DATAMATION® 79

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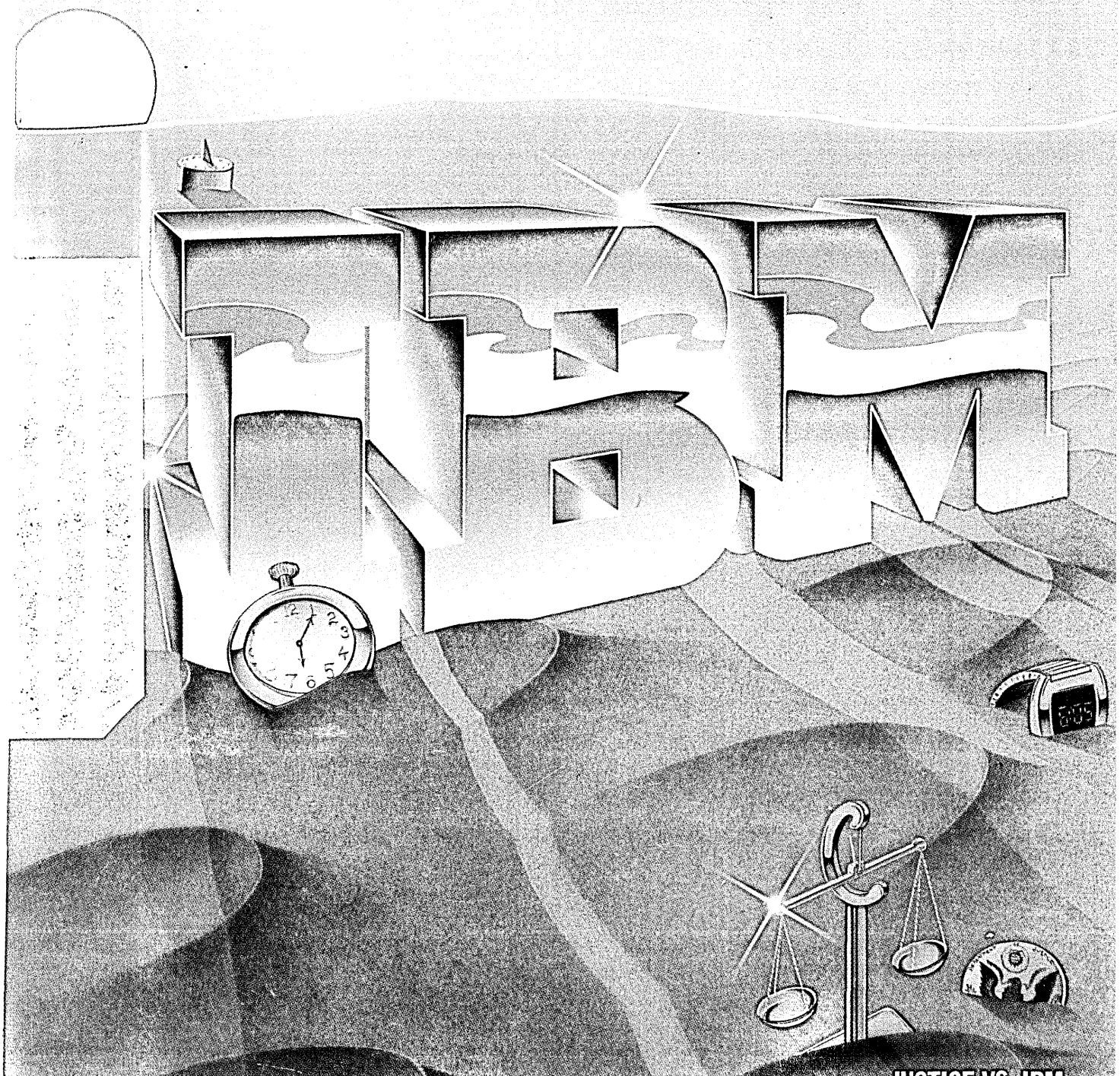

JUSTICE VS. IBM
ANTITRUST STALEMATE
IS SBS DOOMED?
IBM ON THE DEFENSE

1979 DP BUDGETS, p. 162

Also: How software is really managed, dp celebrities, back-end processsors, and changes in the operator's role. . . .

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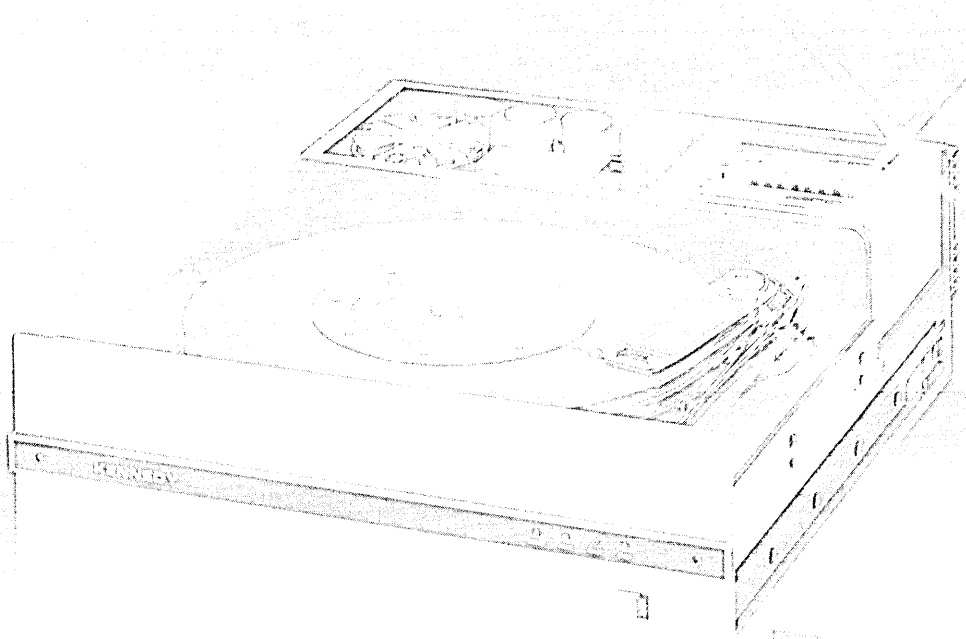

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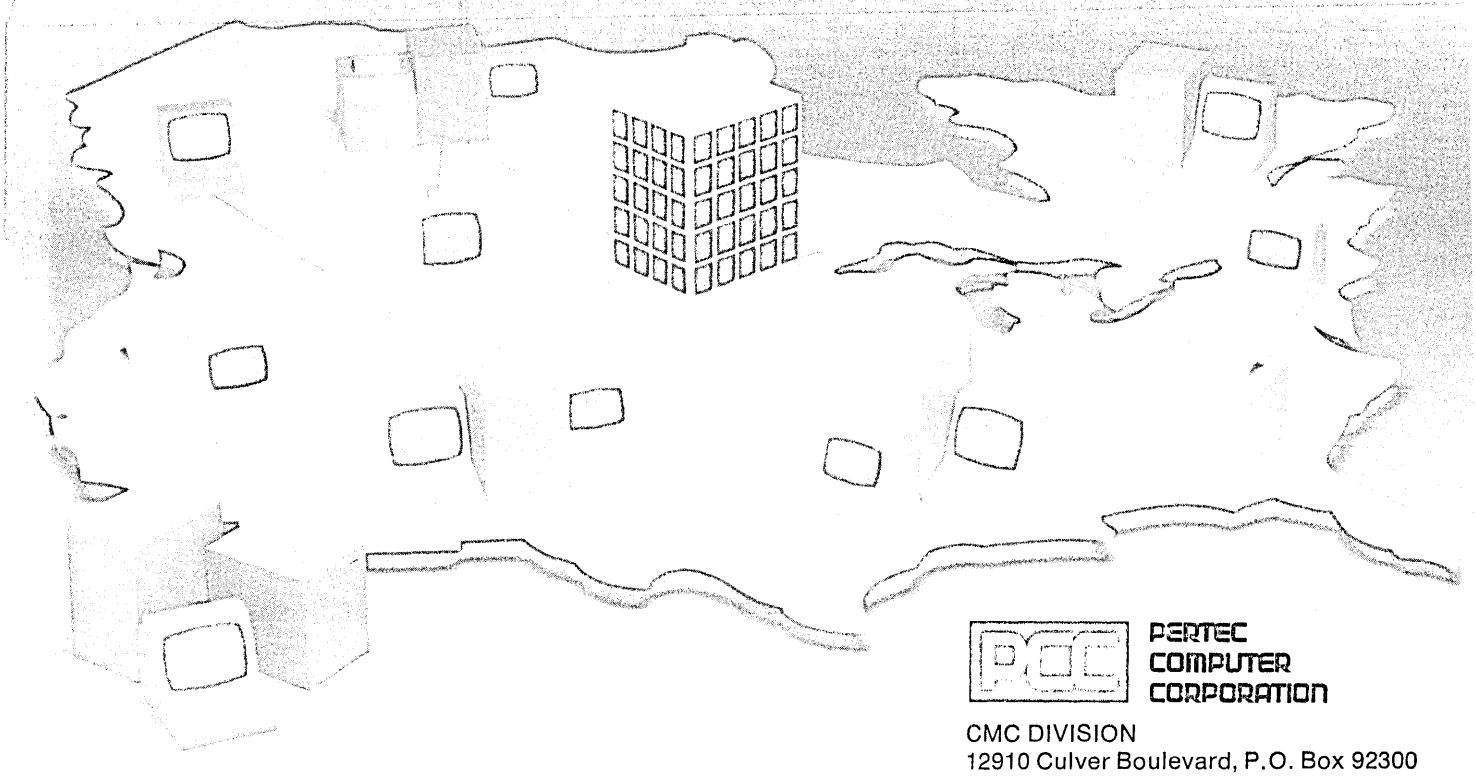
Call or write today for a detailed brochure on XL Distributed Processing – now appearing on your favorite network.



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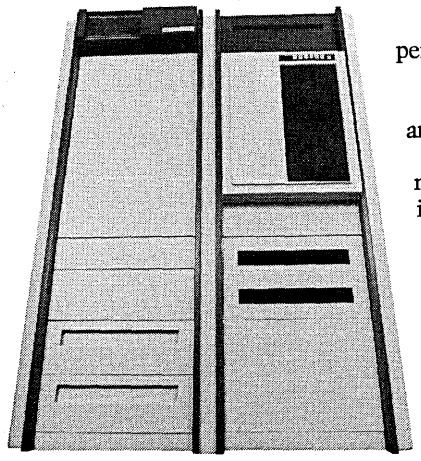

The BTI 8000 uses new hardware and software technology to offer mainframe level performance at an order of magnitude lower cost.

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The BTI 8000 is an entirely new system. It's the result of four years of intensive development. And it's backed by proven experience with BTI systems, operating successfully at over 900 installations in the United States, Canada and Europe.

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CIRCLE 16 ON READER CARD

DATAMATION 79®

JANUARY 1979/3.00 U.S.A.
VOLUME 25 NUMBER 1
This issue 138,106 copies

FEATURES

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As the antitrust trial sinks ever lower beneath the sands of time, IBM looms even larger. Air-brush painting: © Tim Alt 1979

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CIRCULATION
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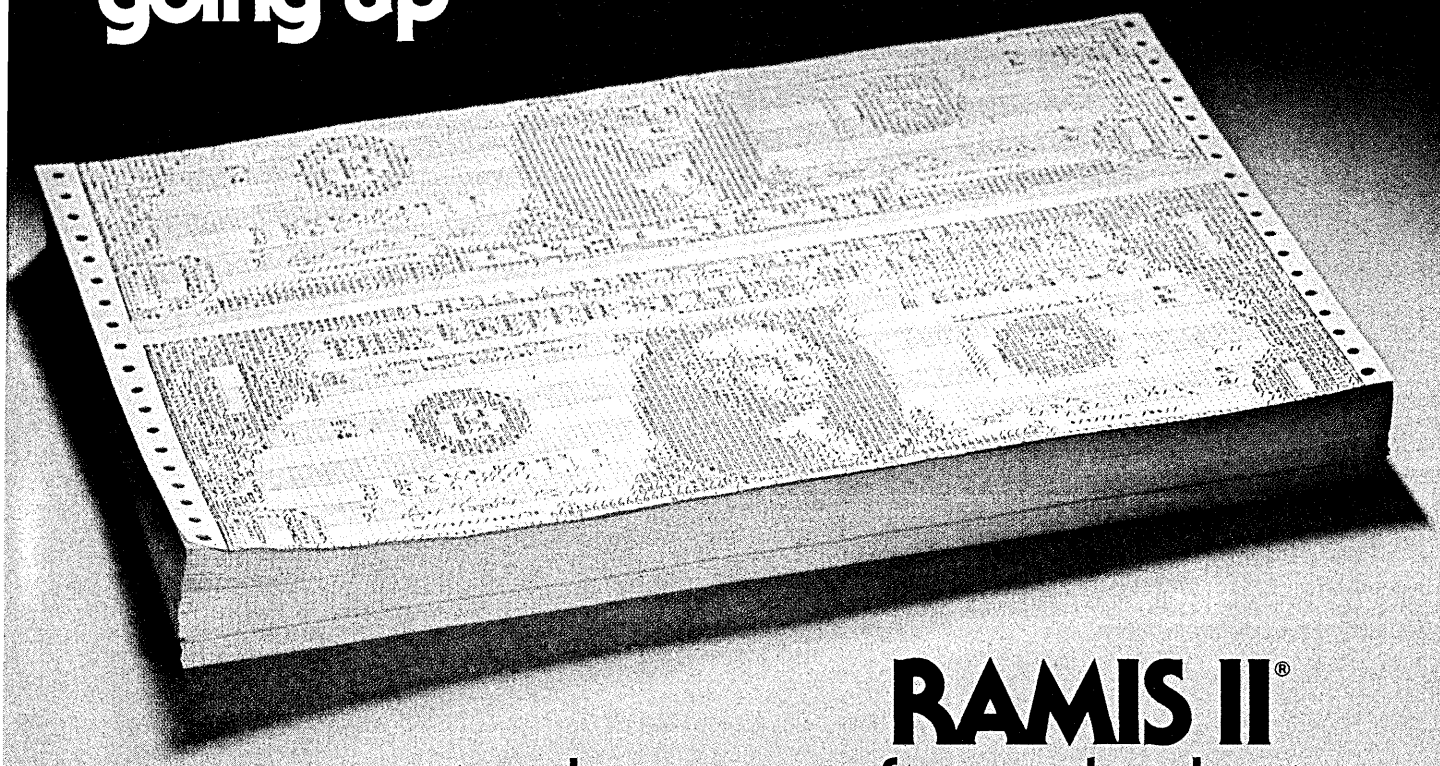
BPA Circulaton audited by Business Publications Audit

ABP Member American Business Press, Inc.
American Business Press, Inc.

DATAMATION is published monthly on or about the first day of every month plus a special issue in November by Technical Publishing Company. A Dun and Bradstreet Company, 1301 South Grove Ave., Barrington, Illinois 60010; James B. Tafel, Chairman; John K. Abely, President. Executive and Advertising offices, 35 Mason Street, Greenwich CT 06830, (203) 661-5400. Editorial offices, 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Published at Chicago, Ill. DATAMATION is circulated without charge by name and title to certain qualified individuals in the United States and Canada who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $32 (U.S.), $42 (Canada). Reduced rate for qualified students, $16 (U.S.). Foreign Subscriptions £33:50, for airmail, additional £30:00. Japan, Australia and New Zealand £38:50 (air-shipped). Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA 13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus OH.

Printed by Beslow Associates, Inc.
Circulation Office: 34 East Putnam Avenue, Greenwich, CT 06830. POSTMASTER: Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000, Greenwich, CT 06830.
Publication Number: 148800. Single copy: $3.00 (special November issue $5.00) in U.S.A.

Software is 80% of costs & going up



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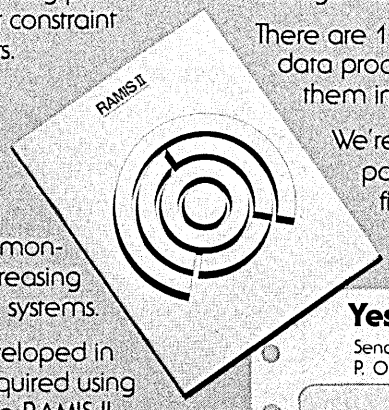

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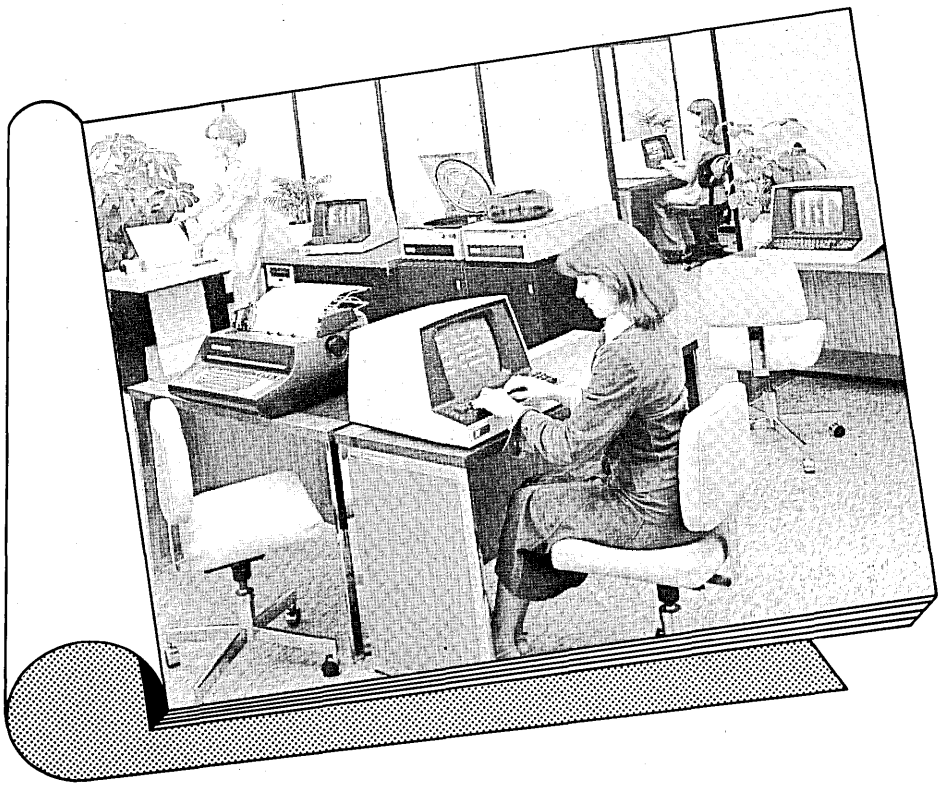


LOOKING BACK

JANUARY/FEBRUARY 1959

METEOROLOGICAL SYSTEMS AND THE JAPANESE

Delivery of a large-scale IBM 704 mainframe to the Japanese Meteorological Agency in Tokyo was revealed in a news story in this issue. It was noted that the Japanese at the facility, interested in long-range forecasts for the typhoons that lash the island chain, had never before seen a large-scale system. A 704 had also been used by the U.S. Weather Bureau at Suitland, Md., to predict weather conditions over the northern hemisphere.

Contrast that episode with what was to happen less than 20 years later. In the spring of 1978, the Japanese firm of Hitachi Ltd. had completed its delivery of three large computer systems (one Hitac M170 and two M160-II's) to be installed in the Central Meteorological Agency in the People's Republic of China. Hitachi had won that order back in October of 1976 and had received COCOM approval to make the shipment in February '78. The order was valued at more than $11 million. In May of '78, Hitachi also received an order for another M160-II system from the Chinese for use in the search for mineral resources. Delivery of this $3.5-million system was scheduled to be completed last month.

JANUARY 1969

OBSOLESCENCE

A taped discussion of the problem of obsolescence for the computer industry in this issue was accompanied by articles on obsolescence of hardware, on obsolescence in business organizations and in management, obsolescence of people and of systems software, all written by the publication's staff of advisors.

Addressed was obsolescence of machines that result from the introduction of newer models offering price-performance advantages, but acknowledged also were new machines that offer buyers only the psychological thrill of having the latest model. Lowell Amdahl noted, "A mood of change dominates the area of peripherals. New peripherals for remote use are appearing almost daily to accommodate interactive and batch processing. We even gave them a new name: terminals . . ."

And Bob Patrick wrote about technical people who allow the technology to pass them by, who fail to keep up with the latest significant advances and thereby fail to qualify for promotions to better jobs. There will be jobs paying $50K a year, he said, but they will require more than technical knowledge; he suggested acquiring skills in writing, personnel management, budgets, and project control.

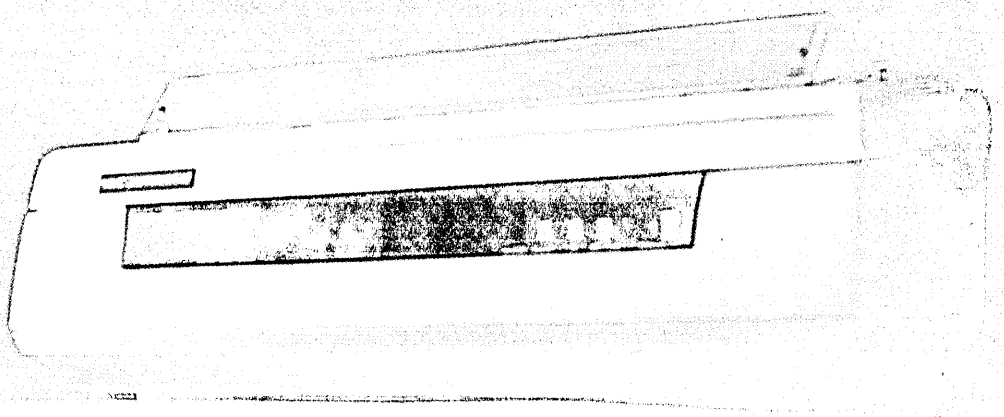
In this era before the 370s and before IBM's ill-fated FS, Phil Dorn worried that the industry might too soon forget the agonies experienced by users converting to the 360s. "Can the vendor protect the multibillion dollar user investment (several orders of magnitude larger than his own investment in third-generation FORTRAN, COBOL, and PL/1 programs and still provide the benefits of the decreased costs of the new electronics?" he asked. "Some believe that the only solution lies in the increased use of writable control stores . . ."

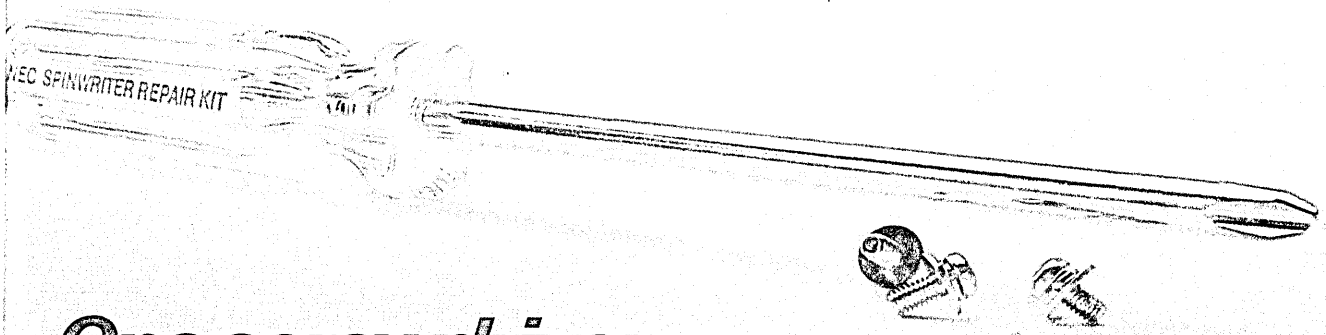
Of course, obsolescence was one of many user concerns. Only the month before, in December 1968, IBM announced its intention to begin in mid-'69 the practice of charging separately for support services. There was much conjecture, but no one outside IBM knew why the company had to announce its unbundling move six months prematurely. Nor did anyone know, of course, what specific services were to be priced separately, much less the effect of the new unbundling strategy.

Comments from people in the industry included a concern that "wild purchase-rental ratios" might result—perhaps as much as 2,000 to 1—in an effort to devastate independent leasing companies. Many saw unbundling as a major boon to software companies.

Also announced was the Control Data 7600 computer, the first model of which was already scheduled for delivery to the Lawrence Radiation Labs in Livermore, Calif. Noted this magazine: "Outperforming the 360/85, maybe two to three times as fast as a 360/91 and 10 times as fast as an 1108, the super superscale machine may even outperform the rumored 360/85 mod II and 360/105." ✻

NEC's Spinwriter repair kit.





One screwdriver. 30-minute MTTR.

NEC's Spinwriter character printers are a serviceman's dream.

That's because 90 per cent of all routine service problems can be fixed with nothing more than a #2 Phillips screwdriver. Result: your service rep can fix almost any printer problem in less than a half-hour.

Take the carriage assembly, for example. With most printers, it's a huge time-consumer to fix, and often requires shipment of the printer back to the factory. With Spinwriter printers, you remove three screws, lift the carriage out, insert a new one, and replace the screws. That simple. Ten minutes, no more.

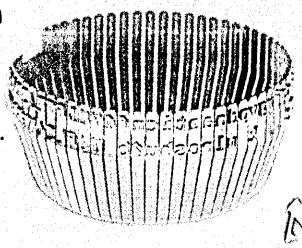
Or printed circuit boards. Any one or all can be replaced by removing just two screws—so a Spinwriter board can be changed in just three minutes. Much faster than on other printers.

The operator control panel. A cinch. Remove four screws, and the entire assembly comes off—right down to the baseplate. The same is true with power supply, fan, inverter block and keyboard assemblies. The only tool: a #2 Phillips.

Extraordinary serviceability? Sure. Now add to MTTR the Spinwriter MTBF—more than 2000 hours, the highest in the industry—and you get a printer that not only can be fixed faster, but one that needs very little service at all.

There's much more to Spinwriter printers: the superior print quality that comes from its unique thimble print element, the wide range of available fonts and forms-handling options, the eight most popular interfaces, and the whisper-quiet operation.

Find out more about Spinwriter character printers. And when you do, ask about our brand new Trimliner™ series of line printers too.



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CIRCLE 83 ON READER CARD

Hard copy made easy.

With the help of a high-speed microprocessor, Hewlett-Packard combines exceptional performance and convenience in a new low-cost printer and printing terminal.

The HP 2631A printer and HP 2635A printing terminal with alphanumeric keyboard are the first members of a new Hewlett-Packard family of hard copy terminals.

Each machine was designed to give you a number of high-performance features. And both can support a variety of interfaces, including RS232 and CCITT.V24, to fit into systems made by HP and other manufacturers.

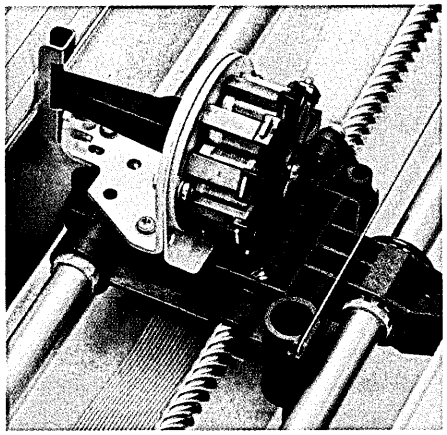
Bi-directional printing increases throughput. Both printers zip along at 180 cps in both directions, depending on your line layout. The microprocessor chooses the quickest path, and increases the speed even more by suppressing leading and trailing blanks.

High-speed slew for columnar data. When the microprocessor senses more than ten blanks in a row, it slews the print head at 45 inches per second to the next print position.

Three ways to print. The Character Compress/Expand Modes let you print more data on a page and emphasize points with headlines and titles. You can get as many as 132 characters on an 8-inch line, or 227 on a 14-inch line.

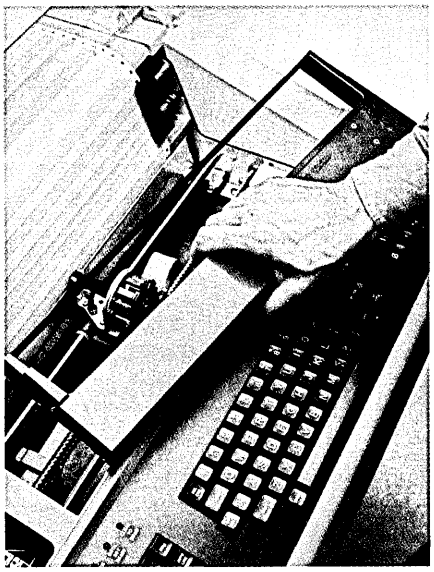
High-quality print, with six copy resolution. A 7 x 9 dot matrix (versus the usual 7 x 7) gives you clear, crisp printouts, right down to the sixth copy and meets the 128-character USASCII standard. And the extra two dot rows allow true underlining and descenders without character blurring.

Programmably interchangeable character sets. The HP 2631 can be made to print alternate character sets without reconfiguring the printer.



Long lasting, quick change print head saves service calls. The 9 wire print head is conservatively rated at a 100 million character life-span. It's also self-aligning. When you finally replace the head, you can do it yourself in a couple of minutes.

Long-life cartridge ribbon for a clean change. With a life span of at least 10 million characters, this innovative drop-in cartridge takes the mess and trouble out of ribbon changes.



Self-test for quick status checks. One key tells you if the printer is ready to go. If it isn't, the self-test feature helps you isolate the problem, reducing the time and cost for repairs.

Run everything under program control. All the features described and more can be programmably controlled. The software can take you in and out of the various modes. Or you can make a change yourself using one of the front panel switches or keys.

In a network or as part of a stand-alone system, HP now makes it simple to get the hard copy you need. If you'd like to see our printer or printing terminal in action, call the Hewlett-Packard sales office listed in the White Pages and ask for a computer systems representative. Or send us the coupon.

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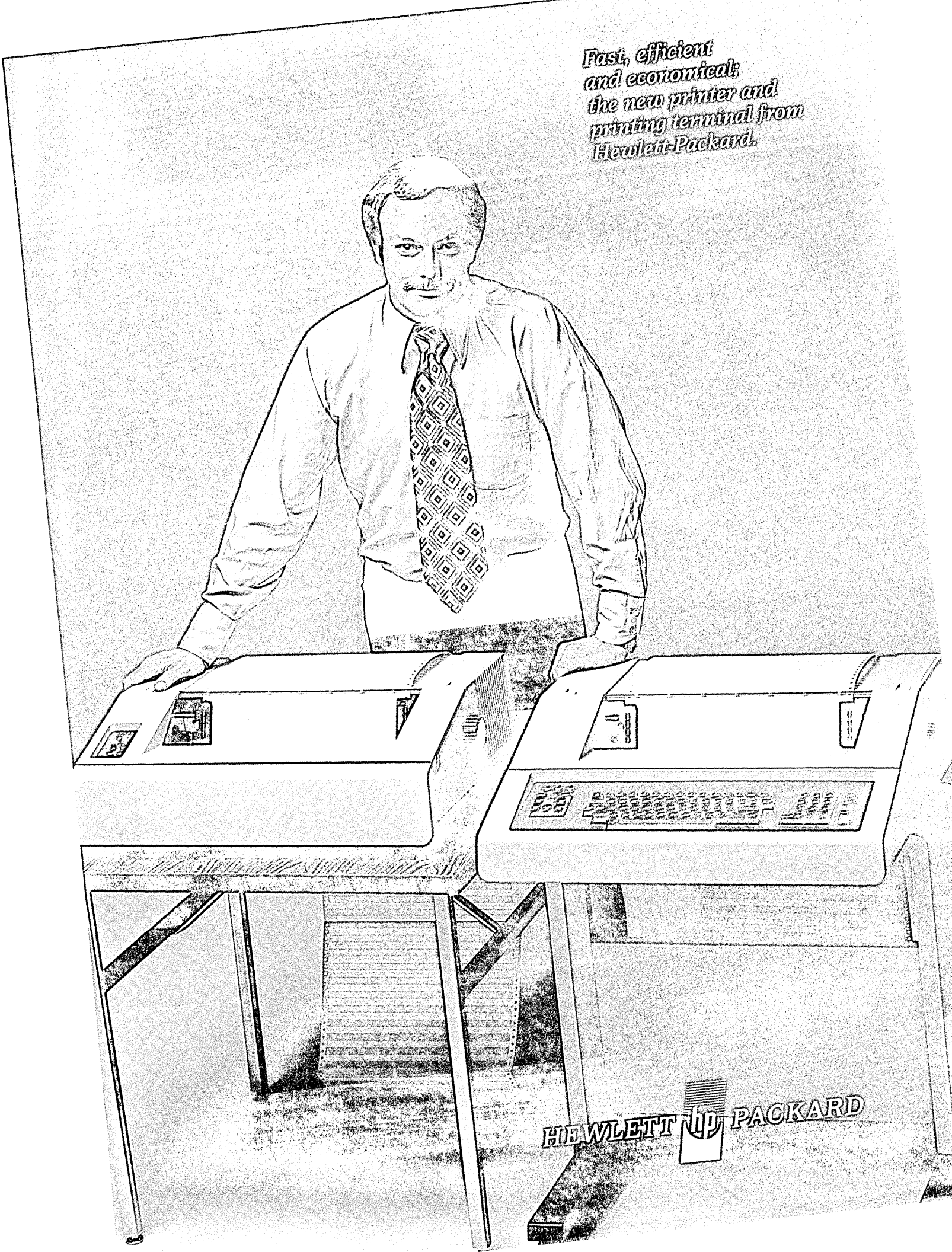
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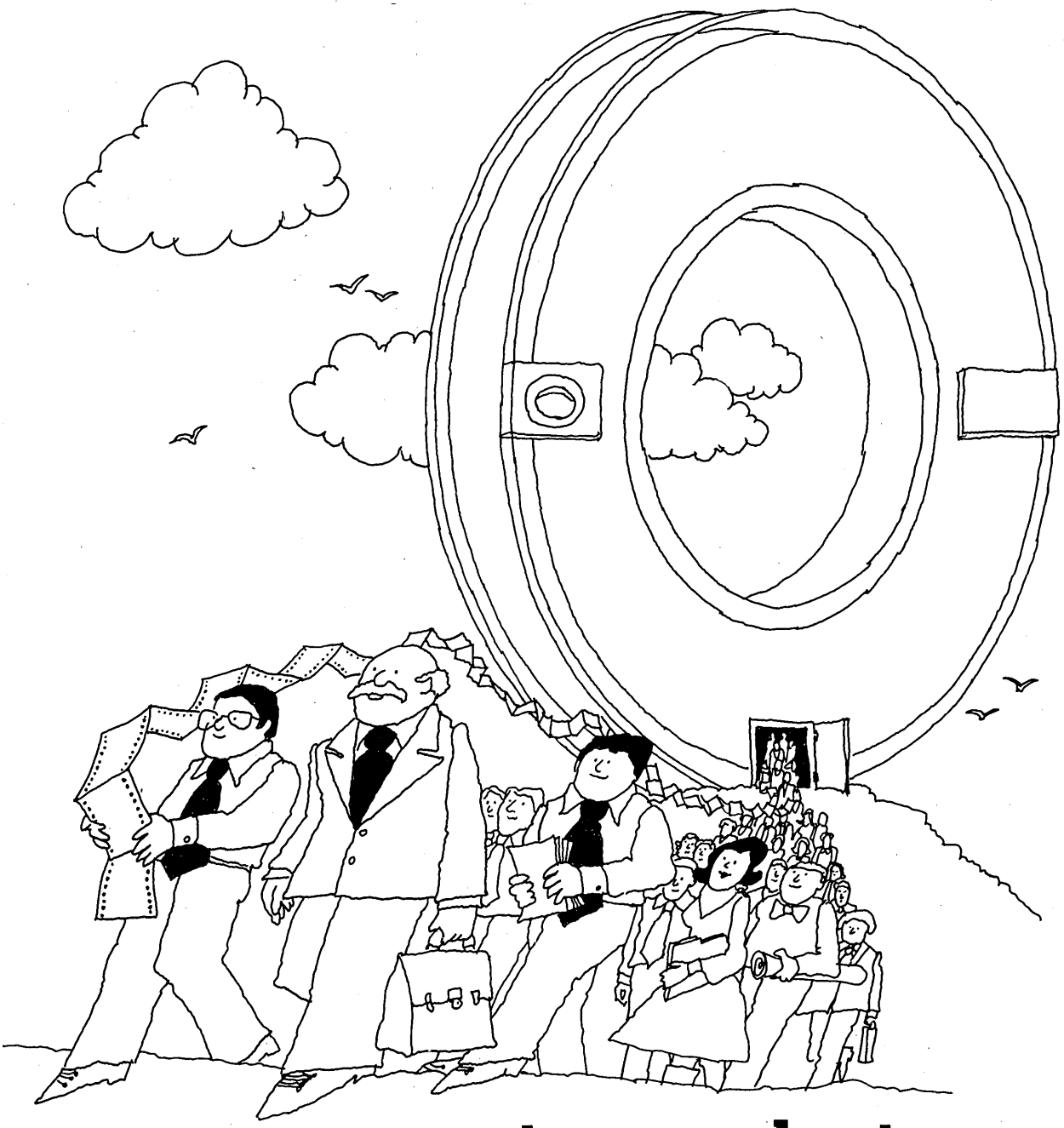

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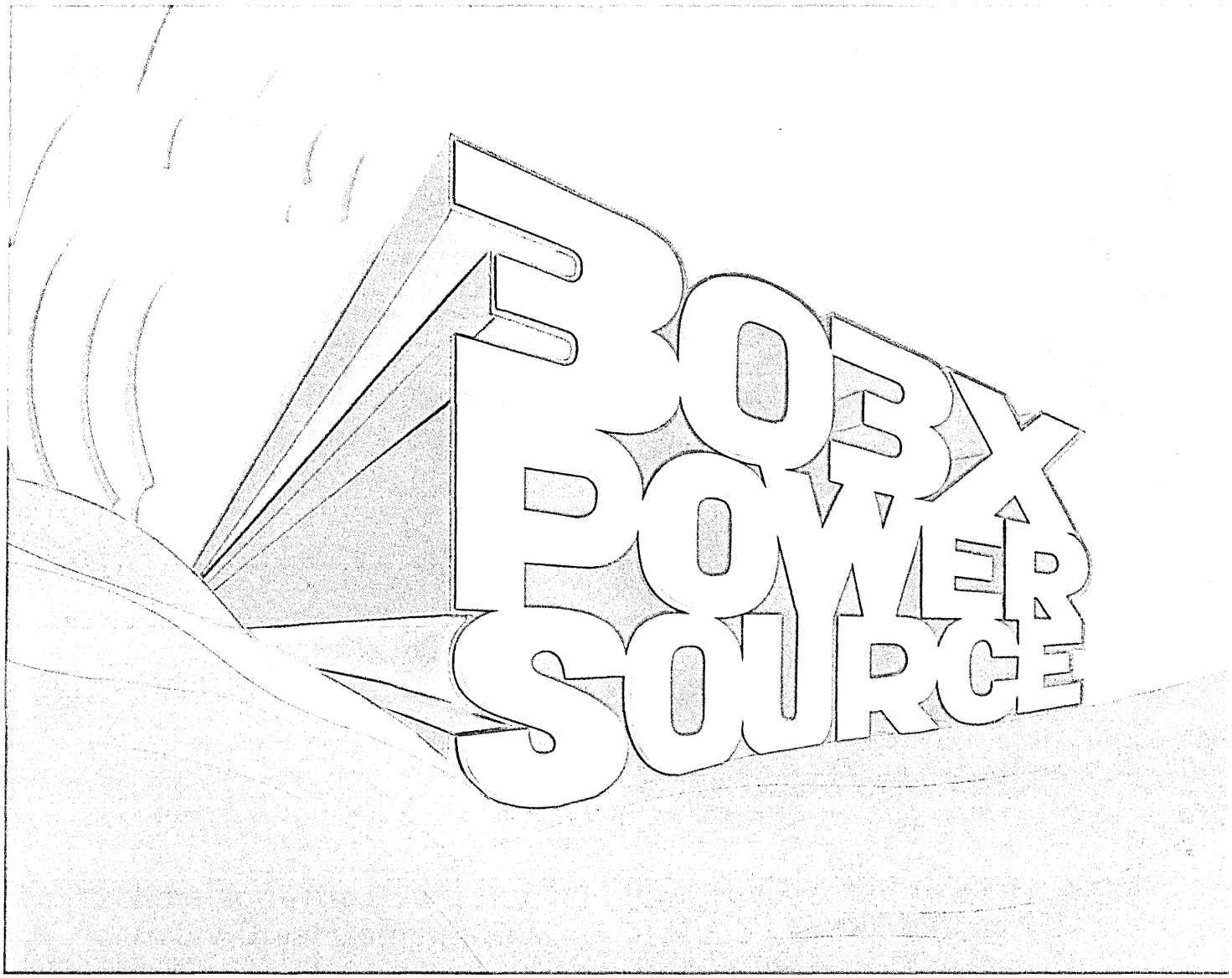
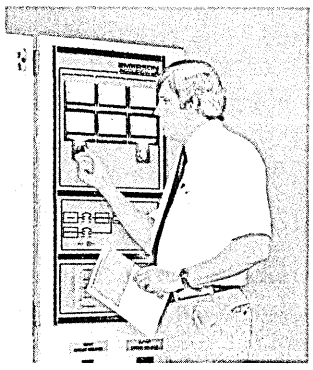


Emerson–The Power Behind Every Great Computer

For users of new generation computers, the days of using standard utility power are gone. Separate 415Hz power sources are needed for the newer, large-scale mainframes such as: • IBM's 303X series, 370/168 • Amdahl's 470V/5, 6, 7, 8 computers • Control Data • Univac.

For reliable, efficient and cost effective 415Hz power, the best solution is a solid-state uninterruptible



power supply system from Emerson. An Emerson UPS system gives you • increased reliability • low operating costs • increased up-time • ease of installation • minimal maintenance requirements • convenient, modular expansion • total compatibility with all IBM and other mainframe specifications for 415Hz power systems. And, Emerson UPS systems are so quiet, they can operate in the equipment room or out on the computer floor.

Power Protection

Emerson UPS systems also give you valuable power protection. In the event of a power failure or a power outage, Emerson gives you reserve backup power or, if necessary provides a means for an orderly shut-down of your computer operations.

Emerson–The First Choice

When you consider the choices in 415Hz power sources, you'll see why Emerson is the first choice for many of the new generation computer installations.

For more on Emerson UPS power, send for our free brochure, *303X Power Source*. It'll give you the full story. Call or write Emerson today at:

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CONSIDER ONE THING ABOUT HARDWARE BEFORE CHOOSING A COMPUTER COMPANY TODAY.

