texas Instruments. Current growth trends, an

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	LA34 DECwriter IV	995	95	53	36
	LA34 DECwriter IV Forms Ctrl.	1,095	105	58	40
	LA120 DECwriter III KSR	2,295	220	122	83
	LA120 DECwriter III RO	2,095	200	112	75
	VT100 CRT DECscope	1,595	153	85	58
	VT132 CRT DECscope	1,995	190	106	72
TEXAS INSTRUMENTS	TI745 Portable Terminal	1,595	153	85	58
	TI765 Bubble Memory Terminal	2,595	249	138	93
	TI783 Portable KSR, 120 CPS	1,745	167	93	63
	TI785 Portable KSR, 120 CPS	2,395	230	128	86
	TI787 Portable KSR, 120 CPS	2,845	273	152	102
	TI810 RO Printer	1,895	182	102	69
	TI820 KSR Printer	2,195	211	117	80
CENTRONICS	730 Desk Top Printer	715	69	39	26
	737 W/P Desk Top Printer	895	86	48	32
	704 RS232-C Printer	1,795	172	96	65
	6081 High Speed Band Printer	5,495	527	293	198
DATAMEDIA	DT80/1 CRT Terminal	1,695	162	90	61
	DT80/1L 15" Screen CRT	2,295	220	122	83
	DT80/5 APL CRT	2.095	200	112	75
LEAR SIEGLER	ADM3A CRT Terminal	875	84	47	32
	ADM5 CRT Terminal	975	93	52	35
	ADM31CRT Terminal	1,450	139	78	53
	ADM42 CRT Terminal	2,195	211	117	79
HAZELTINE	1420 CRT Terminal	945	91	51	34
	1500 CRT Terminal	1,095	105	58	40
	1552 CRT Terminal	1,295	125	70	48
QUME	Letter Quality KSR, 55 CPS	3,395	326	181	123
	Letter Quality RO, 55 CPS	2,895	278	154	104
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The immediate openings

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SOURCE DATA

evaluation of the European economic environment, and a comparison between IBM's H Series and the Amdahl 580 are examined. Priced at $475, the study runs 66 pages. Available from MSRA, Inc., 115 Broadway, New York, NY 10006, (212) 349-7450.

LISTING FROM RYE

Contracting for dp program development is often a problem for executives and MIS management, and this "Checklist for Computer Software Contracting" addresses the development of customized software for new applications and conversion of existing programs. The first eight pages discuss the problems encountered in this area, and the other 12 make up the checklist. Covered in the checklist are the following five phases: precontract, proposal evaluation, contracting, performance period, and post-contract. The checklist is available for $5 from Reymont Associates, 29 Reymont Ave., Rye, NY 10580, (914) 967-8185.

VENDOR LITERATURE

REMOTE POSSIBILITIES

This vendor offers a 20-plus-page booklet that supplies the reader with the how-tos of buying and using remote computing services. The step-by-step instructions are simple guidelines for companies considering remote services for the first time. The booklet answers such questions as, How do I begin to look for a vendor? When is a job a candidate for remote computing services? How do I make the most effective use of my remote computing services investment? MARTIN MARIETTA DATA SYSTEMS, Baltimore, Md.

FOR DATA CIRCLE 350 ON READER CARD

I/O SUBSYSTEMS

"Industrial I/O Subsystems" is a 32-page booklet that provides a general look at I/O subsystems used in process control and on the factory floor with the vendor's DPM family of management systems for industry. Specifications and configuration summaries are included. DIGITAL EQUIPMENT CORP., Northboro, Mass.

FOR DATA CIRCLE 351 ON READER CARD

AMBASSADOR FROM MICHIGAN

A four-page flyer details the capabilities of the vendor's Ambassador crt terminal. The flyer consists of pictures of the terminal, the terminal's command and control set, a spec sheet, and environmental requirements. ANN ARBOR TERMINALS, INC., Ann Arbor, Mich.

FOR DATA CIRCLE 352 ON READER CARD

UPGRADE YOUR MICRO

This condensed, six-page catalog describes the vendor's line of AC remote controls, data acquisition modules, printer adaptors, and interfaces for use with micros, including PETs, TRS-80s, and Apples. CONNECTICUT MICROCOMPUTER, INC., Brookfield, Conn.

FOR DATA CIRCLE 353 ON READER CARD

BARTENDER'S GUIDE

Designed for users and producers of bar code labels, this illustrated 64-page booklet explains the basics of bar code structures and wand scanners. Chapters discuss how scanners work, bar code structure, characteristics of popular bar codes, bar code printing, and bar code label design criteria. MSI DATA CORP., Costa Mesa, Calif.

FOR DATA CIRCLE 354 ON READER CARD

HIGH SPEED DATA TRAP

The vendor's TRAP (Transient Recorder/Analyzer & Plotter) is described in this four-page brochure on the Model 57-TR high speed trap. PEDERSEN INSTRUMENTS, Walnut Creek, Calif.

FOR DATA CIRCLE 355 ON READER CARD

VIDEO, STORAGE DISPLAY COPIERS

Two four-page brochures available from this vendor highlight its 4611 storage display copier and its 4612 video copier. TEKTRONIX, Beaverton, Ore.

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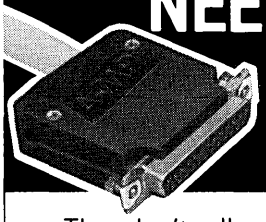

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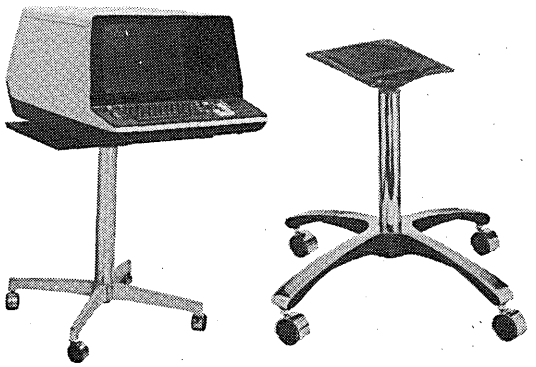
pedestal bases and components for terminal stands



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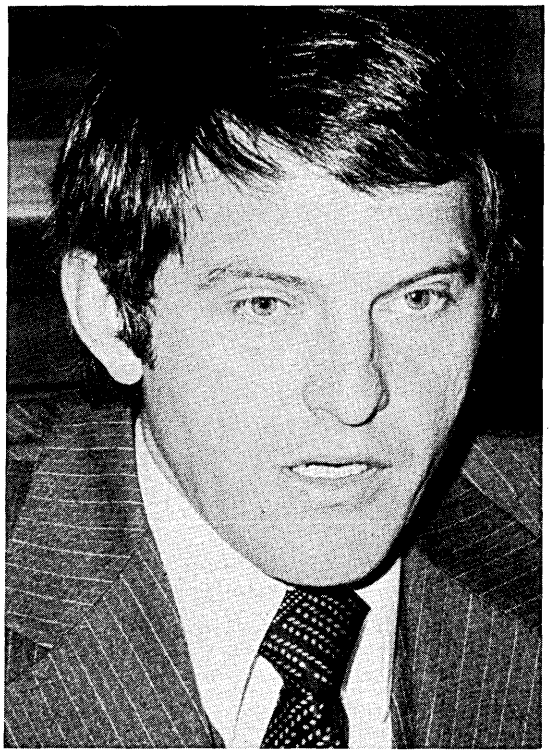

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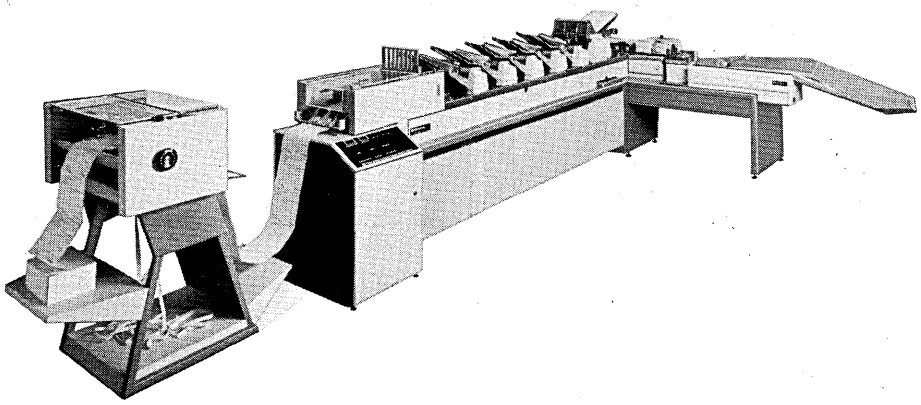

CIRCLE 196 ON READER CARD

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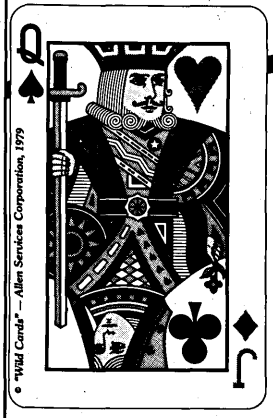