TOMORROW.

Selecting hardware is a difficult process. Get too small a system, and you're quickly faced with an extensive changeover. Overbuy, and you're saddled with costly capabilities you may never need. And even if you do find the right system for your present requirements, there's always the fear of rapidly outgrowing it.

At Itel, all of our mainframes and peripherals are designed to fit your needs today and grow to meet your needs tomorrow. In addition, built-in expandability is enhanced by engineered reliability. Itel field engineers assist in the design and development of our hardware to ensure not only maximum reliability, but optimum maintainability as well.

Itel systems are designed with state-of-the-art technology and are functionally compatible with IBM software. And as a safeguard against obsolescence, Itel's design philosophy assures full compatibility of present equipment with future generations of data processing products.

Itel's sensible approach keeps your hardware investment secure. And we look at system and software support the same way. Because Itel has a total commitment to computers.

You'll see it in every aspect of Itel data processing equipment. So we can satisfy your needs today, as well as meet your growing needs tomorrow.

After all, we know that the only way to protect our computer investment is to protect yours.

For further information, contact Itel Corporation, Data Products Group, One Embarcadero Center, San Francisco, California 94111, (415) 955-0278.

ITEL

"WITH THE MODCOMP CLASSIC, WE DON'T HAVE TO TRADE PERFORMANCE TO GET RELIABILITY."

Bill Greene, Staff Engineer
Process Computer Systems Group
Chemicals & Plastics Division Engineering
Union Carbide Corporation

Bill Greene is a staff engineer for the Process Computer Systems Group which is responsible for designing, building, testing and installing process control computer systems in the company's manufacturing plants.

Because of their experience, we gave them our new Classic 7860 super mini to test. Their experience with it was summed up in three words. "We love it."

"It's a reliable machine. And reliability is the name of the game."

"We'll trade performance for reliability anytime," said Bill. "But with the Classic, we don't have to.

"The Classic hardware is very solid. Especially for a new product. "The performance characteristics of the Classic are impressive, too. With its extremely fast floating point processor, the Classic can run through a program more than 3.7 times as fast as a MODCOMP II."

"A working computer with software that doesn't work is useless."

"We've been running the MAX III operating system for five years and the MAXNET III network extension for the past two years. They've performed well under very demanding conditions. In fact, over the past year, we've had more than 99.5% uptime on more than 30 installed MAX III systems.

"However, we're installing larger process computer networks now with more and more satellites. So we need increased host computer hardware and software capabilities.

"Our tests with MODCOMP's enhanced MAX IV operating system in the Classic have been very encouraging.

"MAX IV and the new MAXNET IV will help us relieve bottlenecks so that we can add more links and do more work with the computer. We also expect that File Manager, which can create a new file anywhere on a disc, will be a useful tool."

"We install 15-20 systems a year, so ease of implementation is important."

"Even though the Classic is a powerful and sophisticated machine, it should be an easy system for our project teams to implement. MODCOMP provides plenty of documentation and they've always been very helpful in working with us to get our systems up and running.

"In fact, we think so highly of MODCOMP and the Classic, we've already ordered two MODCOMP Classic 7860's to be used as host computers in large process control distributed networks."

It takes a tough computer to satisfy a tough customer.

At MODCOMP, we specialize in building real-time computers. They work in chemical plants. In petroleum refineries. In steel foundries. In jet propulsion labs. In electric power plants. In some of the harshest industrial environments you can imagine. Nevertheless, independent surveys have rated MODCOMP computers the most reliable systems on the market.

If you want reliability, but you don't want to trade performance to get it, do what Union Carbide did. Buy a MODCOMP Classic.

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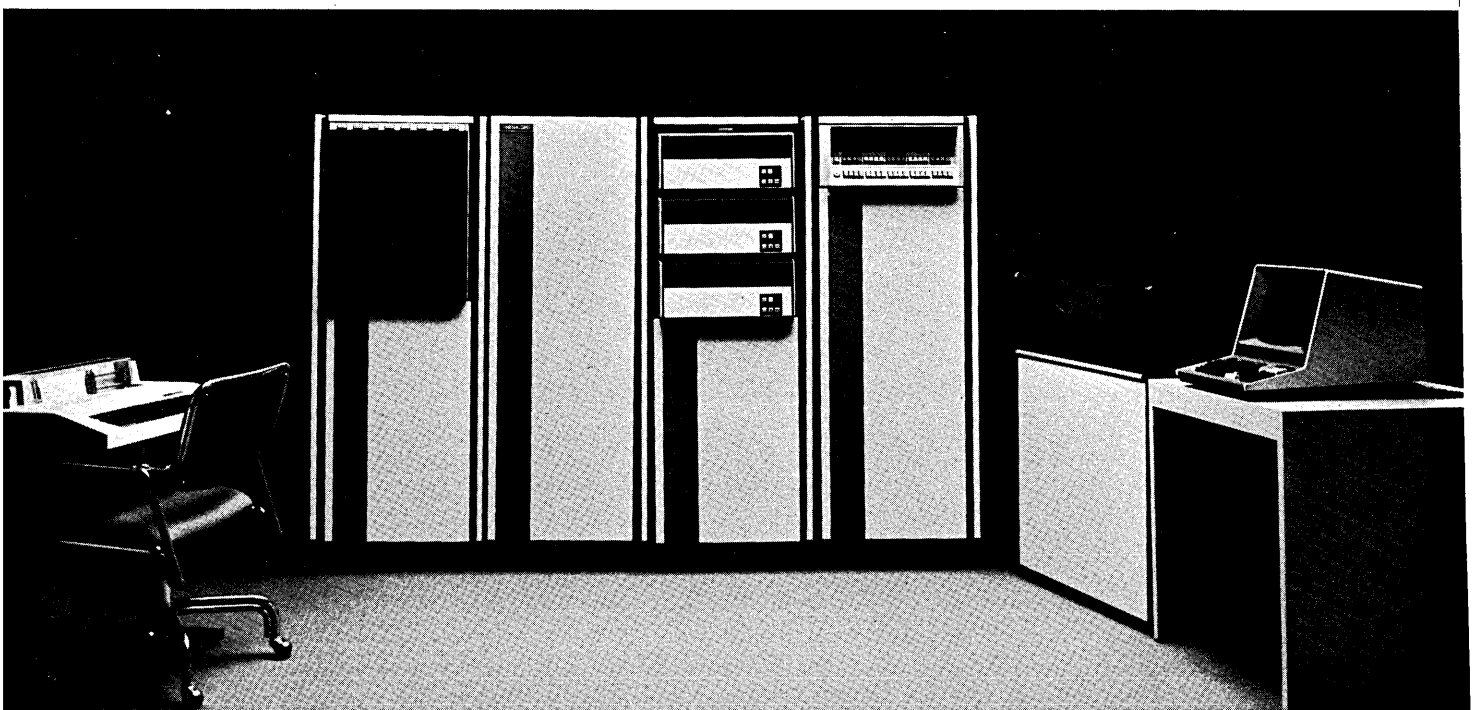
CIRCLE 73 ON READER CARD



LOOK AHEAD

CALCOMP FACES TAXING PROBLEMS	When California Computer Products closes its sale of its memory business to Xerox this month, CalComp should realize a gross of $25 million and a net of $20 million which was to have been used to retire corporate debt. The IRS has other ideas. It wants $15.9 of the $20 million for what it claims CalComp owes in back income taxes. In December the IRS was preparing to take legal action to get what it considered its share of the money coming in from the sale. CalComp was prepared to contest the federal debt. Its corporate debt of $42 million wouldn't be helped much by what the IRS would leave if it got its hands on what it wants from the Xerox money.
BANK STEPS UP SERVICE OFFERINGS	Look for Citibank to move more aggressively into the time-sharing and services business now that its lawsuit with ADAPSO has been settled. The services association had pressed for the bank's time-sharing operations to be broken out from under the Citibank umbrella with separate P&L statements, marketing force, etc. The new separate but wholly owned bank service entity born of this settlement is being called Cityshare and combines the concern's interactive and financial systems groups to provide customers with data processing and financial software capabilities. To support this group, the minicomputer-oriented financial institution has added a big machine -- a DEC 20/60 -- to its interactive processing systems.
BELL'S FIRST ACS CUSTOMER	It's no secret that AT&T is beefing up its marketing efforts. Fresh proof of that comes from a knowledgeable AT&T insider who reports that under a new five year plan, the communications giant expects to quadruple its marketing forces by 1983. Targeted for implementation throughout the Bell system, these marketing boosts will be especially significant in the data services area where the company will be putting the big push on its new Advanced Communications Service (ACS). It's also been learned that Bell's first ACS customer will be none other than its very own Long Lines Dept. With testing slated to begin this May, the in-house ACS net is expected to be fully operational by September.
A MEGABYTE FOR $300?	How about one million bytes of storage on a three pound floppy disk drive that sells for about $300? Al Donnelly, director of engineering with Micro Peripherals, Inc., says such a product will be surfacing late this year, even though most floppy disk drive manufacturers are having trouble developing systems with half that capacity. Reliability problems arise when that kind of density is achieved by recording and writing on both sides of a 5 1/4 inch disk. The problem is solved when someone finds a way to lessen disk deterioration from constant pressure from the two heads. Another problem facing companies that will supply the one megabyte version is that of precise reading of very densely packed data -- 100 tracks per inch. Micro Peripherals thinks its product solves both of these problems, but meantime it's

LOOK AHEAD

aiming at the market for half a megabyte floppy drives -- one it sees reaching a million drives a year by 1982. At least four venture capital companies believe they're right -- they've just coughed up $1.2 million to get the fledgling Woodland Hills, Calif., company into production.

WHO'S REALLY SEEN A SERIES/1

If IBM's Series/1 minicomputer befuddles potential users (Dec. p. 17), consider the poor marketing people supposed to be selling it. Datum Inc., an Anaheim, Calif. mini-peripherals firm which makes a line of peripheral systems for Series/1, had one of the IBM's minis in its booth at the Mini/Micro show in Houston in November. A booth staffer said one of its most interested visitors was IBM's Houston district manager with marketing responsibility for the Series/1. "He'd never seen one before." What's more, said the same spokesman, Datum had a problem with a Series/1 it had in its booth at the Canadian Computer Conference in Toronto later the same month. "We were bounced around in trying to get a service representative from IBM and, when we finally found one who was supposed to be up on the Series/1, it turned out he'd never seen one either."

A NAME BEFORE ITS TIME

Computers were all pretty big back in 1961 but the Electronic Engineering Co. of Calif. (EECO) already was thinking small, in terms of names anyway. In that year it got a trademark for the term Microsystems. In recent years it's had many an opportunity to sell the trademark but it hasn't. It hasn't been used to cover a microcomputer but it still is used as it was when it was obtained to cover EECO's computer modules, logic line and timing systems.

THE BOSS LOVES "HIS AND HERS"

Targeted for introduction in mid-1977, Texas Instruments' personal computer product line is expected to make its long overdue debut next June at the West Coast Consumer Electronics Show. The two-year delay in getting the product on the market, according to one TI insider, is due to problems with the machine's integrated circuits.

This timetable slippage, sources report, is expected to spawn a shakeup in TI's personal computer management team. The company's personal processor has been tentatively dubbed the Home Information System, and Home Educational and Recreational System (HIS and HERS) -- a name which company president J. Fred Bucy personally favors.

RUMORS AND RAW RANDOM DATA

Late in December there were rumors that IBM's Inca-1 announcement -- the so-called E Series -- had slipped to late January or February...Latest word says the IBM E Series could have a virtual memory microcoded operating system. IBM was said to be interested in the "conversation monitor" that just fits on top of the job control language (JCL) and runs the whole shop like a big interactive minicomputer. So far, experts have been guessing on a stripped down version of MVS for the E Series, something that should be made easier to implement by increasingly cheap memory...In the wine land of Northern California, sales trainees at Hewlett-Packard are given a wine appreciation class. The 2 1/2 hour course, taught by public relations man Ross Snyder, a member of the International Wine and Food Society, helps salesmen to entertain customers at dinner.

"Thanks to MARK IV,® our users have beaten the computer room waiting line!"

Jennifer Thompson, Senior Computer Systems Analyst
Great-West Life Assurance Co., Winnipeg, Manitoba, Canada

Founded in 1892, Great-West employs 4,000 people, carries $43 billion in insurance annuities and has $3.3 billion in assets. It is Canada's largest life insurance company in terms of insurance income and the 14th largest life insurance company in North America in terms of total insurance in force.

"As the methods of storing and manipulating data become more varied and complex, the need for easy user access to this data has increased. Even though our 370/168 attached processor with MVS operating system gives us substantial computing power, and we have over 100 programmers and analysts, the company's demands on these resources are tremendous. User requests create an ever-extending queue because we simply could never do all they wanted us to do.

"With MARK IV, our users can get the information themselves, often in quite sophisticated ways. Thanks to MARK IV, they've learned how to avoid the programming waiting line. And from the feedback I'm getting, they're very pleased with this new environment!

"MARK IV has also had an impact in our Computer Systems area. We have developed some complete systems, using the many powerful capabilities of the language, such as transaction processing and file coordination. Even though the programmers were relatively inexperienced with MARK IV, they indicated the development times were considerably shorter with MARK IV than with PL/1.

"Most programmers show resistance to a new tool like MARK IV, but once they have used it, they come back to tell me how much they like it. It's the thrill of getting results!"

GET THE FACTS ON MARK IV. MARK IV is the most versatile and widely used software product in the world for application implementation, data management and information processing. Six powerful models (prices start at $12,000) are in daily use on IBM 360/370, Univac 70/90, Siemens 4004, Amdahl 470, and Itel Advanced System computers at over 1,300 installations in 44 countries. Programs in MARK IV require only about one-tenth the statement of Cobol, and users report 60 to 90% cost and time reductions on most MARK IV applications.

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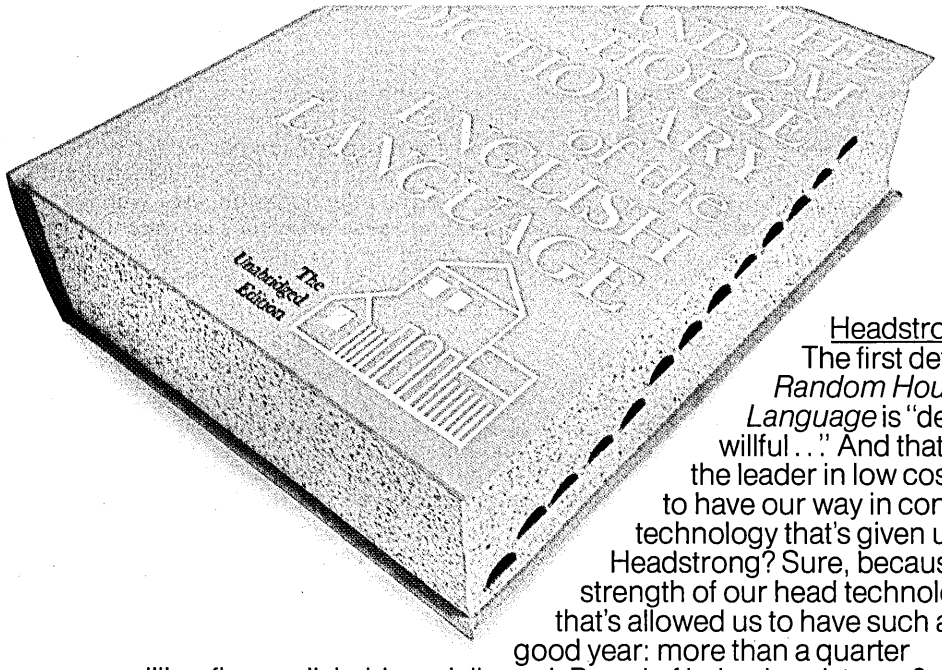
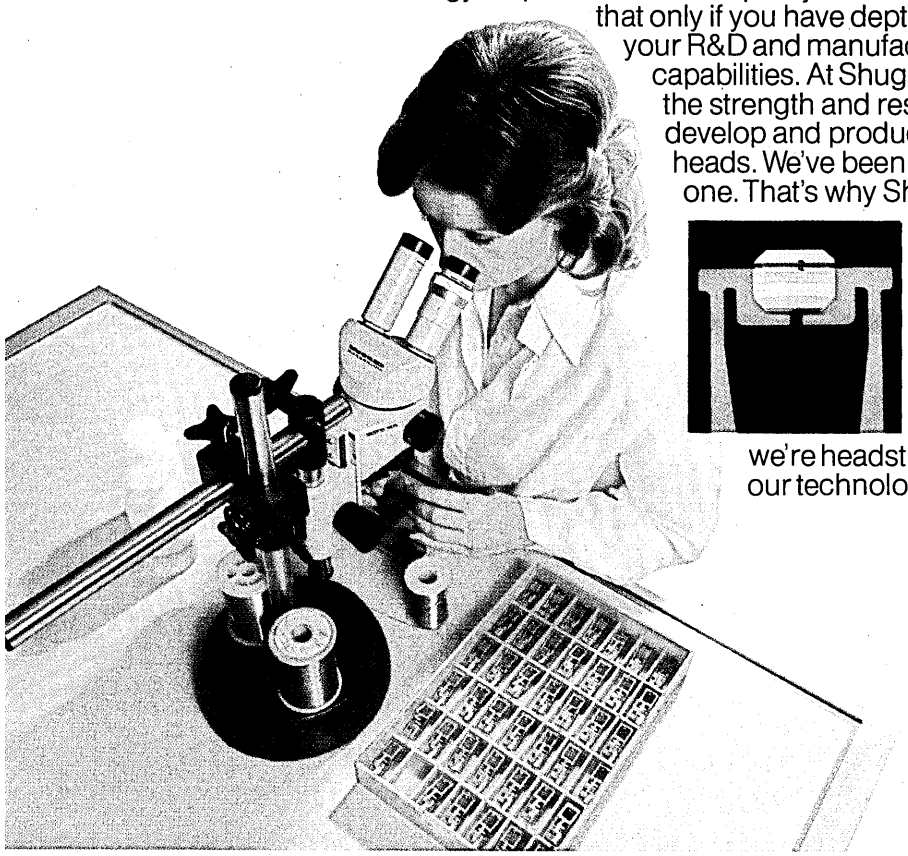


Headstrong about leadership.
The first definition of headstrong in the *Random House Dictionary of the English Language* is "determined to have one's own way; willful . . ." And that's a fine explanation of why we're the leader in low cost disk storage. We're determined to have our way in controlling the read/write head technology that's given us our leadership position.
Headstrong? Sure, because it's the strength of our head technology that's allowed us to have such a good year: more than a quarter million floppy disk drives delivered. Proud of being headstrong? You bet. And proud of our heads-up OEM customers who specify Shugart products.

We headstrong of

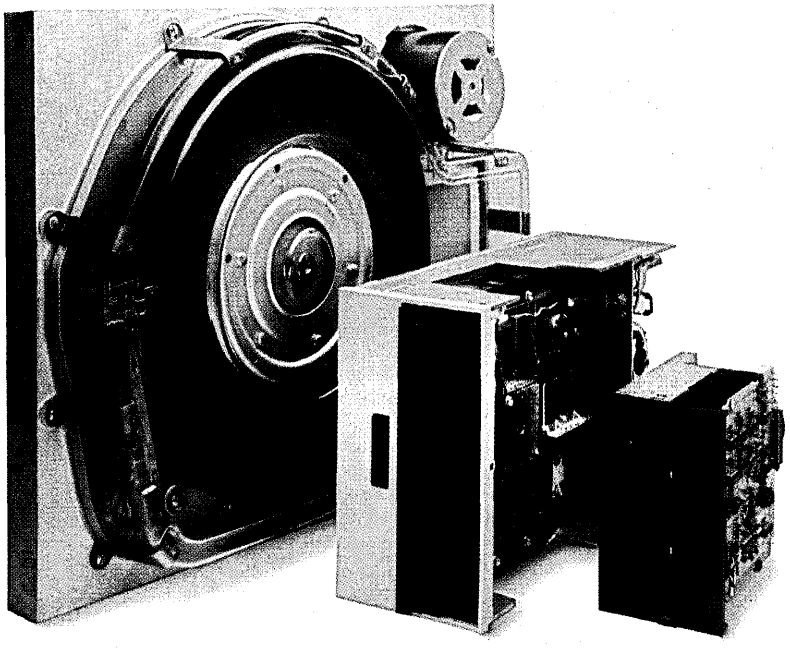
Headstrong about technology.
The only sure way to control quality is to control the key technology responsible for that quality. You can do that only if you have depth in your R&D and manufacturing capabilities. At Shugart, we've got the strength and resources to develop and produce all our read/write heads. We've been doing it since day one. That's why Shugart read/write head technology extends media life to over 3.5 million passes per track, and gives you a head life that exceeds 15,000 hours. And it's one of the big reasons why heads-up OEM's demand Shugart. Because they know we're headstrong about controlling our technology.



Headstrong about R&D. We invest significantly more Research and Development dollars in floppy disk technology than any other manufacturer in the business. Shugart's commitment to R&D is responsible for our introduction of the first independently developed IBM-compatible floppy disk drive; the first, and now famous, Minifloppy,™ and the first low cost fixed disk drive providing state-of-the-art Winchester technology. As your markets broaden, our product lines will grow to ensure your continued success. We're committed to it. Shugart's entire R&D effort is concentrated on innovating and improving low cost disk storage products. It's our only business. That's why we're so headstrong about R&D.

're and proud it.

Headstrong about delivery. In our business, innovation isn't enough. You've got to deliver high quality products in high volume. We're headstrong about our commitment to high volume delivery of low cost, rotating memory products. We fulfill that commitment by implementing production techniques developed by one of the best R&D and manufacturing engineering teams in the industry. Automated systems featuring high-speed conveyor and turret assembly technology provide an unequalled manufacturing capability. And quality control at Shugart means testing 100% of the drives we manufacture. And these test procedures are tough—tougher, in fact, than any of the real applications where you'll be using our drives. Shugart Associates, Headquarters: 435 Oakmead Parkway, Sunnyvale, California 94086 (408) 733-0100; Europe Sales/Service: Paris (1) 686-00-85; Munich (089) 176006; Shugart products are also available from local Hamilton Avnet outlets.



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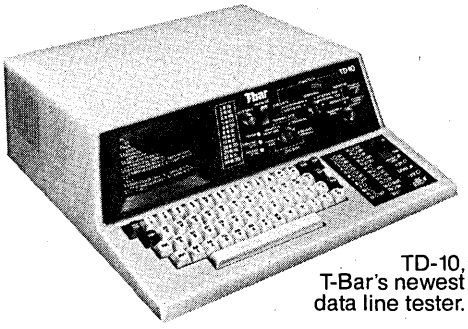

TD-10, T-Bar's newest data line tester.

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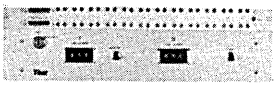
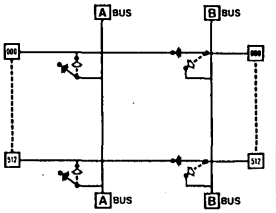
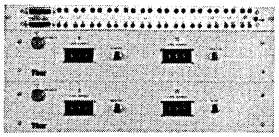
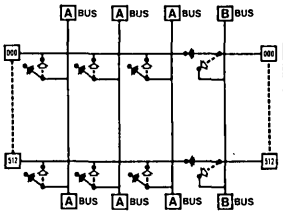
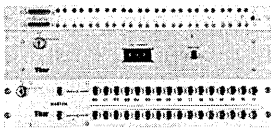
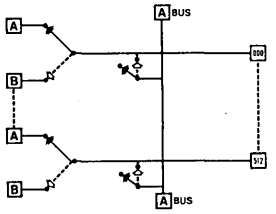
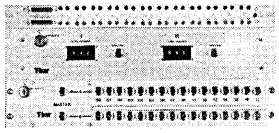
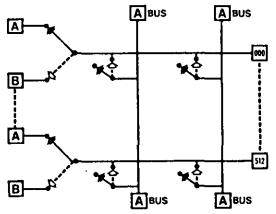
Typical Modular Combinations

(Shown with Digital Access Panel 5971)

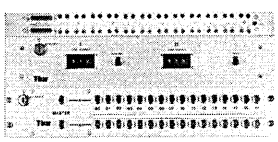
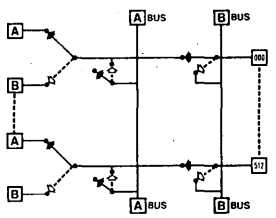
MONITOR WITH TEST

	Control Panel	Switching Diagram
TWO BUSSES Independently MONITOR One Line and Test One Line	 7204	
FOUR BUSSES MONITOR Three Lines Independently and Select One to Test	 7204/7204	

MONITOR WITH TRANSFER

ONE BUS MONITOR One Line Selectable Between Two Digital Devices (FEP Ports, Modems, etc.)	 7205/5102	
TWO BUSSES MONITOR Two Lines Selectable Between Two Digital Devices (FEP Ports, Modems, etc.)	 7204/5102	

MONITOR WITH TEST AND TRANSFER

TWO BUSSES Independently MONITOR One Line Selectable Between Two Digital Devices (FEP Ports, Modems, etc.)	 7204/5102	

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Bank Telecommunications Workshop, Feb. 11-14, Los Angeles.
A large exhibit area is planned. Sponsored by the American Bankers Assn., 1120 Connecticut Ave., N.W., Washington, DC 20036.

IWP Spring Symposium, Feb. 13-15, Los Angeles.
Panels, sessions, and workshops are to be held on various aspects of word processing including administrative support, photocomposition, electronic mail, hardware trends, and word processing education. Speakers are to include Gerald Hershey of the Univ. of North Carolina, an expert in wp management, and Amy Wohl, newly appointed as executive editor for Datapro's office systems group, who will address the development of mixed-vendor multisystem configurations. There will be special interest session panels on word processing in the law office and in the aerospace environment. Over 100 exhibitors will be showing their wp and peripheral equipment, and attendence is expected to reach 900—nearly double last spring's figure. Registration is $150 ($125 for IWP members). International Word Processing Assn., 2360 Maryland Road, Willow Grove, PA 19090 (215) 657-3220.

ACM Computer Science Conference, Feb. 20-22, Dayton.
Invited speakers include Jeffrey D. Ullman, professor of computer science at Princeton Univ., discussing "Database Design Theory," and Maurice H. Halstead, professor of computer science at Purdue, addressing "Software Science." Short papers on current research will also be presented. Registration fee is $50 (students, $10; ACM members, $40). Contact 1979 Computer Science Conference, Computer Science Dept., Wright State Univ., Dayton, OH 45431 (513) 873-2491.

Intelcom 79, Feb. 26-March 2, Dallas.
Seminar topics at this international telecommunications conference and exhibition are to include transmission systems, satellite communications, regulation and policies, telecommunications network planning and management, training, fiber optics, economics, and privacy and security. Registration fee is $120 for the five days, $50 per day, or $15 for the exhibition only. Contact INTELCOM 79, Registrar, Horizon House International, 610 Washington St., Dedham, MA 02026 (800) 225-9977 (in Massachusetts call 326-8220).

International Computer Expo, Feb. 28-March 2, Tokyo.
There is no charge for exhibition attendance. The seminar program will include discussion of voice recognition systems, digital data communication, computer techniques in management of large complex projects, and peripheral devices for low cost systems. Contact Golden Gate Enterprises, Inc., 1307 S. Mary Ave., Suite 210, Sunnyvale, CA 94087 (408) 737-1100.

Interactive Videodisc and Media Storage in Education, Feb. 27-28, Orlando, Fla.
Contact the Society for Applied Learning Technology (SALT), 50 Culpeper St., Warrenton, VA 22186 (703) 347-0055.

MARCH

Micro-Expo '79, March 3-4, Houston.
This is the third annual microcomputer exposition sponsored by the Texas A&M Microcomputer Club. There will be exhibits both by dealers and hobbyists. Seminars of three sorts are planned: basics for the micro beginner, microcomputer applications, and advanced computer topics. Admission is nominal (around 50¢). Contact Larry Brown, chairman, Micro-Expo 79, (713) 693-5748 or Scott Edwards, Microcomputer Club vice-president (713) 845-5531 ex 284 or (713) 693-0217.

Human Resources Conference, March 4-7, New York.
Personnel issues such as economic considerations, employee expectations, government legislation, and the role of the human resources function in the organization are to be addressed. Contact Michael Richards, Conference Director, Human Resources Div., American Management Assn. Headquarters, (212) 586-8100.

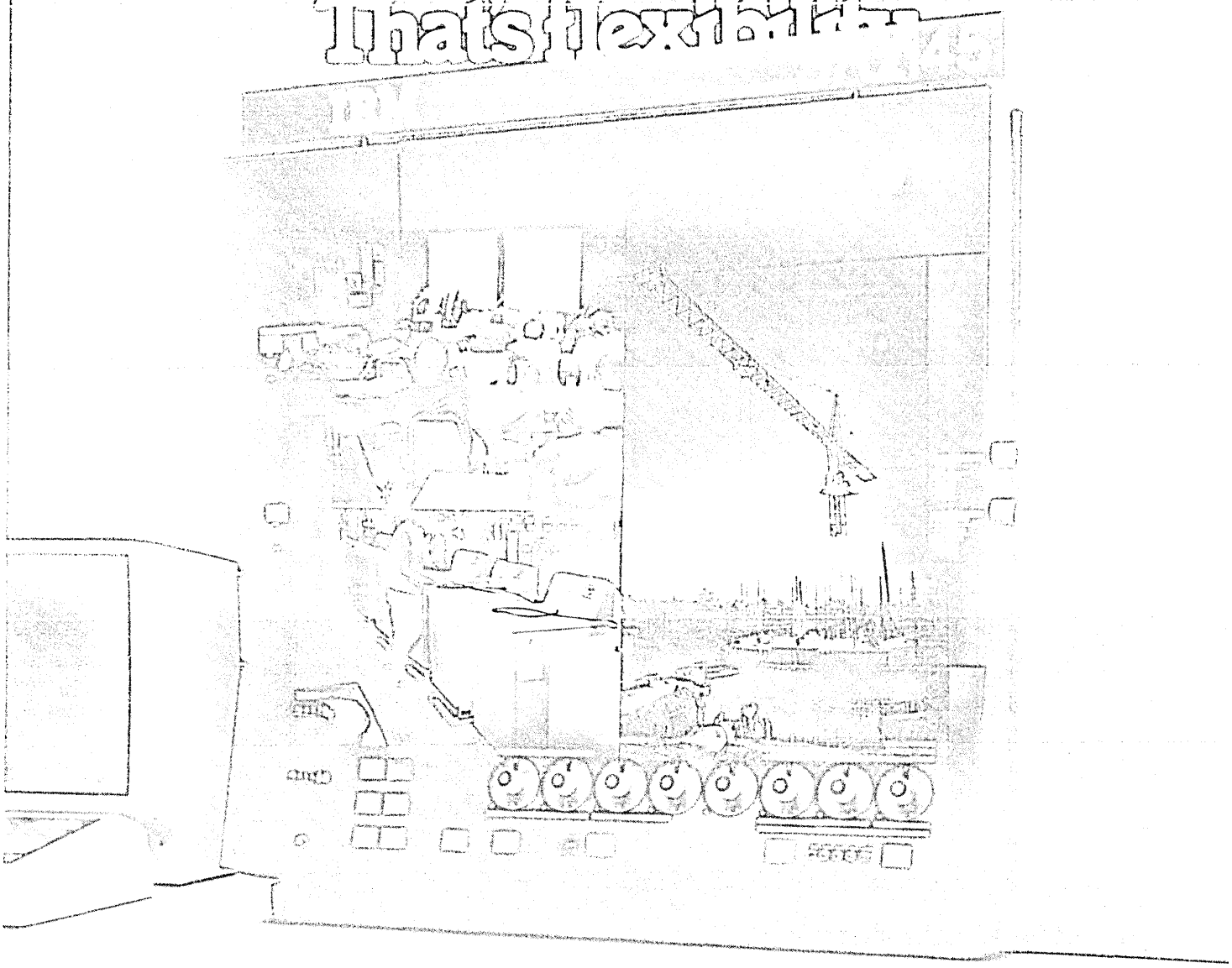
Personal Computer Fair, March 10-11, Seattle.
Last year's event attracted more than 5,000 people. Designed for the general public. Cosponsored by the Northwest Computer Club and the Pacific Science Center. Contact Susan Stocker, Pacific Science Center, 200 Second Ave. North, Seattle, WA 98109 (206) 624-8140.

Federal Dp Expo, March 20-22, Washington, D.C.
Attendance at last year's show was over 4,000. Contact the Interface Show Group, 160 Speen St., Framingham, MA 01707 (800) 225-4620 (in Massachusetts call 879-4502).

APRIL

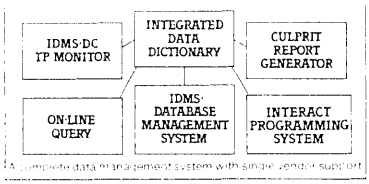
Interface 79, April 9-12, Chicago.
Some 220 suppliers of computer and data communications hardware, software and services are expected to exhibit at the four-day show, a 25% increase over last year. Show organizers anticipate as many as 15,000 attendees. Popularity of the event is considered to be linked to the dramatic growth in the datacomm industry. In the U.S., it is estimated, computer users will spend this year approximately one quarter of their nonsalary dp budgets on data communications hardware, software, distributed dp, networking, line charges and other aspects of computer communications. Contact The Interface Group, 160 Speen St., Framingham MA 01701 (800) 225-4620 (in Massachusetts call 879-4502).

IDMS lets you put your real world into your computer. That's flexibility.



Why have a rigid, unbending database architecture that wastes hardware and people?

When you can have IDMS, the DBMS that mirrors your real world by basing your data structure on your actual informational needs. IDMS is a uniquely responsive database package that saves people and hardware. It has the flexibility to accept your data as is, so you don't have to change your real world to fit your database.



IDMS gets the industry's best vendor support, including continuing enhancements. It is part of a completely integrated data management system that will keep you on the leading edge of database technology.

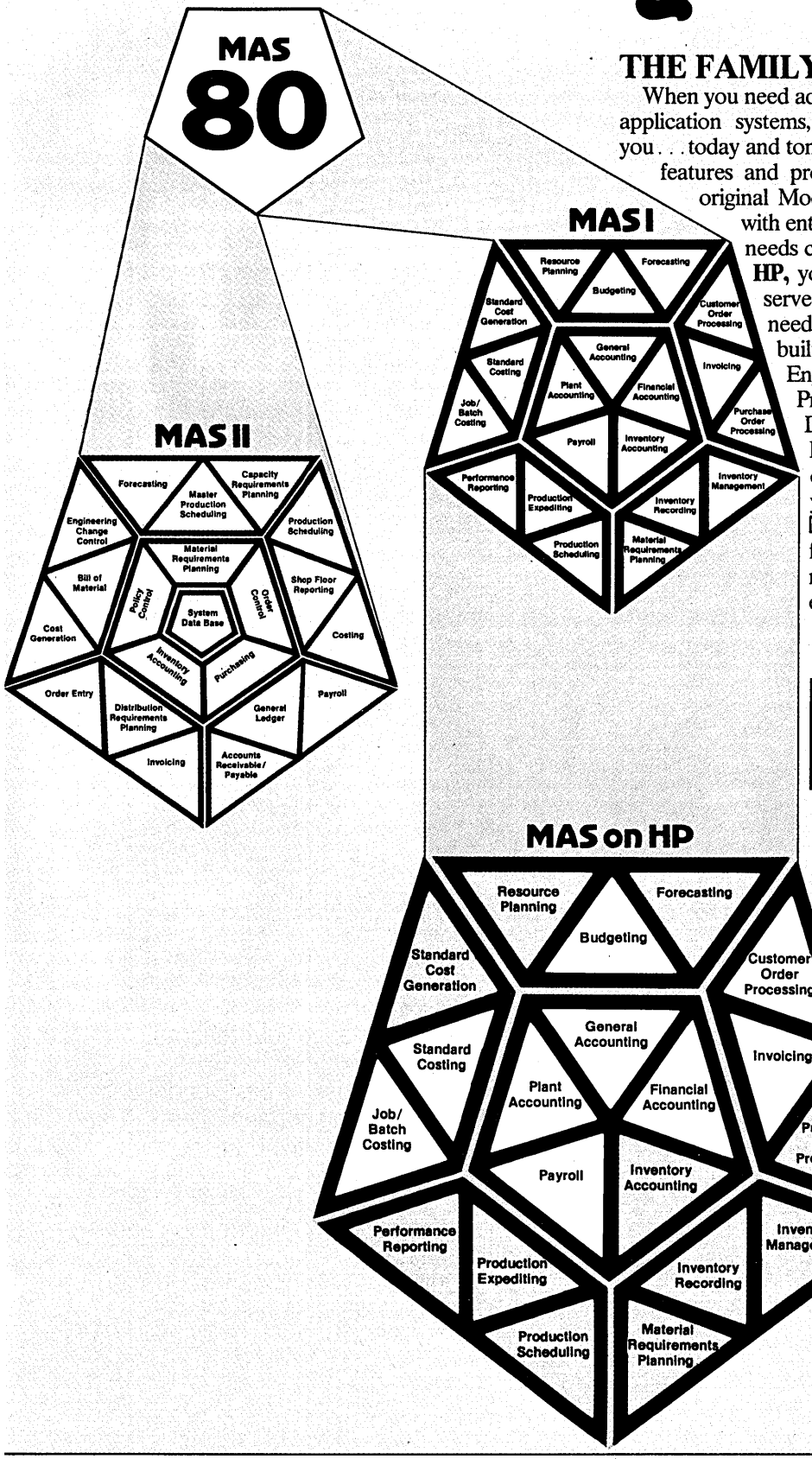
Details? Write or call for information and a schedule of database seminars in your area. Cullinane Corporation, 20 William Street, Wellesley, Mass. 02181. (617) 237 6600.

Cullinane Corporation

Database: Cullinane

CIRCLE 18 ON READER CARD

Manufacturing Systems including the newest



THE FAMILY

When you need advanced software for manufacturing application systems, our MAS-80 Family can cover you . . . today and tomorrow. MAS-80 combines the best features and proven experience gained from our original Modular Application Systems (MAS), with entirely new capabilities. Whether your needs call for **MAS I, MAS II,** or **MAS on HP,** you can be certain your system will serve all of your company's operating needs. MAS-80's functional capability is built around these six business areas: Engineering Control, Financial Control, Production Control, Inventory Control, Distribution Order Entry, and Business Planning. These systems are not only individually purchasable, but you also get . . .

☐ Functional and technical configuration flexibility to fit both your manufacturing and data processing environment.

MAS on HP

MAS on HP is an on-line, interactive Materials Management System specifically for the Hewlett Packard 3000.

from the MAS-80 Family family member...

☐ A cost-effective way of achieving proven, viable manufacturing systems.
☐ Comprehensive and integrated systems covering your primary business areas. They are independent, yet still automatically interfaceable.

But, while MAS-80 family members share certain functional aspects, each offers a unique set of benefits you can utilize, depending on the needs of your manufacturing environment.

MAS on HP PROVIDES . . .

☐ **Individually purchasable systems modules for Inventory Control, Manufacturing Control and Purchase Order Processing.**
☐ **On-line, interactive inquiry and update capability.**
☐ **Fully integrated Data Base using IMAGE as the Data Base manager.**
☐ **Complete transaction recording for all systems activities and functions whether batch or on-line.**
☐ **Data Entry Language invoked for CRT screen processing to readily change screen formats.**
☐ **Increased system throughput performance tuning to optimize vital storage processing, e.g.:**
- **—minimize stack size**
- **—consistent code segmentation**

☐ **Use of QUERY for specialized inquiries or special reporting to enhance your on-line capability.**
☐ **Data Base security assuring privacy and integrity of your data.**

MAS-I PROVIDES . . .

☐ Batch processing capability to run on mainframes such as IBM, Honeywell, Univac.
☐ 20 individually purchasable elements.
☐ Functional compatability with MAS II.

MAS II PROVIDES . . .

☐ Individually purchasable elements, constituting a complete Materials Management Closed Loop System, including necessary Data Base control and maintenance functions.
☐ Full Data Base capability with the independence to utilize the DBMS of your choice: IMS, TOTAL, ADABAS, IDMS and others.
☐ A totally transaction driven and oriented system that provides the ability to grow your system in a centralized or distributed processing mode, including on-line functions.

WRITE ON . . .

MAS-80 has already proven its worth as the manufacturing application system for the future. It's the world leader in **comprehensive,** proprietary manufacturing systems software. In fact, in our more than 10 years of experience, more than 900 manufacturing system modules have been selected.

To learn more about the MAS-80 Family, and how **MAS I, MAS II,** and **MAS on HP** can assist you in your Materials Management needs, just fill in and return the coupon below for our **free** brochures. If it's easier, call Marketing Services at MMDS headquarters . . .

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MAY

NMA Conference and Expo, May 8-11, Atlanta.

The National Micrographics Assn.'s 28th annual conference will emphasize micrographics technology as part of total information handling systems, under the theme "Confluence of Technologies." It is being predicted that there will be 150 exhibitors and more than 9,000 attendees.

Monday, May 7, seven preconference seminars will be offered on fundamentals of micrographics and related technologies. Contact NMA, 8728 Colesville Rd., Silver Spring, MD 20910 (301) 588-2722.

NAECON '79, May 15-17, Dayton.

The 31st annual National Aerospace & Electronics Conference. The following major topics will be addressed: engineering systems; flight essential avionics; digital technology; life cycle considerations; command, control & communication; commercial applications; sensor/weapon technology; software engineering/management. Contact NAECON, 140 E. Monument Ave., Dayton, OH 45402 (513) 228-4121.

CODASYL 20th Anniversary Meeting, May 21-22, Arlington.

The focus of the meeting will be the impact CODASYL has on the user community it seeks to serve. There will be opportunities to participate in panel discussions and presentations of CODASYL's past, present, and future work. Fee: $25. Contact Mrs. Nonnie Robertson, Honeywell Information Systems, 7900 Westpark Drive, McLean, VA 22102.

JUNE

NCC '79, June 4-7, New York.

Biggest ever. Contact NCC '79, c/o AFIPS, Inc., 210 Summit Ave., Montvale, NJ 07645.

Teleinformatics, June 11-13, Paris.

Sponsored by UNESCO, the Commission of the European Communities, and the International Conference for Computer Communication. The theme of Teleinformatics is "Applications." Contact AFCET, 156 Bld. Pereire, 75017 Paris, France.

International Microcomputers Minicomputers Microprocessors '79, June 19-21, Geneva.

The subjects to be covered include software development systems and tools, advances in software technology, peripherals for minicomputers and microcomputers, industrial control and automation applications, small business systems, and testing and standardization. Contact Dr. Fred L. Morritz, Industrial & Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606 (312) 263-4866.

Design Automation Conference, June 25-27, San Diego.

Topics to be discussed at the conference include implementation issues, such as data base design, design languages, and hardware/software tradeoffs; applications, such as manufacturing, architecture, and software; functions, such as interconnection, layout, documentation and requirement specification; and techniques, such as software engineering, verification, simulation, and analysis. Contact Robert J. Smith II, Univ. of Texas, Electrical Engineering Dept., P.O. Box 7728, Austin, TX 78712 (512) 471-4540.

Syntopican VII, June 26-28, Chicago

Sponsored by the International Word Processing Assn. Contact IWP, 2360 Maryland Rd., Willow Grove, PA 19090 (215) 657-3220.

JULY

System Safety Society Meeting, July 9-13, San Francisco.

The 4th international conference of the society has as its theme "What Price Safety in a Regulated Society?" Contact Carrol Burtner, System Safety Society, P.O. Box 731, Cupertino, CA 95014.

OCR Users Association Expo '79, July 15-18, Boston.

Contact the OCR Users Assn., 10 Banta Place, Hackensack, NJ 07601 (201) 343-4935.

1979 SCSC, July 16-18, Toronto.

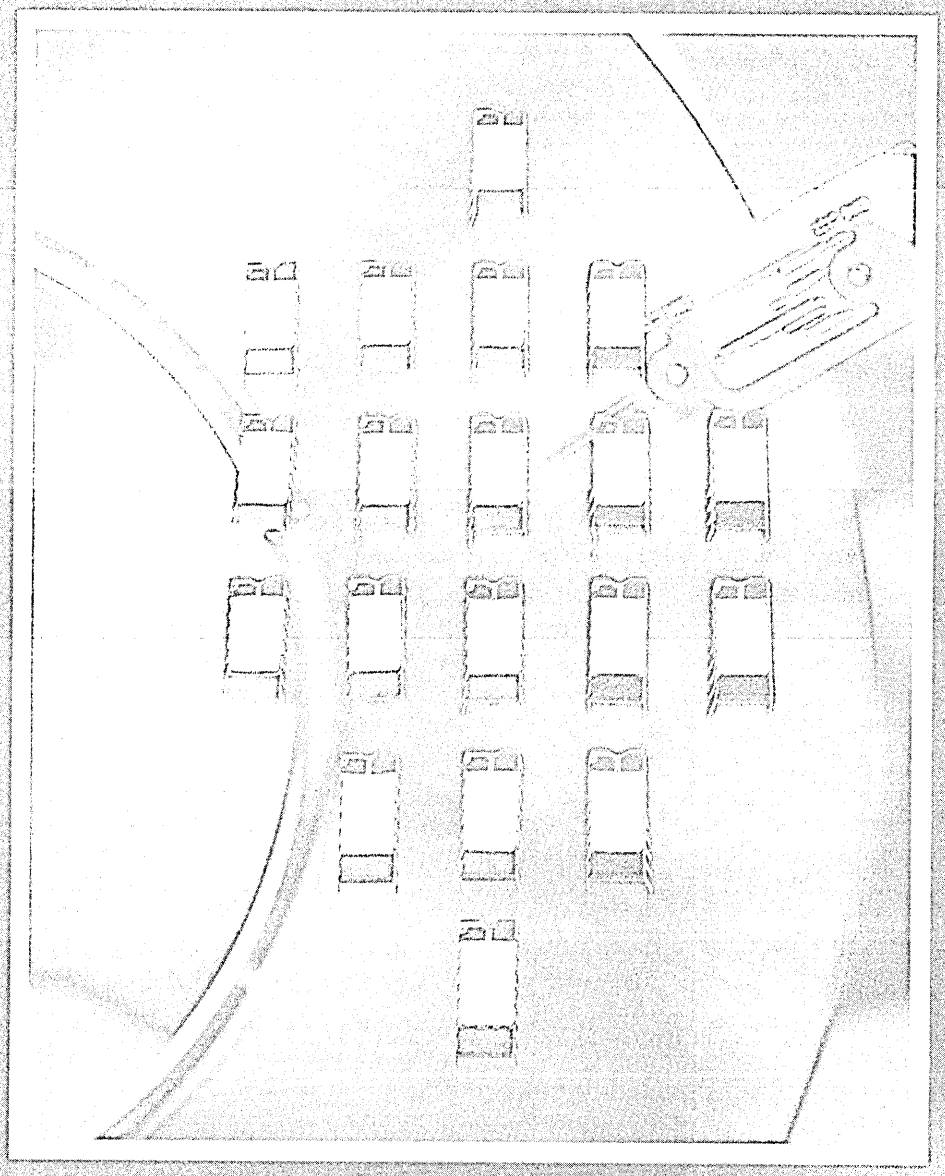
The theme of the 1979 Summer Computer Simulation Conference is "Simulation in a Rapidly Changing Computer World." Contact Dr. A.J. Schiewe, The Aerospace Corp., P.O. Box 92957, Los Angeles, CA 90009 (213) 648-6120.

CALLS

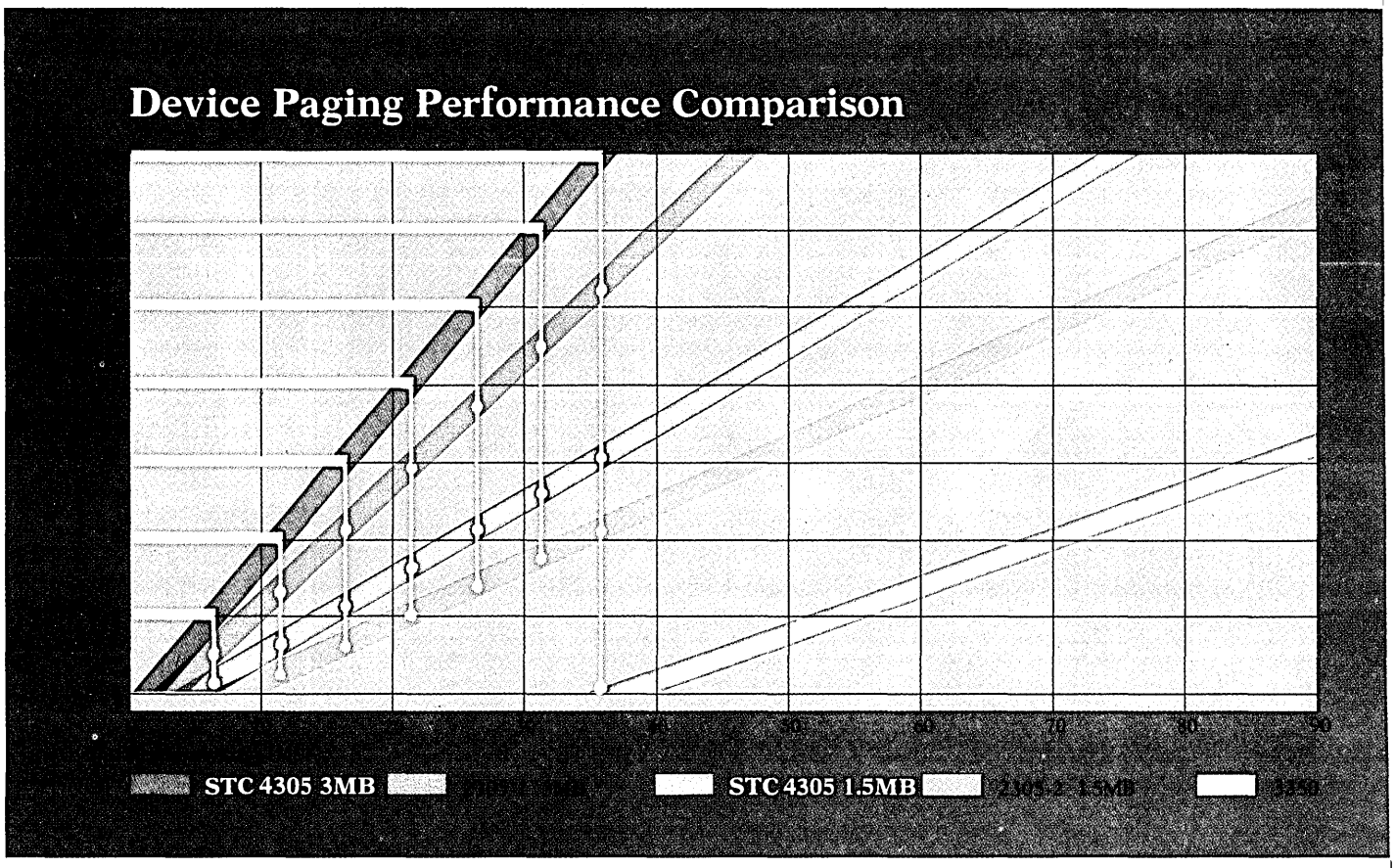
The first annual International Conference of Computer Capacity Management (ICCCM) will be held in Washington D.C. April 30-May 2. Papers are invited on research, experiments and other activities concerned with various aspects of software physics, to be presented in a forum discussing the importance, requirement, and benefits of capacity management in today's dp environment. Case study papers are sought concerning the capacity management functions of workload forecasting, performance control, data analysis, equipment planning, instrumentation and standard costing. The impact of capacity management on management and operations will also be discussed; papers for that session are being accepted on organizing a capacity management group, using software physics, and capacity management reports for upper management. Sponsored by the Institute for Software Engineering, P.O. Box 637, Palo Alto, CA 94302. For more information contact Dave Morley or Dave Schumacher, (415) 493-0300.

Papers are being accepted for the 1979 annual ACM conference, to be held October 29-31 in Detroit. The theme will be "Advances of the '70s—Challenges of the '80s." Papers directly related to the theme are of particular interest, but papers on any aspect of computer science or computer applications are welcome. Papers should not exceed 15 pages including abstract, text, references, and bibliography. Sessions proposals for panels or special activities are also being sought. Session proposals should indicate a topic, type of activity, and suggested participants. Deadline in March 1; five copies of a paper or a proposal should be submitted to program chairman James L. Elshoff, Computer Science Dept., General Motors Research Labs, Warren, MI 48090 (313) 575-3180.

Storage Technology's new disk system: Doesn't spin. Doesn't seek. Doesn't fly.



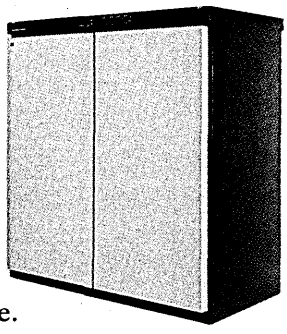
STC introduces the Solid State Disk: It gives you faster virtual storage paging for a fraction the price of the fastest drum.



Until now, you've had three options to improve virtual machine performance, all of which were expensive: upgrade the CPU, add memory, or add drum storage.

Today, there's a better answer: The STC 4305 Solid State Disk. In a basic configuration, it gives you 134% of the virtual paging rate for 50% of the cost of IBM's 2305 Fixed Head File. Better still, Solid State Disk's capability grows faster than its price. You can add options to increase its performance more than five times that of the 2305, yet still pay 20% less.

The best of both worlds: plug compatibility with superior performance.



Your CPU will think Solid State Disk is an IBM 2305 in every respect but performance. It runs with no software modifications under all releases of OS, VS1, VM and MVS operating systems. An STC field engineer simply plugs Solid State Disk into the block multiplexor channel of your 370 (135 or above), 303X or PCM equivalent CPU. They lead you through a straightforward conversion procedure. And you're ready to reap the performance benefits of the Solid State Disk's unique semiconductor, charge-coupled device (CCD) architecture.

For instance, with Solid State Disk, you get 0.7 millisecond access time vs. 5 milliseconds for the 2305. Storage capacities up to 45 Megabytes vs. 22.5 Mbytes. And selectable channel rates of 1.0, 1.5 and 3.0* Mbytes per second vs. a fixed 1.5 Mbyte rate.

This latter feature, when combined with dual channel option, lets you share your Solid State Disk among processors with different channel characteristics. Add the

* 3.0 Mbyte/second and 6.0 Mbyte/second (aggregate) transfer rates are options and require two byte wide interface from IBM.

powerful dual port capability, and you can attach to more processors, or gain concurrent access for a 2.0, 3.0, or 6.0* Mbyte/second aggregate transfer rate.

Lowest cost of ownership. When it comes to cost, Solid State Disk is a real penny-pincher. It costs less to buy, because it's easier to build. There are no critical mechanical parts to precision machine and assemble, just straightforward IC and PC board fabrication. In your data processing center, a typical Solid State Disk Configuration saves you 65% of the space required by the 2305, cuts power consumption by 60%, and reduces heat dissipation by a healthy 66%.

Extensive FE controls, coupled with a built-in microprocessor, enable STC field engineers to service your Solid State Disk in-line, off-line, or on-line. And because all components are modular and field replaceable to the module, board or chip level, you get the fastest time-to-repair at the lowest possible cost.

Solid State Disk: Just one of the ways STC helps you get more for less.

The Solid State Disk is just one of many STC products and services designed to help you get more productivity, and more useful life out of your IBM computer. And do it with significant cost savings in both purchase price and operating expenses.

If you have the impression that one of every three tape drives is ours, it's more than an impression. If it's ever seemed to you that everywhere you see medium and large-scale computers, you see our name, it's not just an impression.

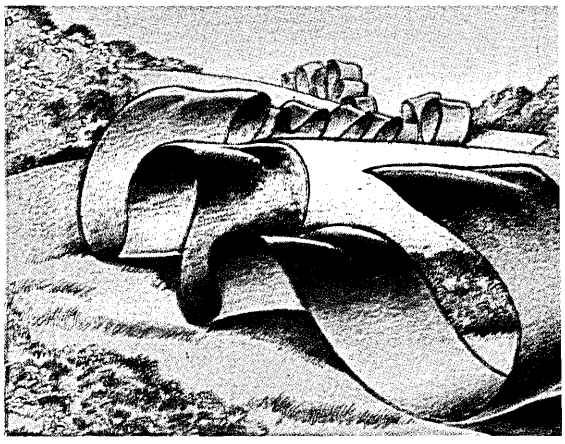
Over the past nine years we've installed 22,000 tape drives—or about 30% of all tape drives installed during that period of time. In fact, today STC makes more tape drives for medium and large scale systems than anyone else, including you know who.

The secret behind this success isn't any secret at all. STC tape drives deliver superior performance at a very attractive price.

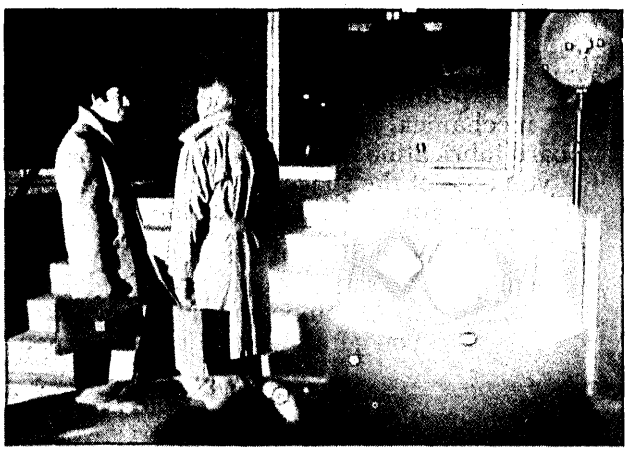
For instance, only STC drives incorporate SPAR, a unique, built-in diagnostics system that took 16 man-years to develop, and that allows our field engineers to perform all diagnostics and maintenance off-line, on-line, or in-line. Which is just one reason why national reliability studies show STC drives outperform IBM equivalents. So when you choose Storage Technology, you get more than performance. You get availability, serviceability, and reliability.

Now, to our customer (and you know who you are) who is still using STC tape drive 001:

Come on. Give us a break. How long will a STC tape drive last? After 9 years, we still don't know. You see, the first engineering prototype we built back in 1969 is still being used by a California-based electronics firm. It hasn't had a service call in over two years. And our first production model, serial number 001, was field-converted from a 2450 to a 3470 (IBM 3420-7 equivalent) two years ago, and is also still being used heavily by one of America's largest retailers. So we're beginning to wonder if they'll ever buy a replacement. In the meantime, we'll keep giving them the same great service that's made our field engineers a legend in their own time.

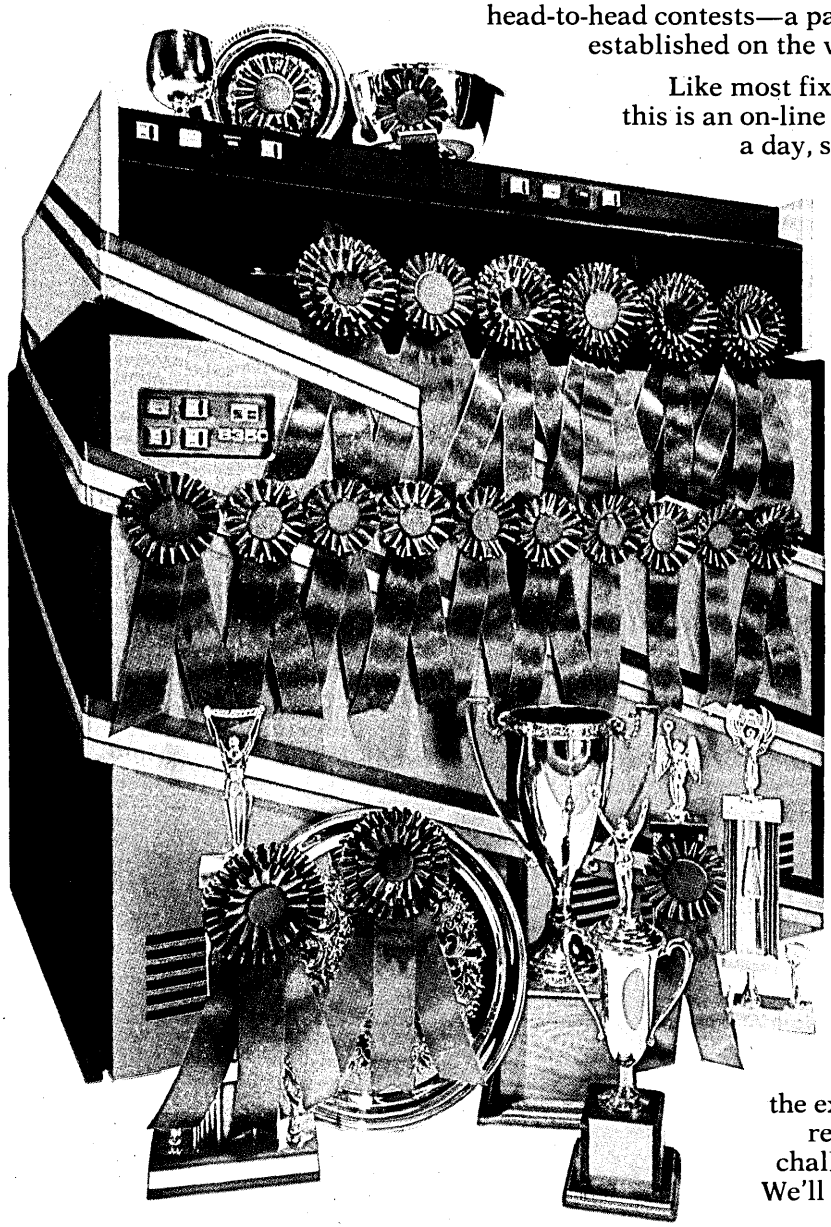


Help, police! Creativity can sometimes make the difference between good service and great service. For example, can you imagine yourself asking the police to pick you up? That's what a couple of our field engineers did during Boston's driving moratorium last winter. An STC customer had a significant problem, and since the only legal way to drive was with a police escort, our people had to call for police assistance to reach the site.



Now, we obviously don't relish the image problems that might result from our FEs riding around in squad cars. So we're thankful that this was a rare event during the 3-day, 12-state storm. But it does underline why STC field engineers are popular enough with our customers to top the June **Datapro** report with a 3.6 rating.

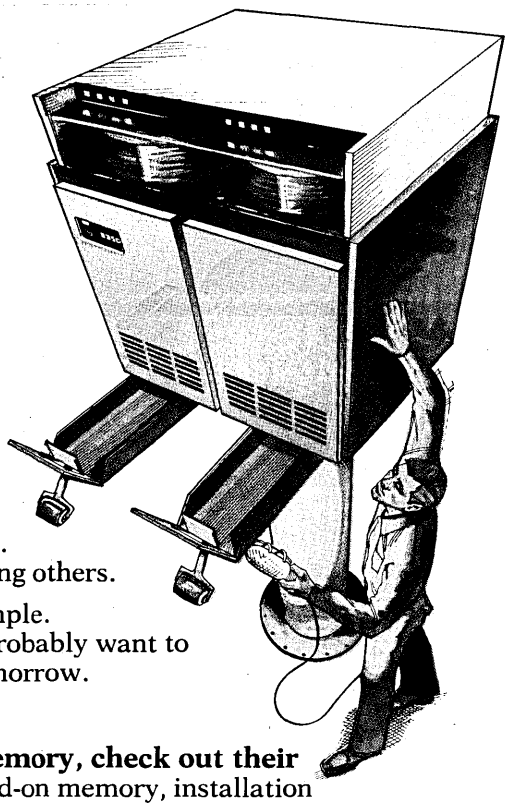
Why the 8350 has never lost a contest. Fixed media disk users are a very picky lot. Many of them demand vigorous benchmarks before buying a winchester drive. The STC 8350 is used to winning these head-to-head contests—a pattern of success established on the very first installation.



Like most fixed media disk applications this is an on-line system running 24 hours a day, seven days a week. Anticipating typical new product problems, we arranged for this customer to provide computer time for engineering work. As it turned out, we didn't need even a fraction of a CPU second. During the 90 day test period, there wasn't a single hardware failure.

That performance was designed into the 8350 from the outset with such features as fully redundant electronics and power supplies. Elimination of discrete components in favor of easily serviced PC boards. And MIDAR, STC's proprietary diagnostic package designed to quickly direct the field engineer to a problem component for fast repair.

How would the 8350 measure up in your environment? Why not put us to the test? As the leading independent supplier of high-performance fixed media disk drives, we can provide you with the product, the experience and the service resources to satisfy your most challenging requirements. We'll even guarantee it. In writing.



Tips and tools to tune up your storage subsystem performance. How many channel tries before you get a start I/O? Are catalog requests idling in the queue? What's the distribution of your data sets by size? By frequency of access?

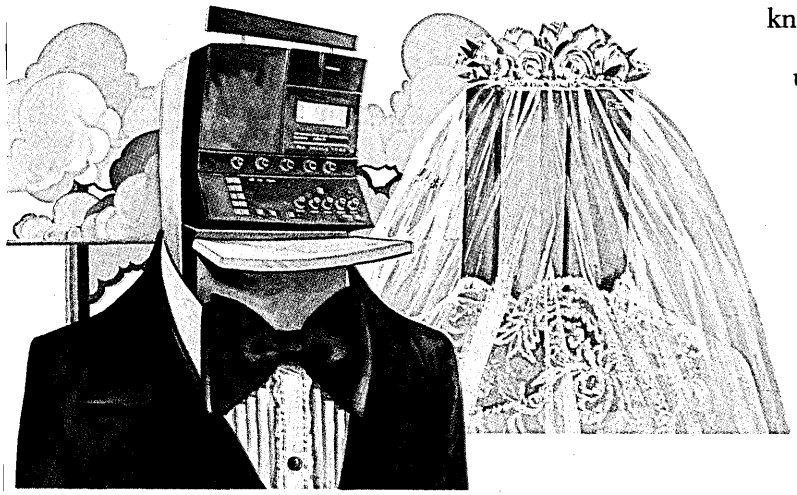
STC Systems Engineers can help with answers to questions like these to squeeze more mileage out of your existing storage equipment, and help you plan for more efficient system growth. They've helped our customers solve a wide range of storage problems under virtually every conceivable combination of CPU, operating system, and job mix. Their experience is now at your disposal in the form of free software packages.

Some of the tools you can put to work today include Configuration Planning Software with programs for evaluating tape and disk data set characteristics. High Speed Dump/Restore. And Performance Maximization, among others.

Our philosophy in providing these tools is simple. If we help you get more from what you have today, you'll probably want to do business with us when you're ready to grow tomorrow.

Before you wed your CPU to an add-on memory, check out their hand holding. You know that when it comes to add-on memory, installation and service are as important as hardware.

So you should know that our STC field engineers have over 250 Mbytes of large system memory experience (including more 168 add-on than any independent). So they know how to get you up and running fast. STC's new family of 158, 168 and 303X add-on memory uses the latest MOS technologies. They have fewer components for fewer failures, reduced power consumption and less heat dissipation. Their modular design makes for an easy growth path, too. All our people have to do to give you additional capability is plug in additional cards. This typically takes less than a shift, including the diagnostics. And if that's not enough to convince you, price and availability should be. Because STC add-on memory costs up to 40% less than IBM's. And it's available today.



For more details on STC data storage products and services, call your local STC sales office. Or clip and mail the coupon below to: Storage Technology Corporation, Mail Drop 3M, 2270 South 88th Street, Louisville, Colorado, 80027. Phone (303) 497-6262.

Yes. I'd like to know more about the following STC products:

Sales Call	Literature Only	CPU Make	Model	Operating System
☐	☐ 4305 Solid State Disk			
☐	☐ 8350 Disk Drive			
☐	☐ Add-on Memory			
☐	☐ STC tape storage products			

Name_____

Position_____

Company_____

Phone_____

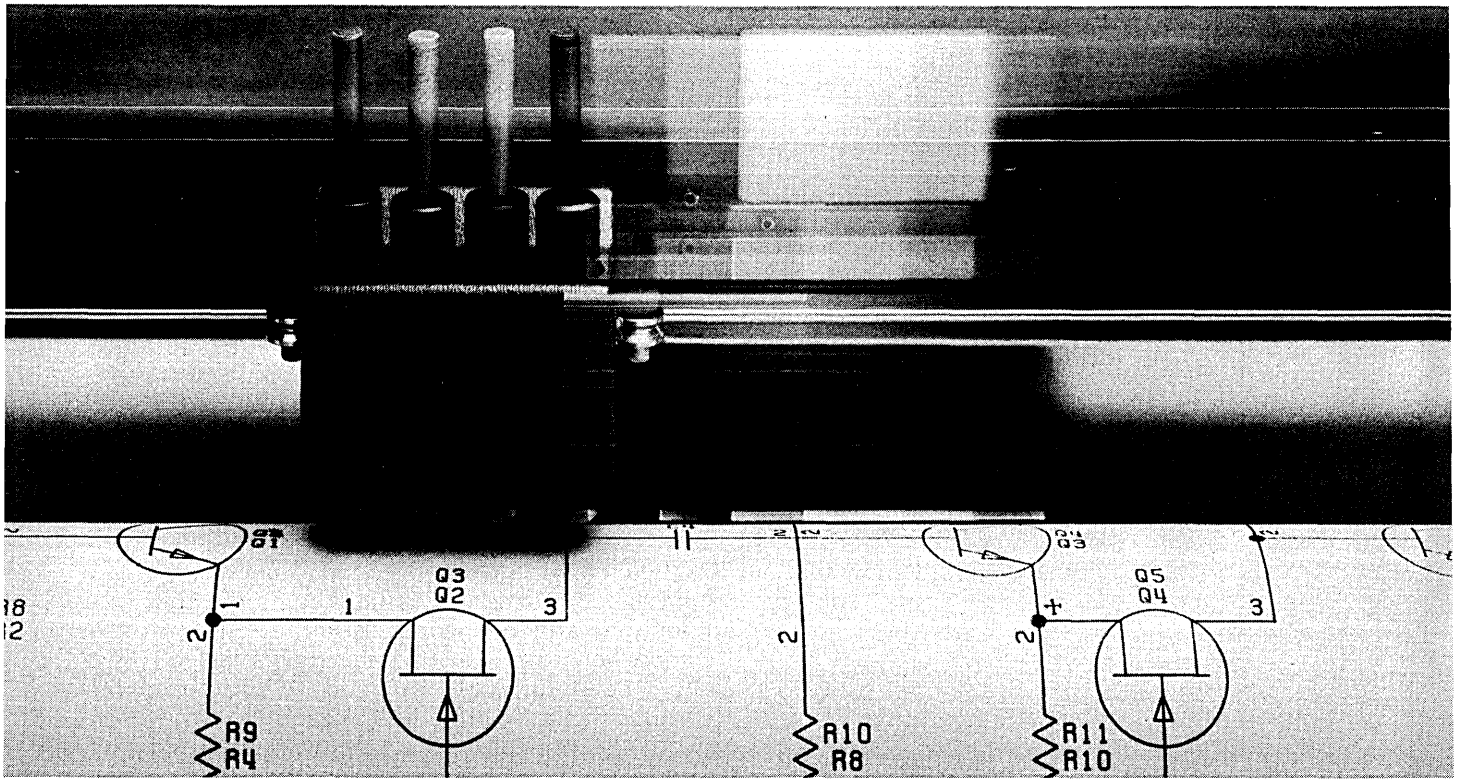
Address_____

City/State/Zip_____

D1/79

STORAGE TECHNOLOGY CORPORATION

How to drum-up superior graphics in record time.



There's nothing to it.

Not when you start with the best. And that's exactly what the new CalComp 1055 high-performance drum plotter is – the best. In fact, it easily surpasses everything we – and our competitors – have created to date.

There's simply no other 36-inch, roll-fed drum plotter with specs like these. Plotting speed is an unprecedented 30 inches-per-second (762 mm-per-second) on axis. Complemented by a 4G acceleration ramp and 10MS pen-down time. The results are unbeatable quality and throughput.

What's more, you get the versatility that only four pens can provide and a practical, roll-fed design that keeps operator intervention to a minimum.

But that's not all. For increased accuracy, we made the 1055 completely d.c. servo-motor driven. And we gave it a special linear pen drive mechanism to help maintain consistently superior line quality. In every application.

The bottom line is this: Our new Model 1055 creates an entirely new set of standards for all would-be, high-performance drum plotters. In terms of speed, accuracy and line quality. And in terms of good old-fashioned price/performance, too.

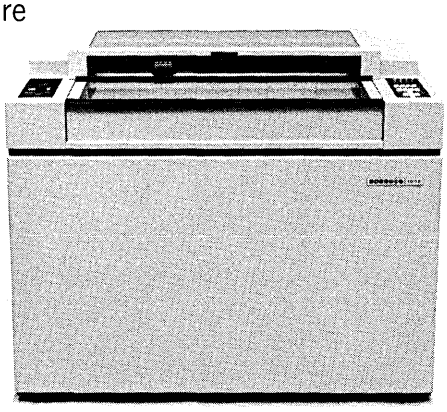
Of course, you may not need the sophistication of a 1055 right now. In that case, our new 1051 is the answer. You get 10-ips performance today, and the ability to field upgrade to a 1055 tomorrow – when your needs have expanded.

One thing hasn't changed, though.

CalComp service and support. It's still worldwide and second to none. For field service personnel. For in-place field systems analysts. And for the kind of help you expect from the world leader in digital plotters.

All of which proves, when it comes to high-performance drum plotters, CalComp's really drawing away from the competition. Again.

To arrange a special preview demonstration of the new 1055, please call your local CalComp sales representative in the following areas:



CALCOMP

2411 W. La Palma Avenue, Anaheim, California 92801

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CIRCLE 14 ON READER CARD

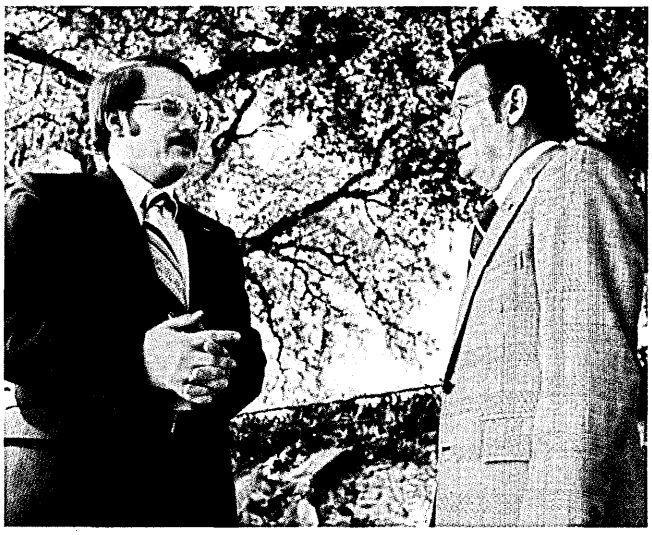
"We need NCR's Direct Processing to keep everybody always current," says James W. Walker, M. D., president of PIMCO.

WALKER:
When PIMCO was formed, in 1975, we began looking at computer hardware immediately. And we looked beyond the hardware. We also considered each manufacturer's history and reputation for integrity and the quality of service provided. When all the information was in, we selected the NCR 8200. I am happy to report that your users here in Florida—and everywhere else —rate NCR service as excellent.

NCR's MIDDLETON:
Did you anticipate moving up to the NCR 8430?

WALKER:
Not specifically. After all, ours is the first 8430 installed and wasn't available then. But as an agency sponsored by the Florida Medical Association to handle insurance for all the doctors in the state, we surely foresaw very rapid growth. And we were pleased by NCR's assurance we could move up to more powerful systems without obsoleting our software.

MIDDLETON:
That is NCR's Migration Path Engineering. You can move from one system to the next larger without paying a software penalty.



James W. Walker, M.D., (right) is president of Professional Insurance Management Company (PIMCO) of Jacksonville. Paul Middleton is his NCR account manager. The photo was taken in the formal garden behind the PIMCO offices on the edge of the St. John River.

WALKER:
I've been pleased, too, with the relationship which has developed between PIMCO and NCR. NCR has done everything you've promised us, and then some. And that's important, because I am making this system the central reference point in our business. I am resisting the tendency of the typical insurance office to depend on files in manila folders. We need NCR's Direct Processing to keep everybody always current.

MIDDLETON:
That is the outstanding feature of the transaction-driven, interactive I-8430. You go directly to the central files through the terminals. If you enter new information, the central file is updated instantaneously. The new information is available for any subsequent operation. The central file is always current.

In the NCR office nearest you, there is an account manager like Paul Middleton who knows your industry and knows NCR systems. He can help you.

To learn more about what an NCR system can do for you, phone him at your local NCR office. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

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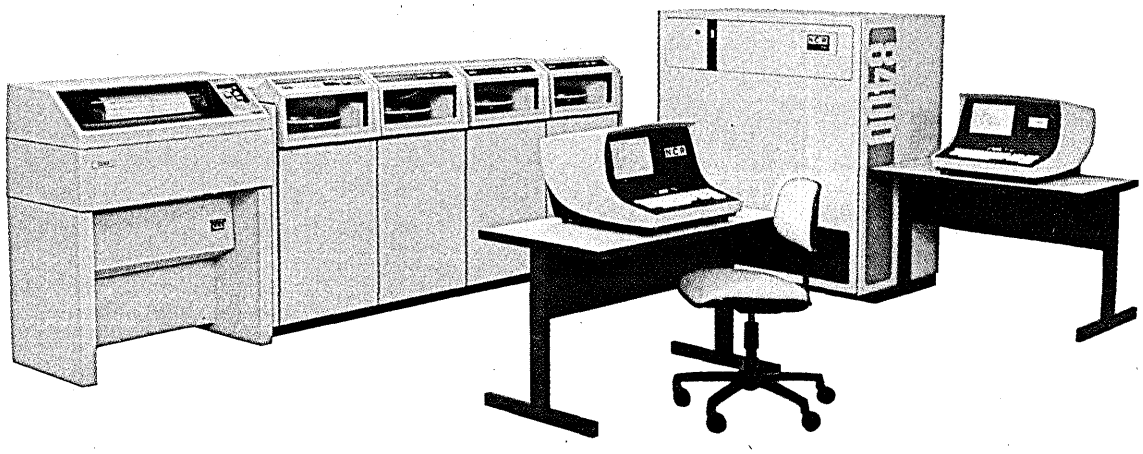
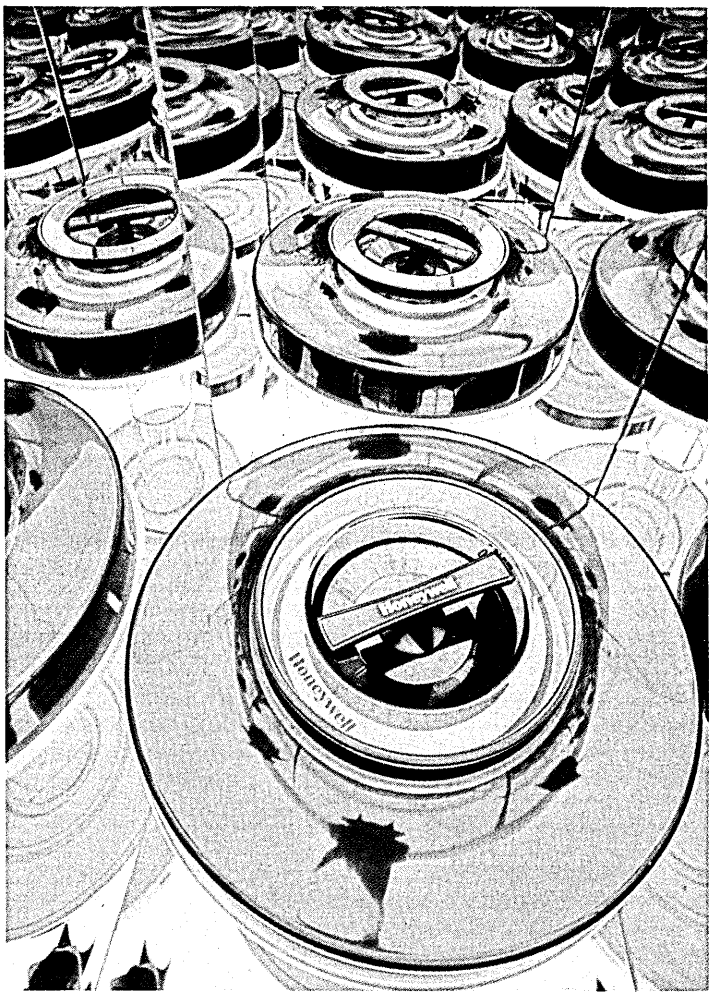
Complete Computer Systems



DATA BASE MANAGEMENT



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As computer users move into interactive and distributed systems, large data bases become increasingly necessary. And the storage and retrieval of this data becomes a problem.

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Does its broad line make Centronics' matrix printer family the best?

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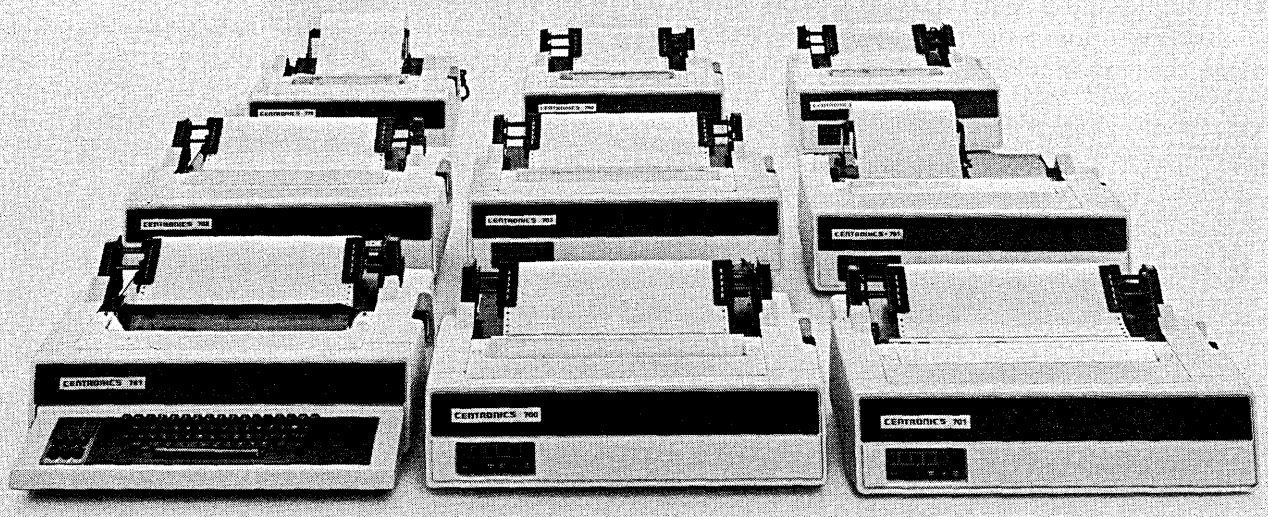

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LETTERS

MICRO MARVELS

D.M. Wood (Letters, November, p. 39) tries too hard to justify her position. Her well-written and humorous letter is marred by false statements and illogic.

Microcomputers *are* being used for many jobs. So much for the claim that they can't be.

Microcomputers *are* hexadecimal (8 bit byte) machines, not octal as Wood says. Some documentation uses octal; most uses hexadecimal, which matches the actual hardware.

The code is ASCII. But so what? Many terminals are ASCII, and are used daily with IBM computers quite successfully. IBM supports ASCII terminals. Front ends such as Comten's routinely convert ASCII as well as other codes to EBCDIC and vice versa, no problem. The overhead is nowhere near 25% as claimed. And if conversion is done in the micro, as we do it, there is no overhead to the mainframe.

Well-written standardized packages are available and more are continuously being announced. Their use requires the industry standard operating system: CP/M. Of course if you have a system which only runs the manufacturer's software then you are limited. But why do that? It should be noted that software in the microcomputer world is unbundled. And many systems run CP/M. Further, using the industry standard S-100 bus, we are able to implement many applications not possible with IBM equipment. This is made possible by the wide assortment of add-on cards provided by many manufacturers competing in the add-on market.

Very few of the packages "so patiently developed over the last ten years" can run on any machine because of hardware architecture changes and systems software changes; not because the machines were originally "binary BCDIC."

Not all people use IBM either. It may surprise Ms. Wood but some people use other equipment. Some with ASCII, too. No conversion problems for them.

As to dependability, we have found that the microcomputers are much *more* reliable. It is exactly that fact—that the host is down more—that makes the micro so attractive. We just keep on running and exchange data with the host later. It's easier to (re)start a micro than MVS, JES, etc.

Using industry standard media formats, the transfer of data is easy. As always if the data formats (field layouts) of the files are different, then some conversion work is required. But that is a file design problem, not a problem of the microcomputer use.

Progress will lead to many microcomputers being used for many diverse purposes. (They will supplement the host-mainframe, not replace it.) And people *are* going for it in droves. And more will be doing so in the future.