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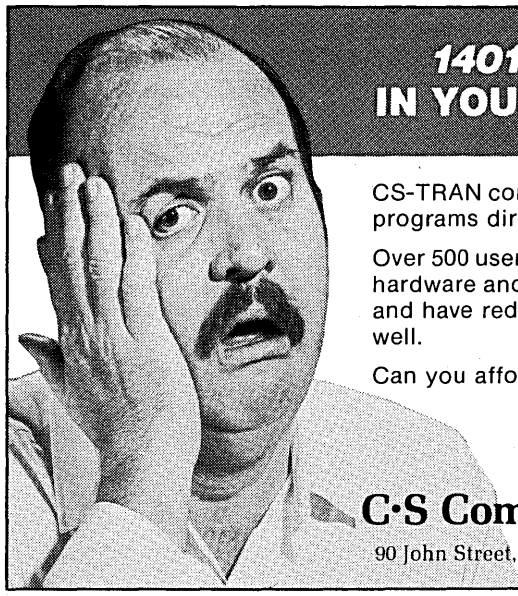

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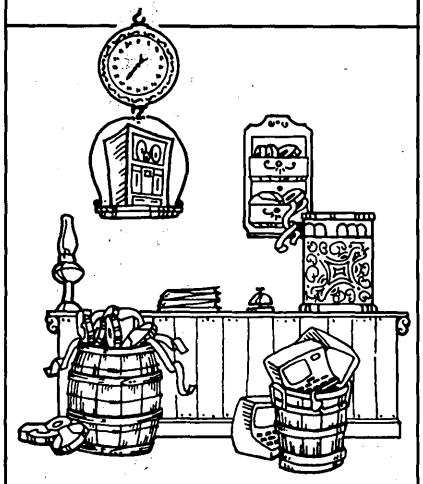

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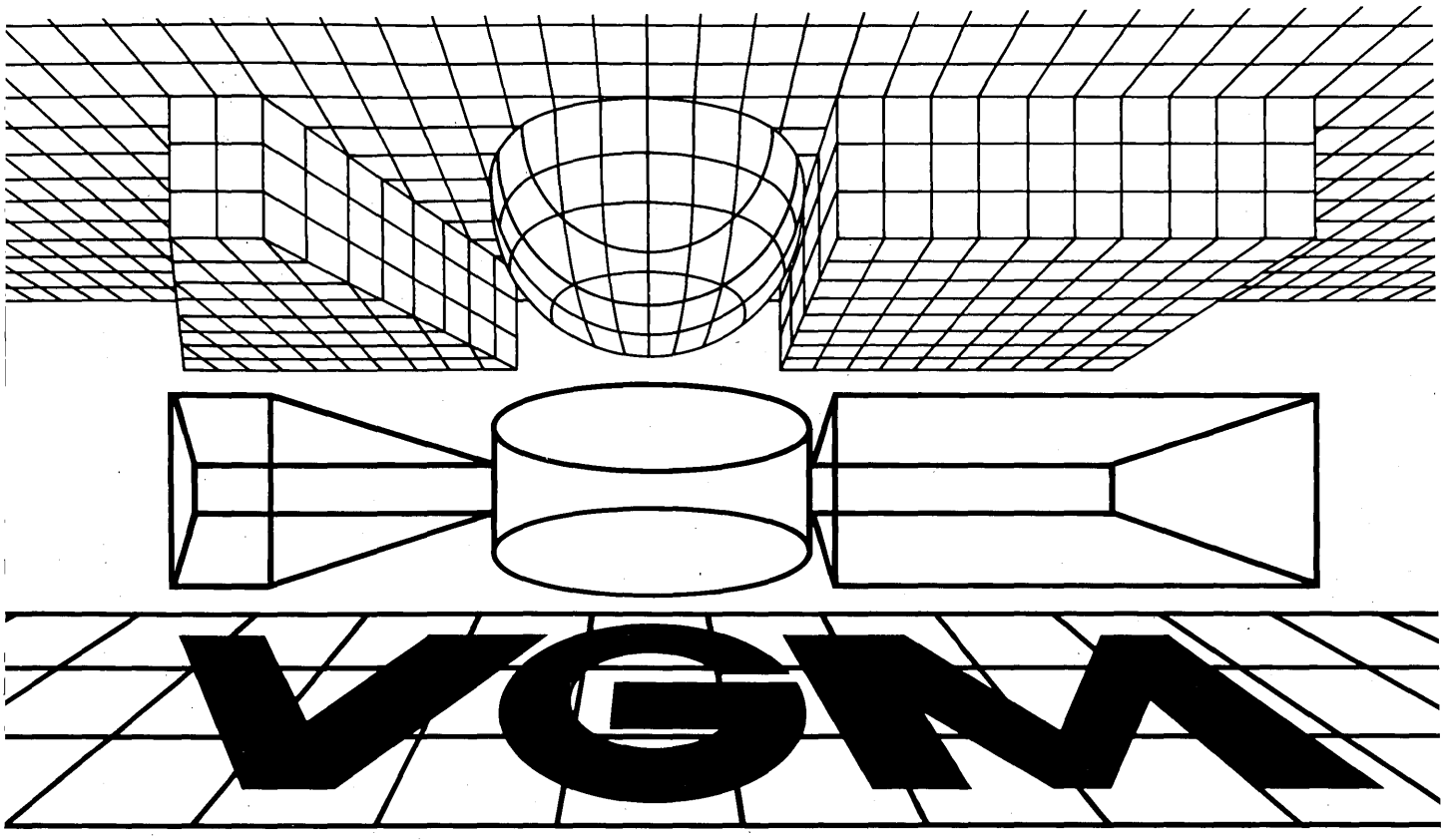

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CIRCLE 198 ON READER CARD

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READERS' FORUM

MANUAL MADNESS

Madness, indeed. Judging the many entries to DATAMATION's Manual Madness contest proved to be no small challenge. (And we confess that holiday madness took precedence over Manual Madness; our apologies for the delay in releasing the contest results.)

We received several dozen entries, including a number from Europe. Micros, minis, and mainframes all have been documented by writers with senses of humor ranging from extremely subtle to borderline obscene. And, of course, there are the outright mistakes, such as the microcomputer BASIC Language Reference Manual (manufacturer's name omitted to protect the guilty) that tells neophytes:

> Type in the following:
> PRINT "ONE HALF EQUALS", ½
> BASIC will reply with:
> ONE THIRD EQUALS
> .5

This entry was submitted by John van Someren, of the Bank of Credit and Commerce International, London.

Errors are all too common; there's the personal computer peddler that uses a six-character input example for a four-character field, for instance, and the minimaker that combines typos in its explanations along with program examples containing bugs, etc., ad naseum.

The late Xerox Data Systems rated two entries, both from its Extended FORTRAN IV Reference Manual. Bill Weisman of the Jet Propulsion Laboratory sent the following example of the format for declaring blank and labeled COMMON blocks:

> COMMON MARKET, SENSE/GROUP3/X,Y,JUMP//GHIA, COLD

"Common market, common sense, and common cold I can tolerate," writes Weisman, "but 'common ghia' is a real groaner!"

D. S. Galbraith of Canada's Department of National Defense, the second submittor of XDS documentation, sheds some light on the XDS FORTRAN manual. "Some sort of recognition should be given to the pioneers of 'human-written' manuals; there are so few of them still around. I enclose samples of the work of my candidate: someone who wrote the FORTRAN manual for Xerox computers. I believe the manual was composed while Scientific Data Systems was still alive, since later versions of the same manual, subject to more influence from Xerox, became as dull as anyone else's," Galbraith says. He indicates a number of entries, ranging from the documentation writers' standard of using puns in examples—CRE(8,ED)=R(ALL,MEN); CALL FOR('PHILIP MORRIS'); ABNORMAL PSYCH—to the deadpan "IBM (International Business Machines Corporation)" entry in the index. He states that his personal favorite is the possibility to change the value of pi: "The primary purpose of the DATA statement is to give names to constants; instead of referring to π as 3.141592653589793 at every appearance, the variable PI can be given that value with a DATA statement and used instead of the longer form of the constant. This also simplifies modifying the program, should the value of π change." Actually, that's not as far-fetched as it sounds: we remember reading that one of the Southern states, many years ago, tried to legislate the value 3 for π on the grounds that it would be easier for schoolchildren. Perhaps that's where we get the time-honored excuse "That's close enough for government work."

Galbraith also found an extremely subtle bit of craftsmanship on the author's part. "Perhaps the example having the most significance," he writes, "is one of the few known references to recursion in FORTRAN, on page 150." That's in the index, and the first entry on the page is "Potter, Stephen, 2, 93, 150." This example "suggests that the anonymous author was one Stephen Potter," says Galbraith in conclusion. "Where is he now, when we need him?" Indeed.

WESTINGHOUSE GETS 3

Westinghouse generated three entries from its Disk Utility System User Manual. Steve Cunningham of Bergen Brunswig Data Service Co., John Kudlaty of American Hoist & Derrick Corp., and Jean S. Lawrence of Abex Corp. all sent us "The Ten Commandments of Reliability." Lawrence and Kudlaty included additional pages, elaborating on the mysterious, elusive "Function 00-06 Error Messages."