Our clients, and others who design their systems to use the new components and subsystems properly, will receive rapid cost payback as well as numerous ancillary benefits. Those who make the mistakes implied by D.M. Wood will not reap the benefits.

WILLIAM B. ADAMS
Adams & Associates, Consultants
Bethesda, Maryland

APPLICATION ALGORITHMS

Mr. Mike Michels' one page article on applications of signal processing in the October issue (p. 161) intimates a parochial view of digital signal processing. Although the invention of the Fast Fourier Transform opened up important new possibilities in digital signal processing, it is not a panacea for wave and image type data. In many applications in biology, for example, waveforms are not characterized by periodicities of constant subforms but by periodicities of distorted subforms, configurations for which the Fourier transform, fast or slow, is not illuminating. Likewise in imagery data, some forms of high frequency "noise" may be filtered by judicious application of the FFT; but some forms of "noise" or "artifacts" (distractions or departures from an "ideal" image) can be understood and handled better by structural analysis.

With respect to computer-aided tomography (CAT), a tremendous amount of effort and money has been expended on the investigation of reconstruction algorithms. FFT-based methods are but one approach, perhaps suitable for current minicomputer implementations, but many other algorithms are being investigated and are implementable on low-cost machines of emergency technology. In fact, commerical CAT systems use convolution algorithms rather than the direct Fourier approach.

Overpopularizing and exaggerating the utility of even a good tool like the FFT is a disservice.

JUDITH PREWITT, Ph.D.
Division of Computer
Research and Technology
National Institutes of Health
Bethesda, Maryland

Mr. Michels replies:
I couldn't agree more; my article was parochial—it was intended to be. Furthermore, there is no doubt that digital signal processing functions other than the Fourier transform are often of more value in analyzing various phenomena.

The digital signal processing field is so broad and diverse that it cannot be adequately presented in many volumes, let alone one page. My intent was merely to mention a few applications which might help show this diversity to a readership that might not be familiar with the field.

BLITHE SPIRIT

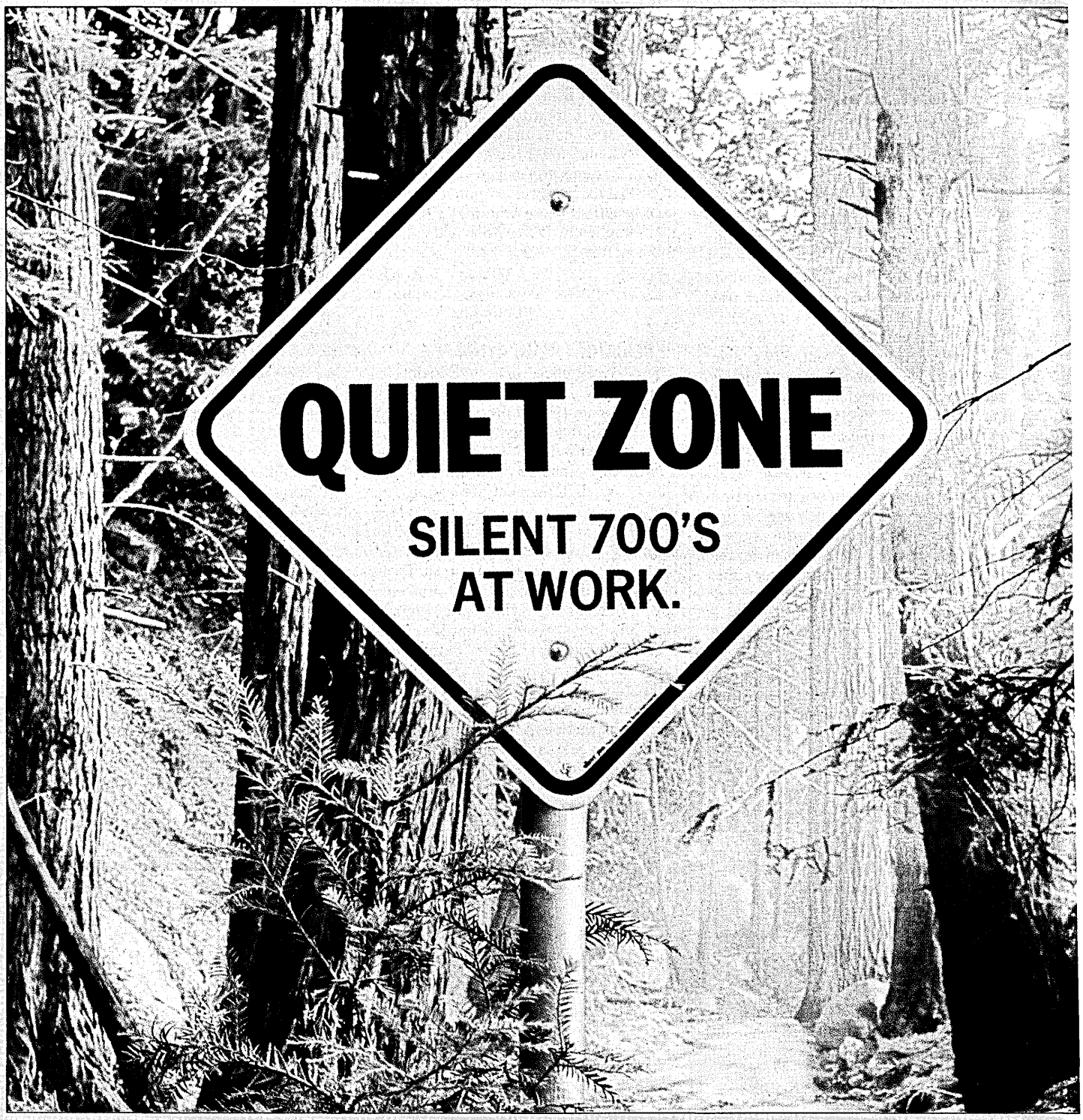
About five years ago I met a lovely girl named Shelia. Shelia Littrell, she was then; later she took back her family name of Connally. She worked vigorously in ACM chapter and regional activities in the Southeast—was a dp consultant for the State Department of Administration in Raleigh. She enjoyed not only the technical processes of our business, but the human side; wanted to move through systems programming into management.

She was an athlete, a trained dancer; drew men and women to her by her liveliness and by her openness. She was moving up into a new job, at the university. Then, in early 1976, her friends were shocked to hear she had had a serious operation; a brain tumor, malignant. With typical decisiveness she moved back to her family base in Chattanooga and entered an experimental chemotherapy program.

She kept up her contacts in the computer field. Nancy and I had her with us at the Dallas NCC.. She was gay, vital; bought new evening dresses, turned down more dates than we could count, danced every night. In early October this year, she was a guest at the ACM meeting in Gatlinburg; met old friends from North Carolina, and made new ones. They watched out for her. She tired very easily; was thin, like an elegant white bird, under her pretty clothes. But we were delighted with her.

And that's the way we will remember her. Happy, alert, beautiful — and among her admirers. She died only five weeks later. She made her doctors proud; she had strong family support; her athletic body fought well. But above all, it was her spirit, her brave blithe spirit, that sustained her and her many friends.

HERB GROSCH
Sunnyvale, California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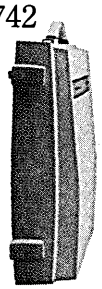

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LETTERS

POWER AND PROGRAM PRODUCTION

I just finished reading Philip Kraft's book *Programmers and Managers* and found it terrifying. It's probably the best book on despotism since *1984*! What Kraft wrote about has happened to me—and more than once.

I was really surprised that Jerry Weinberg would pan this book in his review (October, p. 210). Perhaps since Weinberg is at the top of this field he doesn't know the horrors that are visited on those of us in the middle. Also, Kraft's book puts a depressing new perspective on *The Psychology of Computer Programming*. Weinberg's concepts of open code and egoless programming were intended to make the programming shop a happy, democratic place. They were intended to curb the power plays made by some programmers. But look how these ideas have been used: programmers are made to write open code while managers practice duplicity and secrecy.

The one objection I'd make to Kraft's book is his blaming the profit motive. Managers are motivated by many things, some bad (like lust for power) and some good (an example momentarily escapes me) but rarely by profit for their company. I don't know whether the supression of programmers has been profitable. I hope it hasn't. In fact, there should be an opportunity here for a bright software firm to make some money by *not* supressing its programmers.

ROBERT ABBOTT
New York, New York

After reading Gerald Weinberg's review of *Programmers and Managers* I must come to the defense of the book, which, incidentally, is required reading where I work.

For credentials, my programming background began with the IBM 650 in the late 1950s and continues to my present work on the CDC-6400 and HP3000. I've worked as programmer, analyst, lead, supervisor, manager and coder in hospitals, defense plants, software houses, academic computer centers, and research centers. Perhaps I supply some of the in-depth code-cutting that Weinberg says Kraft lacks.

My experience convinces me that Philip Kraft is essentially correct: managers want all the code they can get at the lowest cost while programmers want a reasonable, livable wage for a job well done. There are individual exceptions on both sides but sociologically this holds.

At the Atlanta software engineering conference I heard what I'd been reading about for the past year: the industrial engineers are trying to "automate" us! The theory is that now that hardware costs are going down software costs must follow. Their methods for increasing programmer productivity fall into two categories: changing the way code itself is written, and changing the relationships between the people who write the code. Both categories will supposedly increase productivity by making programmers easy to manage, easing documentation and reducing maintenance. The reality is that the techniques will create jobs for industrial engineers and middle managers to evaluate and monitor the people actually doing the work.

Programmers need to know this and to know that, despite "one big happy family" myths, they are *workers* and subject to layoffs, firings, harassment and speedup. Programmers are beginning to learn that they must organize with other workers to protect jobs, salaries, and dignity.

It interests me that Kraft is working on a paper concerning minorities and women in computing because I think the greatest burden of the de-skilling of programmers will fall on them. Many women and many people of color have found lucrative employment in data processing because of the shortage of trained people and the openness of the field. It will be precisely the female and minority programmers who will be relegated to the supporting roles in chief programmer teams. Even now their salaries and positions are generally less than that of white men, but this will worsen considerably.

It's time to organize with other working people and, in so doing, to look for leadership from those who will have the most to lose—our minority and female colleagues.

HENRY NOBLE
United Workers Union-Independent
Seattle, Washington

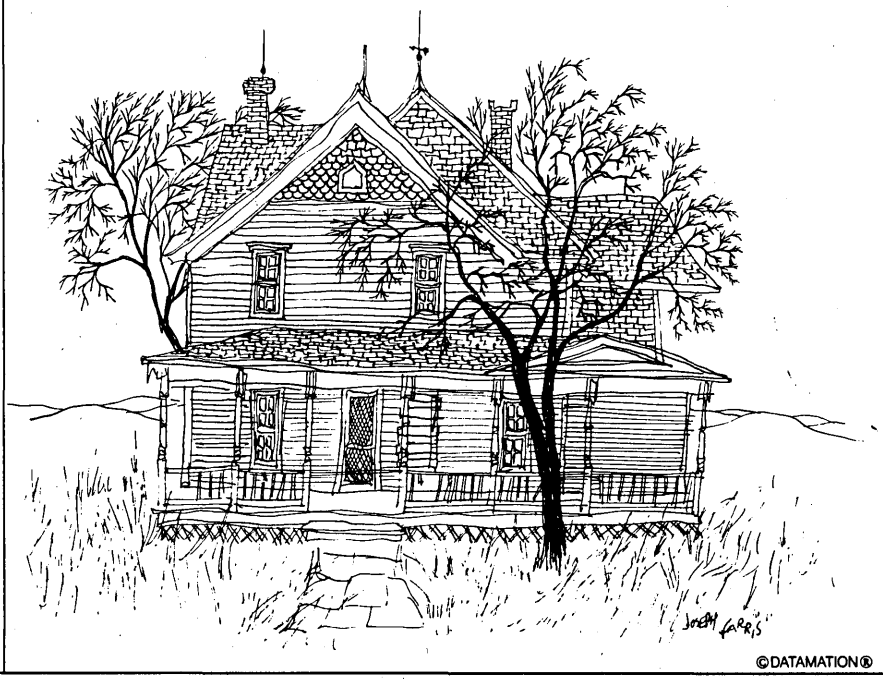
MORE ON MANUFACTURING

With reference to the Burnstine letter (August, p. 34), another useful analogy between programming and manufacturing can be drawn in the area of quality control.

The manufacturing engineer understands that it is "yield" as a percentage of units stated that is important, and not units started. He also understands that if you are to get a high yield at each assembly step, you must detect and cull or rework faulty subassemblies. You do not wait until after final assembly.

It seems to me that most programming managers could do with a good course in manufacturing quality control.

WILLIAM H. MURRAY
New Canaan, Connecticut



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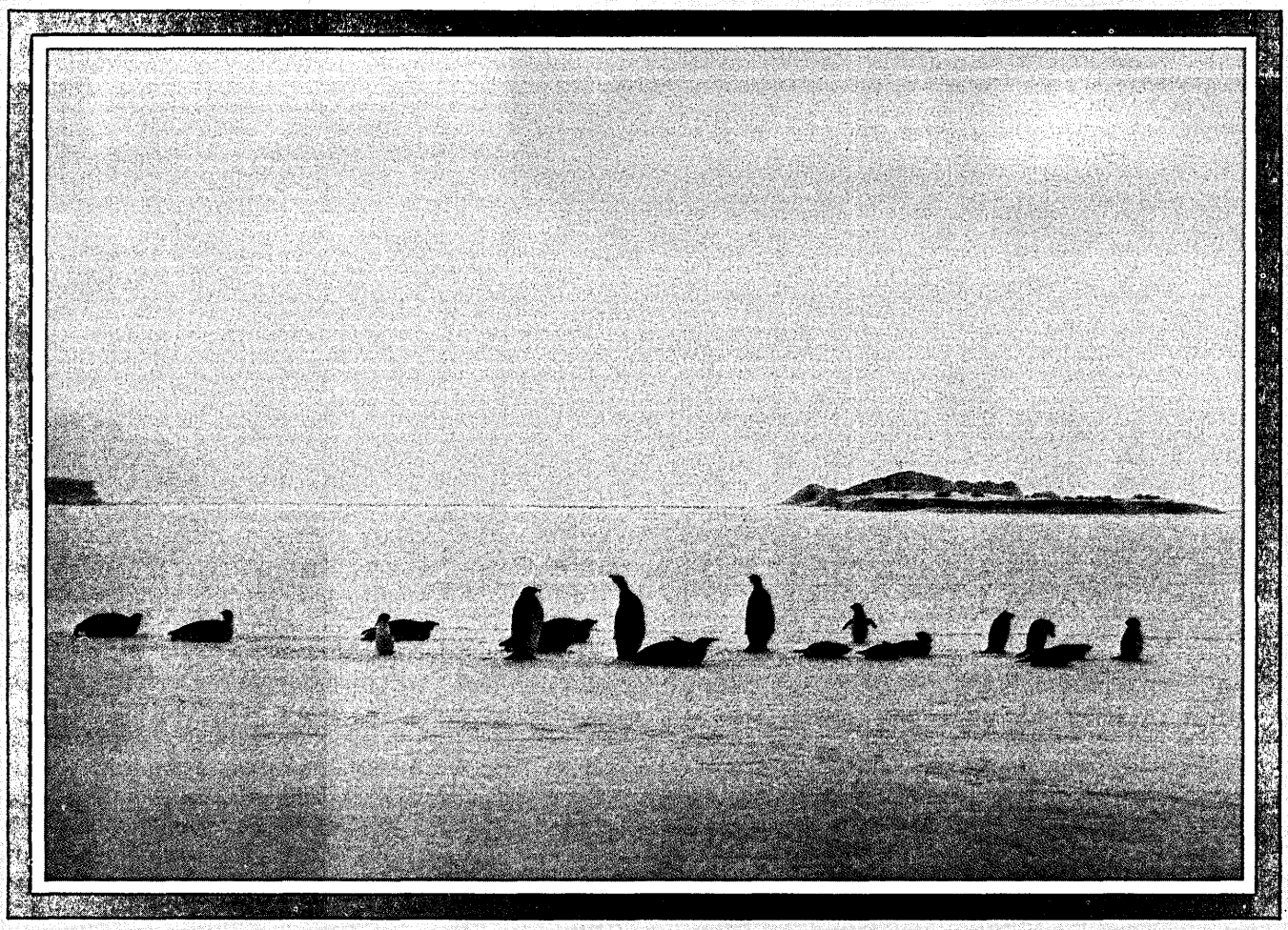

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The latest computer hardware, systems, and services will be on display at NCC '79 on all four floors of the New York Coliseum and at the nearby New York Hilton Hotel. More than 350 organizations will occupy nearly 1,700 booths, making this the largest exhibit of its kind ever assembled.

The Personal Computing Festival will feature program sessions and application demonstrations of interest to professionals, EDP specialists, and computer hobbyists. A major attraction of the Festival will be commercial exhibits devoted exclusively to personal computing.

The Professional Development Seminar program will consist of 15 one-day minicourses designed to increase professional skills and aid in career development. A separate fee of $50 will be charged for each course. Rounding out NCC '79 will be plenary sessions, a Pioneer Day program commemorating the 20th anniversary of COBOL, a computer stamp exhibit, and other high-interest activities.

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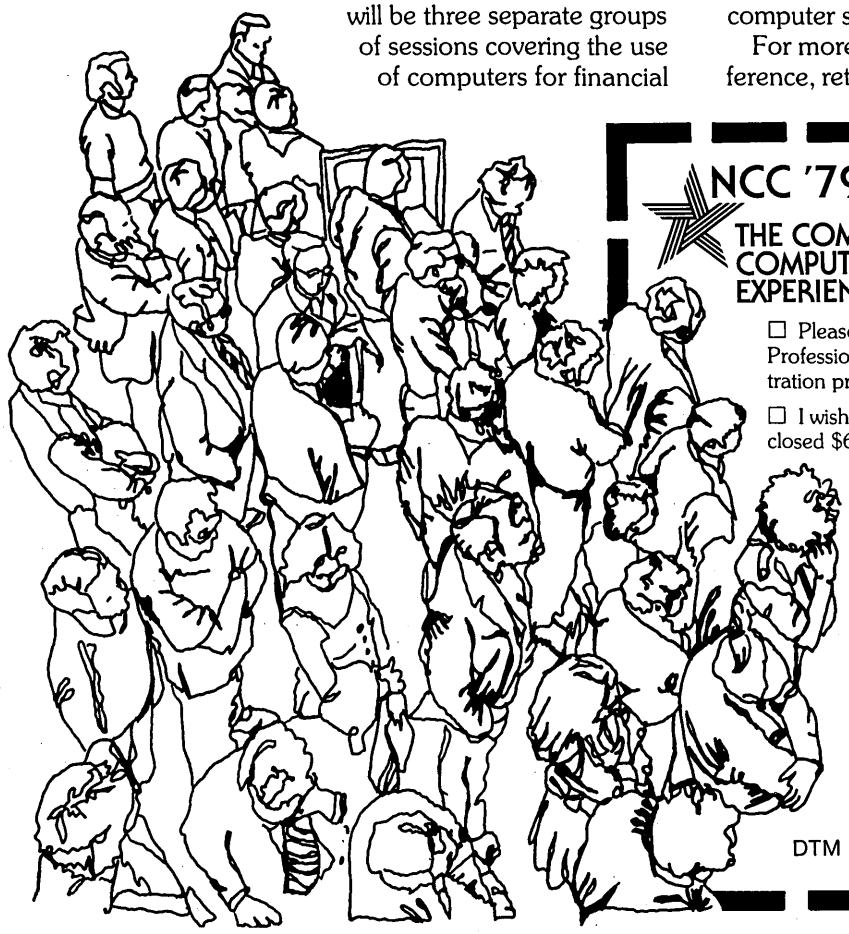

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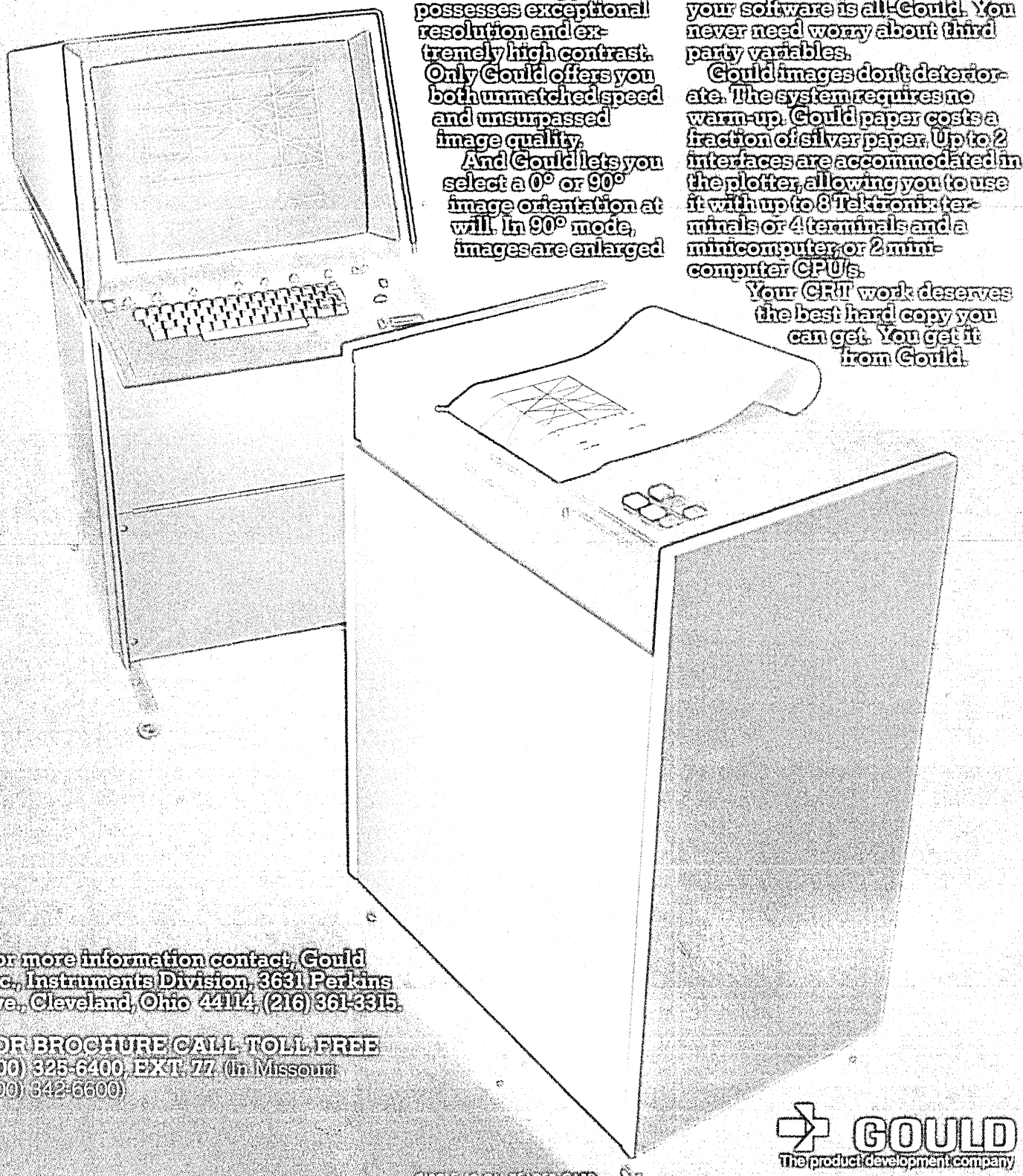

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CIRCLE 68 ON READER CARD

JOHN L. KIRKLEY, EDITOR

EDITOR'S READOUT

THE COMING SHOWDOWN

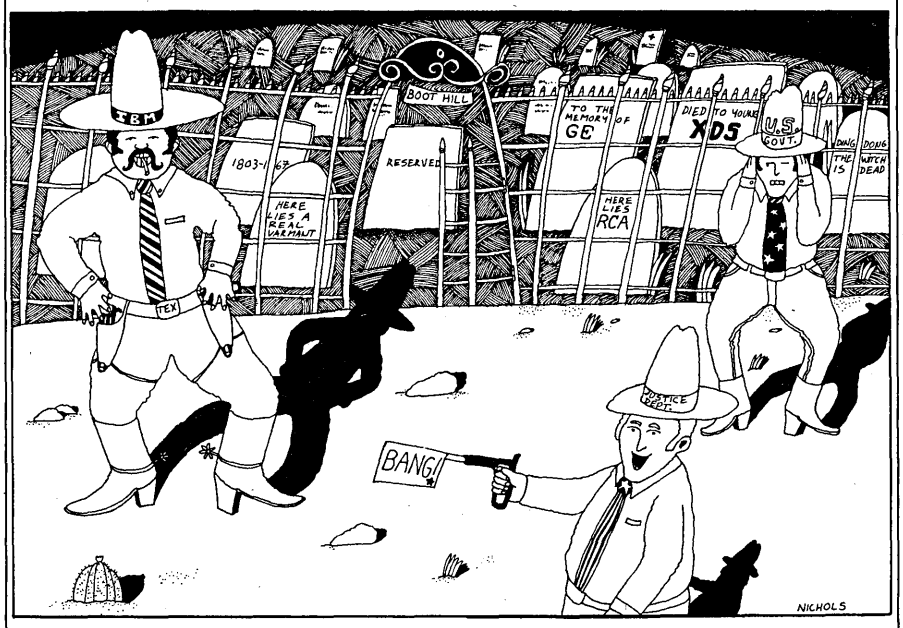


ILLUSTRATION ©MIKE NICHOLS 1979

If we were going to film the saga of IBM we'd do it as a Western.

The star—tall, tanned, white hat, white shirt, teeth glistening in the sun, ivory-handled pistols sheathed in cordovan leather holsters. The rest of the cast—bureaucrats, the other gunslingers, and all the little folk scurrying around trying to stay out of the line of fire. And, of course, on the outskirts of town—Boot Hill.

One of IBM's longest and most inconclusive gunfights has been their lingering showdown with the Justice Dept. This month the trial passes the ten year mark. For a while it appeared that Justice had enough ammunition to force the issue in the form of interim relief or perhaps a consent decree. But, over the last year, IBM's aggressive pricing policies and a spate of highly competitive product offerings reveal a confident IBM perfectly willing to go the distance.

The trial has been long and arduous. Lawyers have come and gone. And the computer industry has totally changed over the last decade. A dp version of Rip Van Winkle, asleep for the last ten years in the Social Security Administration's tape library, would awake to a new world of personal computers, minis, micros, ddp, VLSI, and a rash of other major transformations.

And this brings us to a puzzlement. The Justice Dept. took umbrage with IBM in 1969 over their alleged monopolization of the general purpose digital computer market. But then, in what appeared to be a tactical error, Justice inserted the plug-compatible debacle and IBM's role in today's marketplace. "It was as if the government, in trying to establish that IBM had sinned, was doing so by listing every sin they ever committed," commented computer consultant E.Z. Million in a DATAMATION interview two years ago. Million, who was assisting Justice at the time, remarked, "It was my contention that we slay the dragon and then get on with relief."

But even if the unlikely happened and the dragon was slain, nothing much would change in the medium and large dp shops. Users have a massive commitment to software; they are locked into their mainframes. And any attempts by the government to force massive user conversion in the name of a "free" market would be met with armed uprisings. The Justice Dept. effort is not only overly long and potentially harmful to the user community, it's becoming increasingly irrelevant.

It appears that the computer industry is becoming so broad that IBM's contention that they have a minority share may well come true . . . particularly now that the mainframe pcm's are multiplying and prospering. And then where is the Justice Dept. case?

And while the dust gathers in the corners of the Foley Square courtroom, the real game is being played elsewhere. It's IBM's potential domination of the three fastest growing segments of our industry that deserves the government's attention. IBM is clearly mounting a major assault.

By creating SBS, now stalled, IBM is taking dead aim on the data communications market place (or perhaps frightening AT&T into providing the needed communications links).

We also hear that the giant is eyeing the personal computer market and has a system ready to go.

And, most importantly, IBM is moving aggressively into what is variously called the office of the future or the automated office. As *EDP Analyzer* staff writer Barbara McNurlin commented in the September 1978 issue, "Implicit in the automated office is the use of computers for controlling every facet of the system. So the automated office is really a multifunction, computer-based communications system that allows many business communications to be performed in an electronic mode." It's an enormous, virtually untouched market.

Already AT&T, Exxon, Xerox and many others are marshaling their forces; the real showdown lies just ahead. Everyone in the industry will feel its impact.

To help sort things out we've expanded our Focus section this month to take a close look at IBM and the industry, past present and future. It begins on page 78; we think it's well worth your time. ✲

"My IBM Sales Representative *proved* that IBM ribbons give more lines per dollar... right on my own printer."

James B. Welling / Staff Vice-President—Computer Services / Braniff International

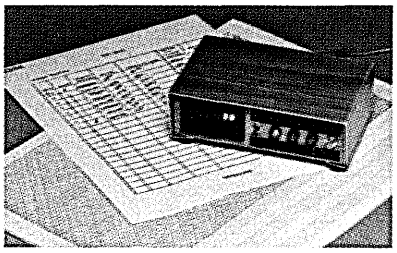
"He attached a device called a line counter that electronically counts each line of print. Then we ran both the IBM ribbon and my regular ribbon to exhaustion. And we found that the IBM ribbon printed 50% more lines.

"Of course, the IBM ribbon costs more—25% more, to be exact. But with 50% longer life, it's worth it. I'm getting over 20% more lines for every ribbon dollar and my yearly savings are significant.

"As my rep told me beforehand, results may not always be that dramatic. But I'd sure recommend that any ribbon user give the test a try. It only takes a few hours, and the results could pay off in savings for years to come."

Most tests show savings

In another test, a manufacturing company compared IBM high-speed wide ribbons to another brand on their 1403 printer. Their results: the IBM ribbon gave over 40% more print life, at only a 20% higher price. That's 17% more lines for every ribbon dollar.



The same long-life fabrics and ink formulations used to manufacture high-speed wide ribbons are used in IBM narrow ribbons, providing similar long ribbon life for your other printers.

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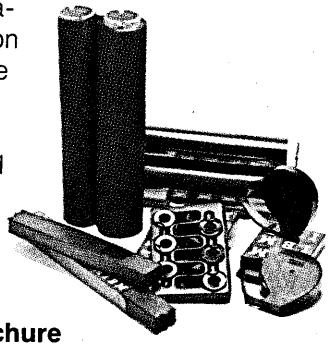

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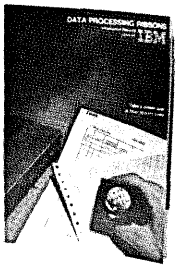

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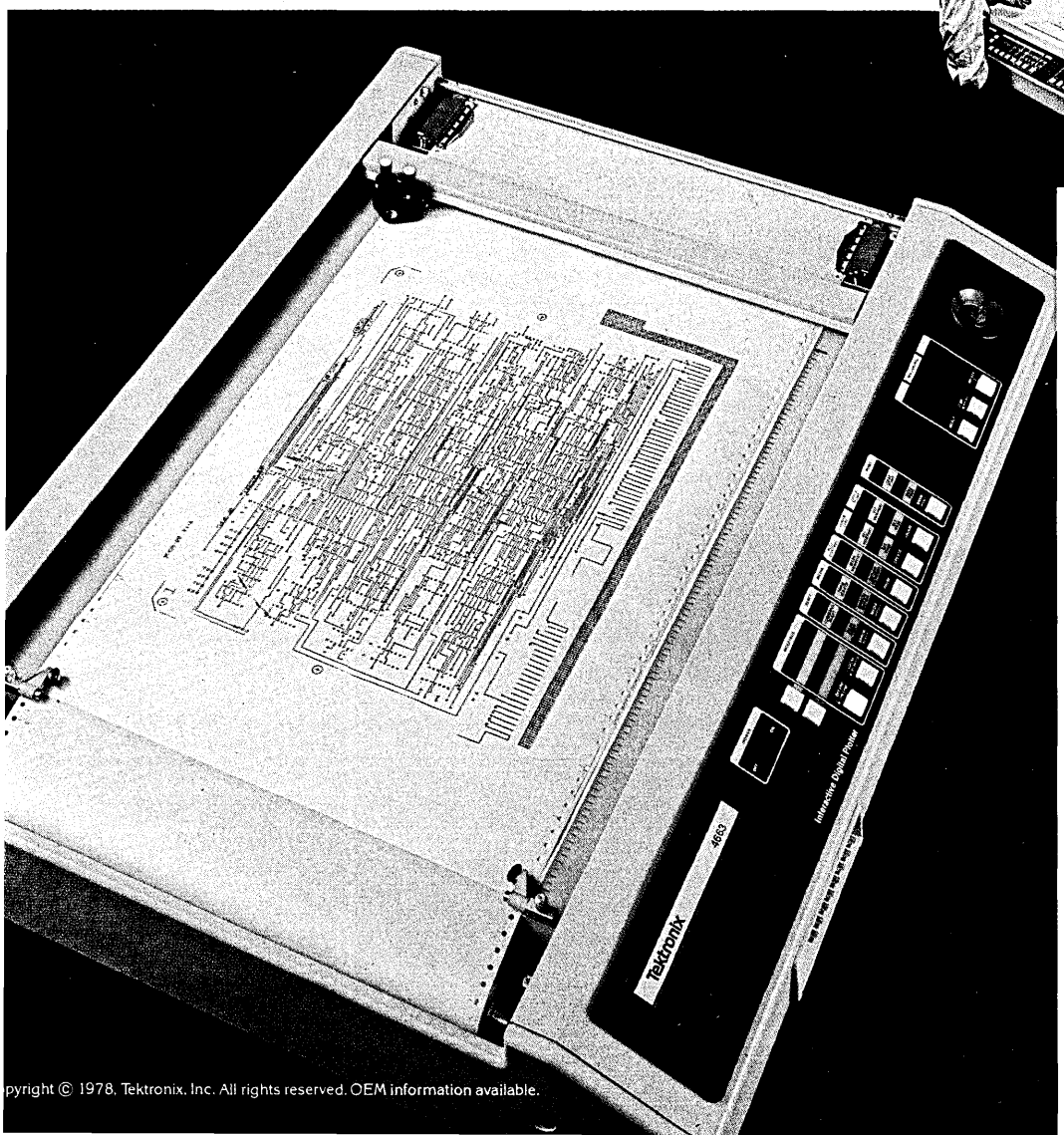

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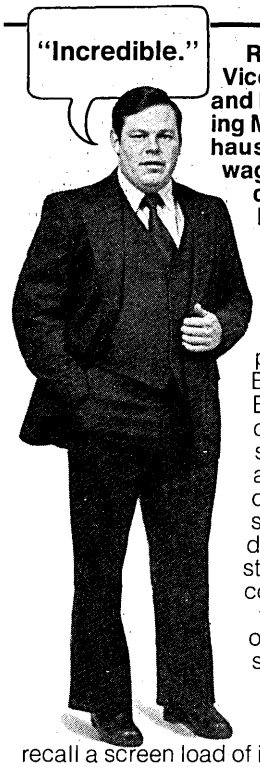
CIRCLE 86 ON READER CARD

EDP professionals have a word for the new Wang VS computer.



Richard Berger, Vice President and Data Processing Manager, Bughaus, Inc., a Volkswagen service center network headquartered in Hartford, Conn.

"Because we had been using a computer—the Burroughs B1700—with card input sequential files and no video displays, we suffered long delays and storage constraints.

"Now, with our Wang VS system, storage is virtually unlimited, and we simply recall a screen load of information on the CRT to make a change in seconds—all of this without interrupting our normal flow of work.

"We've put everything in our business onto our VS system, including payroll, accounting, sales and wholesale and retail inventory control. And we did it in 90 days without changing languages and with only minor modifications in almost 90 COBOL programs."

"We are absolutely amazed at the throughput rate we've achieved with our Wang VS. On our very first job for one of the country's largest student insurance agencies, the VS arrived in Pittsburgh on December 23 and was completely installed and operational on-site on February 15, with 61 programs written, debugged and tested—all by only two people—and not a single line of code had been written until the machine came in the door.

"The VS really fulfills all of our requirements, particularly in areas where other systems are weak: cost/performance, language-availability, user-utility software.

"I think the real key for the DP manager is the utilities available with the VS, its speed and its interactive COBOL compiler. These three things combined make for a very powerful tool."

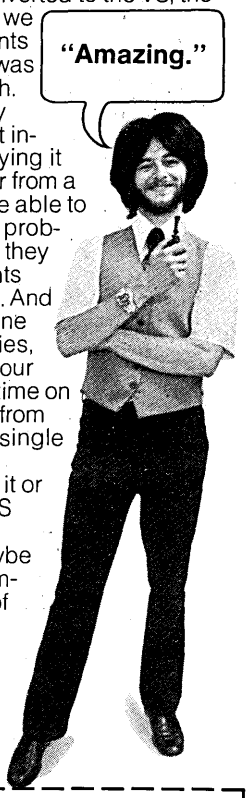
J.P. Scott, Data Processing Manager, Aptech Computer Systems, Inc., Pittsburgh, Pa.

Kenneth W. Cakebread, Manager of Data Processing, Trans-Air Forwarding and Brokerage, Inc., Inglewood, Calif.

"I had 30 days to convert about 220 programs from our old batch-oriented Honeywell 62 system to our new Wang VS system. Not only did I do it: Thanks to the programming power of the VS, I actually came up with more.

"Before we converted to the VS, the biggest problem we had in the accounts receivable area was misapplying cash. No more. Now, by capturing current information and keying it into the computer from a workstation, we're able to sort out potential problems long before they get to the accounts receivable stage. And with Wang's on-line editing capabilities, I'd say we've cut our average editing time on a per-item basis from 30 seconds to a single second.

"And believe it or not, while the VS gives us faster access and maybe triple the programming efficiency of our old system, it was only half the cost."



EDP professionals in more than 100 companies are singing the praises of the Wang VS. And for good reason.

The VS is a remarkably sophisticated, fully expandable virtual storage computer designed to provide maximum interaction in a mainframe environment.

The VS provides for distributed data processing, thus avoiding costly consumption of mainframe resources. It's fast, responsive, ease to use and can support up to 2.3 billion bytes of on-line storage. What's more the VS speaks EDP people's language: COBOL, BASIC, RPG II and ASSEMBLER.

We also think you'll appreciate how simple the VS is to operate. In fact, because of its level of sophistication, it can be operated by people with little or no computer-related training or experience.

One more thing: the entry level price of the VS is under $50,000. Which is perhaps the most remarkable thing of all about this computer.

For more information on the VS, return this coupon to Wang Laboratories, Lowell, MA 01851.

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NEWS IN PERSPECTIVE

A VERY DIFFICULT BIRTH

Users of mass storage devices have had problems with microcode and with training of user personnel.

For almost two years, the National Center for Atmospheric Research (NCAR) has been using an Ampex mass storage system, the Terabit Memory (TBM). The system, which was linked initially to a Control Data 7600 and has been joined also by a Cray-1 mainframe, is running so smoothly that NCAR in Boulder, Colo., is very happy with the TBM. "We'd be hard pressed to live without it, I'll tell you," says NCAR's Bernie O'Lear. "I don't know what we'd do if we had to go back to (half-inch) tape."

Informed of these sentiments, Chuck Satink of Eastern Airlines says, "Those would be my comments exactly." In Miami, Fla., where Satink is a senior systems planner, Eastern is running an IBM 3850 mass storage system (MSS) that they've had for three years. With the exception of real-time applications, including a parts inventory job and data entry (airline seat reservations are handled at a separate computer center), just about all applications are running on the MSS, which also stores about 70% of Eastern's data. Of the mass store, Satink says, "If that thing goes down, I think the whole shop goes down. Nothing would run except the real-time jobs."

Around the world, mass storage systems are going into more shops and at an accelerating rate, although none of the hardware vendors including IBM seems to be emphasizing it to any great extent. "I think the only company that has marketed their device effectively has been IBM," says Erik Salbu, president of Masstor Systems Corp., a consulting service in Santa Clara, Calif. "And even IBM, I think, hasn't done as good a job as they normally do."

Since the announcement of the 3850 in December of 1974, IBM has installed only about 250 systems, according to Masstor's estimates. Control Data followed with the debut of its CDC 38500, of which there are only some six installations. There are five Ampex installations of its TBM, and perhaps 40 installations of CalComp's Automated Tape Library. The total value would be between $300 million and $335 million.

The value of the installed base could be between $600 million and $700 million by the end of 1979, says Salbu, based on the fact that IBM achieved somewhere between a doubling and a trebling of its base in 1978 and could double it again in '79.

"Somewhat surprisingly, the international installation rate is very high as well," Salbu adds. He estimates that 60% of the installed base is in the domestic U.S. market; 40% is international. And that is surprising, he explains, because the mass store "has had a very difficult birth."

Vendors have had problems with the microcode and with training of user personnel. Early users had problems in deciding which files to place in the mass store and which to leave on disk, stemming partly from an inability to determine the frequency of usage of files. They've had to go through a trial-and-error period, which made the initial reaction to mass storage less than favorable. "We look at the 3850 as having been a useful device for not much more than a year or a year and a half" because of the problems at the start, Salbu says.

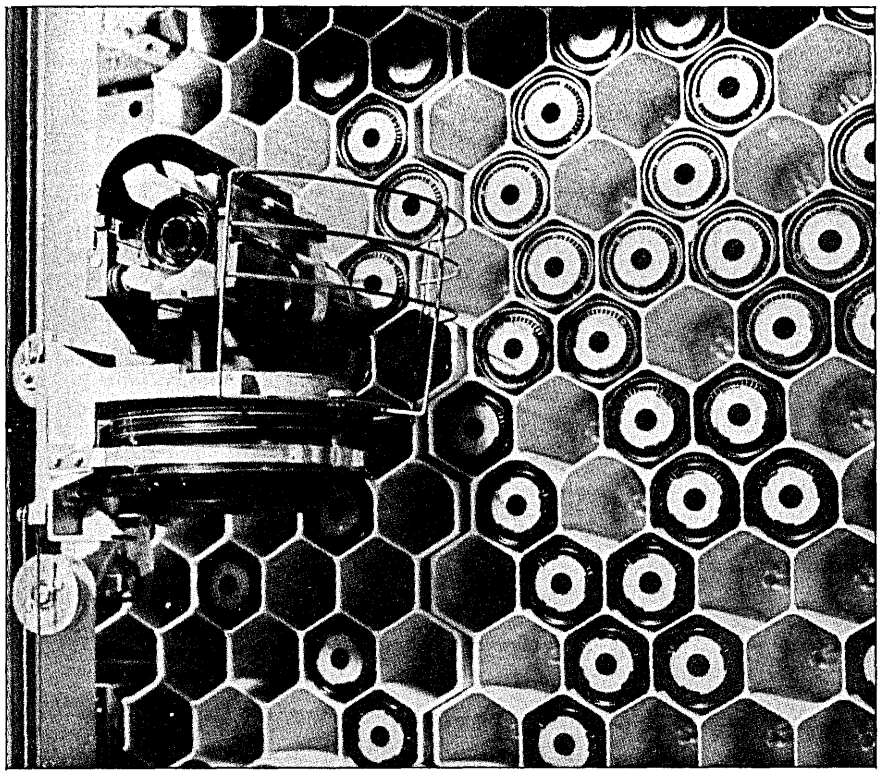
But over the last year, people have become attached to their new machine. They are getting useful work out of it and are starting to rely more on it. "And the successful users, I think, would not like to see it go," says Salbu. "We know a number of installations where it has become an integral part of the way they process data."

Over the last year, people have become attached to their new mass storage machines and getting useful work out of them.

Who are the users? They are companies with products to distribute—retailers such as Woolworth and Kresge and automotive manufacturers. They include broadcasters and publishers, large manufacturers, insurance companies, and a few banks. But Masstor vice president Lynn Shirley says, "It probably tracks better by the total size of the installation than anything else." The companies most likely to have a mass storage system, he explains, can be found among IBM installations, since that's the main market being served, and secondarily among large installations, those with multiple cpu's.

Indicative of the acceptance of mass storage systems is this bit of intelligence moving along the industry grapevine: For every two new installations, the gossip has it, IBM is experiencing one field upgrade to a larger capacity machine.

An example of such an installation is Atlantic Richfield Company (ARCO) in Dallas, Texas. The company installed a B2 model of the 3850 back in April 1976, enlarged its 102-billion-byte capacity a year later to 169 billion bytes, and six months later went to the maximum 236 billion bytes of a model B4. Subsequently ARCO traded in the B4 for an A4 (236 billion bytes) and an A2 (102 billion bytes), and early this year should be up-



AROUND THE WORLD mass storage systems are going into more shops and at an accelerating rate, although none of the hardware vendors seems to be emphasizing it to any great extent. This is photo of the IBM cartridge storage device that IBM introduced with its 3850 mass storage system in the fall of 1974.

grading again to two A4 systems. That would bring the company to the maximum of 472 billion bytes of 3850 storage that IBM allows on one operating system. Both mass stores are linked to a mainframe complex consisting of a multiprocessor 168, a uniprocessor 168, and a 3033.

In the Dallas computer center, then, where seismic processing is the main activity, ARCO's on-line storage has gone about as big as IBM will allow.

"We've seen a lot of improvements over the last two years in mass storage, and we anticipate or hope to see other improvements in the future," says the center's supervisor of data media management, Willard Brockinton. What they look forward to, he adds, is double density packing, something that's being talked about, although he admits he doesn't know when IBM will announce such a capability. But they could sure use the added capacity at ARCO.

Currently ARCO creates the geophysical data sets on the mass store. If they haven't been accessed for 60 days, the data sets are migrated to tape. And after an additional 60 days if they're still not accessed, the files are scratched after review with the user. But even this attempt to clear the 3850 of seldom-used data isn't enough to prevent adding more capacity.

The use of double-density tapes in the 3850's cartridges "should not be too hard for IBM to accomplish," says Eastern Airlines' Satink. At that installation, too, the saturation point is being reached. Eastern installed the 102-billion-byte capacity B2 model in January 1976, and now there are only five cartridges not being used. The mass store, serving a 5MB 168 and a 4MB 158, at peak hours has been performing 250 to 275 cartridge picks an hour. (For those unfamiliar with the 3850, a cartridge holds 50 megabytes; two cartridges are equivalent to a 3330 model 1 disk pack. Thus two cartridge mounts would be equal to a disk pack mount.)

"For the last two and a half years we've had excellent experience with it," says

Eastern Airlines has used IBM's 3850 to completely replace tapes.

Satink of the 3850. "We've used it to completely replace tapes." He thinks the reliability of reading off a mass store is "probably a couple thousand times better" than half-inch tape. Eastern's 3850 is in operation for 24 hours a day, seven days a week with virtually no scheduled downtime; preventive maintenance is normally done on the fly. "Outside of some real-time applications we have, which don't use the mass store," says Satink, "there's probably nothing in the way of batch work that doesn't touch the mass store."

In the way of benefits from the use of a mass store, he cites throughput improvement, shorter turnaround times, adding: "It has opened up a whole new area for testing by programmers." In addition to program compiling from terminals, they also can submit test data from terminals without operator intervention, "which made turnaround time very much shorter than it ever was before."

At NCAR in Colorado, where the Ampex TBM is installed, they're moving upwards of 30 gigabits in both directions on an average day. The center's O'Lear says their primary benefit is the ability to move data faster and at less cost than with tapes. "This mass storage device, for certain kinds of use, just has it all over the cartridge-type device," he says, explaining that it appears ideal for large scientific applications such as those at NCAR, but also for processing large data bases sequentially, as is probably being done at such places as the Social Security Administration and the IRS.

Lockheed California Co. in Burbank has encountered a different sort of problem with scientific applications on the 3850. Rick Fromm, manager of data resources, says scientific users tend to have far more data that requires backup. And "mass storage isn't the easiest device in the world to back data up in—outside the box, particularly, and even within the box. It's a noticeable shortcoming of mass storage," he says.

"If we had waited six or eight months we never would have seen a lot of problems. It was the price you pay for getting a brand new type of hardware."

This installation, too, was an early user of the 3850, installing an A1 box in December 1975. The original intention was to upgrade to a model A2, which they did prematurely because of problems with the hardware. "I expect if we had waited six or eight months we never would have seen a lot of the problems we saw," says Fromm. "We suffered through hardware problems, microcode problems, things that were advertised to work a certain way but didn't work at all or worked in a different way. It was really the price you pay for getting a brand new type of hardware." He adds that when they got the A2, which was a new machine, not a field upgrade, their problems vanished.

At this formerly tape-oriented shop, the primary benefit of mass storage is said to be improved throughput. "We don't have to worry about hanging tape anymore," at least not to the extent they did before. Gone are the problems associated with tape—its going bad, being lost, and being erroneously written over. And with a 5 million byte 168, a 6MB 168, and two 8MG

3033s, they're starting to run out of floor space. So Fromm also observes that a mass storage system stores a lot of data in a smaller space.

ARCO's Brockinton echoes some of Fromm's remarks, saying one of the primary benefits for ARCO of the mass store is its ability to store so much in such a small space. "That's one of the biggest kickers right now," he says. But he also agrees with Eastern's Satink on reliability. He says, "I think mass storage is a whole lot more reliable than tape."

With the installation of the MSS, he adds, "we really didn't get rid of any tapes." The ARCO library now has 53,000 tapes, and perhaps it would be 80,000 to 90,000 without the MSS. It now has 24 tape drives and perhaps that would be more than 40 without the 3850. And maybe they would need six more tape hangers.

"We run about 21,000 to 22,000 tape mounts a month," he says, and that's a reduction of 10,000 to 12,000. But since that time ARCO has added two mainframes and now is pumping from 45,000 to 50,000 jobs a month through the system. So Brockinton feels they've added significantly to productivity.

One primary benefit of mass store is its ability to store so much in such a small space. "That's one of the biggest kickers right now . . . but we really didn't get rid of any tapes," says ARCO.

Both Fromm and ARCO's Brockinton have job functions that were necessitated by the new mass storage systems. Essentially their jobs are to regularly purge the mass store of little-used data. "Before the 3850," notes Fromm, "in selected areas there was some monitoring of real disk space, but that's a small fraction of what it takes today because effectively you have a lot more real disk." At Lockheed, he adds, his job function didn't exist in its current form, but they soon learned there was a requirement for it. They also found a requirement for someone to perform data set maintenance and cleanup.

At NCAR, too, there are one full-time and two part-time people engaged in keeping inactive data sets out of the TBM mass store. Says the facility's O'Lear, "Anybody who justifies mass storage on the basis of removing tape drives and personnel is just kidding himself." Instead, he maintains, you just move people to a different job.

—Edward K. Yasaki

ANTITRUST

COMPUTERS AID IN AT&T CASE

Justice Dept. formed Information Systems Support Group a year ago to streamline litigation activity.

Improved computer technology is being used to help the Justice Dept.'s Antitrust Division in its pursuit of American Telephone and Telegraph Corp.

Until a year ago, the government's trust-busting troops used *ad hoc* automation and antiquated manual schemes in support of litigation, particularly in its 10-year antitrust suit against International Business Machines and in its four-year-old case against AT&T. But late in 1977 it established the Information Systems Support Group to pull together the computer applications activities that had rested within two offices in the Antitrust Division. That group since has been beefed up to include a staff of 20 that is headed by Larry Stevens, 40, a former head of the Federal Trade Commission's computerized litigation support effort. Says Stevens: the AT&T suit "definitely is a test of our capability."

It's clear the Antitrust Division doesn't want the AT&T case to turn into a *déjà vu* of the decade-long IBM case. Stevens, sitting recently at his cluttered desk sipping Coca-Cola, mused that the IBM case "predated" many of the dp and information service tools which he said his new group plans to use to back up the AT&T litigation efforts.

"So many of the things we do today for the AT&T case, we simply have not done for the IBM case because events have passed beyond that stage."

Stevens' job with the Justice Dept. came out of a move last year by the Justice Dept.'s antitrust chief, John Shenefield, to centralize his division's data processing expertise and to modernize its litigation support systems. Shenefield at that time observed that Justice couldn't mount the dp activities of its opponents, but that it was trying. "I do not say," he acknowledged, "that the government can or even should be able to match the resources—legal, paralegal, adp and other support—of the biggest defendants. But we must make an adequate investment in all these areas to maintain the initiative in big cases and thus avoid the even greater eventual costs of unnecessary delay."

At the Information Systems Support Group (ISSG), Stevens says his current duties are to provide data processing help to manage such trial documents as exhibits, transcripts and proceedings in the IBM and AT&T lawsuits.

Among its five major activities, these take up about half of its work. The rest consists of management information systems, economic analysis support, attorney work product assistance, and word processing. But within the next 18 months, 80% of its activities will be in providing assistance to the Antitrust Division in its litigation activities. And about 80% of that will be devoted to the AT&T and IBM cases. He notes, though, that these figures "change daily as we start to pick up additional activities."

Finding a way to organize the millions of documents the government and AT&T collects in the "discovery" stages of antitrust case.

"Litigation activities," as ISSG sees it, mean finding a way to organize the millions of documents the government and AT&T collects in the "discovery" or pretrial stages of the case.

There are various steps in this process, which starts with a Justice subpoena for certain AT&T documents. Government lawyers often speed off to Bell's New York headquarters to review the documents for relevancy. Once the appropriate material is selected, outside contractors are brought in to microfilm them.

Back in Washington, the document microfilms then are read by Justice personnel who fill out a coding sheet, listing various pertinent data such as individual or company names or equipment type. This keyed information is then fed into one of the Justice IBM 370/168 computers.

"The role of the computer," Stevens explains, is "to provide access points to these millions of documents." To provide this access, the Feds have an on-line retrieval system set up with standard kinds of text processing that allows retrieval of combinations of documents with multiple facts.

All of this is part of the government's new way of building document indices for the AT&T case. A key element in this process is an Inquire data base management system sold by Infodata Systems Inc. which provides the standard DBMS features to allow interactive access, report production, updating and maintenance.

Stevens' support squad keeps track of all Antitrust Division cases, providing basic management information on those cases so they can be prioritized on the basis of available support. Other standard dp management functions also are

LARRY STEVENS—"So many of the things we do today for the AT&T case, we simply have not done for the IBM case."

handled under this MIS category.

Another ISSG task is to offer analytical assistance to division economists. Working with balance sheets, shipment records and other statistics, economists design the kind of analysis necessary to determine such things as a company's market share. The group does all the programming and processing work. "The economic analysis," Stevens says, "is more of a batch report process as opposed to the document activity where the attorneys have on-line terminal access to the document indices." In providing this economic analysis, the ISSG functions "basically as a dp service bureau."

It's also been helping antitrust attorneys organize their work product. In legal lingo, the work product is all the written communications of a lawyer. This includes motions, subpoenas, briefs, documents describing case facts and any analyses of legal issues and recommendations.

Under the group's new project, certain work product data with future research value will be funneled into the 370/168 so that an attorney wanting to write a brief on a particular legal issue can easily find out if any other lawyer has previously covered that issue.

Stevens' group will design the indexing schemes and the vocabularies used to retrieve the data. They also are responsible for developing the delivery mechanism—in this case they've opted for microfiche which will be supplemented by on-line access to an index.

"At the moment," Stevens says, "we have been putting together a manual compilation of selected high-quality, current documents so that we have a foundation for the rest of the system for the future. And we're beginning to transmit through word processing the full text of new documents after they've been typed on a word processor. Then it goes into a full text retrieval system."

Working with balance sheets, shipment records and other statistics, economists design the kind of analysis necessary to determine a company's market share.

So far, only a few documents have been fed into this system. One hang-up is the sluggish transmission speeds of the three word processors (Lexitron, Vydec and IBM mag card) which currently are being used to send only a limited volume of data. So the group is looking to replace all its existing wp gear with what Stevens calls "one compatible system of equipment." The single system approach is a must "so that we have both equipment and personnel backup for either workload peaks or equipment failures." Stevens expects selection of the new equipment to be made late this spring, with installation beginning in late summer.

He says there's a need for "compatibility and communications so that magnetic media can be used throughout the division." The high speed communications requirement also is necessary for an envisioned electronic mail setup. This service would allow larger volumes of the attorneys' work product to be collected, and also provide better communications with the Antitrust Division's eight field offices.

Using such a system strategy, linking dp and word processing functions, "will allow us not only to send the text of the work product into the computer, but it will also enable us to get back management reports, using the system as a distribution tool tied to our data processing." The system will also serve in the MIS area, he continues, as a data collection device for gathering attorney workload statistics.

"We do think that's pretty far down the road," he admits. "But we are not looking for a unique piece of equipment designed for us for this application. There are half a dozen companies with new products capable of doing these kinds of things. So we're looking for a very new product but not the first of a kind."

All these new equipment plans have spawned new hopes and a new goal. And that goal, Stevens declares, is to "bring us into the 20th century." Once there, he affirms, antitrust users will reap the benefits.

"Very few of these projects are really productive from the user standpoint. Many of them are in the early stages of development and the users are not yet receiving any benefits. So the goal is to give them these benefits as soon as possible—especially our staff on the AT&T case. And they need the help."

—Linda Flato

COMPANIES

MORE MINIS FROM PRIME

Growth is a defensive move in the eyes of Prime president Kenneth G. Fisher.

Waiting for IBM.

Again.

The minicomputer manufacturers should feel that waiting for the "imminent" Series-E announcement—rumored to be a quadrupling of price/performance at the low end of the 370 line—is like waiting for Godot. A time of reappraisal, self-definition, anticipation and no little anxiety.

Yet Prime Computer, the seven-year-old Wellesley, Mass., mini manufacturer whose phenomenal growth has made it a

KENNETH G. FISHER—The price advantage shrinks, but not too much for Prime.

darling of the N.Y. Exchange, has chosen this time to again raise its distinctive colors—with a bigger flag and brightly dyed. Prime has announced four new large-scale mini systems, substantially increasing the company's exposure to any aggressive IBM initiative. It seems a confident statement from one of the leading growth firms in the computer industry that there is time yet before the giant takes a serious swipe at the "superminis."

Prime has interjected its minis skillfully into the mainframe game, cutting away from the oem competition to focus almost entirely on end-user sales, providing the software depth that has built a cadre of user loyalists, and pushing heavily for sales growth with a muscular marketing program that commands more than half of the company's personnel. Alone among the mini manufacturers, Prime matches IBM with a marketing/revenue ratio of 28%, nearly double that of DEC and DG.

With this rather flamboyant "mainframe mentality," Prime has skyrocketed from sales of $11 million in 1975 to nearly $100 million last year, which was double those of the year before. With the converging trends of the computer industry, growth is a defensive move in the eyes of Prime president Kenneth G. Fisher. When Fisher, Honeywell's former vice president of operations, came to Prime in August 1975 (with an HIS marketing team in tow), minicomputers held nearly a tenfold price advantage. Today, said Fisher, that has shrunk to less than half: "They're still three to four times more expensive than we are for given performance."

"Rumor has it E will change that," he said, "but we'll just have to see. Our anticipation is that with the combination of E and our new products, we'll still have at least a two-to-one edge. Enough," he smiled, "to command a following."

The three new systems which upwardly expand the line—the 32-bit Prime 550, 650, and 750—and a fourth, the Prime 450, which uses 550 architecture in an attempt to woo back the oem buyers the company has almost scorned for the last three years, will offer substantial economies over current Prime offerings, said Fisher. "From 25% more performance at less price, to 600% more performance at less price, depending on environment and configuration."

The Prime 750, system-priced between $180,000 and $300,000, will support up to 63 simultaneous users, with a 32-million byte virtual address space per user, eight million bytes of main memory, and maximum disk capacity of 2.4 billion bytes. With a built-in instruction set for optimizing COBOL, Prime claims the 750's COBOL performance will be "unmatched by any system that isn't a mainframe."

The 750 will offer a 300% to 500% improvement in COBOL over current Prime products, already widely favored in multiuser COBOL environments, said Fisher. "It might be very interesting to run benchmarks against (DEC's) VAX 11/780," soon expected to have COBOL, he added, with evident anticipation.

Although DEC has fielded the VAX and Hewlett-Packard has brought out its 3000-III, Fisher claims that thus far there has been no direct challenge to the Prime line in its sophisticated end-user markets—still primarily in scientific or computational processing, but with a rapidly expanding base in business dp—where Prime's MULTICS-based systems have been replacing mainframes in interactive, multiuser environments.

"Most of the companies have announced their new products," said Fisher." The only thing left to come is E, basically . . . and we see nothing on the product horizon that is going to change the competitive picture very much. And we see no companies really addressing the marketplace the way we are. Not to say there isn't competition. Certainly there is. But all the competition mounted so far hasn't slowed us down."

But Prime's growth has finally hit a bottleneck, he conceded. "It's just not prudent to double again. We don't have any plans to double again (this year). We're telling the world that. But it is not because the marketplace isn't there, or the product isn't being accepted, or that we can't finance it. All of those things are possible. It really has to do with the need to attract thousands of people to the company: identifying them, hiring them, training them. That's a long slow process and as you get bigger it becomes slower."

Prime ended 1977 with 1,070 persons, 1978 with 2,000 employees. "We did it with relatively good efficiency," noted Fisher. "If you take a look at our revenue per employee, we have literally the highest in the industry. If you take a look at our cost of goods sold, we have one of the lowest in the industry." But for growth this rapid, "you do pay a price, and the price is that you are not really as efficient as you would like to be." Fisher said Prime will hire between 1,000 and 1,500 new persons this year, but sales growth will be slowed purposely to allow for more tightly integrated development—reflecting perhaps the greater support

Thus far there has been no direct challenge to the Prime line in its sophisticated end-user markets.

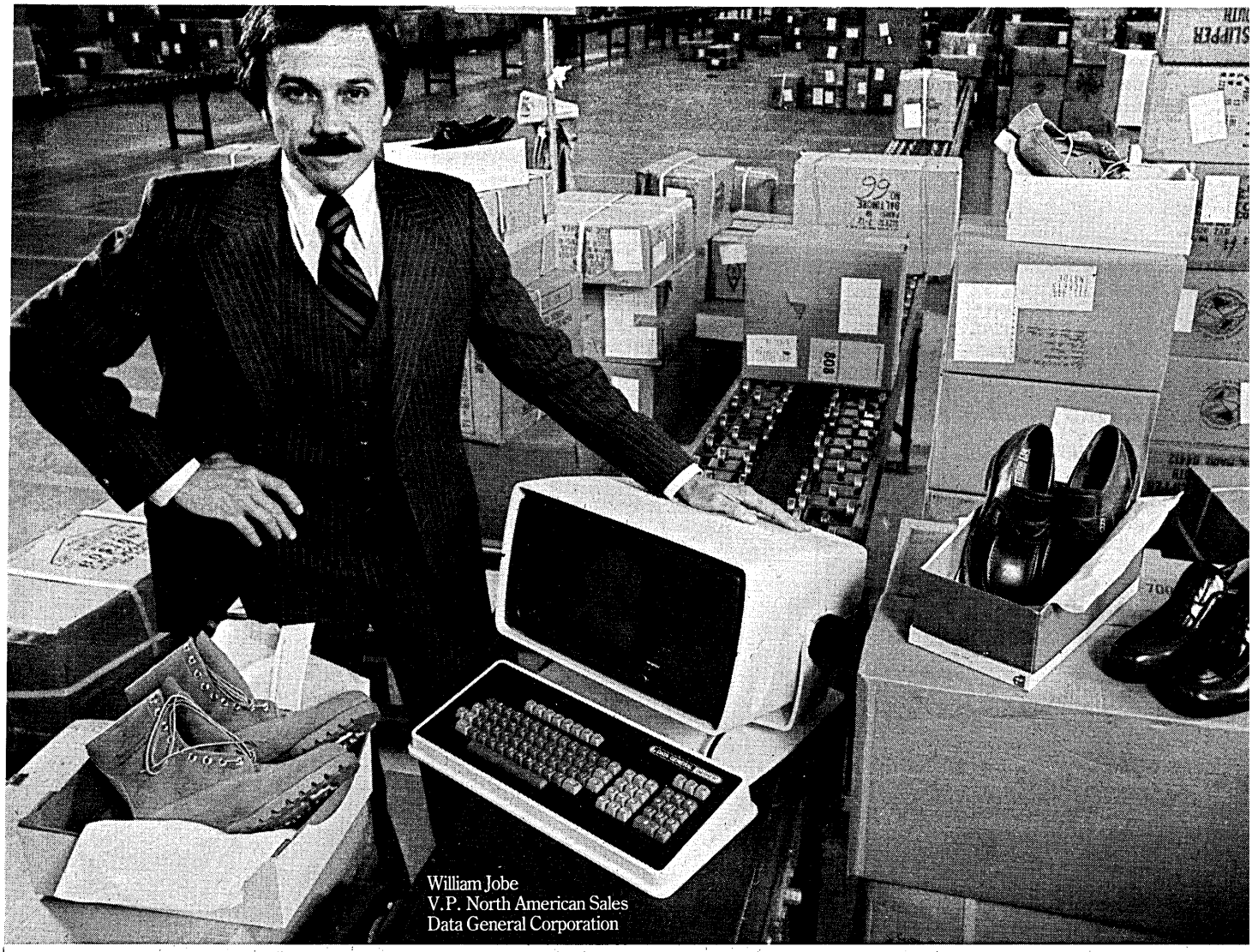
requirements in business dp which is over 30% of sales and rising.

Prime's new systems are offered with communications capabilities—PRIMENET, a packet-switch network capability, and a distributed dp subsystem called the Distributed Processing Terminal Executive—built-in remote diagnostic panels, and a new guaranteed two-year trade-in plan. These are options which may be particularly attractive in this market. With the company's much-touted software flexibility and per-terminal expansion costs less than half the 36-month tag on new I/O units for an IBM 8100, Wall Street analysts are generally cheery about Prime's prospects as a mini amid the mainframes.

The finesse with which Prime has managed its growth, allocating resources and balancing sales against capital needs, bespeaks a remarkable degree of internal control. Fisher boasts of credit control so efficient as to have virtually eliminated bad debts, and inventory control that limits year-end book-to-physical variances to "less than one-tenth of a percent."

Confronted with a relatively tempered equity market, Prime has always heavily leveraged its capital with debt: Citibank, its lead bank on a $25 million line of credit, has been particularly important. In 1977, Citibank picked up $10 million of the line and brought in other banks just before Prime made its second major equity offering. Market pros called it "an endorsement."

After a $20 million convertible debenture offering last year, Prime claims that it will be able to continue to finance growth—with sales up "about" 60% in 1979, said Fisher—with ongoing profits, and cash flow generated by an unusual system for deferred tax credits. Prime



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CIRCLE 21 ON READER CARD

sells long-term full-payout leases to either Citibank or Chase Manhattan, getting cash within ten days. "For book purposes, it's an immediate sale," explained Fisher, "but for tax purposes, it's carried over five years."

There is more than experience and intuition to Prime's precision management. Fisher said Prime has a computer model for its own development—keyed to sales force experience on Prime products—that has continuously predicted sales within one percent over three years. Without the sometimes surprising insights offered by the model play, said Fisher, "I think it would have been impossible to do some of the things we've done. This *is* the way we're running this company." It may not be perfect, he shrugged, but it's very close. "Even our marketeers are beginning to believe it."

There is more than experience and intuition to Prime's precision management.

—Vin McLellan

NEW FACE FOR EECO—This new facility occupied last month by the Electronic Engineering Co. of California brings the firm's total square footage to 200,000, connects two other facilities, and takes up most of what used to be an orange grove separating them. Some orange trees remain.

WHAT'S IN A NAME?

Thirty-year-old Orange County firm likes to think an acronym could change its image.

The Electronic Engineering Co. of California is a company seeking a new identity.

It's still in electronics. It's still heavily involved in engineering and it's still in California. But, having made one 180 degree turn in the '70s from a military orientation to a commercial one, it's looking to do another in the '80s, and principals say, "We're thinking systems."

And, while computer-related products have long been part of the firm's product stable, it never has made a cpu, but that now is a strong possibility.

The company is in the throes of a reorganization, begun in mid-September, which will give it three operating divisions as opposed to a flat organization encompassing seven product lines. Also, it, say company principals, would like to be known by the acronym EECO, although no move has been made to officially change the company name.

EECO, founded in 1948 as a partnership by Burgess Dempster and Robert Bonney, started out in a small facility in downtown Los Angeles. It has the distinction of being the first electronics manufacturer to move to California's now heavily electronics-oriented Orange County. The year was 1954. In its early years, EECO's business reflected the thrust of Southern California and was heavily military oriented—80% military and 20% commercial. This has been completely reversed.

Early-on, the company became known for its line of switches and punched paper tape equipment. Both lines are still an important part of EECO's business. But there's much more.

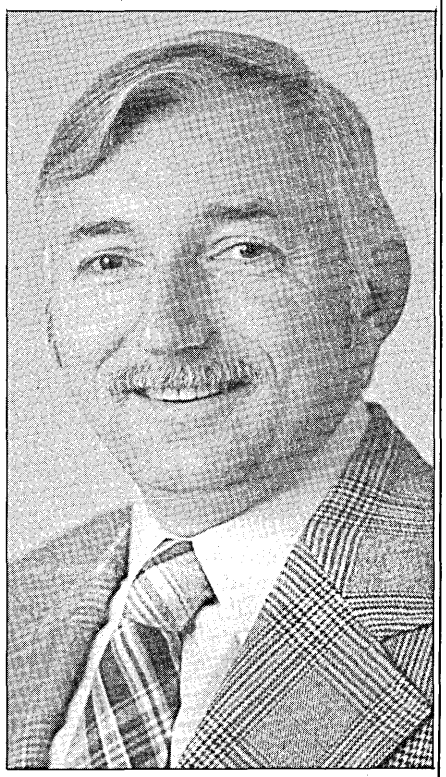
In 1970 it pioneered the hotel systems business with its EECO Hotel Computer system, introduced at a time when the lodging industry was wary of automation due to a number of highly touted failures.

The hotel systems are the focus of one of the company's new divisions, directed by Frederick J. McKee (May 1978, p. 49). Heading up a second division, Electronics Products, is a former business associate of McKee's, Jerry Murphy.

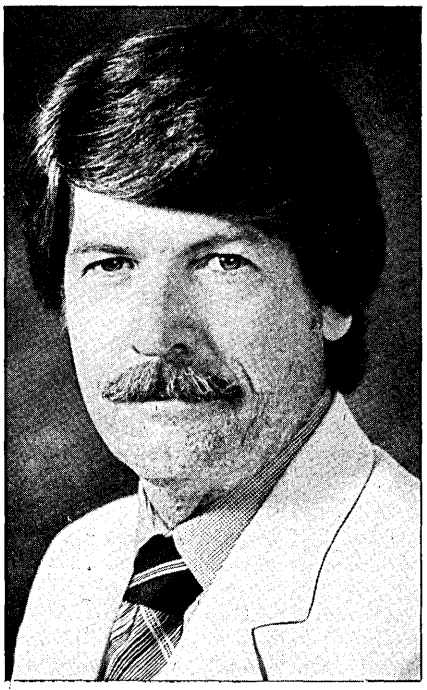
McKee and Murphy founded M&M Computer Industries, Inc., an intelligent remote batch terminal firm, and ran it through its acquisition by Singer Business Machines in 1973 and until its acquisition from Singer by Harris Corp. in early 1976.

Perhaps some of the new character of EECO reflects McKee and Murphy "together again," although they didn't join at the same time. McKee became director of EECO's hotel systems operation in February 1977. Murphy took over EECO's engineering department the following June. "I heard Fred had joined EECO and wondered what he was doing there. They make switches, I thought," said Murphy.

He made a lunch date with his former partner and visited EECO. "I was amazed at their basic resources and the things they were into." He remained head of the engineering department until October, when he was named vice president and general manager of the newly created Electronic Products Dept.



FREDERICK J. MC KEE—EECO's hotel man.



J. C. MURPHY—Rejoined a former partner.

PATRICK F. CADIGAN—"He cleaned house and tightened things."

E. L. SCHEIBEL—His isn't a division yet, but maybe.

Murphy's division includes three product lines: broadcast video/audio tape editing equipment, punch tape equipment, and computer terminals. McKee's is soy concerned with the minicomputer-based hotel systems. A third, the Component Products Div., temporarily headed by EECO president Patrick F. Cadigan, includes airline passenger controls/entertainment systems, switches, and electronic packaging equipment.

A fourth operation within EECO is manufacturing, headed up by E. L. Scheibel. It hadn't been granted divisional status at writing, but such a grant was "a distinct possibility and being considered," Murphy said. He said access to manufacturing capability was one motivating factor behind the reorganization. "Instead of seven product line managers with equal call on our manufacturing capabilities we now have this demand prioritized across three divisions. There's better control."

"They make switches, I thought."

Another EECO spokesman characterized the reorganization as "the second major change since the early '70s." That's when Cadigan became president and Burgess Dempster moved up to become chairman of the board. "He cleaned house and tightened things. He turned the company around." This was the period when EECO made its 180 degree turn from military orientation to commercial. It was a move dictated by the economic facts of life of the times. Cadigan, 43, joined EECO as general sales manager in 1967. He was appointed vice president and general manager of electronic products in 1969, was elected a corporate director in 1971, and became president on Jan. 1, 1973.

Holder of two master's degrees in management, he is due to receive a Ph.D. degree in management next month from Claremont Graduate School. Murphy characterized him as "a brilliant man who likes to experiment with new technologies. He inspires confidence and enthusiasm."

Whether it's Cadigan inspired or company inspired, enthusiasm sums up Jerry Pisano, product line manager for computer terminals within the Electronic Products Div. Pisano thinks EECO, as a company, "has been a sleeper" that is about to take off.

Murphy said EECO has had a 15% compounded annual growth rate over the last seven years. He expects this to accelerate in the '80s. "We're focusing on the '80s." Within his own division, "we're going to put the major emphasis on crt's; that's the growth area." He also is beginning to build a direct sales force for Electronic Products to complement EECO's network of representatives.

And he's "thinking systems." The broadcast equipment produced by his division, for which Ampex and RCA are the biggest customers, is, he said, "heavily systems oriented. It's a high technology area and we hope to apply that technology to computer terminals."

EECO's terminals were first developed for the company's hotel systems, later were designed into video tape editing systems and now are being marketed to both oem's and end users. Would they sell to other producers of hotel systems? "We'll sell to anybody," said Pisano.

Terminal sales are currently 85% oem and 15% end user. The line includes the D300 full feature editing terminal and the D400 polling terminal. Both are characterized by Pisano as "smart" terminals. His definition as to the difference between smart and intelligent terminals: "An intelligent terminal processes data and is user programmable, while a smart terminal contains fixed programs and does neither of the above."

In "thinking systems" for his division, Murphy said he is being careful to make sure there are no conflicting goals with the hotel systems operation. Hotel systems has, since its inception in 1970, used Data General Nova 1200s as systems base.

"We need more computing power,"

"We're focusing on the '80s."

said Murphy, "but we also need to protect an investment of several millions of dollars in software." He said he and McKee have been thinking of reviving a concept developed at M&M, "a state of the art concept. We have some processor in mind."

So maybe Orange County's oldest electronics firm could become its newest computer company. **—Edith Myers**

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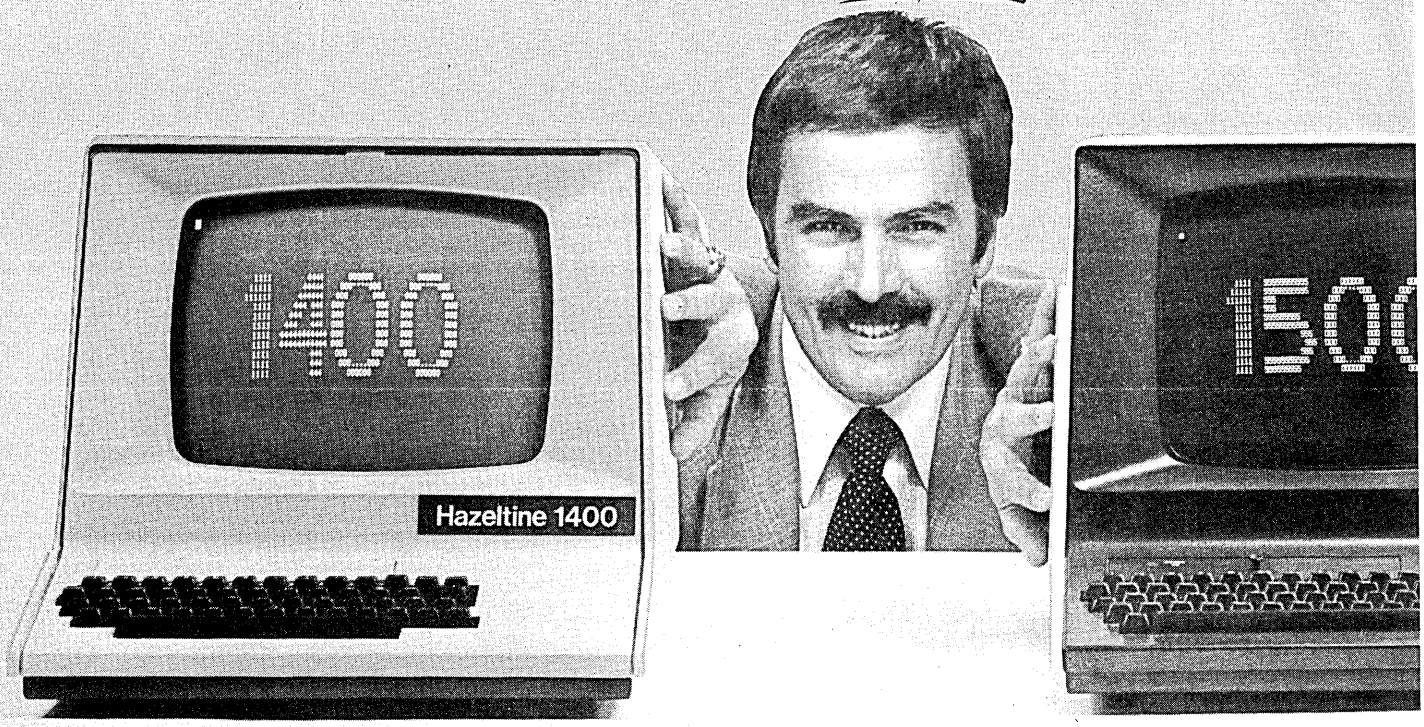

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MAINFRAMERS

UPGRADES WITH A SERIES/1

IBM soon will offer DOS/VS on the minicomputer and thus dissuade users from opting for a PCM system.

IBM's General Systems Div. is expected sometime this year to implement the company's popular and enduring 370 mainframe operating system, DOS/VS, on the Series/1 minicomputer. It's a development that could swing the evolution of IBM's 370 mainframe base downwards, rather than upwards. And it's considered by sources to be a "real surprise."

As well as this, the software used by the vast majority of IBM's 370/115 to 370/148 users and a good many from the 370/155 to 158 class, is expected to be stabilized for five years, sources say.

This will shake many industry pundits who have proclaimed that IBM will wind down support for DOS/VS over the next couple of years and hustle its users onto MVS, the company's big "flagship" operating system of the '80s. This aggressive move by the "Atlanta Tigers" also will rock IBM's senior division, the Data Processing Div., whose eagerly awaited E series of mainframes is intended to soak up the DOS/VS community and carry it up range—eventually to MVS.

Now, these same mainframe users will face the intriguing possibility of upgrading—to a mini.

The Series/1, which during its two year life has been thought of mostly as a communications handler, thus will be given new life. IBM is believed to have subcontracted some applications software development to European companies to produce a microcode-enhanced extended version of DOS/VS on the mini. The combined result, sources say, is a system with the power of a 370/148 at a minicomputer price.

For small to medium 370 users who already have a Series/1 mini, this could mean a 148 upgrade for next to nothing. Only the DOS/VS release would be necessary or if, as is likely, the operating system is already installed, its extension.

In addition to this, IBM is expected to make it even easier for its users to buy Series/1s by offering its first volume discounts—probably by next April, observers think.

According to one source, GSD has been virtually forced into this development because Series/1 has been "a marketing disaster." A senior manager at a European software company used by IBM for program support, says that IBM has been hit by cancellations.

SOURCES say IBM's Series/1 was a market disaster. Perhaps new DOS/VS offering will help clear the warehouses.

"Up to 30% of its initial glut of orders for the mini have been lost," he said. "GSD tried to sell them just like typewriters; users just didn't know what to do with them."

He added that if DOS/VS users take the machine it will help eat up the surplus. It should also dissuade them from switching to PCM's (plug compatible manufacturers) such as Magnuson, National Semiconductor and National CSS (Two Pi) for 370/148 power. IBM is believed to be particularly concerned with losing the bottom end of its user community to Magnuson, whose M80/4 is claimed to have 60% more cpu power than the 148, at 20% less in price.

GSD has been forced into this development because Series/1 has been a marketing disaster.

Up until now, IBM was expected only to challenge the PCM's with its E series—expected by April, say IBM-watchers. They say this machine will be "staggeringly cheap," with main memory down at the $25,000 per megabyte level, half the figure projected by some add-on suppliers as the norm by next summer. But according to these same observers it is precisely this dramatic fall in main memory price that opens up the possibility of big machine operating systems on small computers.

DPD has already seen its sister division's Series/1 show itself to be a useful replacement for its terminals and controllers (like the 3790 and 3705). It may now have to witness the mini doing a number on the much hallowed dp mainframe range. IBM declines to comment on the DOS/VS move, saying the company does not speculate on unannounced products.

—Ralph Emmett

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CIRCLE 23 ON READER CARD

MEMORIES

APPETITE IS BIG FOR MEMORY

It should help independents move products at good prices, despite IBM's recent memory reductions.

The colossal size of the IBM 303X market, and IBM's problems in meeting its backlog, haven't gone unnoticed by independent memory manufacturers. By year-end, 10 had announced add-on memory products for the models 3031, 3032 and 3033 for which IBM's backlog of orders is estimated at between 12,000 and 14,000 machines.

Lower prices, of course, is a key factor in their attractiveness to users, but the memory makers cite other reasons for their optimism:

—Most entrants are well-financed and have extensive experience in the IBM environment, unlike the situation seven or eight years ago when these suppliers ran into trouble financing leases and were vulnerable to IBM price maneuvers.

Users who opt for the independent add-on companies will have more flexibility in their upgrading paths.

—While IBM is moving the 303X line, its deliveries of the memory portion is slow.

—IBM doesn't display the flexibility of the add-on suppliers in the memory increments it offers.

—Many of the add-on companies are entering the market early, at a time when the purchase to lease ratio is at its highest.

Computers that are purchased outright or leased by users from third parties are targets of the memory companies. Graner Thorne, end user marketing manager for Ampex Corp., cites figures from International Data Corp. showing that of the 800 3033s that will have been installed in 1978 and 1979, close to 700 represent purchased equipment (425 will be outright purchases and 270 will be leased from third parties). That represents a purchase to lease ratio of between 85% and 90%. Traditionally, the purchase rate is high early in the life of a machine and could decline; but industry observers note that it should never get down to the 80% rental rate for the 360 line or 40% rental rate for the 370 line.

Purchase rate on the 3031 and 3032 models is in the low 70%. Of the 1,275 model 3031s to be shipped in 1978 and 1979, 935 will have been purchased. And of the 350 3032s due for shipment in the same period, 230 will have been purchased.

Users who opt for the independent add-on companies will have more flexibility in their upgrading paths, at least for the time being. IBM has set a limit of six megabytes of memory on its 31 and 32 models, while many of the independents will go as high as 16MB and in smaller increments and using newer technology. For example, Ampex Corp., Control Data, and National Semiconductor offer memory expansions in increments of 1MB on the 3032, while IBM and some other vendors only sell it in increments of 2MB.

And if physical box capacity is a factor, IBM's offering, with its 2K-bit chip technology pales in comparison with the offerings of Ampex and National Semiconductor of 16K chip technology and the 8K and 4K technology of some of the others. IBM announced last month that it would begin delivering 4K chips in the third quarter of this year with its model 3033s. But that would be available only on expanded 12MB and 16MB models of the 3033, which previously had been limited to 8MB. That meant that customers with four, six, and eight megabytes on their installed machines, would have to replace the older 2K chip technology if they were to expand to 12MB or 16MB models.

The players in the 303X add-on market are Intersil and National Semiconductor, which market their products on an oem basis, although National recently entered the end-user market. Control Data, Memorex, Itel, and Storage Technology buy their memory on an oem basis but do not sell systems which they've developed. The systems houses are Ampex Corp., Cambridge Memories, Electronic Memories and Magnetics, Intel Corp., and National.

Ampex Corp., which did not offer memory for the higher end of the 370 line because it was in the throes of a financial reorganization at the time, was the latest to enter the 303X market with a product called the ARM-303X. The company said it also will offer it for the higher end 370 line.

Unlike other memory companies which in their specification sheets don't quote IBM "native" memory, Ampex said that no IBM "native" memory need be installed in the host computer, although the Ampex memory can be expanded from any standard IBM increment. A spokesman said that meant any IBM customer "with sufficient clout" could order IBM to replace its native memory with Ampex memory, although Bob Flansburg of Intel said just about any other memory house can do the same. "There's no technical problem," he said. "We don't want to find ourselves in the middle of a squabble between IBM and the user." Intel sells its products in increments above the IBM 2MB limit for the 3031 and 3032 and 4MB on the 3033.