According to the Disk Utility System Manual, "Shortly after these programs began to be used by customers other than Westinghouse locations a strange random phenomenon appeared—namely, unpredictable results after a RESTORE. In over two years of continuous internal use no Westinghouse location had experienced anything similar. It became known as 'THE' problem. As the number of external users went up, so did the incidence of 'THE' problem . . . Then one day a core dump came in the mail of a COPYDT failure and everything became clear—these external customers hitting 'THE' problem all had garbage strewn over their disk tracks. [Subsequent simulations on Westinghouse equipment demonstrated that the programs virtually always dumped and restored the garbage exactly.] Next, whenever a user program would attempt to access

these garbage tracks and fail, the blame was always, but always, placed on the DUMP/RESTORE/COPY programs—not a single victim would believe the programs were strictly following the ancient data processing maxim of Garbage-In, Garbage-Out."

A disbelieving user-public necessitated program modifications to detect and flag garbage tracks encountered by the utilities. Westinghouse "began then a concerted effort to build extreme paranoia into the programs. No longer would they be simple, trusting, carefree, uncomplaining souls accepting without question anything written on a disk track . . . It was fully expected these massive program changes would solve 'THE' problem for all time—alas, wrong again. [The programs identified bad tracks galore, but few users actually believed they had garbage tracks in their files.] In a series of actions, which eventually became as stylized as a Japanese dance, the following scenario is repeated regularly.

"FUNCTION 00-06 SCENARIO

"1. A user runs into a 'Function 00-06' error message. The systems programmer is called in.

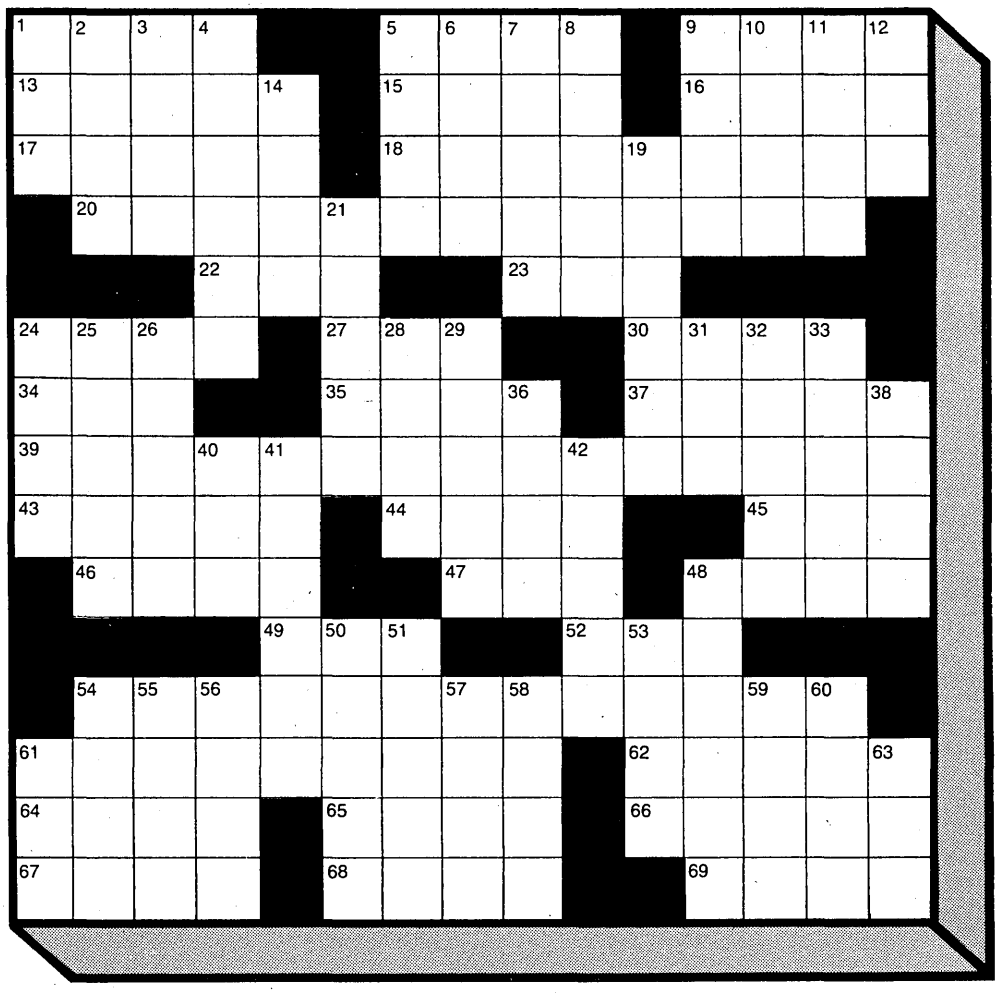
"2. [The systems programmer refers to the manual, finds it means data out of place, DITTO prints the entire cylinder indicated in the error message, and finally receives eight pounds of printout, showing everything is where it belongs.]

"3. [Systems programmer next calls in IBM CE,SE, and FE. All three swear on their green cards that you can't misplace data on their hardware using their software.] It just seems regrettable 'foreign' software sometimes doesn't understand these devices like IBM does, but what can you expect. [The cylinder contains only IBM checkpoint records; the IBM DITTO program shows] everything in place, so what's to worry. If you can't trust your IBM DITTO program and your IBM checkpoint records, what can you trust—the problem

DATAMATION CROSSWORD

A FITTING RELATIONSHIP

by
Brian FitzGibbon Burke



Across

1. Author Ayn
5. "_____ thou take this . . ."
9. Kind of sax
13. Braid
15. Involved in
16. Withered
17. Chewing surface of a tooth
18. What to look for
20. What to look for
22. "The law is an _____."
23. Part of R.S.V.P.
24. Inland sea in U.S.S.R.
27. Neuter possessive
30. Metrical foot
34. Circular file
35. James or Dizzy
37. Karl Doenitz craft
39. What to look for
43. Follow
44. Beyond: prefix
45. Dash's partner
46. Kind of party
47. Johnny _____
48. Part of N.B.
49. Position, on the links
52. Exclude
54. What to look for
61. What to look for
62. Genuine Risk et al.
64. Prerequisite for a diplomat
65. Diminutive suffix
66. Roberta Peters' specialties
67. Arthur of the courts
68. Units of electrical conductance
69. Inflamed

Down

1. Tachometer concern
2. Guiness
3. One billionth: comb. form
4. Cheerless
5. Bodily tube or vessel
6. Serpent: comb. form
7. Attempts
8. Gateway of a Shinto temple
9. Oval spore sacs in yeasts and molds
10. Baltic denizen
11. Die or domino with three pips
12. Above: poetic
14. Final bugle call
19. Garlic genus
21. Type of remark
24. Word with head or heart
25. Showers
26. Dread
28. Word
29. Morley of tv
31. Esq. org.
32. World, to Weygand
33. Roger or Francis
36. Observe
38. Head, in Le Havre
40. Former Chinese Premier
41. Captain Hook had one
42. Teacher
48. Br'er Rabbit used them
50. Type of legal action
51. Singer Piaf
53. _____ mater
54. Genetic compounds
55. Trace
56. Seeger or Rose
57. One quintillionth: comb. form
58. What Borg and McEnroe draw
59. Kingston _____
60. 525,600 minutes
61. Thus, to Cicero
63. Comp. dir.

Solution on page 280

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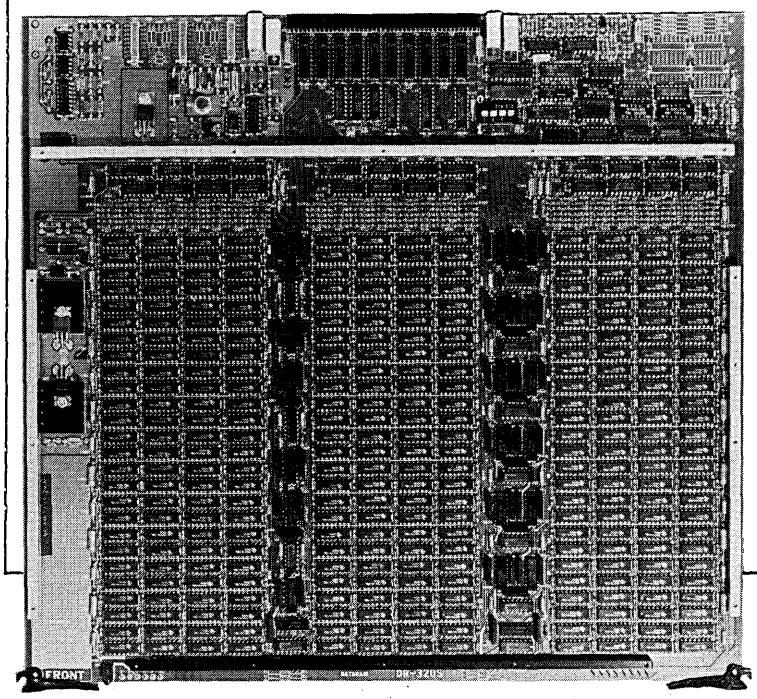

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CIRCLE 199 ON READER CARD

just has to be those Westinghouse programs.

"4. [The customer calls Westinghouse for help. Westinghouse says it isn't aware of any undocumented bugs, and asks the customer to rerun, and ask for a dump when the error occurs.]

"5. Repeat the failing job and get a core dump. Send everything to Pittsburgh—14 pounds of paper (it's a virtual storage machine).

"6. Original delivery envelope (including the return address label) is shredded by the automatic-stamp-canceling-and-zip-code-routing-machine of the U.S. Postal Service. [Temporary postal clerk repackages the now-separated contents and original shredded envelope into a number of franked government envelopes, dispatching them onward to Westinghouse in Pittsburgh.]

"7. [Westinghouse in Pittsburgh receives the aforementioned envelopes, sends them to the program support group, which attempts to reassemble the output and deduce the identity of the customer through] bits in the core print. . . .

"A letter is composed to an unknown data processing manager stating the error message is valid, that DITTO reads real addresses from the disk but prints simulated addresses on the printer, that the record in error is probably on [another track] of the indicated cylinder, and that this problem with the disk checkpoint records is a 'known' IBM problem on their release of DOS.

"Now comes the hard part. Using first principles, it is divined from trace bits in the core dump that the unknown company has either just cornered the market in filet of old gnu, or is doing advanced geriatric research on aardvarks. The letter and the probable company profile is sent to Pittsburgh.

"8. Pittsburgh narrows the profile down to only 20 companies, types the letter, and sends it to all of them. This has been found to be an excellent way of suddenly stimulating customer interest.

"9. Nineteen managers (the wrong ones) get the letter and immediately write back wanting to know how Westinghouse guessed they had just hit a 'Function 00-06' error message on IBM checkpoint records, and to keep confidential the information that they are doing advanced geriatric research on aardvarks.

"10. Manager (the right one) gets the letter, and although he is puzzled by the reference to aardvarks when everyone knows that they specialize in filet of old gnu, calls IBM, asks what is going on. Westinghouse says the problem is real and they knew it all along; it is a 'known' IBM problem.

"IBM rises to the challenge, company honor at stake, and brings out the big guns. Tell the manager their records clearly show that of their 12,546 DOS users, only 11,142, including him and 19 others just yesterday, have actually hit precisely this same problem, and so the problem is still 'unknown' to at least 1,404 DOS users. It is common knowledge in the data processing community a problem will only become 'known' when every one of those 12,546 DOS users hits the same error, after which it is 'known' to everyone, and this problem obviously had 1,404 users to go. Ironclad logic like that is irrefutable, so no further mention is made of 'known' problems.

"[IBM proves its point by making a DITTO print of the track. As additional proof, they dump and restore the cylinder of checkpoint records, with IBM utilities.] This all comes to pass, and sure enough there are no errors.

"11. Pacified with this dazzling display of expertise and really good reliable software, the manager returns the Westinghouse programs with a note saying they appear to still have some 'bugs,' but if they are ever corrected to let him know.

"[DITTO is reassuring to both IBM and its customers, but it doesn't print the contents of record zero. It reads real track addresses, but prints simulated addresses. It also assumes data cannot be placed on a track after the first EOF record.]"

Ah, finger-pointing, the bane of the multivendor shop. It reminds us of the dp manager who called the support manager from each of his vendors into a group confrontation over an intermittent failure in his teleprocessing system. After hearing each explain that his part of the system passed all diagnostics, our friend could only say, "Well, gentlemen, based on the evidence you just put before me, I can only conclude that there is no problem." (Software turned out to be the villain—under certain rare circumstances the code was so busy it stopped watching the lines for a millesecond or so—just long enough to lose a message.)

Westinghouse's seventh commandment: "Thou shalt believe all Function 00-06 error messages, and gainsay both DITTO and your IBM CE, for they speak with forked tongue."

When not protecting itself from the barbs of forked tongues, Westinghouse also endeavored to save its customers embarrassment, as evidenced by the first step for operating the 047 tape-to-card punch:

"1. Turn the keypunch machine on. (Red switch near operator's right knee. Be careful not to offend the operator.)"

This item was submitted by Paul Carlson of Westinghouse.

"Mr. Mackenrow is here with his report on three signs of spring he spotted today."

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CARTOON BY HENRY R. MARTIN

APPLE MANUALS FUNNIEST

Apple Computer got two entries, though from what we've seen of Apple's manuals, the micromaker probably deserved more—its manuals seem to be full of wit and wisdom. From the DOS 3.2 manual, subtitled "Do's and Don'ts of DOS," there's the following explanation: "What happened was this: your Apple II went on a fruitless unending search for information on a blank diskette (on a clear disk you can see forever . . .)." Charles Aylworth of Taco Time International supplied this example, with a high praise for Apple.

"I think," he writes, "that, in whole, the funniest set of manuals ever published is the work of Apple Computer. In their Pascal reference manual, there is a program example 'FROG' with attributes 'Wartsize,' 'Jump Length,' etc. All in all, a very welcome humorous approach to otherwise dry material."

Jack P. Christenson of New Ulm, Minn., found another goodie. He writes, "I would like you to consider the Apple II DOS Manual. At least one of their manual writers has a fairly whimsical approach to choosing examples of commands . . . I think the computer science industry in particular and any technical discipline in general needs a little lighthearted foolishness once in a while." A lack of humor might drive some to drink. Our favorite of the half-dozen or so examples highlighted by Christenson has to be:

"To LOAD a program named AGATHA, use the command

LOAD AGATHA

and the program of that name, if there is one in the catalog, will be

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loaded. To test if AGATHA is loaded, see if she can walk a straight line. "If you want AGATHA to RUN after she's LOADed (poor thing) . . ."

Maybe AGATHA's drinking problem prompted three nearby examples: "SAVE OUR HAPPY HOME, D1, S7"; "LOAD UP"; and "RUN AMOK, S7."

DECsystem-10 (née the PDP-10) brought in three entries. ". . .I think [the enclosed three-page flowchart of a DEC-10's instruction execution cycle] is worthy of being added to your collection, perhaps to be filed under 'PATHOS,' " writes Peter H. Roosen-Runge of York University. "As one who attempted to present the gyrations of the DEC-10 instruction cycle to a class of rather numbed undergraduates, by the time we had lost our way on the 'double memory operand fetch,' waited to 'start a bus discharge,' fell through the 'store second accumulator' branch, and finally found the 'Otherwise DONE (thank God)' box . . ., we had every sympathy for the author's well-justified expression of gratitude to the Diety, for providing an exit box to the most tangled flowcharts of life." (We won't even try to reproduce the flowchart—it really does take up three pages.)

We've always thought that DDT was a great name for a debugging package, and now, thanks to Merleen Gholdston of the Water and Power Resources Service in Provo, Utah, we know the history of the name. On the first page of the DDT-10 manual there's an "historical footnote" which reads "DDT was developed at MIT for the PDP-1 computer in 1961. At that time DDT stood for 'DEC Debugging Tape.' Since then, the idea of an on-line debugging program has propagated throughout the computer industry . . . Since media other than tape are now frequently used, the more descriptive name 'Dynamic Debugging Technique' has been adopted, retaining the DDT acronym. Confusion between DDT-10 and another well-known pesticide, dichloro-diphenyl-trichloroethane [C(14)H(9)CL(5)], should be minimal since they attack different, and apparently mutually exclusive, classes of bugs."

A clean computer is a happy computer, and it pays to vacuum up all those bugs that bit it when the DDT hit. Manufacturing Data Systems, Inc.'s Karlfred Schillack sent us an appendix from the DECsystem-10 Hardware Reference Manual. Under the heading of "Cleaning the Equipment," there's the following cautionary note: "When cleaning, be careful not to change the position of any switches as this could easily cause a software crash. Also be very careful not to jar any disk or drum equipment as serious head problems may result.

"It is alright to use spray cleaner on exposed vertical surfaces, but do not use it around switches, near intake gratings, or near any other openings, because the 'guck' can cause severe problems if it gets inside the equipment.

"The 'alright' in this caution applies to the sheet metal. Whether the carcinogens that come out of aerosol cans are alright for your lungs is up to you to decide. It has never been shown that the presence or absence of fingermarks or other stains has any effect whatever on the operation of the system. And anyway, it is probably much healthier to get a little exercise using something like Spic and Span." And a healthy customer is a happy customer.

A LOVELY ONE FROM PDP-11

Then along came the PDP-11—of which so many have been installed, we're quite amazed that its documentation elicited only one entry. But it's a lovely entry, nonetheless, that David L. Hanz of SRI International found—in, of all places, the description of a diagnostic routine. A page-and-a-half historical note describes the adventure of four engineers—Field Service Engineer, Memory Engineer, System Engineer, and the narrator, a Software Engineer —who found an "indirect path to the CSRs" in early 1977. "[We four] departed the cpu on our search for the CSRs. Memory Engineer promised that CSRs would conditionally reside in the shadow of a giant memory, depending on whether or not they felt switched.

"We began our search for the first CSR believing that if we found one, that the rest of the tribe would surely be nearby. Our task

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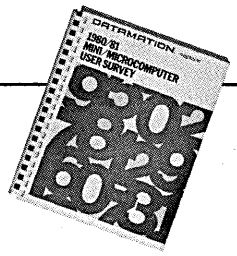

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was clear: find CSR 17772100 behind the giant memory 0 through 16777776 (2 meg words).