The ARM-3031 and ARM-3032 have four-way interleaving and are expandable in one megabyte increments. The ARM-3033 has eight-way interleaving and also is expandable in one megabyte increments. All three are expandable to 16MB.

It's a self-contained box—28.5 in. wide, 18.25 in. deep and 67.25 in. high—that is installed on a hinge in place of a cabinet door, but also is available as a free-standing unit. It has a fault indicator panel at the operator console that will show whether the fault is located in the Ampex memory or elsewhere. A probable cause is indicated if the fault is within the ARM-303X. The company provides standalone diagnostic software for the fault diagnosis.

Ampex also claims its power consumption, heat dissipation and floor loading are the lowest available. Power consumption is rated at 0.9KVA @ 208 volts for the initial two megabytes and 0.4KVA @ 208 volts for each additional two megabytes.

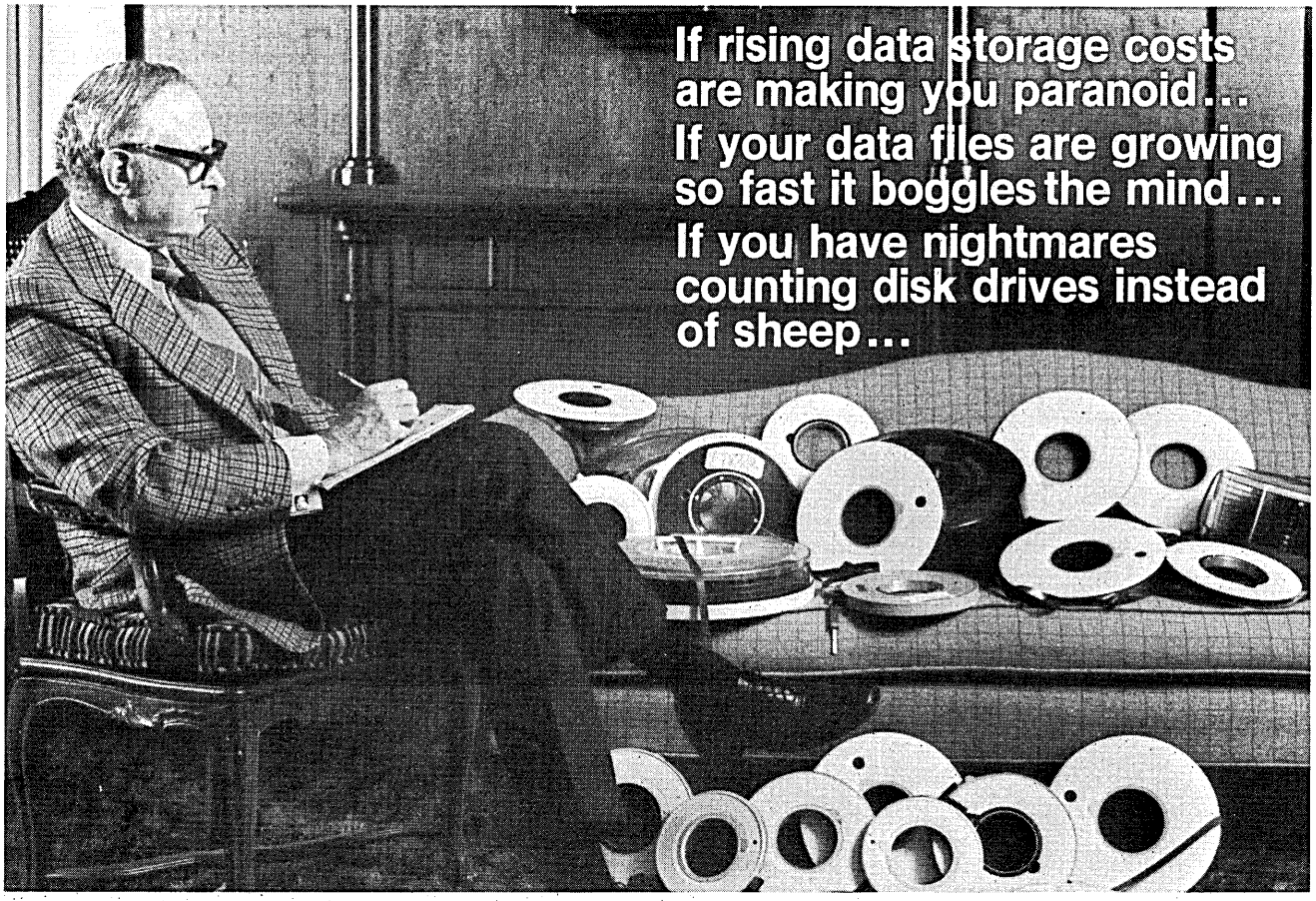
Ampex says no "native" IBM memory need be installed with its new product.

Heat dissipation is 2100 BTU per hour for the first two megabytes and 950 BTU per hour for each additional 2MB. Floor loading weight averages 1.1 pounds per square inch.

Thorne of Ampex admitted that the company may be at somewhat of a disadvantage having missed the 370 line and thus being without an installed base of users who could upgrade. "But we're not exactly new to the market," Thorne says, noting that the company was the "first and largest" supplier of add-on memory in the IBM 360 market. Ampex estimates that it's installed some 500MB of 360 memory. The company also has been providing memory to the Univac, DEC, and Xerox lines.

And, says Thorne, many users are displaying evidence of having voracious appetites for more memory because of expanding systems software and ever-increasing functionality. Some observers note that MVS requires at least one megabyte. TSO, IMS/VS, and VTAM probably each require a megabyte and IBM customers moving into distributed processing with the 8100 will have larger memory requirements.

Ampex, which prices its memory at a flat $50,000 across the board for all mod-



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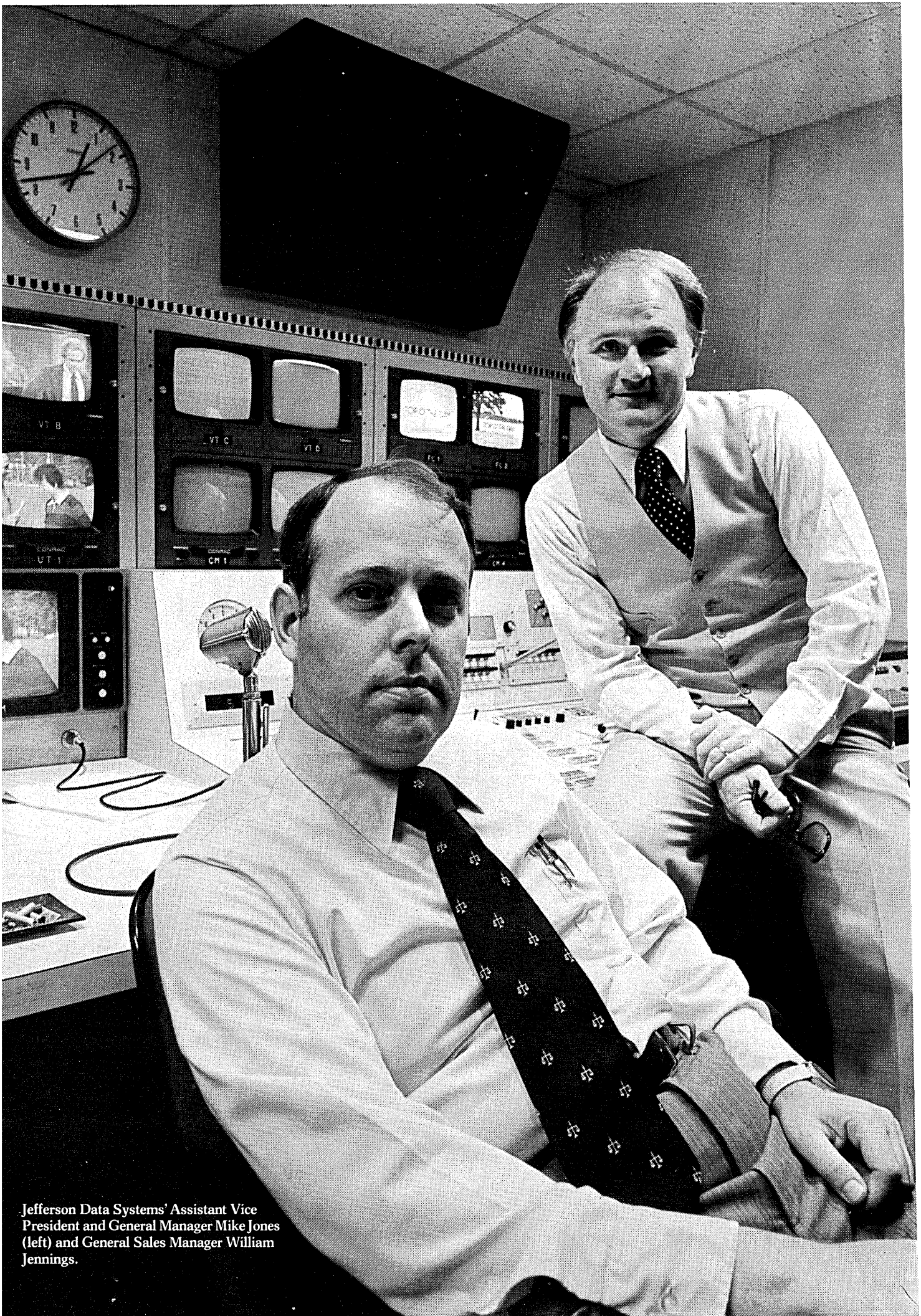


Jefferson Data Systems' Assistant Vice President and General Manager Mike Jones (left) and General Sales Manager William Jennings.

"For us, Sycor's total service is second to none."

Mike Jones
Assistant Vice President and General Manager
Jefferson Data Systems

The Sycor 400 family. All the power JDS needs to help major broadcasters get their programming together.

In 1969, Jefferson Pilot Broadcasting Corporation made a major decision.

Instead of seeking an existing corporate general accounting software package, they developed one themselves, using Sycor equipment and support.

The venture was so successful it quickly blossomed into a subsidiary, Jefferson Data Systems. Today, JDS provides distributive software programs to over 60 of America's largest radio and TV stations, as well as their own broadcast properties in North Carolina, Virginia, Georgia and Colorado.

Sycor has always played a key role at JDS. Initially, Sycor 340 and 350 systems formed the nucleus of each station's remote capability. As service demand grew, Sycor 440 systems were deployed. Now, Sycor's most powerful equipment, the new 445 with multifunctional operating software, has been successfully tested and is scheduled to be installed.

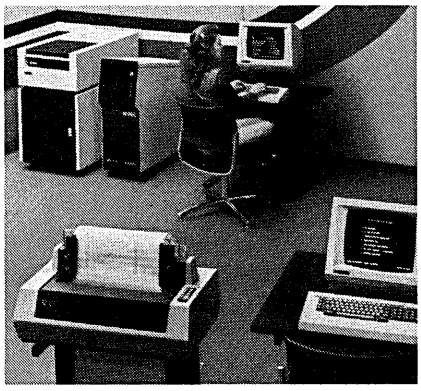
"We wanted to provide our clients with equipment that performed without making computer people out of them."

"It's a fill-in-the-blank type of system, which is very easy to handle," according to Bill Jennings, JDS general sales manager. Compact Sycor 440 systems are placed within the stations. Each is used for entry and retrieval of data pertaining to every aspect of the stations' operations, as well as for providing each station with its own data processing capability.

Information is then telecommunicated directly to Jefferson Data's central computer, where it is processed and stored. Processed information is periodically returned to each of the 440 systems over undedicated telephone lines, for generation of program scheduling, contracting, invoicing, and general accounting reports. In fact, the JDS System 80™ package produces over 100 reports for subscribers.

"People have been freed to perform additional tasks."

"Before Jefferson Broadcasting obtained the Sycor systems, at least three or four people per station were required for writing up contracts, and editing the log while moving commercials around. The Sycor systems have automated this entire process. In addition, they have allowed us to tighten operations. Before, six to ten percent of our annual billing was 'falling through the cracks.' And with 30-second commercials costing as much as $20,000, losing one was a very expensive proposition. Now, once data is entered into the system it is never lost.



One of the Sycor systems that helps Jefferson Data Systems' subscribers save time and organize work.

"We went to Sycor after evaluating several manufacturers. We feel they have one of the finest technical and service organizations in the world."

"We've never had anybody miss a processing day or lose a log," boasts Jennings. All JDS accounts have a toll-free number and access to Sycor's National Dispatch Service in Ann Arbor, Michigan. There, 20 operators and 13 Sycor terminals are available 24 hours a day to handle service calls. As calls are received, information is relayed to one of more than 110 service locations. "In all of the applications we're now performing, the Sycor equipment is fantastic," adds JDS Systems Engineer John Reidy.

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For more information on how you can get a Sycor system performing for you, call Tony Fazio, VP Sales. Or write us at Sycor, Inc., Box D, Ann Arbor, MI 48106.

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CIRCLE 60 ON READER CARD

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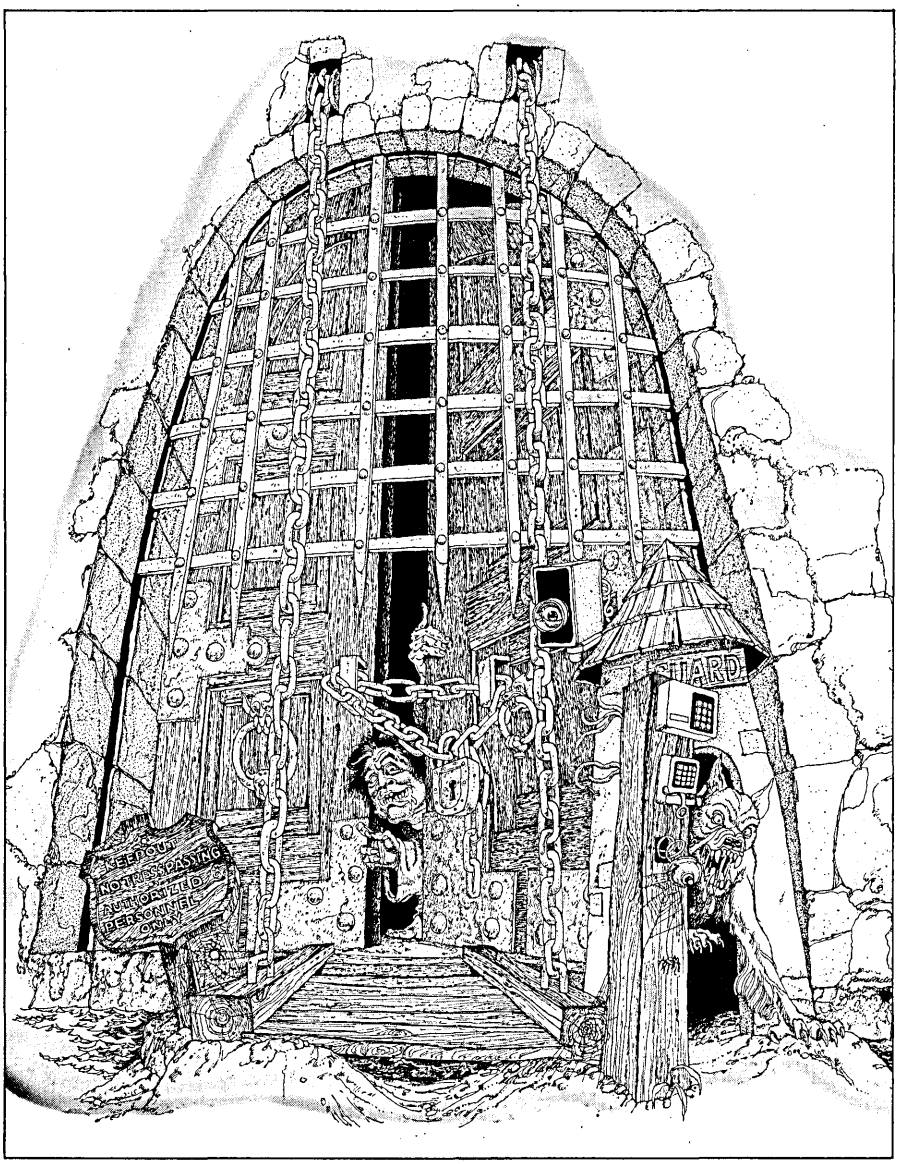

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CIRCLE 42 ON READER CARD

els of the 303X line, clearly is the price leader in a highly volatile market which in late December was beginning to react to IBM's December price cut of $35,000 per megabyte. IBM reduced its incremental price to $75,000 from $110,000, a move that long had been expected (September 1978, p. 17). Itel was the first to react in public, announcing that it would match the new IBM price. Control Data's price per MB already was at the $75K figure, but all additional increments were being priced at $61K. National Semiconductor was quoting $80K for the first megabyte and $60K for additional 1MB

The market is different today—most customers want their additional memory right away and may not want to wait for IBM.

increments. Storage Technology quoted $65K and $50K. Intel quoted $65K, but said increments of 2MB would range from $130K to $150K. Cambridge was quoting the same prices as Intel.

(DATAMATION sought in late December to publish a table of purchase and lease prices offered by the memory vendors, but gave up when many vendors called up at deadline to change prices and the others couldn't be reached for their reaction.)

One marketing person said he expects the prices offered by independents will continue to erode as they have in the past until they reach 50% to 60% of IBM's list prices. But for the present, at least, it seemed that they're selling the memory for the highest price they can get. Until IBM catches up on 303X deliveries, it's all a factor of demand and deliverability by the independents. Only about 60MB of add-on memory had been shipped by the independents at year-end. And Ampex,

Until IBM catches up on 303X deliveries, it's all a factor of demand and deliverability by the independents.

which late in December still hadn't decided on a source for its memory chips, won't be starting deliveries until the spring.

Thorne says the market is different today—most customers need additional memory in a hurry and may not want to wait for IBM. "In previous (add-on) markets, a customer would order IBM machines and then wait some 9 to 12 months before making a decision about putting on additional memory. That's no longer the case today."

And that could slow price erosion, whatever IBM does.

—Tom McCusker

PUBLISHING

FLORIDA TO SWEDEN

What started in a medium sized Daytona Beach paper is now the property of an international conglomerate.

John Gallant of the Daytona Beach, Fla., News-Journal is a newspaperman who got into the systems business just to get his newspaper out on time.

He joined the then 75-year-old newspaper publishing operation as a city editor in 1957. Ten years later the family owned organization moved into a modern $1,850,000 plant which was to provide the ultimate in state-of-the-art newspaper production facilities, including a then relatively new photo-typesetting capability and an offset press.

"Printing was great," recalls Gallant, "and fast. But corrections were slow and tedious, having to be done sometimes letter by letter with a letter cut out of a pasted down proof and replaced as opposed to lines of lead type being thrown out and replaced. We were coming out hours late."

Then Gallant and the News-Journal's executive editor and general manager, Tippen Davidson, son of Herbert Davidson, editor and publisher, and grandson of Julius Davidson who purchased the operation in 1926, attended a publishers' convention and trade show and met an automation consultant, Ed Burg. They talked about the correction problem and decided to try correcting via crt terminals. A number of Hendrix terminals were purchased and used for one year. "It was an immediate improvement," Gallant said.

Then Burg introduced them to a young man from Boston named Steve Rotman, a recent graduate of Rensselaer Polytechnic Institute with a degree in management engineering. Davidson and Gallant were looking to further streamline their operations. Rotman was into computer use and agreed to work with the News-Journal on a computer-based typesetting system. "He worked out of a motel here (Daytona Beach)," Gallant said, working round the clock.

Rotman selected minicomputers from GRI Corp., Newton, Mass., as the basis for the system. Gallant found a then-temporary, since-permanent replacement for himself as city editor, became the News-Journal's director of research and development, and worked with Rotman. And Rotman brought in two Boston friends, Rob Bushkoff, a 1969 grad of MIT with a degree in electrical engineering, specializing in computer technology, and Larry Liebson, a 1970 grad of Northeastern Univ. with a degree in engineering management, to help. Rotman was the system's software brain.

The Hendrix terminals were replaced by crt's made by Delta Data Systems Corp., Cornwall Heights, Pa. Facit input typewriters were cable-connected to the computer. These ultimately were supplemented with CompuScan ocr readers. Both input was on-line.

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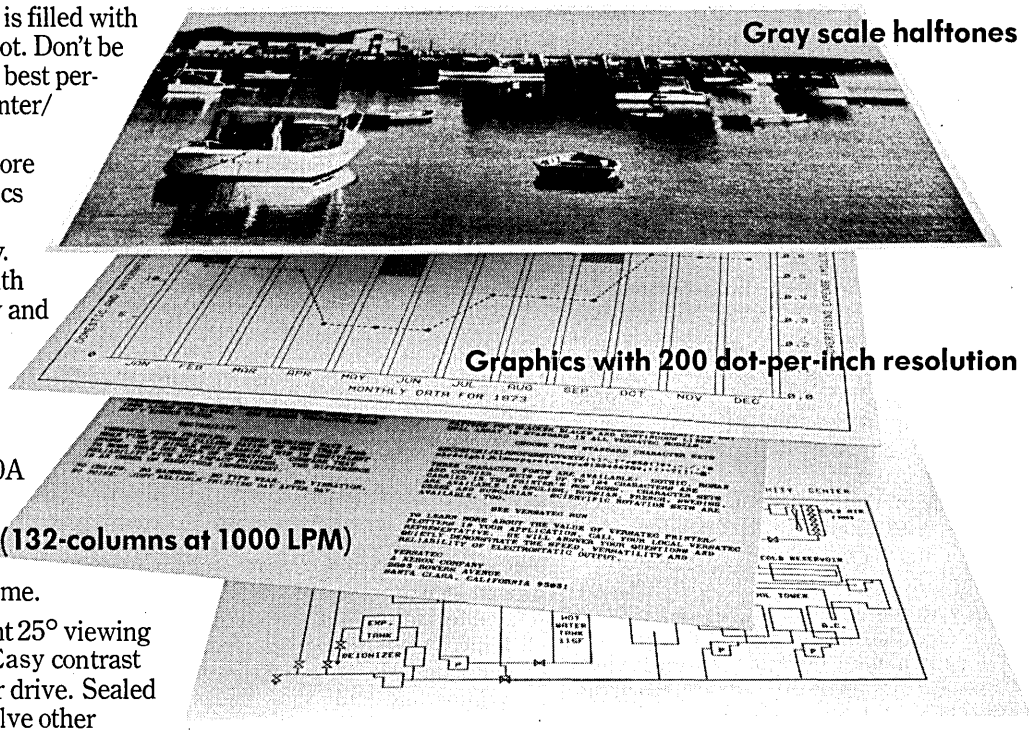

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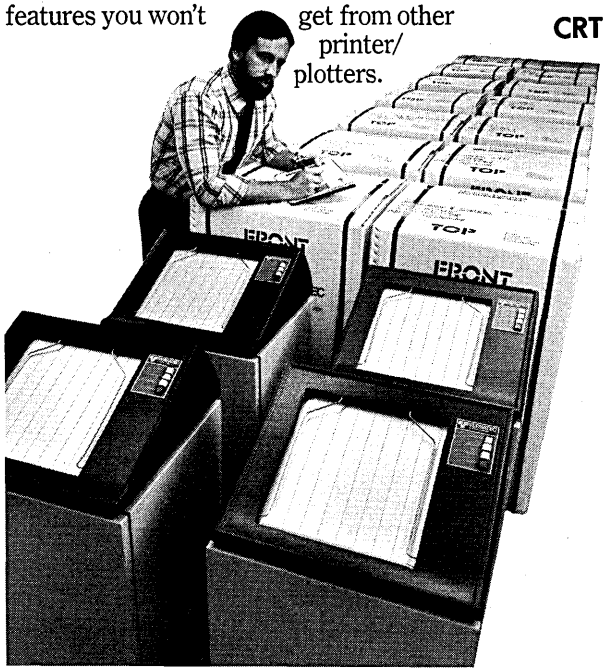

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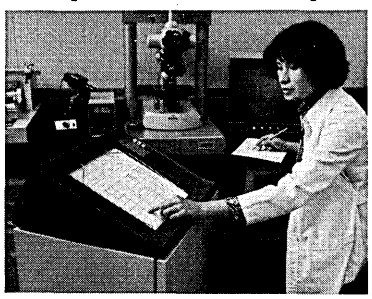

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CIRCLE 36 ON READER CARD

justification, formatting, copyreading and proofreading, and handled wire service input. It later was expanded to handle classified ads. Initially it was called the Daytona System and was the property of the News-Journal which sold it to only one customer, the Farmington Daily Times in New Mexico which became interested as a result of a News-Journal presentation at a publishers' conference.

"We really didn't want to be in the systems business," Gallant said. The system's three key developers, Liebson, Rotman and Bushkoff, did. So, with a royalty arrangement with the News-Journal, which had funded development, the three formed Xylogics Corp. in Burlington, Mass., to refine and market the system. It became the Xylogics/Daytona system.

"We really didn't want to be in the systems business."

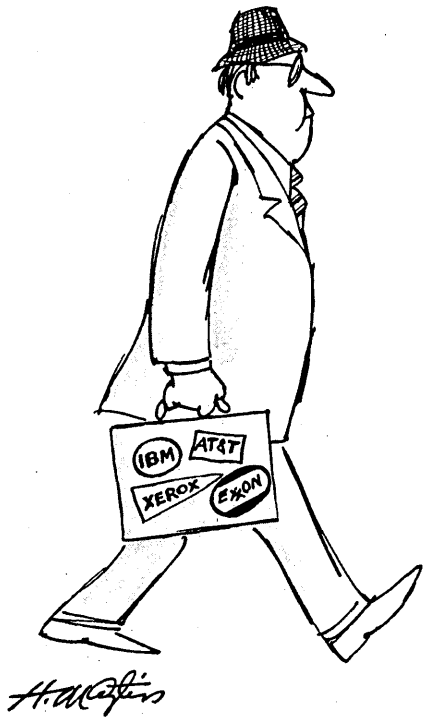
And so began a typical Topsy-type growth of both a system and a company. Liebson became president of Xylogics while Rotman and Bushkoff continued to contribute their software and hardware expertise. The company branched out from newspaper systems into lines of interfaces, controllers and disk subsystems.

Earlier, in the '60s, Star Parts, an old line hot metal typography parts manufacturer, had been acquired by Datascan Corp. which hoped to move into automated typesetting. Datascan/Star became interested in the Xylogics/Daytona system. In June 1972, Xylogics signed a marketing agreement covering the system with Datascan, contingent on Datascan being purchased by Dymo Industries.

This happened in 1973, shortly after the third system went on stream at the Daily Pantagraphic, Bloomington, Ill. This system included two linked GRI computers, four press wires, one CompuScan ocr unit, one paper tape reader, five visual display terminals, two on-line CompStar 191 typesetting units developed by Datascan/Star, two paper tape punches, and two Tri-Data magnetic cartridge drives on which material could be dumped for off-line storage and backup.

A fourth installation was due to be completed at Waterloo, Iowa, and a fifth in Lynchburg, Va. All systems used six or more 500 byte fixed-head disks manufactured by Data-Flux.

Xylogics' classified ad program was complete and operational, working from ocr input from preprinted forms with other means of input also possible. Coding was placed at the top of an advertisement with straight text following. Data was stored as typed and proofing could



be done either by terminal or typeset output. The file was maintained in unjustified format and sort and merge could be accomplished in about two minutes for eight pages. Sorting was first by category, then by primary and secondary subfields (in order, such as Chevrolets before Fords, followed by 1973 before 1972). The file was self-purging and various run sequences, such as Monday, Wednesday and Friday, could be assigned.

The system was marketed as the Star/Xylogics System from June 1972 until 1975, when Dymo bought Photon, a Wilmington, Mass., phototypesetting company and set up Dymo Graphic System Inc. Xylogics continued to furnish software and some specialized hardware and Dymo manufactured, marketed, and

He found a temporary replacement for himself as city editor.

serviced the system until November of 1976 when Dymo purchased the system portion of Xylogics' business. With the system went Rotman and Bushkoff who still are with Dymo Graphic Systems. Liebson remains president of Xylogics which continues to produce interfaces, controllers, and disk subsystems.

The system today is called the Dymo Copy Processing system and is in use in more than 100 newspapers around the world. It also is installed in a number of commercial printing plants. Dymo also has developed and is marketing a newspaper business system. Last year, Dymo

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CIRCLE 11 ON READER CARD

Industries, including Dymo Graphic Systems, was purchased by the Swedish conglomerate, ESSELTE.

And back in Daytona Beach, where it all started, the News-Journal has grown and so has its system. Combined circulation of its two dailies and one Sunday paper today exceeds 80,000 with, said Gallant, no increase in the production staff from when it was considerably lower. The Times-Journal also makes use of its system's capabilities to print a number of smaller papers for outlying communities and to handle operations of its commercial printing division.

As for Gallant, he never went back to city editing. His title remains director, research and development. One of his prime responsibilities is to be on a constant look-out for ways to refine and improve what still is known, in Daytona Beach anyway, as the Daytona System.

—Edith Myers

GUIDELINES

BREAK FOR COMPUTER COMPANIES

Revisions to wage and price guidelines may exempt computer vendors faced with personnel shortages.

Thanks in part to the behind-the-scenes efforts of an industry trade association and its member companies, the computer industry now looks as though it will emerge relatively unscathed from what were viewed as potentially harmful effects of the Carter Administration's wage and price guidelines.

Prior to the Dec. 14 revision of those guidelines, a number of industry figures had expressed concern that a seven percent wage cap would trigger an epidemic of job hopping among programmers and technicians.

"In this industry we've managed to show continued increases in productivity without raising our prices," noted John F. Cunningham, an executive vice president with Wang Laboratories. "And our employees should be able to share in the benefits of that productivity. However, with fixed guidelines that may not be possible and, as a result, there could be a lot of job hopping."

"Remember when the Nixon Administration put in the mandatory guidelines?" adds Vico Henriques, head of CBEMA (Computer and Business Equipment Manufacturers Assn.). "People couldn't get the kind of raises they were looking for and consequently they began switching jobs. The turnover in the computer industry increased 40%."

Industry executives like Henriques argued that with the existing shortage of technical labor, such guidelines could have a damaging impact, particularly on medium size companies which are substantial enough to attract government scrutiny but not large enough to boast the kind of institutional loyalty of an IBM, say, among their employees.

Electronics association working against a tight deadline spelled out its own guidelines on how a firm could show it was having a severe labor shortage.

Further, since the computer industry has historically continued to reduce the costs of many of its products—products that in turn were often used to reduce customer overhead—computer firms felt they were unfairly being lumped together with industries in which prices have jumped markedly in the past few years. "The wage and price guidelines program was structured for traditional industries where prices have been rising," asserted Edson de Castro, president of Data General Corp. "But prices in our industry and our company have been falling dramatically."

While de Castro voiced concern publicly, he was concurrently working privately to try to ensure the guidelines would not inhibit computer industry—and Data General—growth. Several months ago he wrote to Alfred E. Kahn, Carter's anti-inflation chief, suggesting that companies be able to compensate employees in direct proportion to the amount costs were reduced. In effect, this meant that if a firm slashed its prices 10%, it could add 10% to its employees' paychecks, instead of being restricted to 7% as specified in the government's guidelines.

Following on the heels of the de Castro recommendation, Data General and a number of other companies approached the federal government directly through the American Electronics Assn. (AEA), the Palo Alto, Calif.-based trade association to which they belonged. The tack here was to underscore the industry's dearth of technical personnel and the adverse consequences of Carter's guide-

EDSON DE CASTRO—What about an industry where prices have been falling dramatically?

lines, if they remained unchanged, on the computer, semiconductor, and high technology electronic sectors.

Consequently, AEA representatives met with Barry P. Bosworth, director of the Council on Wage and Price Stability, on Dec. 1 in San Francisco. Sympathetic, Bosworth suggested the AEA group give him specifics, a concrete proposal the administration could work with. The kicker was Bosworth had to have this information almost immediately if it was going to affect the final guidelines due to be announced in less than two weeks.

Almost immediately AEA members formed a task force, a group consisting of representatives from Hewlett-Packard, Data General, Tektronix, National Semiconductor, and other member concerns.

Working against a severely tight deadline, the task force attacked the guidelines issue on two fronts. It hammered out its own guidelines which spelled out the conditions under which a firm could show it was experiencing a severe labor shortage. These conditions focused on the percentage of employee vacancies a company had experienced during the previous quarter, the time required to fill vacancies, its pay rates, and recruitment expenses.

At the same time the task force had Price Waterhouse, the accounting firm, make a quick audit of the personnel needs of a number of AEA member firms. Within 36 hours some 25 firms, including DEC, MAI, Prime, Memorex, Ampex, Storage Technology and Fairchild, responded to the Price Waterhouse request.

Collectively, this group, which employed more than 260,000 people, showed more than 16,000 jobs it needed to fill. More than two-thirds of these firms also said they were so anxious to obtain qualified people, they were offering "bounties" to their own employees for bringing in new hires. Additionally, half of these firms said they were offering immediate financial incentives—above salary and benefits—to attract new personnel. And 24 said they could grow more rapidly were they not inhibited by labor shortages.

These findings were Telecopied to Bosworth on Dec. 7. On the following day he received the task force guidelines as well. When the final government revisions came out a week later, the task force language appeared as part of the package. Moreover, companies which had a history of lowering prices could effect increases of up to 1½%—a bone to the computer and electronics industries.

As an upshot of this, a user or manufacturer which can show a labor shortage among its technical staff will not be hurt by the guidelines. For all practical purposes, then, the computer industry, or much of it anyway, is exempt.

—Laton McCartney

ELECTRONIC FUNDS TRANSFER

A NEED FOR MEMBERS

Electronic Money Council finds its programs stalled for lack of money from new members.

The Electronic Money Council was formed in June 1977 to promote the positive side of electronic funds transfer (EFT).

One and a half years later it is finding that one of its most difficult tasks is promoting membership in the council. Started as a group of 24 depository financial institutions, it decided in December 1977 to become a multiindustry group and to seek members from among retailers, oil companies, card issuers and equipment manufacturers. So far it remains an organization of banks, savings and loans, and credit unions.

"Many of our programs have been stalled for lack of money new members would bring in," said Henry Vazquez, vice president, Hollywood Federal Savings & Loan, Hollywood, Fla., and a member of the EMC's executive committee. One such program is a planned 28 minute film.

"We've had no luck with hardware suppliers (those who make equipment for EFT systems) although we've been actively courting IBM and NCR," said Vazquez. He finds this lack of interest hard to understand as "they have as big a stake in public acceptance of EFT as we (the financial institutions) do."

Hollywood Federal joined EMC in August 1977 because "we were concerned about the amount of negative publicity EFT was getting. We were bothered by those negative stories. We had been into EFT for two-and-one-half years by that time and our experience was the opposite. We saw EFT as a technical advantage with benefits to both provider and consumer. The negative things had been blown out of proportion."

Hollywood Federal, with 16 offices and assets of more than $900 million, offers six EFT services: direct deposit of payroll, direct deposit of Social Security and pension payments, Bill-O-Matic telephone bill paying, Publix Plus supermarket banking, Buy-O-Matic point of sale (POS) terminals, and descriptive customer statements.

In its supermarket banking program, it has customer operated Concord 750 terminals in 16 supermarkets and 24 discount drug stores. With a bank-issued Plus card, a customer can use the terminals to make deposits and withdrawals and to guarantee checks during store hours.

Hollywood Federal started Bill-O-Matic in May 1975. Customers with dial phones dial an operator seated in front of a crt to pay their bills. Those with Touch-Tone phones communicate directly with the bank's computer. Vazquez said more than 28,000 bills per month were being paid via Bill-O-Matic at the end of the first year; at the end of the second year, 58,000; at the end of the third, more than 100,000 and now, 110,000.

Hollywood Federal offers six EFT services including a banking program in 16 supermarkets and 24 discount drug stores.

Buy-O-Matic was started in May 1977. With this service, the customer's Plus card becomes a debit POS card. It's an on-line system utilizing Touch-Tone pads through which a customer's personal identification number (PIN) and a merchant's number are entered for each transaction. Merchants are charged 2% of each transaction which is passed on to customers via credits to their accounts. "The advantage to the merchant," said Vazquez, "is instant transfer of money to his account. It starts earning interest right away."

Six months into the program, Vazquez said, "we had 400 merchants. Now we have more than 700 participating merchant locations and more than $4,000 per month in sales. We don't have the volume we'd hoped for. Training has been a problem. It's an alien concept. We don't always get to all of the clerks and in stores where there is not much volume there is a reluctance on the part of clerks to use the system."

Vazquez himself tried to make a purchase with his Plus card in a low volume store only to have the clerk urge him to pay with cash or a check. "With education, though, volume has been climbing from the first month on."

Vazquez said Hollywood Federal's losses with automated withdrawals "have been minimal compared to losses with conventional pass book, signature type withdrawals."

Hollywood Federal's participating merchants in the Buy-O-Matic service run the gamut. They include retail stores, restaurants, health spas, doctors, and even two funeral homes. Obviously there are some customers who can't resist EFT.

—E.M.

$59 MILLION CONFIRMATION: General Telephone & Electronics confirmed agreement in principle to a $59 million stock transaction to acquire specialized carrier Telenet Corp. The acquisition would give GTE a three-year-old packet-switched network currently in use in 170 U.S. and 22 foreign cities and linked by 225 host computer centers. It also would gain access to a family of network processors currently supplied to Telenet by Prime Computer and Digital Communications Corp. without incurring an expensive R&D commitment. A GTE spokesman said the firm would form a new subsidiary encompassing Telenet operations, separate from GTE Information Systems, a marketer of financial and point-of-sale systems and services.

NO EXECUNET REVIEW: The Supreme Court declined to review a lower court ruling that AT&T has to provide the local telephone interconnections that MCI Communications Corp. needs to expand its Execunet long distance telephone service. AT&T and the Federal Communications Commission had sought the review. The Supreme Court's action climaxed three-and-one-half years of litigation. MCI's chairman and chief executive officer called the high court's action "expected not only by MCI, but by the entire telecommunications industry. This ruling, coupled with the understanding that MCI has reached with the telephone industry, which permits us to secure all the local facilities we want, will allow us to continue to expand."

IBM VS. TRANSAMERICA: The latest in the antitrust cases against IBM, that brought by Transamerica Computer Corp., will be decided by the court if the selected jury deadlocks or drops in number below the constitutional limit of six. Both sides agreed to this prior to the trial's opening last month in San Francisco. Also, pretrial Judge Robert H. Schnacke granted an IBM motion striking prejudgment interest from Transamerica's damage claims reducing them from $105 million to between $63 million and $90 million. Prejudgment interest is that accrued on damages from the time of suit filing. Richard J. Lucas, Transamerica counsel, in opening his case, called the case one which "is about corporate greed, IBM's corporate greed." IBM attorney William Vaughn characterized Transamerica as a leasing company that took a gamble and lost.

OFFER FOR TALLY: Mannesmann Ag. of West Germany, which in November purchased 441,000 shares of Tally Corp. stock from Pertec Computer Corp., (Dec. '78, p. 77) tendered an offer to purchase all of the computer printer manufacturer's outstanding stock for $14 per share. The purchase from Pertec was at $9.40 per share. Tally's board later approved sale of 620,000 shares to Mannesmann for $14/share. James E. Rottsolk, Tally's vice president of finance, has said that if a merger could take place as early as late first quarter this year, "Mannesmann has said it intends to retain current Tally management. . . and plans to let the company operate at its present location in Washington with no restrictions."

INTERSIL ACQUISITION: In its first acquisition move since 1976 when it was the surviving name in a merger with Advanced Memory Systems, Intersil, Inc., Cupertino, Calif., agreed in principle to acquire Datel Systems, Inc. The agreement came at a time when Datel was roughly doubling its capacity and moving into a newly built 120,000 sq. ft. plant in Mansfield, Mass. The acquisition would put Intersil, which has been active in data acquisition components, into the data acquisition systems business. Under the agreement, Datel would become a division of Intersil and Nicholas Tagaris, Datel president, would continue to head the operation with the title of Intersil senior vice president.

CORNERSTONE FOR EXPANSION: National CSS, Wilton, Conn., completed its previously announced acquisition of Zytron Corp. and merged it into a division which retains the Zytron name and management. Robert E. Weissman, National CSS president, said the division will be "the cornerstone for the expansion of our capability in the image technology field." Zytron is a large independent provider of computer output microfilm products, services and systems in the U.S. The acquisition of Zytron gives National CSS 1,260 employees in 54 locations in the U. S., France, and the United Kingdom.

"TRUE EMULATION": Fred B. Cox, the original founder and first president of Microdata Corp., and William H. Roberts, a former vice president of research and development for Microdata, have formed Emulex in Irvine, Calif., to produce peripheral controllers and other subsystems for use with minicomputer and microcomputer systems. "Our controller designs are predicated upon the full and complete system-level emulation of established controller methodologies and are therefore fully supported by existing operating systems and diagnostic software," Cox said. "True emulation is the only realistic way to insure continuing software support since the user can deal directly with the original source for revisions, updates, and additions to software." Cox more recently was chief executive of California Data Processors, now part of Data 100.

SUPPORT FOR WP: A consulting and recruiting firm specializing in word processing has been formed in New York City. Blossom S. Furst & Associates was organized to place trained word processing personnel, both temporary and permanent, and to operate a service bureau compatible with IBM, Vydec, Wang and other major systems.

STAMP DESIGN COMPETITION: The American Federation of Information Processing Societies (AFIPS) said it will hold a contest for design of both a cancellation and a cachet as part of a Computer Stamp Exhibit at the 1979 National Computer Conference, June 4–7 in New York City. Entries should be based on the theme of computers and data processing. The winners will be used at a temporary postal station to be set up at the New York Coliseum during the NCC. Cancellation designs must be line drawings from which rubber stamp hand cancellers can be made and should include the name "National Computer Conference Station," said Dr. Ira W. Cotton of the National Bureau of Standards, editor of *EDP Philately,* and contest director. Cachet designs can be more complex, but cost of printing the envelopes will be a factor in the final selection, Dr. Cotton said. A bonus will be awarded if a coordinated cancellation/cachet design is selected as winner. Entry deadline is Feb. 19. Information can be obtained from Dr. Cotton, NCC '79 Philatelic Program Chairman, National Bureau of Standards, B-226 Technology Building, Washington, DC 20234, (301) 921-3517.