"Field Service Engineer suggested that since we could arrive in the east by heading west, then surely we could find 17772100 by heading for 152100. This didn't make too much sense to my other brothers and myself; however, since Field Service was willing to pay for the expedition, we all left cpu city in search of 152100. 152100.

"The first village we came upon was managed by an old, experienced relocator named Kay Tee. We told Mr. Tee of our expedition and our high expectations of finding 17772100 by looking for 152100. He expressed doubt that the feat could be accomplished, but he said since our three most significant bits were six that perhaps his most trusted friend Six (one of the Par brothers) could help us. So we proceeded to see Six Par.

"We found Six Par at a busy highway control center directing traffic with his brothers. He greeted us warmly and assured us that we had come to the right place. Six said that his older brother Seven was not to be trusted since he preferred devices to people. Also, Six told us how his younger brothers were much too inexperienced to guide us, and that they usually only do 1-to-1 relocations. So, at Six Par's highway we were given 177400, which he said to multiply by 64 and add to our 12100 (152100 less 3 MSBs). Thus, we were leaving Kay Tee's village with a total address of 17752100.

"At the outskirts of the village there were two tollgates—one to Cash and one to Uni. We decided to take the Cash route at System Engineer's suggestion that 'Cash makes no enemies.' However, the gate guard would not let us pass because he thought we were a device. We tried to explain, but he insisted that unless our most significant bits were 16, we could not pass. Reluctantly, we decided to try the Uni gate. Here the guard was more negotiable and he let us pass, charging only four bits. Just outside the gate we boarded a Unibus with address 752100.

"The bus trip was supposed to be quite long with many stops; however, it turned out the first stop was the last stop for anybody without a device address. Here we departed the Unibus to find a long row of 36 checkout girls at special registers called Maps. Each Map register had a number 0 through 36 and a checkout girl with a matching bust size. We all agreed to visit Map register 36. The checkout girl was very cordial and went on to say that she preferred customers whose most significant five bits were 36 also. She charged us our five most significant bits and added her favorite number 17760000 to our address of 12100 and we departed with 17772100, which Memory Engineer promised would lead to the CSR.

"Next we came to the cash highway, but since the cash register was turned off, we were declared amiss and allowed to pass all the way down the highway toll free, where we arrived at the Memory bus. We gave the driver our address of 17772100 and proceeded on our way. The driver warned us that no one ever goes there, and he waited for us at our stop since it is not a regular part of his route.

"Here waiting at the bus stop with open arms, we found the CSR and the entire tribe. We briefly exchanged data and climbed back on the Memory bus since we had to return to cpu city before the last Unibus timed out.

"The journey home was without incident. It is interesting to note that once home none of the engineers, including myself, could remember what the checkout girl's face looked like."

IBM GETS LION'S SHARE

With its overwhelming number of installations, IBM garnered the lion's share of entries. Robert Hart of Badger wrote, "Unfortunately, I can't provide the exact citation, but [Manual Madness brings] to mind my favorite—and to my mind rather characteristic—IBM error message, namely, 'WRONG ERROR.' This came up while handling tapes, I believe. Can anyone out there give me a 'CORRECT ERROR'?" Good question.

In the same vein, a paragraph explaining error correction

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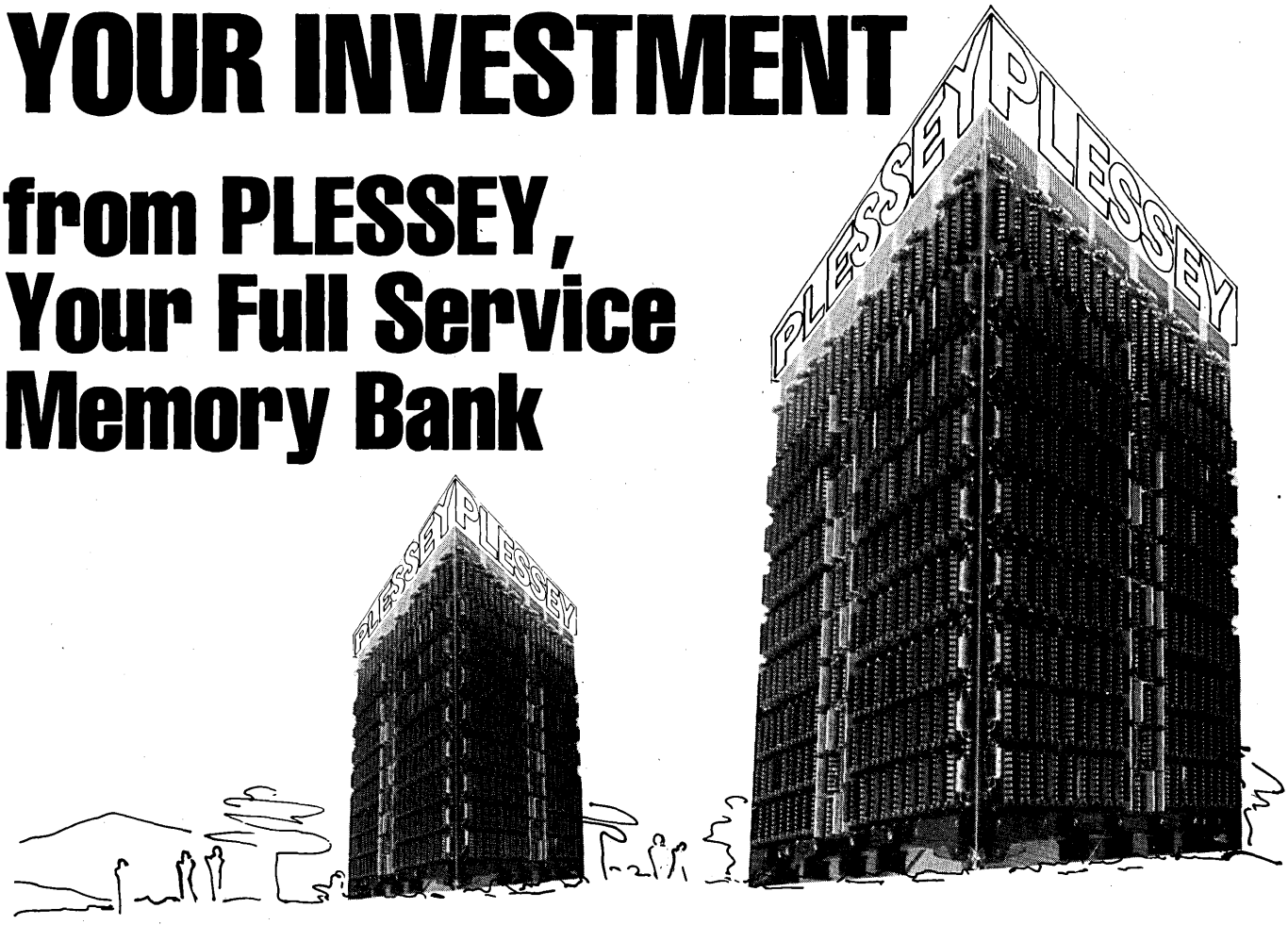

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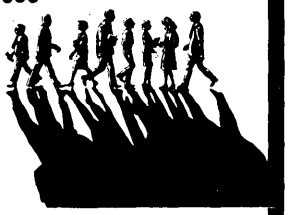

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codes (ECC) on the main memory of a 370/155 II explains: "Errors of more than two bits, detected as uncorrectable errors, are treated as true double-bit errors; those detected as single-bit errors are treated as true single-bit errors. . . . *Undetected errors are handled as if no error occurred.*" Sounds reasonable to us (and thanks to John Rich of Charlotte, N.C., for sharing this one with us).

An IBM public relations man once told us that even manuals go through quality assurance before release. But we have the proof in our hands that a tech writer can use sufficient subtlety to slip a zinger past them, at least once in a while.

From the OS PL/1 Checkout Compiler: TSO User's Guide (an October 1976 revision, to be sure) comes such an example.

"?e — Edit unit submode to generate a logical unit

"E?c 250 'f' 'he'

"1 STATEMENT IN LOGICAL UNIT — Changed statement 250 becomes logical unit.

"E?1

"250 PUT EDIT('LIST OF PATIENTS FOR HEART TRANSPLANT')(A);"

"Think of what the original was to produce HEART," writes Procter and Gamble's Philip G. Osborne. We must admit that with IBM's love of opaque command languages, it took us several minutes to deduce that "c 250 'f' 'he' " must be an editor directive to change the occurrence of "f" to "he" in line 250. Why the change didn't affect the "f" in "of" or "for" is beyond us. (If this example still is in print, you can bet it won't be for long.)

The person IBM calls on the carpet for that example will probably wind up putting spaces in the right places of the IBM FORTRAN IV language specification manual's Debug Facility appendix, where IBMer Bruce Davidson draws our attention to an example program containing the following declaration:

INTEGER SOLON, GFAR, EWELL

Davidson says the example has been there for at least 12 years, and as yet no editor has told it "so long, farewell."

IBM's VM/System Product XEDIT manual caught the attention of two readers, Jack Feldman of Boeing Computer Services and Marvin L. Weisberg of INSCO Systems. Both sent us the text example, "Although porcupine fishes blow themselves up and erect their spines, they are sometimes eaten by sharks. No one knows what effect this has on the sharks." Weisberg sent additional examples, some attributed to Ogden Nash (and most sounding as if they sprang from his pen). Two of the unsigned verses that we liked were:

CELERY
Celery, Raw,
Develops the jaw,
But celery, stewed,
Is more quietly chewed.

and

THE PARSNIP
The parsnip, children, I repeat,
Is simply an anemic beet.
Some people call the parsnip edible;
Myself, I find this claim incredible.

After wading through all these entries, we find we can't, in all honesty, say that one entry is funnier than another. So we've decided to make all contest entrants winners. Every contributor will receive a wallet-sized calculator with a memory constant.

Finally, to unwind after this massive typing job, we're going to take a hint from Hewlett-Packard's RTE FORTRAN IV Reference Manual, submitted by David Barber of Simpact Associates, Inc. In an example of declaring an external function or subroutine, that manual tells us:

EXTERNAL SIN, IS, FUN

We've got eight editors in this office, so lets make it eight to the bar. Who knows, we may even run into the faceless checkout girls or AGATHA and a couple of her friends.

—Bill Musgrave

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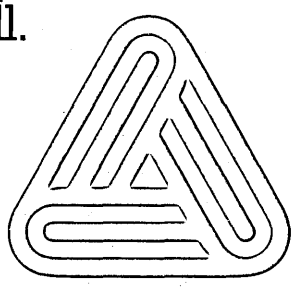

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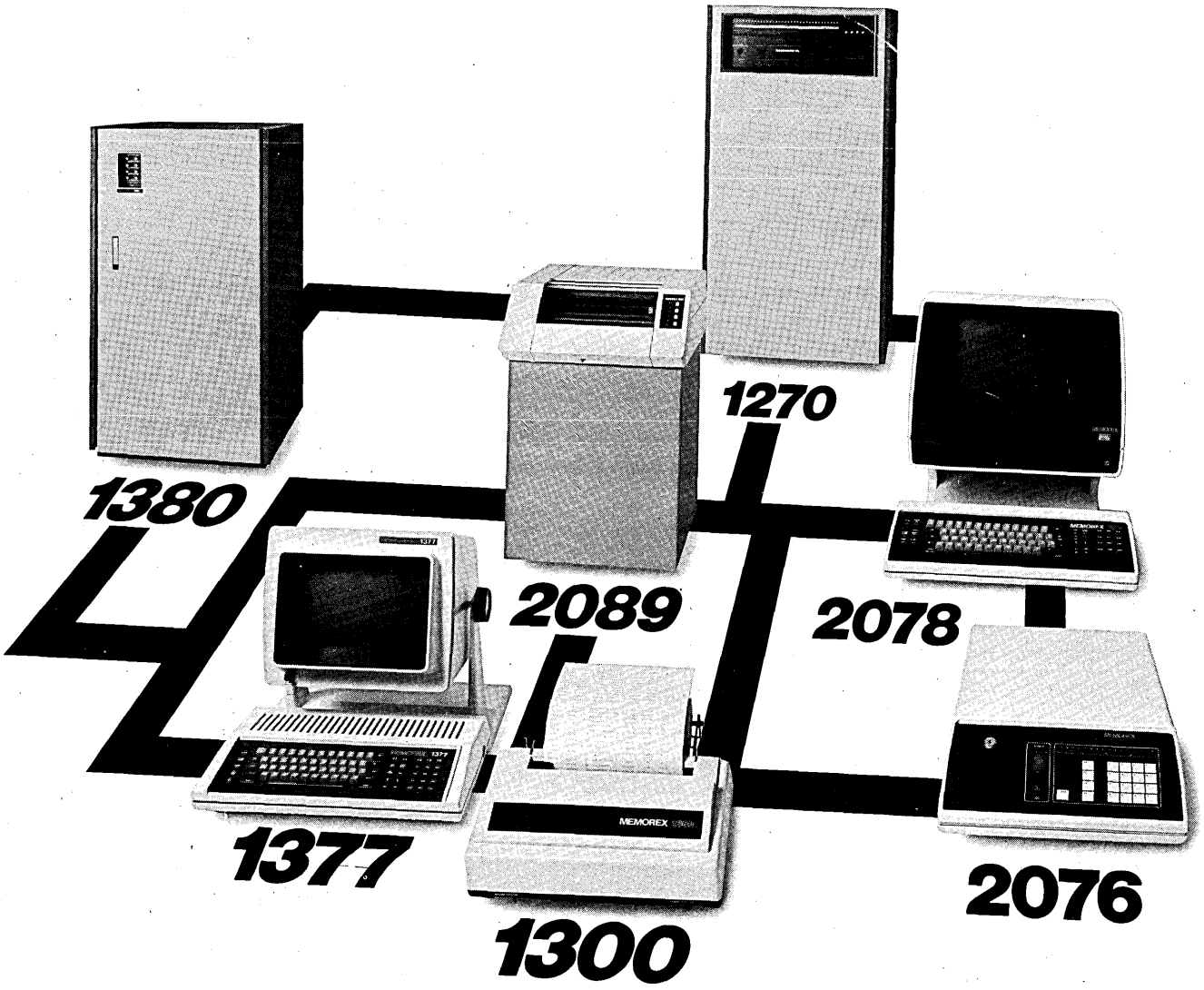

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A SEPARATE IBM SOFTWARE COMPANY

As a company that has directly competed against IBM since 1965, Applied Data Research has advocated structural relief which would separate IBM's major businesses into six distinct companies:

1. One software company
2. Two hardware companies
3. One peripheral company
4. One services company
5. One office products company

Applying the principle of maximum separation, the following separation guidelines are recommended: For each company there should be separate physical facilities, personnel, names, research groups, and accountability for profit and loss and physical equipment. There should be no advances of capital or loans between organizations; and no exchange of services and products as is generally available to third parties.

Simply stated, each company would be separate. Each would have its own destiny—for better or worse.

For competing firms, the proposed restructuring would reduce IBM's marketing power since each company would have its own marketing force. The restructuring would eliminate tie-in and cross-marketing sales; and would ultimately provide for interface specifications and standards for competing software and peripheral companies. It should also provide for fairer and more competitive pricing and eliminate bundled pricing.

The restructuring would not significantly disrupt users' current operations and plans. It would increase competition, lower prices, improve the quality of IBM software, and increase life expectancy for both hardware and software.

This structural relief has been advocated by the author since the early 1970s. Many discussions have been held with Justice Department personnel, at computer association meetings, and with executives from other software companies. Most of the discussions have centered on whether a separate software company for IBM would be desirable for the computer industry as well as for companies competing against IBM. ADAPSO has supported this position—but there is a strong minority that is uncertain about its desirability.

The most common objection voiced by the Justice Department and other groups is based on the belief hardware and software are developed together. They question how IBM could design effective computer systems if its software capability were in a "separate" software company.

We need only look at IBM's internal structure, as well as that of the hundreds of independent software companies, to debunk this misconception. IBM has many "internal" or "separate" software companies within its overall structure. Separate IBM software centers around the world develop software products for IBM. IBM formally disseminates hardware specifications to these separate software companies. Examples include IBM PL/1 compilers and CICS, developed by IBM's United Kingdom center; selected 4300 series operating system software from Germany; and sorting systems from IBM's Swedish center.

Since the late 1960s, independent software companies have been developing systems and application software for IBM computers. These independents do not have the benefit of the proprietary hardware information that the internal IBM software companies have. How have they fared? From a state of the art technology viewpoint, they have proven over and over again that their software is better than IBM's. I believe that even IBM would concede that point. The Datapro User surveys throughout the 1970s consistently

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READERS' FORUM

showed IBM users generally rated independents' software superior to IBM's. User evaluations also support that contention. While many users do buy software from IBM, they usually buy it for reasons other than technological superiority.

OS BETTER TOO

The technological superiority of the independents' software even extends to the operating system, where IBM should be the strongest. So why is it unreasonable for IBM to separate its "internal" software companies and continue to develop software as it has in the past—but as a separate company?

IBM would continue to develop hardware. It could have internal software consultants to decide the delineation between hardware and software. Or, IBM could consult with software companies. In reality, however, the question of what is hardware and what is software applies to less than .001% of all software that IBM builds. Because of many practical considerations, most system software functions will remain "soft" for the foreseeable future. From a technological viewpoint, IBM would suffer virtually no gap if its software were developed by a separate internal company.

Several software companies seem convinced that even a separate IBM software company would be so strong as to overwhelm the independent software vendors. They suggest a separate IBM software company might actually build more effective software and cause the independents to lose their advantage. They don't want to awaken the sleeping software giant.

Be assured, however, that the giant is already fully awake and getting bigger and hungrier every day. By the end of 1979, IBM software revenues were estimated in the $1 billion range—about 5% of its total computer revenues. By 1985, predictions are that IBM software revenues will be in the $3 billion-to-$5 billion range and will be up at least another $5 billion by 1990. Conservative projections show IBM will receive 50% of its revenues from software by 1990. IBM is adding computer science graduates to its staff by the thousands each year. The company knows the importance of software and its impact on growth and earnings.

All the facts clearly point to IBM developing more effective software, especially if a separate IBM software company is created.