WORDPLEX REORGANIZED: Wordplex Corp., Westlake Village, Calif., has been reorganized into product, software, and marketing divisions by its new parent, AES Data Ltd., Montreal. AES officials said the reorganization was aimed at bringing Wordplex closer to Lanier Business Products, Atlanta, a part owner of AES and exclusive U.S. distributor for AES word processors. AES last month had yet to name a successor for former Wordplex president Paul Van Alystyne, who left following a management dispute, but AES president Walter Steele said the new executive will direct the California operation as the U.S. operation of AES Data rather than as an independent entity. A new name for the operation, AES, Inc., is expected. ✲

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CIRCLE 15 ON READER CARD

IBM: THE NEXT $20 BILLION

IBM will double in size as the result of an effective management process and the fortuitous health of worldwide information markets.

by Gideon Gartner

In 1978, IBM revenues topped $20 billion. By as soon as 1983, the company will have doubled in size. How IBM reached its first $20 billion is history. Figuring out *how* it could muster the wherewithal to add another staggering $20 billion in five years is a challenge.

We think IBM will hit the $40 billion revenue mark in 1983 as a result of the fortuitous health of worldwide information markets, a product stream designed to meet the needs of these markets, and a management process which has transcended human frailties and become a most effective decision mechanism.

How challenging is the target? The Computer and Communication Industry Assn. president Jack Biddle last month demonstrated IBM's approximate 15% trend lines (both revenue and earnings) since 1962 and extrapolated the line out to 1988 when revenues would reach $80 billion. That was postulated on the assumption that management will act to at least match the results of its predecessors.

Implicit in this contention may be the generally dubious assumptions that the environment which has been, will be. Also, that management can exercise various kinds of control. But it was pointed out that 15% may not be so tough. After subtracting the effect of inflation of about 7% from the generally expected real growth of the economy, say 3%, IBM would only have to find the sources for about five additional percentage points of growth rate. This could be obtained through: (1) The information technologies already gaining share in the world economies; (2) the computer industry increasing the primary markets for information systems; and (3) IBM increasing its market share, or by some combination of these. (It is obvious that information industry net price increases do not keep up with inflation. However, it can be shown that at the revenue level a given inflation rate can account for at least as much computer industry growth, mainly because the ratio of computer performance/price to labor performance/price is directly impacted by inflation.)

The momentum suggested by the growth in IBM's backlog seems to assure strong shipment and revenue growth for at least half of the five-year period which we are forecasting. At the end of 1975, IBM's net backlog, as reported in its filings with the SEC, was at an if-sold value of $4.9 billion (using a purchase to monthly lease price multiplier of 40). Since then, despite a strong consistent increase in shipments, the backlog has grown to $6.1 billion in 1976 and $11.4 billion in 1977. We expect it to be up again at year-end 1978 to about $14 billion, and 1979 in turn will benefit from the so-called E-Series announcements and other products.

During the last half of the five-year period, we expect to see tangible evidence of progress in the productivity and pricing area discussed below.

The end users: The number of end users of computers may be doubling every 1–2 years (granted, the implied revenue per user is declining). And during that year, when 100 million citizens of the world find $400 of value apiece in using information services, the market will have produced an extra $40 billion in revenues. If IBM obtained 50% of that market, it will have generated its $20 billion incremental moneys.

The 8100 and S/38 create new standards of high-level user interfaces *for IBM.* But beyond these, and the lower priced S/34 and 5110 (other ease-of-use entries), there is a long way for it to go. We expect to see important developments coming out of IBM's labs, which will work toward bringing computer power closer to the *end user* of information services, compared with IBM's historical concentration on large corporate data centers.

Small systems: A good proxy for both IBM's potential success in penetrating the *end* user, and for customers' apparent willingness or even enthusiasm for playing ball, is the recent takeoff of IBM small systems. Each of IBM's five lines of so-called minicomputers announced before Jan. 1 is demonstrating outstanding strength, and expectations of orders from the January Inca-1 (low end of the Series-F) are riding high, too. Estimated gross backlogs for four of these systems as of mid-December have an if-sold value of over $8 billion, including displays (Table 1). This represents about 40% of the total size of IBM today (and about four times the total size of Digital Equipment Corp.).

A separate calculation can show that just the four systems shown and their successor models will generate annual revenues by 1983 in excess of $6 billion, compared with under $1 billion today. Thus, a full 25% of the incremental growth which underlies our 15%/year growth hypothesis, can be accounted for by IBM's success in commercial minis, despite its belated meaningful entry.

The data centers: The end-user market opens new sources of payment for information services. But even within the corporate data center, IBM can directly affect its own growth rate by impacting the productivity of the application development and programming processes. Assuming that there is always an "application" backlog, such productivity improvements would increase the rate of expenditures for capacity vehicles (computers), certainly relative to people expense. It should be noted that most surveys of spending categories have noted a trend in the opposite direction during the last decade. Creating mechanisms for reversing this trend would certainly have a great payoff for system vendors. Historically there have been few breakthroughs in these categories, but we have seen numerous improvements and

IBM Small Systems Backlog* Bodes Well For Growth

System	Estimated Worldwide Unit Backlog	Estimated Value Per Unit	Estimated If-Sold Value
S/1	7,000	$ 40,000	$ 280,000,000
S/34, 32	15,000	70,000	1,050,000,000
8100	40,000	120,000	4,800,000,000
S/38	13,000	150,000	1,950,000,000
	75,000		$8,080,000,000

* including "uncredited" business and displays but excluding software and maintenance revenue.

Table 1

Percentage of Programming Shops Using Productivity Techniques Is High

Techniques	Percent Using (est.)
Interactive Programming	40%
Structured Programming	45%
Top-Down Design	35%
Walk-Thru	35%
HIPO	20%

Table 2

refinements in the techniques used. Table 3 lists a few of the more widely used productivity techniques which have been disseminating through large IBM user organizations during recent years. The exhibit estimates the percentage of programming shops currently employing each technique.

Users are optimistic in their expectations of payoffs from adding structure to the application development art. The most common outlook sees perhaps a 15% improvement in bottom-line productivity by perhaps 1983 (optimists see gains as large as 25%). Even such increases, if a reasonable piece is transferred to IBM, can add significantly to growth.

For example, IBM users now spend about as much on labor as on hardware. IBM will make attempts to substitute hardware (or more accurately "systemsware") for humanware. For example, we already are moving into an environment where virtually all programming and testing will be accomplished interactively, improving efficiency and eating up machine cycles. By 1983, we will be observing more fundamental changes. If IBM can translate just 10% of computer labor expenditures into IBM-billed expenditures by 1983, a calculation would show that this in itself could account for 5% to 10% or more of our projected growth requirement.

The pricing: It is readily accepted that a shift is occurring in IBM's pricing methodologies. In the future, instead of being virtually given away, software will carry its own weight. This basically is motivated defensively, to protect against a too-rapidly eroding cost curve in electronics. However, IBM may move quickly to the offensive, once it has achieved control of the larger segments of the software market, and once it can capitalize on its scale and power to price once again on a functional basis. This is by far IBM's greatest opportunity for future growth.

IBM's software pricing strategy may have at least two phases.

First, the company is increasingly charging for program products on a license basis. This approach has a great deal of merit from IBM's point of view (especially when IBM exceeds its unit forecasts, resulting in windfall profits from the extra copies sold). Most importantly, the amorphous nature of software (as well as firmware) almost guarantees that most will be leased and not sold, even if IBM ultimately allows sale. Such lease revenues are recurring and therefore cumulative, thus lending a great deal of stability to IBM's growth.

But such pricing may work to the disadvantage of the smaller user who must pay the same fee for his CICS as a large user's CICS.

Second, IBM should attempt to implement pricing algorithms which charge according to the frequency-of-use of a function, which is an equitable approach between computers of varying capacities and speeds. This approach can work both for System Control Programs and for Application Software. This value, or function, pricing can only be implemented with unique, differentiable products which IBM must let out all stops to develop.

IBM priced functionally once, when it charged for use of its equipment beyond a 176 hour per month allowance. (In a sense, rental pricing is also functional, in that a customer who rents, let us say for 80 months, has paid more than the "absolute" value of the equipment.) IBM was forced by competition to reduce its extra shift charges from 40% of prime shift rate, to 30%, to 10%, to zero on all its lease plans. This served as an inhibitor to growth, just as a resumption of functional pricing should have an accelerator effect.

The potential payoff to IBM from the general reestablishment of functional pricing is staggering, and in fact will tend to assure IBM's continued 15% growth trend line as much or more *beyond* 1983 as before. For the near-term five-year time frame, the current gradual unbundling trend simply protects IBM from the catastrophe which would result from hardware elasticity ratios below 1, and thus *is* an important factor in defending the 15% growth rate contention. Beyond this short term, perhaps the best indicator of the power of pricing by function, or by transaction, or by multiplication or whatever, is to track the growth in user demand for computer power rather than current revenues to the manufacturers. Table 3 shows our calculation of MIPS (millions of instructions per second) rate growth for IBM products in the class of 370/165s and above through 1981. Our calculation of the MIPS rate growth for the small systems which will flood the market are equally staggering, especially beyond 1981, when we see S/38 and 8100 class machines at the 3 MIPS level (equivalent to 370/158 power). MIPS *used* by organizations will correlate fairly closely with value received, and value will be the object of IBM pricing ambitions.

The industries: One mistake we all tend to make when macro-evaluating a computer firm is to categorize it by product. We have done just that above, by focusing on small systems. A more relevant approach is to divide a company into the industries and subindustries into which the company markets. IBM's awesome size appears more manageable when thus divided. Table 4 shows a set of broad industry classifications, with approximations of their relative importance to IBM, via what they would roughly mean in revenues were each to be a separate company. Can IBM manage to grow each of these by 15% per year on average?

The point is made clearer when subindustry classifications are considered, because then IBM is simply running a group of entities with a typical size of one to a few hundred million dollars each. It just happens that the base product sold through all these industry segments is the same—or almost the same—but drifting farther apart as industry specific terminals and application software assume greater importance. Soon, we are apt to see tailored application development languages, and different business practices. IBM has almost always planned with the industry view being one of the pri-

IBM MIPS Rate Projections* Are a Proxy for User Value Received

	370/165 and Up MIPS Installed	% Growth
1978	3,800	
1979	6,700	76
1980	11,300	68
1981	17,500	55

*year-end estimates

Table 3.

mary-planning matrix axes, and we believe this approach will continue (despite its ups and downs) and will be strengthened more in the future, with each industry group responsible for maintaining growth rates which balance to the overall corporate averages. Each industry will not grow at the same speed. But it is the nonhomogeneity of IBM's business when split by industry which gives it greater control overall, and a greater natural resistance to localized areas of weakness.

Also, from an interindustry point of view, industries which appear relatively saturated are balanced by those which are undermechanized. From an intraindustry point of view, the relatively advanced firm which has the scale and vision to implement "leading edge" applications, simply shows the way to its competitors. Thus, the second-tier firms catch up in time in the percent dp expenditure-to-revenue ratio, as they grow, simultaneously with reductions in the cost of information handling.

If IBM, with its mass of clients, does its job well in subtly facilitating information transfer *between* companies in each industry, then it could theoretically realize its growth objectives with little true new market development.

The countries: Consideration of market segments which are undersaturated is accomplished more easily geographically than by industry. Statistics of dp expenditures per dollar of GNP show that we spend more on information services per dollar of GNP than any other country in the world. Our premise is that the computer industry, with IBM in its wake, may derive conceptually some growth simply from geographic catch up, as nations with relatively undersaturated markets increase their utilization of computers.

According to that hypothesis, the rest of the world (ROW) eventually will be near the current expenditure rate of the U.S. based on catch up alone, independent of the increased penetration of information services into the fabric of society. Together with a faster GNP growth rate, then, overseas markets grow on a long term basis about seven percentage points more than U.S. markets. Thus, if U.S. growth is as low as 11.2%, an ROW growth rate of 18.3% brings the total to 14.5%. This trend can be intercepted at various points in time to obtain absolute estimates. This is simply an idea which, if valid, does not hurt IBM's quest for growth one bit.

When dealing with worldwide demands, we must make some assumptions relating to the relative stability of the political and economic nationalism arenas and, since we are measuring IBM in dollars, a reasonable strength in foreign currencies relative to the dollar.

The divisions and diversification: IBM's huge cash lode invites diversification. IBM has been diversifying rapidly, but not very visibly, since most of the numerous opportunities which the company has been chasing fall within the definition of information processing, and have been relatively small scale.

IBM typically, although not always, has waited for a market to be developed by others before jumping in with both feet. But IBM management is pragmatic, and will open the development valves as needed to meet its revenue growth goals, within certain limits of acceptable profit risk. In fact, there is a tradeoff between revenue growth and profits; since each incremental venture is theoretically apt to produce a lower return on investment than its predecessor, IBM might require an *acceleration* of revenue-generating product programs to achieve some *absolute* level of profit growth with any assurance. For example, a 13% profit growth objective could be obtained with 13% revenue growth and constant profit margins, but what happens to profits if either revenue or margins dip (or worse, both simultaneously)? It is clearly healthier to achieve a 13% profit growth rate via a 15% revenue achievement combined with some possible margin deterioration as potentially less profitable projects are pursued. This might imply hyping the revenue stream somewhat, which would help explain some recent IBM actions.

The most meaningful diversification actions which will be visible soon, if not already, are in the areas of communications and office products. Communications embraces the SBS investment, satellite system support products, new PABX equipment, and a plethora of terminals of all sizes and colors, down to surprisingly small size and price levels. Office products embrace new integrated point-of-need work stations, a variety of nonimpact printing devices, and of course the data processing network support required to connect numerous locations and diverse requirements and products into an IBM-sponsored electronic message switching capability.

Other areas ripe for pseudo-diversification include digital instrumentation, very very small business products, and services which feed off IBM-controlled information utilities. A recurring temptation which we think IBM will shortly succumb to, is the consumer market, where what is called IBM Special Projects is busy at work developing concepts and system technologies which might capitalize on IBM strengths and be relatively immune to commodity pricing. We assume that IBM will join the industry trend of using microprocessors extensively in its products, define new products in the process, and participate in the lifestyle revolution which is just beginning.

In order to grow at a 15% rate, IBM must stay relatively nimble, a most difficult challenge for a company this size. IBM has always recharged itself and capitalized on opportunities through reorganization, and we see no less inclination to do so now. For example, the thrust of office products selling in the all important "systems" area has been steadily shifting from the Office Products Div., first to Data Processing Div. through the Enterprise Administration Dept., and more recently to the General Systems Div., thus once again producing potential and important contention. The General Products Div., which has storage products responsibility within IBM (and high-speed nonimpact printing) is also involved to a large extent. The effort is being made to marshal and manage a variety of distributed resources, into a cohesive assault on the office environment, so as to preclude Xerox or AT&T from establishing any unassailable beachheads. The competitive battle which looms ahead may yet develop into the industrial story of the century. ✲

IBM Subdivided by Industry* Makes Its Growth Targets Appear More Manageable

	Possible 1978 Worldwide IBM Revenues, $ Billion
Manufacturing	2.2
Process	1.3
Finance	1.8
Insurance	1.1
Distribution	1.9
Utilities	1.3
Federal	1.0
State & Local	.8
Medical	.6
Education	.5
Airlines	.5
Surface Transportation	.3
Media	.5
Securities	.2
Business & Management Services	.5

* data processing only

Table 4.

The Microcomputers you should take seriously.

The C3 Series is the microcomputer family with the hardware features, high level software and application programs that serious users in business and industry demand from a computer system, no matter what its size.

Since its introduction in August, 1977, the C3 has become one of the most successful mircocomputer systems in small business, educational and industrial development applications. Thousands of C3's have been delivered and today hundreds of demonstrator units are set up at systems dealers around the country.

Now the C3 systems offer features which make their performance comparable with today's most powerful mini-based systems. Some of these features are:

Three processors today, more tomorrow.

The C3 Series is the only computer system with the three most popular processors— the 6502A, 68B00 and Z-80. This allows you to take maximum advantage of the Ohio Scientific software library and the tremendous number of programs offered by independent suppliers and publishers. And all C3's have provisions for the next generation of 16 bit micros via their 16 bit data BUS, 20 address bits, and unused processor select codes. This means you'll be able to plug a CPU expander card with two or more 16 bit micros right in to your existing C3 computer.

Systems Software for three processors.

Five DOS options including development, end user, and virtual data file single user systems, real time, time share, and networkable multi-user systems.

The three most popular computer languages including three types of BASIC plus FORTRAN and COBOL with more languages on the way. And, of course, complete assembler, editor, debugger and run time packages for each of the system's microprocessors.

Applications Software for Small Business Users.

Ready made factory supported small business software including Accounts Receivable, Payables, Cash Receipts, Disbursements, General Ledger, Balance Sheet, P & L Statements, Payroll, Personnel files, Inventory and Order Entry as stand alone packages or integrated systems. A complete word processor system with full editing and output formatting including justification, proportional spacing and hyphenation that can compete directly with dedicated word processor systems.

There are specialized applications packages for specific businesses, plus the vast general library of standard BASIC, FORTRAN and COBOL software.

OS-DMS, the new software star.

Ohio Scientific has developed a remarkable new Information Management system which provides end user intelligence far beyond what you would expect from even the most powerful mini-systems. Basically, it allows end users to store any collection of information under a Data Base Manager and then instantly obtain information, lists, reports, statistical analysis and even answers to conventional "English" questions pertinent to information in the Data Base. OS-DMS allows many applications to be computerized without any programming!

The new "GT" option heralds the new era of sub-microsecond microcomputers.

Ohio Scientific now offers the 6502C microprocessor with 150 nanosecond main memory as the GT option on all C3 Series products. This system performs a memory to register ADD in 600 nanoseconds and a JUMP (65K byte range) in 900 nanoseconds. The system performs an average of 1.5 million instructions per second executing typical end user applications software (and that's a mix of 8, 16 and 24 bit instructions!).

Mini-system Expansion Ability.

C3 systems offer the greatest expansion capability in the microcomputer industry, including a full line of over 40 expansion accessories. The maximum configuration is 768K bytes RAM, four 80 million byte Winchester hard disks, 16 communications ports, real time clock, line printer, word processing printer and numerous control interfaces.

Prices you have to take seriously.

The C3 systems have phenomenal performance-to-cost ratios. The C3-S1 with 32K static RAM, dual 8" floppies, RS-232 port, BASIC and DOS has a suggested retail price of under $3600. 80 megabyte disk based systems start at under $12,000. Our OS-CP/M software package with BASIC, FORTRAN and COBOL is only $600. The OS-DMS nucleus package has a suggested retail price of only $300, and other options are comparably priced.

To get the full story on the C3 systems and what they can do for you, contact your local Ohio Scientific dealer or call the factory at (216) 562-3101.

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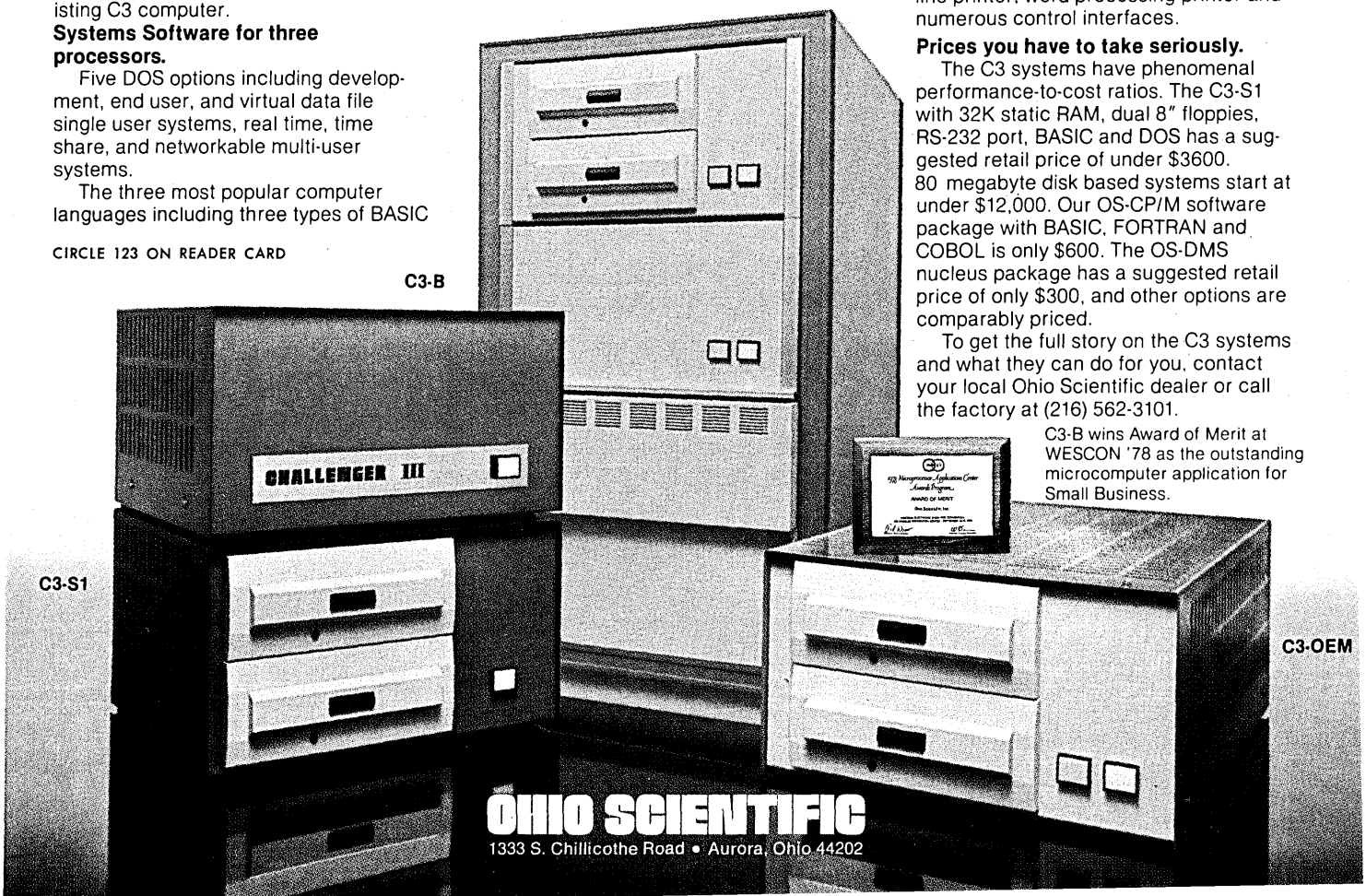

C3-B

C3-S1

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C3-B wins Award of Merit at WESCON '78 as the outstanding microcomputer application for Small Business.

CIRCLE 123 ON READER CARD

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JUSTICE VS. IBM: STILL MANY QUESTIONS

As the case enters its 11th year, the question still remains: Do IBM's countless and seemingly incriminating documents constitute evidence of intent and wrongdoing?

ABOUT THIS REPORT

The Sherman and Clayton Acts were to protect consumers from paying the price of being at the mercy of suppliers who are dominant in their industry. That essentially is what the various antitrust charges against IBM are about: are the fruits of huge R&D expenditures to be made available to customers solely in reaction to competitive market situations? In this *Focus on IBM* report, DATAMATION editors Angeline Pantages, Linda Flato, Vin McLellan, and Laton McCartney examine aspects of IBM in court on antitrust charges that date to when the Justice Dept. filed its antitrust case against the computer colossus 10 years ago this month. Pantages reviews the history of the lengthy case on this page and is followed by Flato's examination (page 87) of Congressional reaction to the snail's pace of that and other cases. McLellan unveils a new aspect—the government's assessment of IBM in the communications business—and McCartney examines (page 104) IMB's newest strategy in its defense in court against Justice Dept. charges concerning IBM's market share.

by Angeline Pantages

IBM long had been preparing to head off the antitrust suit filed against it by the Justice Dept. on January 17, 1969, the last act of the Johnson Administration which fled office the next day.

IBM had spun off its time-sharing services from the data processing group and into a subsidiary, Service Bureau Corp. It also said that by the following July, it would charge customers separately for (or "unbundle") certain software and services. Nothing worked. The suit was filed. IBM protested mightily, spending about $700,000 on advertisements proclaiming what a competitive and dynamic industry it was engaged in. That point was to frame IBM's defense in the years to come.

In the three years that followed the Justice Dept.'s filing, little happened and IBM began pressing Justice to do something or drop the case. In January 1972, Judge David Edelstein, Chief Judge of the Southern District Court of New York, appointed himself to try the IBM case. He was, after all, the judge in the 1952 government suit against IBM which resulted in a Consent Decree in 1956. He said he knew the company and the issues and could "speed things up."

Edelstein pushed both sides to get the show on the road. What a show it was!

For the next three years the following transpired:

—The government and private plaintiffs shoved tons of documents around and asked IBM for more. IBM asked the industry and the government for everything they had.

—A battle that spanned five years then began when IBM protested that it couldn't release documents that it considered privileged client-attorney files. At one period the judge fined IBM $100,000 a day for refusing to turn up papers he wanted to see, a fine that was stayed pending appeal. IBM lost the appeal and handed over the papers.

—Some 1,000 witnesses and potential witnesses gave depositions on aspects of the case. Some complained that they were being asked to produce records of what they had done from the day they first thought about computers.

—At the same time, 2,700 companies were sent questionnaires in connection

with an antitrust case that had been filed in 1968 against IBM by Control Data Corp. They were asked to detail their year by year financial pictures and to provide customer lists. A similar set later went out in the Justice Dept. suit. The results presumably showed that if you threw in every company in the industry, IBM didn't have the 70% market share that the Justice Dept. claimed. But the question continued to be raised: share of what? And that was to be the major question in the Justice Dept.'s case against IBM.

Meantime, IBM continued to say it was ready for trial. It said this four times between 1972 and 1974. Justice, however, still was in "discovery" and trying to expand the issues in the case. Its case against IBM showed signs of crumbling when Control Data settled its suit against IBM early in 1973. In return, CDC's computerized index of some 27 million documents it had collected against IBM and turned over to the Justice Dept., went up in flames. IBM called the action a natural event in such a settlement (in which IBM gave CDC about $51 million and sold CDC its Service Bureau Corp. for a song). Justice complained. But the index was gone.

In the fall of 1973, however, Justice regained some confidence as Judge A. Sherman Christensen delivered what appeared to be a landmark decision in favor of plug-compatible peripherals manufacturers. He decided that such peripherals were a relevant market, in the case of IBM products involved in antitrust lawsuits: ". . . a manufacturer's product or product line may constitute a relevent product market . . . if in the realities of the marketplace, widespread competition has been developed around it as a separate economic entity recognized and acted upon by the manufacturer, competitors, and end users as such," the judge ruled.

Christensen further spelled out his answer to what constitutes unlawful practices by a monopoly.

"This is not to say that there was any ruthless or naked aggressive program contemplated or carried out," he said. "Anything that was done by way of strategy was sophisticated, refined, highly organized and methodically processed and considered. But in this day and age such conduct is hardly less acceptable than the naked aggressions of yesterday's industry if lawfully directed against competition. The organized, selective, subtle and sophisticated approach, indeed, may pose more danger under modern conditions than instantly more obvious strategies."

Specific intent was not the issue, the judge felt. "It is sufficient that monopoly power is willfully acquired or maintained as distinct from the growth or development as a consequence of a superior product, business acumen or historic accident."

The Justice Dept. was in ecstasy, even if it was to be short lived. (In February 1975, an appeals court in Denver reversed the Telex decision and let stand a heavy fine levied against Telex for theft of trade secrets.) Private defendants rejoiced. The European Economic Commission, investigating IBM's dominant power in Europe, felt it had just been given strong encouragement to proceed. Several private suits brought against IBM between 1968 and 1974 fell or were settled, but Telex was enough to live on.

Justice Dept. expanded triable issues to include peripherals and abusive practices against leasing companies.

In 1974, the Justice Dept. expanded its list of triable issues to include monopoly of the compatible peripherals (disk drives and tape drives) submarkets and abusive practices against leasing companies. IBM protested, to no avail.

Meantime, Judge Edelstein, then 64, grew tired of the bickering and delays and pressed hard. The case finally came to trial on May 19, 1975. The diatribe that was (to this date) to produce more than 80,000 pages of transcripts and 4,000 exhibits began.

DAVID N. EDELSTEIN—trial judge in Justice vs. IBM case, also was the judge in 1952 case against IBM which ended with Consent Decree in 1956.

The Justice Dept. was to establish the market: general purpose digital computers systems, as characterized by the offerings of Univac, Burroughs, RCA, GE, Xerox Data Systems, Honeywell Information Systems and, peripherally, Singer and DEC. No minicomputers, scientific computers, supercomputers, and the like were involved. The submarkets were disk and tape drives and add-on memory for use with IBM processors. The practices the Justice Dept. sought to establish were that IBM used: introduction of fighting machines, in the form of such prematurely announced systems as the 360/44, 360/90, 360/67, and 2319A and B disk drives; bundling software, services, and hardware prices to lock in its customers and lock out competition; offering educational discounts not only to garner market but to orient educational institutions to IBM systems and standards; and control of standards.

IBM, led by attorney Thomas Barr of Cravath, Swaine & Moore, then 41, established the fundamentals of its defense. The general purpose market Justice defined was not relevant because it excluded products and services that were competitive with IBM products. The practices IBM used were natural and lawful responses to both competition and the needs of the marketplace. The Telex decision had proved how relevant the peripherals submarket was.

Characterizing himself as a "plain trial attorney," the far-from-plain Barr set the stage for what IBM knew was to follow: the IBM documents that the government would produce. IBM has a "contention system," he said, in which one group proposes a plan and another challenges. "It is not unusual when you take a large number of people like that, that from time to time someone within the IBM corporation will have a thought or write down a thought on a piece of paper which is not the most brilliant thought in the world . . . but it is not that which, it seems to us, your Honor should take as the intent of the IBM corporation." Thinking, or writing, isn't the same as doing. It was a statement tantamount to President Carter's admission that he had lusted after women . . . in his mind.

The judge's response to Barr set the tone for his attitude toward the IBM lawyers throughout the case: "You are arguing, not opening . . . I repeated *ad nauseum* that an opening statement is a privilege and I can strike both the opening statements of the government and IBM and nothing much would have been lost."

After some yawning testimony on introductory matters and definitions, the government presented witnesses from among the executive ranks of the dead

DOWN MEMORY LANE: IBM IN COURT SINCE 1956

Following is a compilation of milestones in the continuing saga of the United States vs. IBM. Left column shows private litigation. The second lists milestones in the U.S. vs. IBM cases and the right column lists major industry developments and forecasts. (Source: Computer & Communications Industry Assn.).

	Private Litigation	U.S. vs. IBM	Industry Developments
1956		Consent Decree	
1967		DOJ begins investigation	
1968	CDC vs. IBM filed	IBM seeks settlement	
1969		Suit filed Pre-trial discovery begins	IBM FY net $934 mil.
1970			IBM enters photocopying field GE leaves computer field IBM FY net $1 bil.
1971	Greyhound vs. IBM filed		IBM introduces ETP-FTP leases RCA leaves computer field IBM FY net $1.1 bil.
1972	Telex vs. IBM filed Greyhound vs. IBM dismissed Greyhound vs. IBM appeal filed	Judge Edelstein assigned to case. Privileged Doc. Impasse #1 begins	IBM FY net $1.3 bil.
1973	CDC vs. IBM settled Telex vs. IBM decision Calcomp vs. IBM filed Hudson vs. IBM filed Marshall vs. IBM filed Memorex vs. IBM filed Transamerica vs. IBM filed	CDC data base destroyed	IBM plans satellite Itel sells peripheral co. IBM FY net $1.6 bil.
1974	Telex vs. IBM appeal filed Forro vs. IBM filed Memory Tech. vs. IBM filed	Doc. Impasse #1 ends Doc. Impasse #2 begins	IBM FY net $1.8 bil.
1975	Sanders vs. IBM filed Telex vs. IBM appeal decision Telex vs. IBM Supreme Ct. appeal filed Marshall vs. IBM settled Telex vs. IBM settled	Discovery ends Trial begins	Xerox leaves computer field Amdahl introduces 4th gen. cpu's Singer leaves computer field IBM FY net $2 bil.
1976	Memory Tech. vs. IBM settled	Trial enters 2nd yr: 29 witnesses, 133 trial days to date Doc. Impasse #2 ends End reading depo.'s into record	Itel introduces 4th gen. cpu's IBM enters mini field IBM FY net $2.4 bil.
1977	Sanders vs. IBM settled Calcomp vs. IBM dismissed	42 witnesses to date 330 trial days to date	IBM slashes prices 30% IBM FY net $2.7 bil. est.
1978		IBM defense begins?	IBM FY net $3 bil. est.
1979			IBM FY net $3.2 bil. est.
1980		Case to judge?	IBM FY net $3.7 bil. est.
1981		Judge's decision?	IBM FY net $4.2 bil. est.
1983 1984		Supreme Court appeal?	
1985 1990		If guilty—trial on relief	

dwarfs: GE, RCA, and Xerox. The questioning was aimed at showing how IBM's dominance and practices—standards and pricing control, sheer resources, ability to control technological introduction—affected their ability to stay in business. Those points were made. GE had found through its task force that "any competition over time will exist at the tolerance of this dominant company." RCA's own surveys showed that users were prone to stick to IBM as a safe decision; competition would have to show more performance for less dollars, but keeping up with IBM was impossible for RCA, it turned out.

IBM, on cross-examination, raised the issue of ineptitude and lack of commitment on the part of these multifaceted competitors. RCA admitted it had the resources to stay in computing, but opted for more profitable markets. Its then president, Anthony L. Conrad, stated, "Nothing IBM did or any other company forced us or caused us to exit from the computer business *per se*." GE witnesses admitted the management of its computer operations was poor, and chairman Reginald Jones stated it was that GE had failed to commit adequate resources, not any act or practice of IBM, that caused his firm to sell out to Honeywell.

The government used IBM's own documents repeatedly to prove definition and share of market. Statements of the 1960s peddled the concept of system and solution and showed IBM's competitive analyses broken down by system installations (in value, not number). The shares, whichever way IBM cut them then—by vertical industry, by system size—were up in the 60% to 80% range. In 1968, the documents show IBM set about to change its way of measuring the market because "the marketplace is changing" and "if IBM's internal measurements cover the data processing industry in methodology and scope, then our share percentage borders on monopoly." Besides, the lawyers asked that IBM change it. In 1968 and 1969, IBM did change, adding to the "systems" it measured, "nonsystems": communications products, products for small business, oem devices, add-ons, etc.

What is it IBM had to amass such power? Industry, foresight, superiority? Or was it a series of practices aimed at maintaining the monopoly and helping to kill competition? Or, both?

After examining all the allegedly abusive practices in the systems market, the government turned to the peripherals and leasing industries. More pricing moves and practices were enumerated: the Fixed Term Plan, the 2319 disk drives which obliterated the 2314 and stifled competitors with plug-compatible versions, the pricing of the 3340 drive, the threats of refusing to maintain systems

with independent memory, the SMASH strategy with the IBM 158 and 168 and its new purchase: lease ratio (bad for leasing companies) and bundled minimum memory. Besides the Telex, Memorex, Control Data, and other witnesses, the government also introduced more IBM documents, including one that showed the "death discount." This enumerated at what price reduction in peripherals the independents could no longer afford to compete.

The goverment spend a long time on Memorex. Several events crippled this firm between 1970 and 1972. It was in the throes of finding financing to establish a leasing company, ILC, to finance its leases when IBM announced a trade secret suit against Memorex in December 1970. Then the Accounting Principles Board came up with changes that would prevent Memorex from recording as sales the leases turned over to ILC. Finally, IBM announced the 2319B disk drive and the Fixed Term Plan. Potential financiers disappeared. Was Memorex badly managed and a victim of events not of IBM's making? Or did IBM try intentionally to put the kiss of death on a staggering competitor? Can the government prove more than Memorex did in its unsuccessful antitrust cast against IBM, dismissed this year?

After midyear in 1977, the Justice Dept. moved on to its expert witnesses, the first of whom was Frederick Withington of A.D. Little, the consulting firm. Withington, a computer industry specialist, caused a commotion before he reached the stand by requesting commercial fees for his appearance, which were ultimately granted. (This raised a legal rights question on how far a court can go in coercing an expert to spill his knowledge without compensation.) Considering that Withington was on the stand for 21 days and provided some market definitions and statistics that the government is now putting great faith in, he was obviously well worth it to the plaintiff.

Withington set off a stream of thinking that carried into the testimony of Alan McAdams, the government's expert on economics. Withington established that the general purpose system was comprised of more than the hardware alone (processor, channel and local communications controllers, and peripherals for high volume storage and I/O). He also characterized the software, by time phases, that was necessary to create a "system."

From 1964 to 1973, he said, the general purpose system had an operating system whose prime function was control of batch I/O file storage equipment and the running of multiple streams of batch processing. Separate programs did time-sharing, transaction processing, and monitoring.

But since 1972, the manufacturers have promised an operating system which incorporated "in an integrated simultaneous mode the capability of running application programs in batch processing, transaction processing, and time-sharing modes of use and also enable programs in these three modes to work with a single integrated data base managed by a data management program which has become in many cases the focus or center of a general purpose computer system."

With these definitions, the government hopes to perpetuate its original definition of relevant market into the present and keep IBM from adding other products into the pot.

1977 closed out with 78 days of testimony from Alan McAdams, who further refined definitions and time periods. IBM attorneys went mad over the changes the government was making and called for a mistrial. Motion denied.

IBM is now into its defense. And perhaps in 1980 it will complete its side of the story. Has IBM been a monopoly in the parlance of our legal system? What lawful practices become unlawful in the hands of a monopoly? Do IBM's countless and seemingly incriminating documents constitute evidence of intent and wrongdoing? Is this a dynamic market with relatively few barriers to entry and wide substitutability for the general purpose system? Or is the systems market in which the remaining dwarfs live a relevant market, and one in which no one can change their market share because the customer is locked in to his "host system"?

Judge David Edelstein will have to decide. Then the loser is at the mercy of the prevailing antitrust attitude of the appeals court, or if that can be bypassed, of the Supreme Court.

Edelstein said something somewhere in those 80,000 pages of transcript that can stand as the postscript to his decision someday:

"Just to add a little humor to this pedagogy, I am always reminded of the very young senator who was being harassed by the senior senator, and one day, in utter frustration, he said: 'I may be wrong but I'm never in doubt.'" ✲

WASHINGTON'S CONCERN WITH ANTITRUST STALEMATES

Interminable delays in IBM and AT&T cases represent too much time for a law enforcement tool to operate effectively.

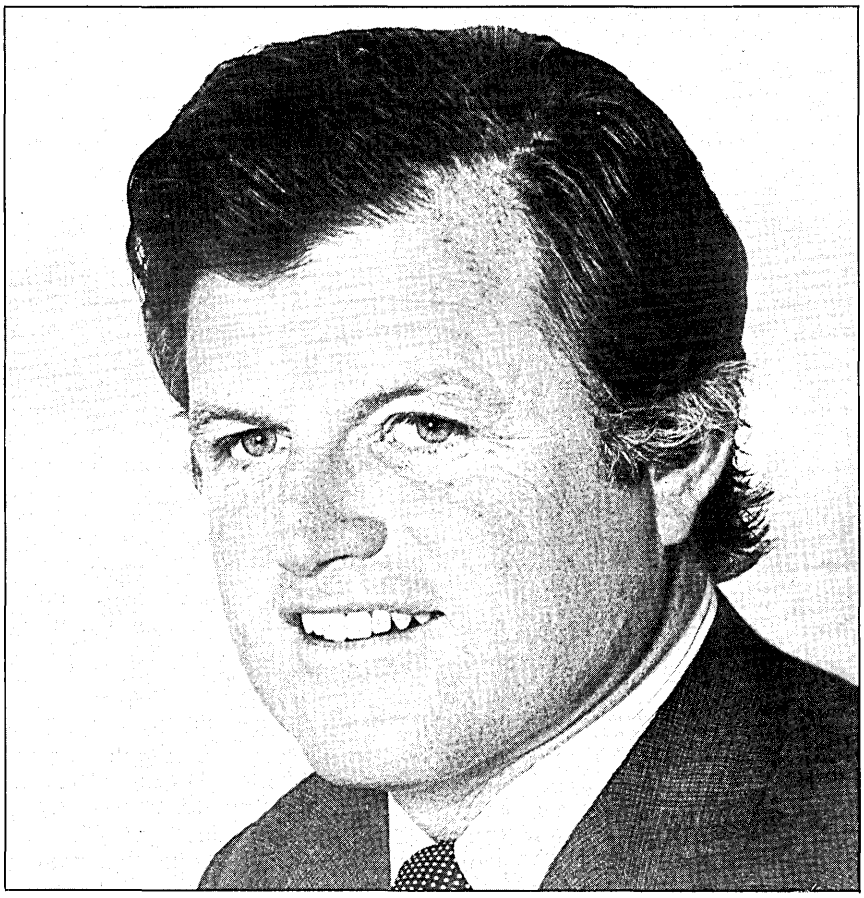
by Linda Flato

"For too long, antitrust enforcement has been an ant eyeing an elephant, an underfunded and handicapped federal program unable to contend with the great corporate power of our dominant firms."

It's been several years since consumer crusader Ralph Nader leveled this blast against the Feds' faltering antitrust efforts. And today, nothing appears to have changed. Despite increased funding and a born-again interest in competition as an anti-inflation weapon, the government's antitrust track record still remains decidedly lackluster. Part of the problem, say government insiders, lies in the ambitious antitrust targets the Feds have chosen to zero in on, namely the corporate behemoths IBM and AT&T.

A substantial chunk of the Justice Dept.'s (Antitrust Division) funding and resources have been poured into these massive monopoly suits that have dragged on for years in a perpetually pending stage. The time-consuming delays in both cases have sparked concern on the part of Congress and top Administration officials, including President Carter. So much concern that the President set up a special blue-ribbon commission last year to probe the problems and come up with solutions to "big case" antitrust litigation exemplified by the 10-year-old IBM suit and the four-year-old AT&T suit.

Sen. Edward M. Kennedy (D., Mass.), who inherited the late Sen. Philip A. Hart's (D., Mich.) chairmanship of the Senate Antitrust & Monopoly Subcommittee, is also hot on the big case issue. The interminable delays in these cases,



SEN. EDWARD M. KENNEDY—
Antitrust ball is squarely in his court.

he insisted, represent "too much time for a law enforcement tool to operate effectively. We want to know why," he demanded. "Is the problem with the statutes, with trial procedures or with limited resources?"

All of the above, agree most antitrust advocates. But while reforms in all these areas could clear the way for more effective and speedier prosecution of complex antitrust cases, antitrust followers are also quick to point out what may be the real bottom-line problem. And that's big business and its big clout with big-time bureaucrats. "The government has for years," declares William Rodgers, author of *THINK: A Biography of the Watsons and IBM*, "been so intertwined with corporate power that effective antitrust enforcement would constitute a radical departure from ingrained habit."