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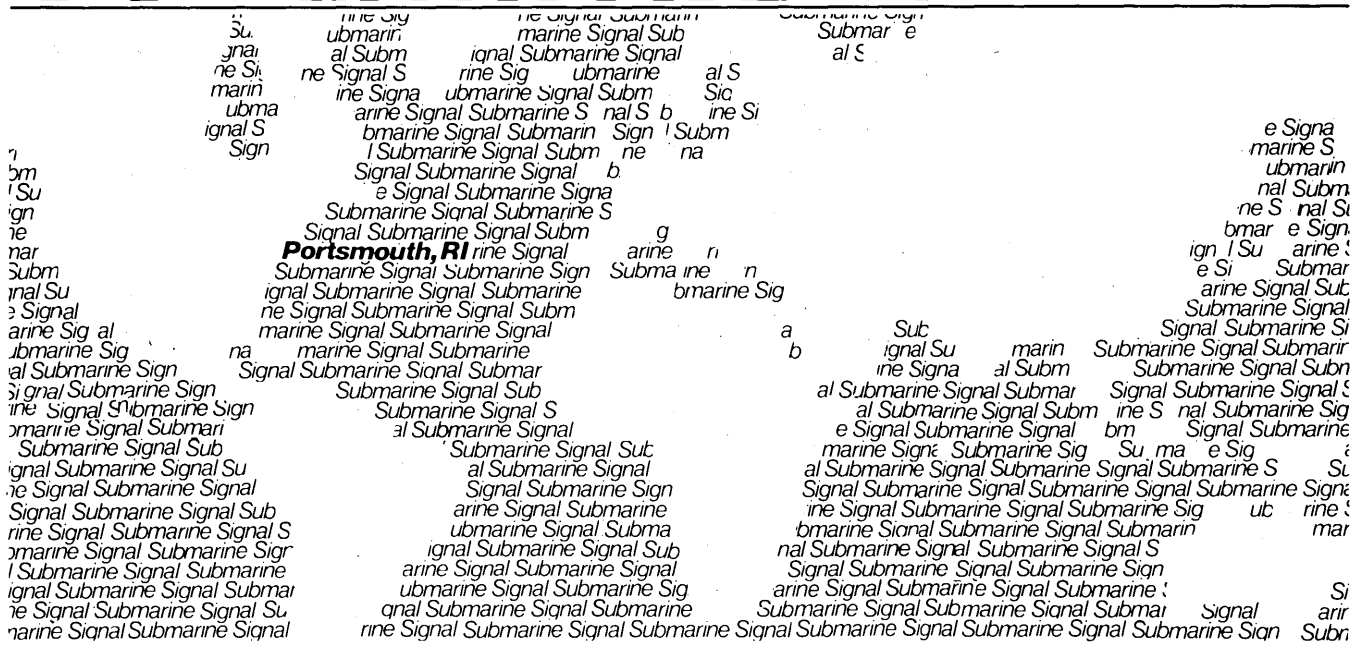

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READERS' FORUM

But since the software will have to be fully priced, it will help to expand significantly the potential of the software market. Thus, on the one hand, a separate IBM software company will require the company to develop more cost-effective software. On the other hand, a separate company will require full pricing and thereby increase the total market for software. Furthermore IBM will have to meet the independent software companies head on. This is the true test of competition.

The IBM software company will not have many of the advantages currently enjoyed. IBM software salesmen will no longer be able to work hand-in-hand with the IBM hardware company. Today, the IBM account manager sells the cpu, software, and the peripherals. This creates a "safe" umbrella for the user—especially the small user. One need only look at the sales literature and selling effort for the IBM 4300s, System 38, and 8100 series to see how strongly IBM markets its systems software to the new hardware buyer. And look what happened in the last few years: these unfortunate IBM System 38 and 8100 series buyers were totally dependent on IBM's ability to build the System 38 and 8100 series software. Not only is the software being delivered late, but it is not meeting performance specifications and is requiring more computer resources than originally promised.

Consider the difference a separate IBM software company would have made in this case. First, prior to announcing the System 38 or 8100 series, IBM would have been required to disclose the hardware specifications to all qualified software companies—including the IBM company. Then, any number of software companies might have decided to build the "suggested software" or alternative software. That's exactly what happened in the past, except the hardware specifications for these systems were given only to the "internal" IBM company, resulting in late and one-of-a-kind software. While software companies were eventually able to build software for the System 38 or 8100 series, they got a late start and will have the opportunity to get only a small share of the market.

Initially, the typical IBM user would probably be opposed to such a separation. IBM users like to eat their cake—and have it too. But if they remember the 1960s, when IBM had a virtual monopoly on software, they may have second thoughts. There was no real software products industry, virtually no innovation, and little progress in improving software technology. The 1970s showed the results of unbundling and a competitive environment.

LITTLE LOSS FOR USER

If IBM could not be the "system integrator" for all its hardware and software, there would be little real loss for the user. Almost overnight there would be an abundance of "system integration" consultants and companies providing a similar service, and these organizations would be objective. New software companies would enter the field, stimulating innovation and lowering prices.

An IBM reorganization would also reduce the company's hardware dominance. If IBM sold its software separately, its hardware and its software would be evaluated independently. Plug-compatible cpu and peripheral companies would be in much stronger positions. The IBM hardware salesman would no longer be able to offer more expensive hardware while he touts IBM's software and the advantages of buying from one vendor. Thus, a separate IBM software company could ultimately lower hardware prices. It would also reduce the users' total hardware requirements. Today, IBM salesmen "upgrade" their wares by a variety of subtle means. First and foremost is the recommendation of such inefficient software as TSO, IMS, CICS, and ICCF. When a user does not install these packages and uses a more efficient piece of system software, the IBM salesman loses precious hardware upgrade opportunities.

What else would a reorganization do to IBM? Probably a fair amount of good. Whether because of internal politics, empire building, or internal structures, IBM has reacted slowly in software. A separate software company could improve IBM's ability to reorganize and change direction. Indeed, some IBM watchers believe the company may voluntarily reorganize. But IBM's own plan may be to

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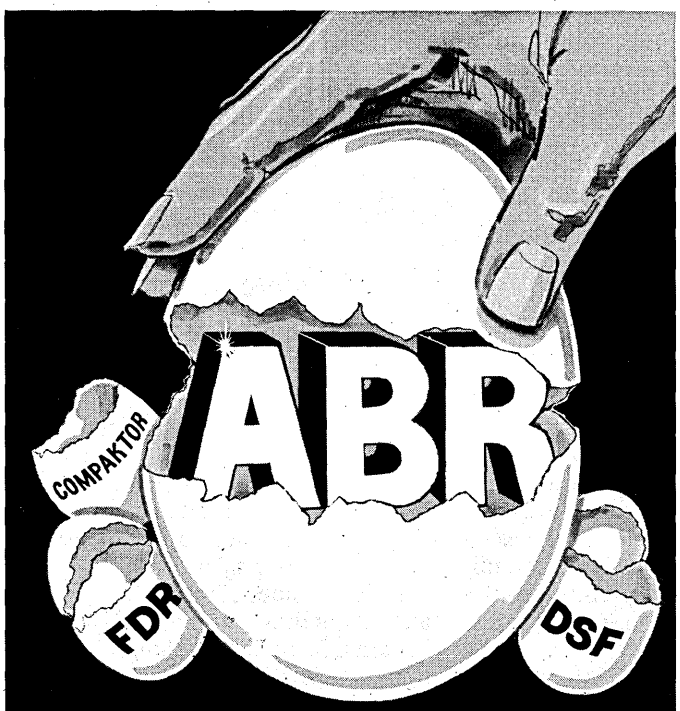
CIRCLE 226 ON READER CARD



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READERS' FORUM

separate software development without separating the marketing of software and hardware. Good strategy for IBM, but very bad for the independent software companies.

To date, IBM has not had the luxury of simply developing cost-effective and innovative software. Software development strategy is intimately tied to hardware strategy and hardware goals. With a reorganization, there would be no restraints on new software development.

A separate IBM software company would have the opportunity to enter many new markets—including the development of software products for non-IBM computers. A significant amount of IBM application software is written in high-level languages, and much of its application software products could be marketed to IBM competitors.

Of course, change would not be completely painless for IBM. Separate marketing of hardware and software would deflate IBM's total sales and significantly reduce account control. With a separate IBM software company, funds would be limited and cross-subsidization would be eliminated. The company would no longer enjoy the advantage of advance hardware information. Nor would it have the IBM name, or the ability to offer the theoretical security of a package.

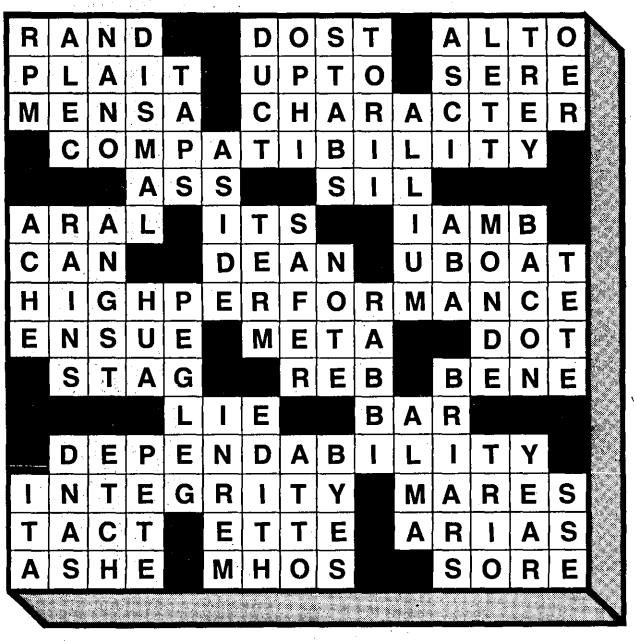
Strong grass-roots support for a separate IBM software company exists among the independent software products companies and within ADAPSO. The principle of "maximum separation" has long been advocated by ADAPSO. It has been an overriding theme and the thrust of its actions against banks and their encroaching activity in data services. It has been the basis for ADAPSO's action against Citicorp. And finally, it is the critical issue in the FCC recommendation on how to ensure fair competition with AT&T when it enters the dp arena.

While on the face of it insisting on a separate IBM software company might sound radical, it is actually very conservative. IBM could continue to develop, support, and market its software products. The company would simply be required to operate these activities as a separate organization. In other words, IBM would be required to follow the same rules that currently apply to Citicorp, AT&T, and other dominant organizations. If the concept of "maximum separation" is good for other industries, there is no reason to believe that it would not be good for the computer industry as well.

—Martin A. Goetz
Princeton, New Jersey

for his use

Answer to puzzle on page 262



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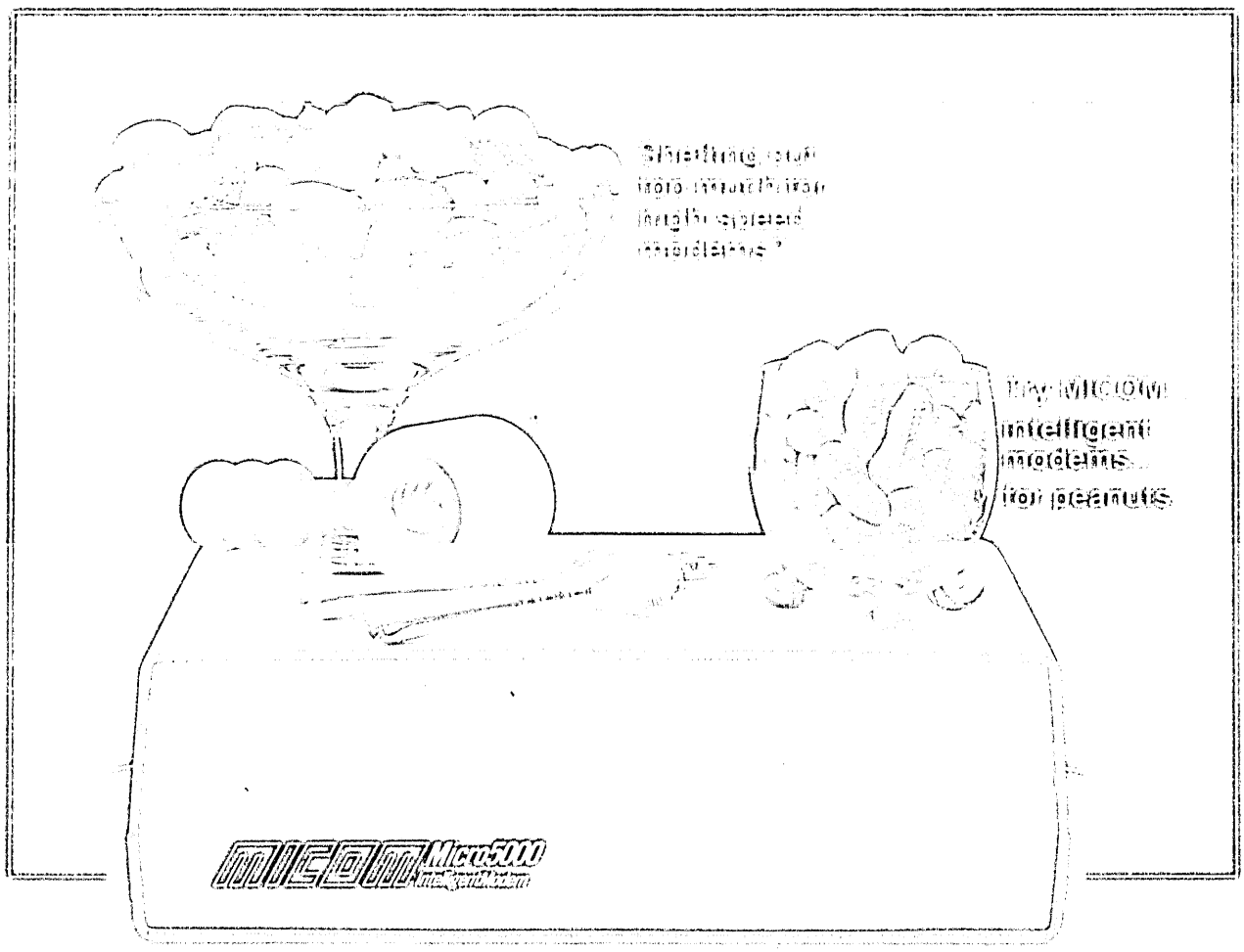

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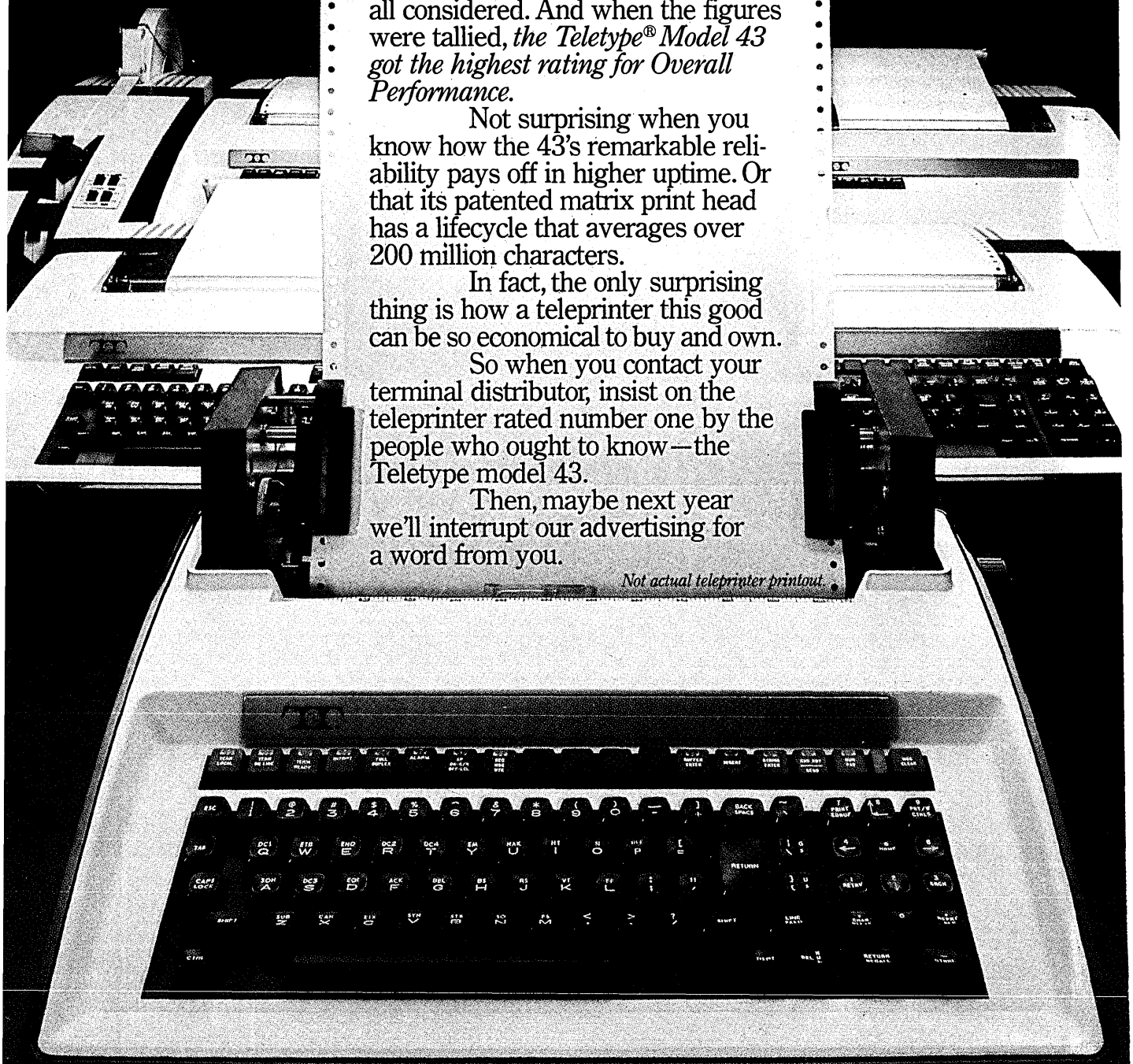

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