A prime example of this is the Business Roundtable. Formed in 1972, the Roundtable is the most vocal and powerful large business lobbying group in Washington. Its impressive membership includes the chief executive officers of some 170 companies—all of which are major corporations in the upper stratum of the *Fortune* 500. Sitting on the Roundtable's policy committee were such industry notables as IBM's chairman Frank Cary and AT&T's outgoing chairman John deButts.

Channeling its considerable clout and resources into protecting and furthering big business and multinational interests, the Business Roundtable has carried its message to the White House, Congress, and key Cabinet officials. These messages seldom go unheard since part of the group's muscle comes from its ability to deliver campaign funds, known officially as "political action committee" money.

The Roundtable's influence, while always pervasive in Washington, has waxed and waned under various administrations. During the Nixon and Ford years, the group and its members had easy access to the Oval Office. Under Carter, that access has improved even further. "Carter has openly courted the business community via the Roundtable," claims a Congressional source.

All of which leads one industry observer to question how committed President Carter really is, specifically in backing both the IBM and AT&T suits, and generally in supporting the antitrusters' mandate "to make competition work throughout the American economy." Assistant Attorney General for Antitrust John Shenefield stands by his man, calling Carter a "pro-competitive President. I seriously doubt," he said, "that there has been any President in recent times more aware, or more supportive of antitrust enforcement in general."

And with two of the largest suits in the history of antitrust still pending, Carter will get a chance to prove his support. He'll also get a chance to dispel the age-old theory that Republican administrations have more of an appetite for antitrust than Democratic ones.

Under Ford's Republican administration, antitrust gains were marginal. While pledging to "continue to create a strong antitrust record," Ford, during his tenure as President, okayed one major reform of antitrust law which upped corporate antitrust fines to $1 million. After several turnarounds and a lot of administration haggling, another Ford era bill was signed into law in 1976 boosting the Feds' information-gathering muscle on antitrust probes. The watered-down law also forces large corporations to alert Uncle Sam in advance of mergers.

But both these antitrust wins were offset partially by the Ford Administration's nonsupport of a significant Hart-sponsored bill that would have stepped up antitrust appropriations by as much as 200% over a three-year period. Testifying on the bill for the Administration, then antitrust chief Thomas E. Kauper protested that such a funding increase "would create severe managerial problems."

Explaining this apparent hypocrisy, one Washington watcher declares: "It's a myth that agency heads want more money. And the reason is, once they get that money, they'll be under the gun to produce results."

The late Senator Hart, a long-time follower of the government's antitrust moves, became fed up with the Feds' snail's pace progress. In 1972, the Michigan Democrat introduced a landmark bill, the Industrial Reorganization Act, which one of his close colleagues admits was prompted by "his frustration with the IBM case."

When he opened hearings on this bill in the summer of 1974, Hart zeroed in on the computer industry which he said represented "the nervous system of our economy." Such an important industry he maintained, should not be dominated by one company, IBM.

"There is some dispute as to what is included when measuring this industry," he conceded. "But most people seem to argue that IBM has about 70% of the central processing unit or mainframe market. If so, that is the greatest concentration of economic power in an unregulated industry today."

To break up such concentrations of economic power, Hart's Industrial Reorganization Act proposed a radical revamp of antitrust philosophy. Specifically, the measure outlawed oligopolies and monopolies, targeting seven key industries for antitrust scrutiny (the computer

and communications sectors being among those).

As part of this bill, a monopoly watchdog commission would determine monopolistic behavior through certain key tests—one major test being if four or fewer firms account for 50% of sales in any year in one industry. Hart's overriding question, addressed in his legislation, was how big was too big? If too big, the monopolizing company under the bill would be broken up—divestiture pure and simple.

But Hart's measure, resurrected while he was in the Senate, never got anywhere. And that's partly because then as now, points out one antitrust maven, the public doesn't buy the argument "that government knows all the answers" and can sit in judgment on such crucial social and economic issues as the break-up of corporate power blocks.

The late Sen. Hart introduced his Industrial Reorganization Act because of his frustration with the IBM case.

But nobody in turn is at all certain the courts can cope with these issues either. Attorney General Griffin Bell added fuel to this on-going controversy by proclaiming as early as April 1977 that big cases such as the IBM and AT&T litigation may be better off in the hands of Congress. "The process," he argued, "would necessarily be more political, but the questions at hand," he maintained, "in a sense, are political. They involve the basic restructuring of American industry and the shape of the American economy."

Bell's remarks didn't go over big with antitrust boss Shenefield who was quick to put down any talk that either the IBM or AT&T case would be turned over to Congress. Ironically, Bell has "removed" himself from any deliberations on the IBM case because his former law firm, King & Spaulding of Atlanta, represents IBM. Edward Levi, Ford's Attorney General and Bell's predecessor, did likewise because of his IBM stock holdings.

Most antitrust activity on Capitol Hill is concentrated in two subcommittees—the Senate's Antitrust & Monopoly Subcommittee and the House's Monopolies & Commercial Law Subcommittee. The Senate subcommittee, under the late Philip Hart, spearheaded the bulk of the work in antitrust. Kennedy, who will step down as subcommittee leader this year, plans to continue his antitrust drive as chairman of the full Judiciary Committee.

Inheriting the Hart-Kennedy antitrust legacy on this important subcommittee will be Sen. Howard M. Metzenbaum (D., Ohio), who will serve as the new chairman. Described as an "antitrust enthusiast," Metzenbaum has caused some consternation on the part of the Business Roundtable which is reportedly wary of his liberal leanings.

Working with Kennedy, Metzenbaum is expected to push for legislation as a result of the recommendations that will be coming out this month from the National Commission for the Review of Antitrust Laws & Procedures. Set up to explore new ways to expedite major antitrust cases, the 22-member commission is expected to recommend some changes in the federal rules such as limiting discovery to speed up massive antitrust cases.

Commission observers feel that although there's been considerable talk among the members about the need to amend the major antitrust law, the 89-year-old Sherman Act, the group will be reluctant to tamper with the "Magna Carta of free enterprise."

Such a clarifying amendment, antitrust buffs feel, is necessary and long overdue since the courts have consistently, and wrongly they say, used behavior as the test for wrong doing in monopolization (or Section 2) suits. Under Section 2's monopoly provisions, the presence or absence of predatory business tactics in obtaining or retaining monopoly power has been the key test of whether a company is in violation of the Sherman Act. Therefore, market behavior, and not industry structure, has been interpreted by the courts to be the determining monopoly factor.

Most antitrust followers agree that this court-construed intent requirement is burdensome for the plaintiff and not necessary. Hart, taking a last stab at some of these issues, proposed a bill embodying the "no-fault monopolization concept." Under this concept, a proven monopolist would be divested and restructured but would not subsequently be heir to treble damage suits brought by other so-called injured parties who have piggy-backed off Uncle Sam's case.

While nobody is betting on the chances of such a bill surfacing in either house of Congress, Capitol Hill staffers feel more confident that some measure aimed at reforming the attempt to monopolize could be put together. Backing such a proposal would be Edward M. Kennedy, whose national prominence, it's felt, could give the whole antitrust arena some much needed clout.

Kennedy's support, declares one antitrust advocate, "is crucial. He can fulfill Hart's dream. The antitrust ball is now squarely in his court."

And in still another court is the IBM case. Kennedy's stand on that seems to be firm. "The IBM case has become a sideshow attraction for those concerned with effective and efficient antitrust enforcement. The government, the defendant and the judge all bear some responsibility," he charges, "for this absurdity." ✲

SBS PARTNERSHIP MAY BE DOOMED

Court ordered hearings into monopoly aspects of partnership are likely to extend two or three years, unless the court reconsiders.

by Vin McLellan

In the latter half of 1977, the staff of the Justice Dept.'s Antitrust Division was still considering what sort of interim relief they would request of the court when the government finished presenting its case against IBM.

Surely, they thought, the court would consider an interim judgment with orders that would at least forbid IBM from extending its dominance in specific markets, perhaps something even more restrictive.

It had been no secret for a year that the Justice Dept. was considering a motion for interim relief—and those with their ear close enough to the ground could hear the murmur of the internal debates at Justice as various options were studied. In the *U.S. vs. IBM*, very few were closer to the metaphorical soil than A.G.W. Biddle of the CCIA (the Computer and Communications Industries Association), the collective yet Lilliputian nemesis of IBM.

In late September, the CCIA deftly interjected itself into the discussions at Justice with a confidential ten-page proposal for the interim relief motion. The CCIA wanted the court to block IBM's reentry into the service business, force IBM to unbundle all pricing, and tie actual costs to services and products. Sales and installation statistics would be ordered to be honest and available; IBM patents and know-how would be licensed at "reasonable cost," and the company henceforth would be prohibited from offering any new product without prior disclosure of architecture and specs.

The CCIA is an organization of IBM competitors, a group with a hard-wired passion; and given the source, the relief proposals, though utopian, were largely predictable. It was, however, surprising to some that a major portion of the CCIA proposal focused on IBM's partnership venture into telecommunications, SBS or Satellite Business Systems, a newly hewn chunk of the monolith that had not been, nor was to be, even explored in the government's antitrust case against IBM.

The procedural requirements of a court trial, even so mammoth an undertaking as the IBM monopoly case, require focus, limitations on scope. The trial is an inquiry into the past; SBS is of the future—and while it has escaped scrutiny in the New York courtroom, Satellite Business Systems has been the subject of an intense and highly charged confrontation in Washington, where a different kind of antitrust case has developed before the Federal Communciations Commission and appelate courts.

Although quite distinct, the Washington and New York cases are integrally entwined, and in the coming years will inevitably become more so. Between them, they will shape the future of IBM—and through IBM, the direction of opportunity for American computing and communications.

SBS is a joint venture by IBM, COMSAT General Corp., and Aetna Casualty and Surety Co., a partnership formed in 1975 to challenge AT&T with satellite-based domestic communications services.

To the CCIA, IBM's SBS entry into telecommunications has evidently taken the cast of an historical replay. The trade association is bitterly aware that when the Justice Dept. challenged IBM monopoly practices in the early 1950s, when IBM cross-locked customers by dominating both the tabulating machine and punch card industries, the government finally succeeded in forcing those two industries into the free market only to find that the focus of the associated technology had moved beyond them into computers—and IBM had moved with it. The 1956 IBM consent decree was virtually worthless.

A. G. W. BIDDLE—IBM and SBS offering could injure competitors both in dp and telecommunications industries.

Now, with the government attempting to break IBM's customer cross-lock in mainframe hardware and software, many industry observers fear that even if the government suit is successful, IBM's focus will have migrated to the new bottleneck, the hybrid blend of communications and computation services available through satellite systems.

"The technological exchange now taking place between SBS and IBM places both companies in a position that can optimize IBM and SBS offering to the injury of competitors within both the data processing and the telecommunications industries," the CCIA warned Justice.

The trade association noted that although SBS had subcontracted much of its design effort, IBM itself is to be the sole supplier for the SBS network control equipment. With IBM designing the entrails of what may well be the most sophisticated communications system five years hence, said the CCIA, "many within the industry fear IBM's dp products and services will be advantaged by prior and intimate knowledge of the limitations and capabilities of the SBS satellite service—an advantage that will not be shared by IBM's competitors on a timely basis."

The remote dp service business, which IBM can reenter in 1979 upon expiration of their 1973 agreement with Control Data Corp., might be particularly vulnerable to an IBM attack using the "potentially unfair" advantage of their SBS liaison, wrote the CCIA. The association wanted Justice to ask the court to restrict IBM's role in SBS "solely to that of an outside investor with appropriate representatives on SBS' board of directors," and enjoin any further technological exchanges between SBS and IBM, to force SBS to go to independent vendors for R&D and support technology.

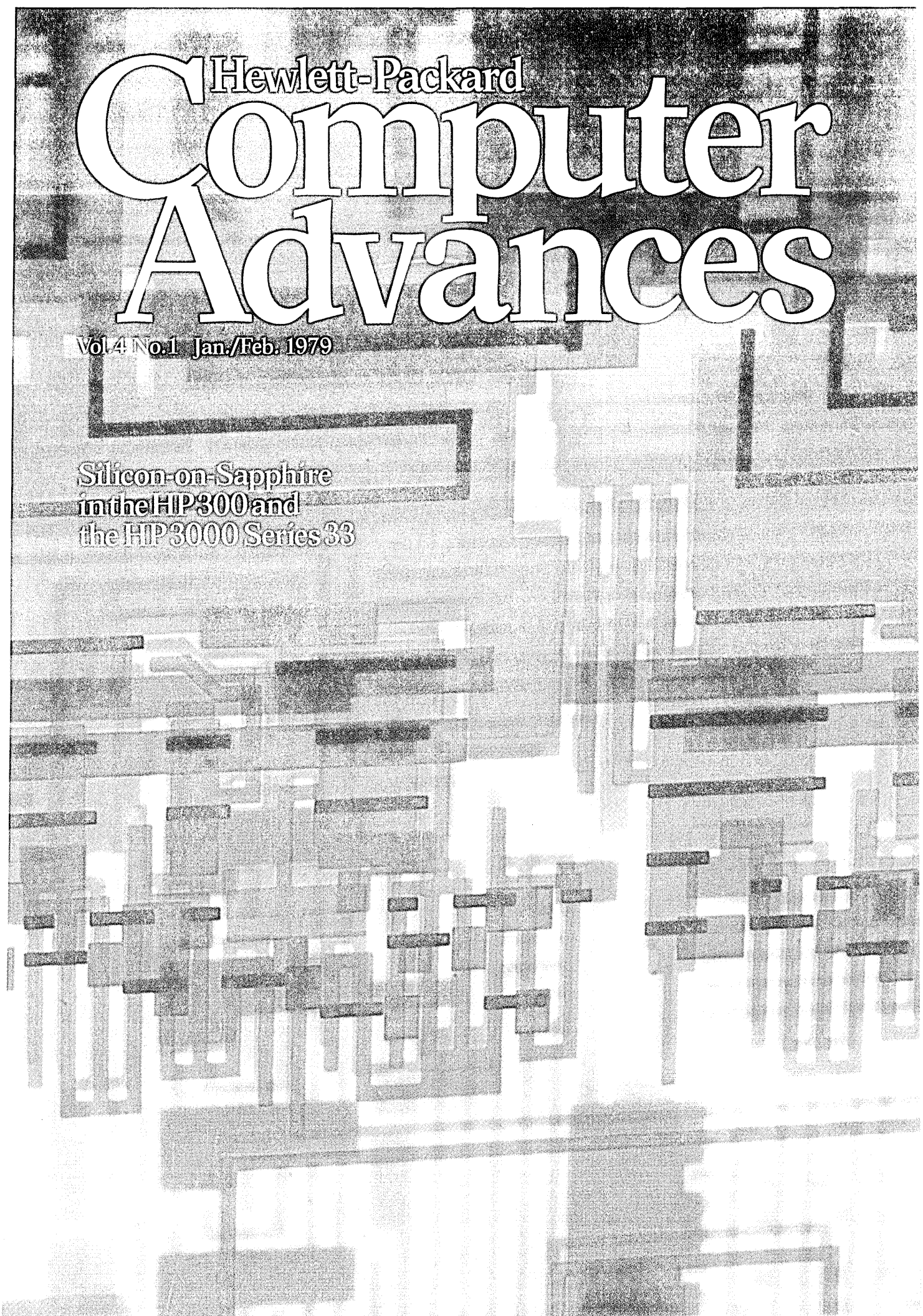
A heady vision that—Gulliver, the giant, down and bound—but last April, the Justice Dept. announced that it would not seek interim relief because such a motion would substantially delay

Hewlett-Packard

Computer Advances

Vol. 4 No. 1 Jan./Feb. 1979

Silicon-on-Sapphire in the HP 300 and the HP 3000 Series 33



HP300: The small computer grows up

Continuing the tradition of bringing customers more computer power for less money and in less space, Hewlett-Packard recently introduced another in its series of computers for business data processing. The HP300—a brand new kind of computer—blends the gains of SOS technology with a philosophy that powerful computers don't have to be difficult to use or costly to own.

Silicon-on-sapphire

Key to the unprecedented power and compactness of the HP300 business computer system is an overall infusion of SOS technology. There are a total of six different HP SOS chip designs in the HP300—the most impressive being that of the processor. Ninety per cent of the HP300's CPU logic and circuitry has been condensed to fit on three CMOS/SOS chips.

Beyond density and compactness, SOS advantages include speed, reliability and low power requirements. In fact, the HP300 operates from a standard wall outlet.

The operating system is called Amigo/300—which gives a clue to the HP300's personality. Its features (as listed in the subheads) attest to its power. Until now, these capabilities have been available only on large, expensive systems.

◀ *Cover*

A dramatic representation of the complexity and density of circuits and layers found in HP's new Silicon-on-Sapphire chips.

Multiprogramming/ multitasking

With the HP300, different and independent programs and system utilities can execute concurrently with program development. In other words, the HP300 can be used interactively even while printing reports, processing transactions, sorting files, or gathering data from up to 16 on-line terminals. Furthermore, any single program can have control of many independently processing "tasks," each performing its own function within the program and executing in parallel with the others.

Priority scheduling

Processor and memory resources are scheduled for rapid servicing of I/O requests on a task-by-task priority basis. The processor supports up to 256 priority levels.

When necessary, operator intervention enables the HP300 to reflect the unexpected demands of the business environment. By pressing an "ATTENTION" key, a user can gain control of the screen and keyboard to satisfy an important request while the other activities continue to run.

Virtual memory

Up to one million bytes of error correcting, 16K RAM semiconductor memory can be packed into the HP300.

But, program size is not confined to this internal memory thanks to the HP300's advanced virtual memory scheme. With this approach, only a small portion of a program is required in main memory at any one time, while the rest remains out on disc. A demand segmentation scheme, together with an analysis of past program behavior, determines which segment should be swapped in from disc. Memory utilization is further optimized for both code and data are segmented.

Data management

The HP300 features a full data base management system, IMAGE/300, and a file management system of six different file structures including keyed sequential.

Two business languages

The HP300 has an enhanced version of business BASIC and RPG II. BASIC features advanced capabilities including full access to all system services. RPG II includes a multiterminal data entry utility that allows batch oriented RPG programs to be easily converted for multiterminal data entry.

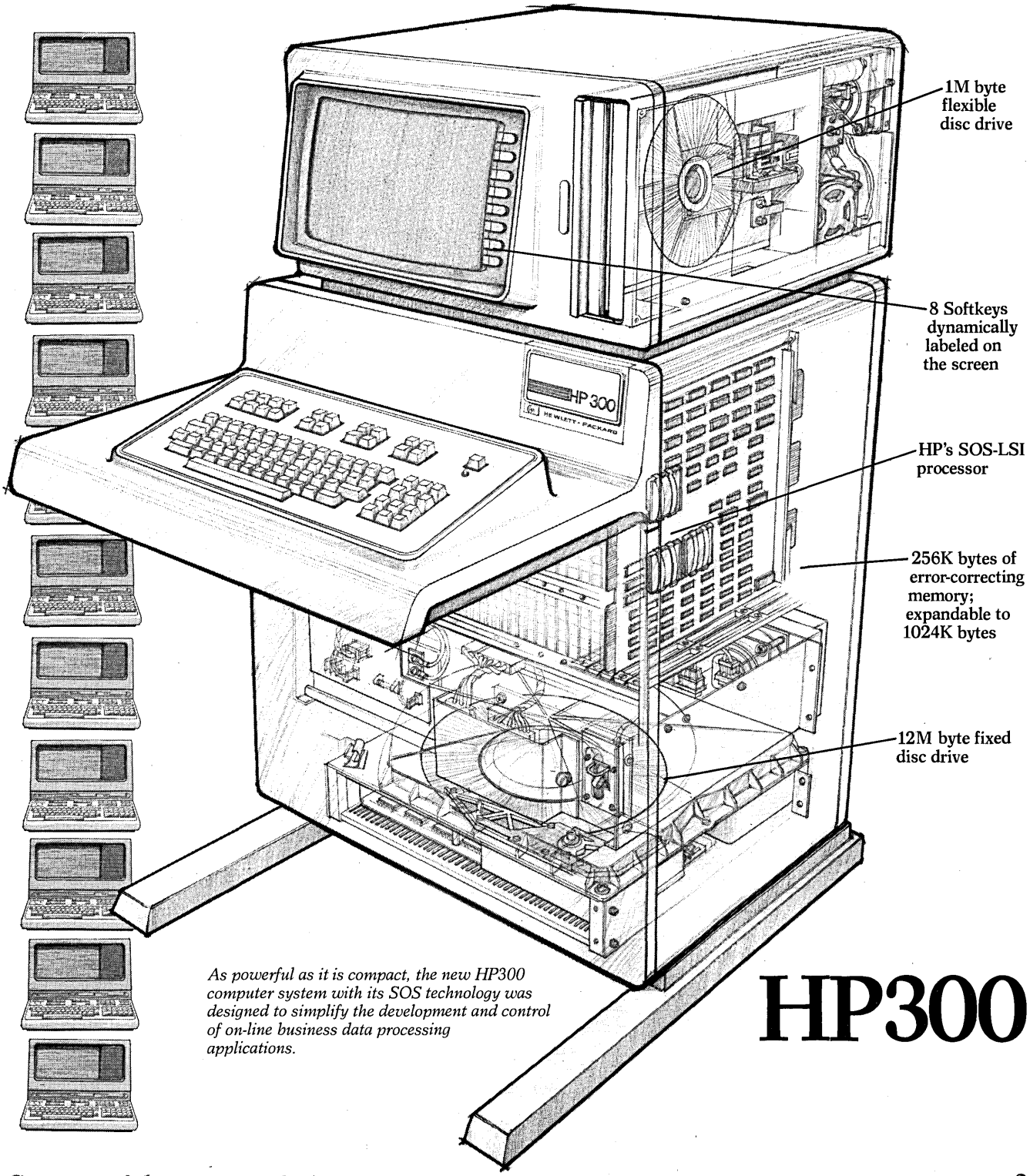
Growth potential

The HP300 was planned for growth. You can begin with a minimal, single user system and expand to up to 16 on-line terminals. The system can be further extended with additional disc storage and multiple printers.

The HP300 starts at $36,500* OEM discounts are available.

Indicate A on the reply card for further information.

**U.S. domestic price*



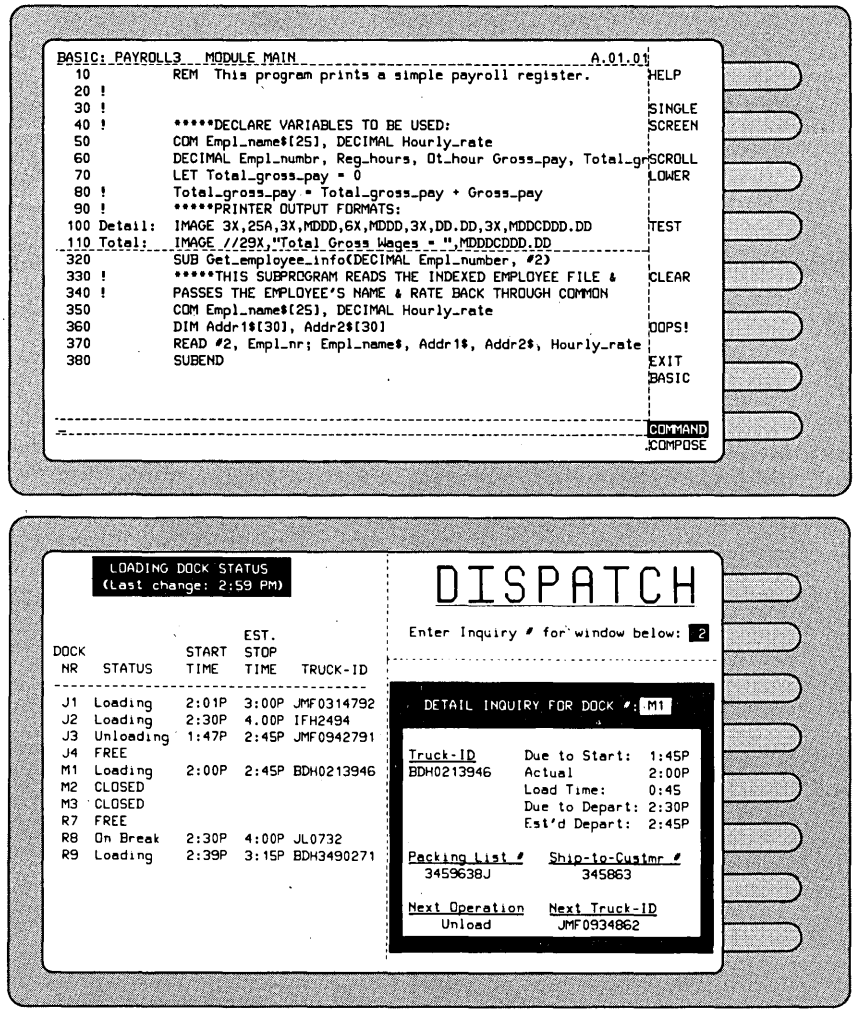
As powerful as it is compact, the new HP300 computer system with its SOS technology was designed to simplify the development and control of on-line business data processing applications.

HP300

...and displays its power

The HP300 was designed to ensure one department full control of on-line, dedicated, data processing applications. Programs control and gather data from up to 16 on-line transaction processing terminals. These terminals function in response to the controlling demands of the application programs or the HP300 console.

All of the system's capabilities are accessible through an innovative, microprocessor-based Integrated Display System (IDS). This screen/keyboard combination is the part of the system with which you interact and will most probably enjoy, for the way it works spoils you immeasureably. Through push-button controls and advanced display and editing functions, the IDS gives you direct control over all aspects of HP300 operation.



The IDS can be used in multiple ways. The first screen shows its role in the programming process. Advanced IDS features simplify program entry, editing and testing, making BASIC programming a much more efficient and enjoyable process. In this example, the split screen capability is used to compare two separate parts of a program by viewing them simultaneously. The second screen shows the IDS in a real-time application where the windowing capability enables presentation of information from various sources in a straight-forward way. This is frequently a requirement in complex inquiry applications.

Innovative programming

All programs pass through several stages before they are executable: text editing, compilation, segmentation, linking, etc. Traditionally, a programmer needs to know not only each of these intermediate forms, but also how to invoke processing at each stage.

To avoid these obstacles which interrupt thought and work flow, the HP300 takes an innovative approach to software development. By simply depressing the "TEST" key, the system automatically does what is needed to get your program running. It appears to you that the system directly "understands" BASIC or RPG.

With this homogeneous approach, the programmer works through one common interface and not a confusing collection of different commands. Even RPG II is simple and interactive. Programmers need not be concerned with the usual inconveniences associated with coding sheets—column counting and justification, and delayed error correction.

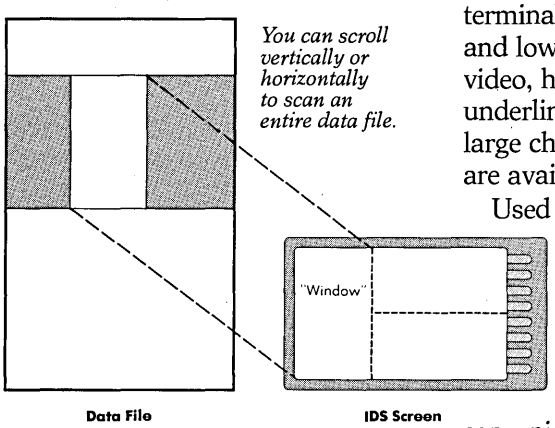
The result of the HP300's innovative IDS approach to programming is a dramatic shortening of the time it takes to design and develop sophisticated application

programs. Debugging, usually the most difficult and tedious aspect of the cycle, is particularly shortened thanks to the IDS. And since the resulting code is fully compiled, there is no loss of efficiency in the execution environment.

The HP300 features an innovative and easy single-step start up. Power on, and the system automatically comes up. The addition of new peripherals or memory is accomplished through a program which guides the user and relies heavily upon softkey menus. This ease of configuration is a salient contribution of the HP300.

Windowing

The IDS can also be used to display and control various aspects of one or more applications. Its display screen can be split into as many as 8 individually controlled and functioning mini displays, each with its own input and output capabilities. Moreover, any one window can be "attached" to a data file and scrolled, both horizontally as well as vertically. Thus, each window can display information that may be up to 160 columns wide and as long as your longest file. The usefulness of this innovative feature as an application design tool can expand with the imagination of a programmer.



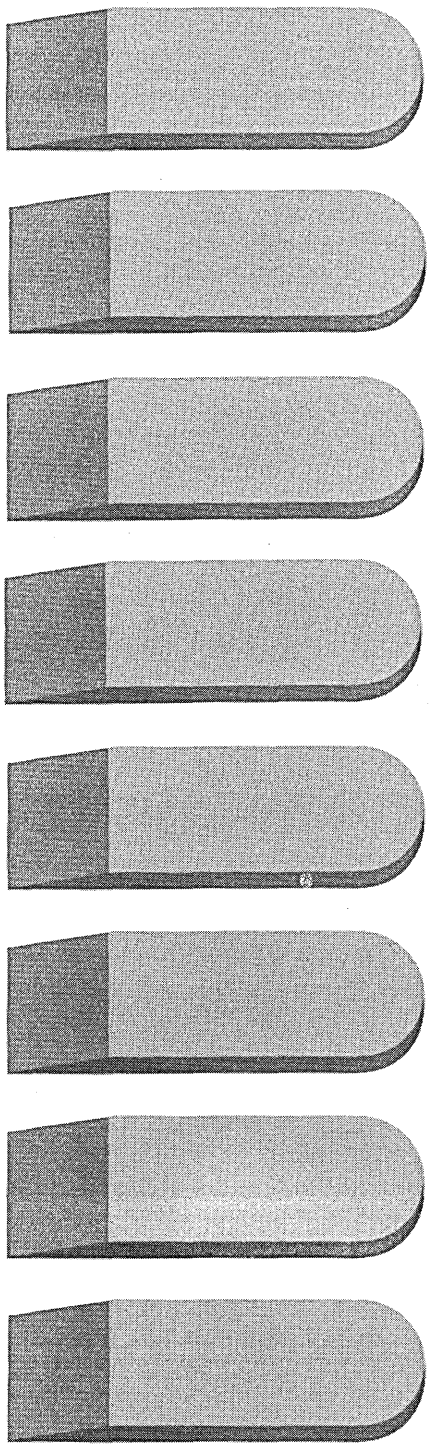
You can scroll vertically or horizontally to scan an entire data file.

An interesting aspect of the IDS approach is its eight special function softkeys that can be programmatically defined and dynamically labeled and relabeled in an adjacent area of the screen. The softkey "HELP" invokes a most useful capability. This interactive facility attempts to answer conversational questions entered at the IDS. Plus, "HELP" gives you on-line access to the documentation which conveys general information about system operation and commands.

Display enhancements

Just like HP's 2640 family terminals, the IDS screen has upper and lower case characters, inverse video, half-bright, blinking, and underlining. A line drawing set, large characters, or math symbols are available options.

Used in combination, the softkeys, windows, scrolling, and screen display enhancements can create a lively, interactive, push key, menu selection environment. A user is conveniently guided through what might otherwise be a complex interaction. In applications, the screen literally comes alive with the guiding interplay of windows and softkeys. Only a live demo can bring this concept to reality for you. We'd be happy to arrange one. **Just request a contact on the reply card.**



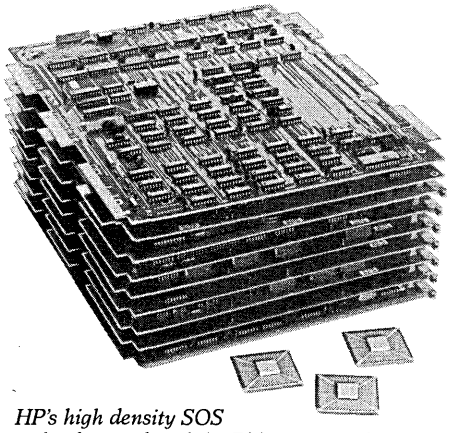
Small is powerful: An HP3000 in a desk

Over 2000 Hewlett-Packard 3000s are currently hard at work in remote or centralized commercial data centers scattered around the world. Now, through our proprietary SOS (silicon-on-sapphire) LSI technology, the sophisticated computing power of an HP3000 can be realized in a new environment—the office.

Boards to chips

The HP3000 Series 33, the low-cost, entry level member of the HP3000 family, is housed in a compact desk console—a direct result of using high density SOS chips. Portions of nine printed circuit boards, totaling 700 square inches of components, have been reduced to three SOS chips of less than one square inch total.

Besides increasing density, SOS technology offers lower power requirements and reduced heat output—letting you place computing power where it's needed and with little site preparation. The Series 33 requires no special power-lines or computer room. Little or no additional air conditioning is needed.



HP's high density SOS technology reduced the 700 square inches of HP3000 components on portions of nine PC boards to three SOS chips. Results? Big computing power in a small package.

Performance tested

Like all HP3000 computer systems, the Series 33's ability to effectively handle on-line transaction processing tasks such as order entry, inventory status, and materials planning is rooted in the powerful MPE III multiprogramming executive operating system. MPE III dynamically allocates system resources, ensuring high throughput and fast response time—crucial to transaction processing environments.

The HP3000 Series 33 has many features commonly found only on large mainframe systems (see HP3000 features listed on page 7). And it is totally MPE III compatible. HP supported Series 33 software and application programs can be run on the Series II and III without any recompilation or coding changes.

Buy only the performance you need now

Hewlett-Packard now offers a compatible family of HP3000s with different prices, reflecting different performance capabilities and designs. As documented in performance studies, the Series 33, with 16 terminals in a one megabyte configuration, can process approximately 2000 transactions per hour at a response time of less than six seconds. A Series III offers approximately twice this performance in a similar set-up. You purchase only what you need.

HP, a leader in semiconductor memory, has 256K bytes of 16K RAM error-correcting, fault-control main memory standard in the Series 33. Expansion to one megabyte requires no additional power supply or card cage. Just add the new memory boards and change one system software parameter.

The Series 33 comes complete with a microprocessor-controlled system console, a one megabyte flexible disc drive, and a 20 megabyte disc drive. However, it can accommodate up to eight HP discs of 20, 50, or 120 megabytes each. External memory can be expanded up to 960 megabytes. The Series 33 can also support 31 terminals, four 1600 bpi mag tapes, and two printers.

Easy maintainability

Maintenance can be a major cost of ownership. Naturally, the more time spent in maintenance-related travel and labor, the more it costs you. Hewlett-Packard has made an effort to reduce these expenses through a high-level, self-test diagnostic program and a remote system verification program. Each turns the system console into a powerful stand-alone maintenance computer.

The comprehensive cartridge-loaded self-test, HP's first level of support, can be run at any time to locate possible failures. Just plug in the cartridge and press the "READ" key. The entire CPU, a general I/O channel, the flexible disc drive, the first 128K bytes of memory, and an

asynchronous data communications controller are tested in less than two minutes—without the aid of a service specialist. The console informs you of test results using friendly, conversational displays. Once the problem is identified, call your Hewlett-Packard customer engineer. The necessary repairs can be made quickly, with minimal system downtime.

Go remote

Some problems will elude even the most sophisticated diagnostics. Should the self-test not locate your trouble, you can utilize the Series 33's innovative remote system verification program (RSVP). Via your own asynchronous telephone modem, it is possible to give complete interactive control of all the system's maintenance capabilities to an HP customer engineer located at any HP office. Remote serviceability puts multilevels of HP expertise at your fingertips and reduces customer engineer travel time. Results: better service efficiency, maximum system uptime, and lower maintenance costs.

Interested in the powerful, low-cost, entry level HP3000 Series 33? Prices begin at $70,000.* **For more information, please indicate B on the reply card.**

HP3000 Series III

MPE III:
multiprogramming executive operating system

LANGUAGES:
COBOL, BASIC, FORTRAN, RPG, SPL

IMAGE/QUERY:
data base management/inquiry system

VIEW:
complete data entry facility

HP3000 Series 33

With the Series 33, low cost doesn't mean low power. This entry-level HP3000 computer has many large-system features and is upward-compatible with the entire HP3000 family.

**U.S. domestic price*

Technology update: Silicon-on-Sapphire

Both of the business computers featured in this issue extensively use Silicon-on-Sapphire technology. We asked the Computer Systems Group R & D Manager, Marco Negrete, to bring us up to date on HP's involvement with this emerging technology.

Marco, why did HP choose to invest so heavily in Silicon-on-Sapphire technology for its computer products?

"We saw some unique advantages in SOS that a bulk silicon approach just doesn't offer. Sapphire virtually eliminates those stray and parasitic capacitances that seriously degrade performance and limit the length of interconnects. Sapphire also dielectrically isolates devices without our needing to add complex process steps.

"The gains we've seen with SOS are significant improvements in speed, power and level of integration—all with a relatively simple process. For example, one single SOS chip, the 16-bit general purpose microprocessor used throughout our product line, contains the equivalent of 10,000 devices. Another example, our processor chip has a micro-cycle time of 270 to 720 nanoseconds.

What are HP's accomplishments to date with this new technology?

"I believe that a good measure of success is the number of products using SOS devices. We've been shipping SOS for more than a year now, and the list of our products using this technology is growing rapidly. SOS was first placed in the HP 2240 measurement and control system, quickly followed by our serial printers—the 2631 and 2635. We're especially pleased with the recent introduction of two new business computer systems: the HP300, and HP3000 Series 33. Both use SOS for the central processor as well as for other functions. The breadth and range of our chips is impressive. We have over 25 different chip designs so far.

"In terms of reliability, we found—as expected—those improvements that are associated with lower power devices.

"To date, I'm pleased to report that with the extent of our SOS use, we've had only a handful of devices returned from the field. We feel this record is in part due to the fact that we subject all SOS chips to an extensive product assurance program which weeds out 'infant mortalities.'"

How does HP plan to advance SOS technology now?

"We have two major goals. The first is to increase our production capacity and efficiency to satisfy the growing product demands. In fact, we're in the process of building a highly automated manufacturing facility of 6500 square feet.

"Secondly, we're aggressively pursuing the advantages of SOS. We're already well on our way toward introducing the first of several planned stages of process improvements."

What challenges lie ahead?

"In any emerging technology, there are bound to be many technical challenges. But specifically for SOS, the challenge will be one of materials—that of maximizing the inherent advantages of sapphire as we push toward smaller and smaller devices. Much of our attention will be focused on improving the Silicon/Sapphire interface and hetroepitaxial growth techniques."

Marco Negrete, Group R & D Manager

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the on going trial and any final structural relief. Yet the CCIA's explicit linkage between SBS and the IBM monopoly trial has been manifest in the SBS proceedings several times, and very likely will be raised at length in the FCC's evidentiary hearings on the antitrust implications of the SBS partnership, ordered last summer by a federal court.

Those court-ordered hearings, likely to extend over two to three years, constitute a major setback for the futuristic SBS project—all the more so because the federal appeals court in Washington, in ordering the hearings, defined a new antitrust standard which the FCC must apply before it can reissue the SBS license revoked by the court.

Unlike the Sherman Act monopoly trial in New York, the FCC hearings will be governed by the antimerger provisions of the Clayton Act which forbids corporate combinations within regulated industries that serve to "substantially" lessen competition. Since IBM's first attempt to enter the DOMSAT (or domestic satellite communications) market in 1974, the Justice Dept., Federal Trade Commission, and private telecommunications firms have all protested that IBM's partnership with COMSAT General, the managing entity for the 96-nation INTELSAT satellite system, constitutes a Clayton Act violation.

The FCC, eager to interject some competition into the periphery of the AT&T monopoly, had gone ahead and licensed SBS in 1976, skipping the time-consuming hearings, with the argument that even if the commission assumed Clayton Act objections, the public interest benefits of a strong AT&T competitor substantially outweighed them.

On its own, however, the FCC had taken several moves to diminish the impact of IBM's potential vertical integration. The FCC required the IBM-COMSAT partnership to bring in a third party, Aetna, to lessen single owner share, and they introduced a number of safeguard provisions that were to insure IBM competitors free access to SBS service.

IBM was required to participate in SBS only through a new subsidiary, to guarantee nondiscriminatory interconnection of dp equipme from other manufacturers, and to market SBS services only through the new subsidiary.

The FCC act of license and the lack of a hearing on the antitrust issues, was appealed in federal court by the antitrust division of Justice, AT&T, Western Union, and Fairchild Industries and its subsidiary American Satellite Corp., with a supporting brief filed by the FTC. The FCC was alleged to have overlooked its Clayton Act responsibilities. Three principal antitrust issues were raised:

—whether the IBM-COMSAT partnership would eliminate the increased competition that would result if both IBM and COMSAT entered the market independently;

—whether the joint entry eliminated the competitive benefits that could arise if either entered independently and the other remained a potential entry; and

—whether the combined resources of IBM and COMSAT would be so great as to raise entry barriers to other potential competitors.

Last August the court remanded the case back to the FCC, ruling that the commission used an improper standard to reconcile its public interest mandate and its Clayton Act responsibilities. It ordered evidentiary hearings to ascertain the facts of the case. Spelling out a new standard that greatly restricted FCC discretion in such cases, the court ruled that the FCC could approve a joint venture that substantially lessened competition only if such a partnership was *"essential* to a communications system sufficient to meet modern day requirements."

SBS and the FCC have asked the court to reconsider and may well appeal to the Supreme Court, but experienced court observers see little chance for any change of standard. And even though SBS has proceeded in its development plans with every sign of confidence—expanding its facilities and signing several huge $multimillion contracts with equipment suppliers almost immediately after the decison—top Justice Dept. officials see the present SBS partnership as doomed.

One government brief suggested SBS approval might allow IBM to shift its lock on industry from the hardware/software link into the communications line.

"With the new 'essential standard,' and the requirement for a full hearing into the issues, there's just no way that I can see that IBM could win," said a Justice Dept. communications expert. An IBM-COMSAT partnership will not put satellites into the sky, he said flatly, "but there is very easy solution that will get the government off their back in this case, and it's called a negotiable instrument. The government is challenging only the joint venture, so all IBM would have to do is write out a check to COMSAT and buy them out."

While the antitrust division at Justice will apparently withdraw its objections to SBS if COMSAT is replaced by another "neutral" partner, the corporate objectors will undoubtedly still press their complaints and demand an exploration into the anticompetitive impact of IBM's dp-to-satellite vertical integration. And with the mandated forum of the FCC hearings, and an obvious interest in delaying *any* IBM telecommunications venture, AT&T *et al.* will keep SBS in limbo for an extended period.

Within the Justice Dept., the SBS case has been the focus of some unusual internal pressures, according to Justice staff forces, including, at one point, "political intervention" by top department executives in the work of the antitrust division. The policy decisions inherent in antitrust litigation necessitates political judgments, explained one government attorney, but the particulars of this situation contrasts sharply with the strong antitrust rhetoric recently heard from the White House in upper echelons of Justice.

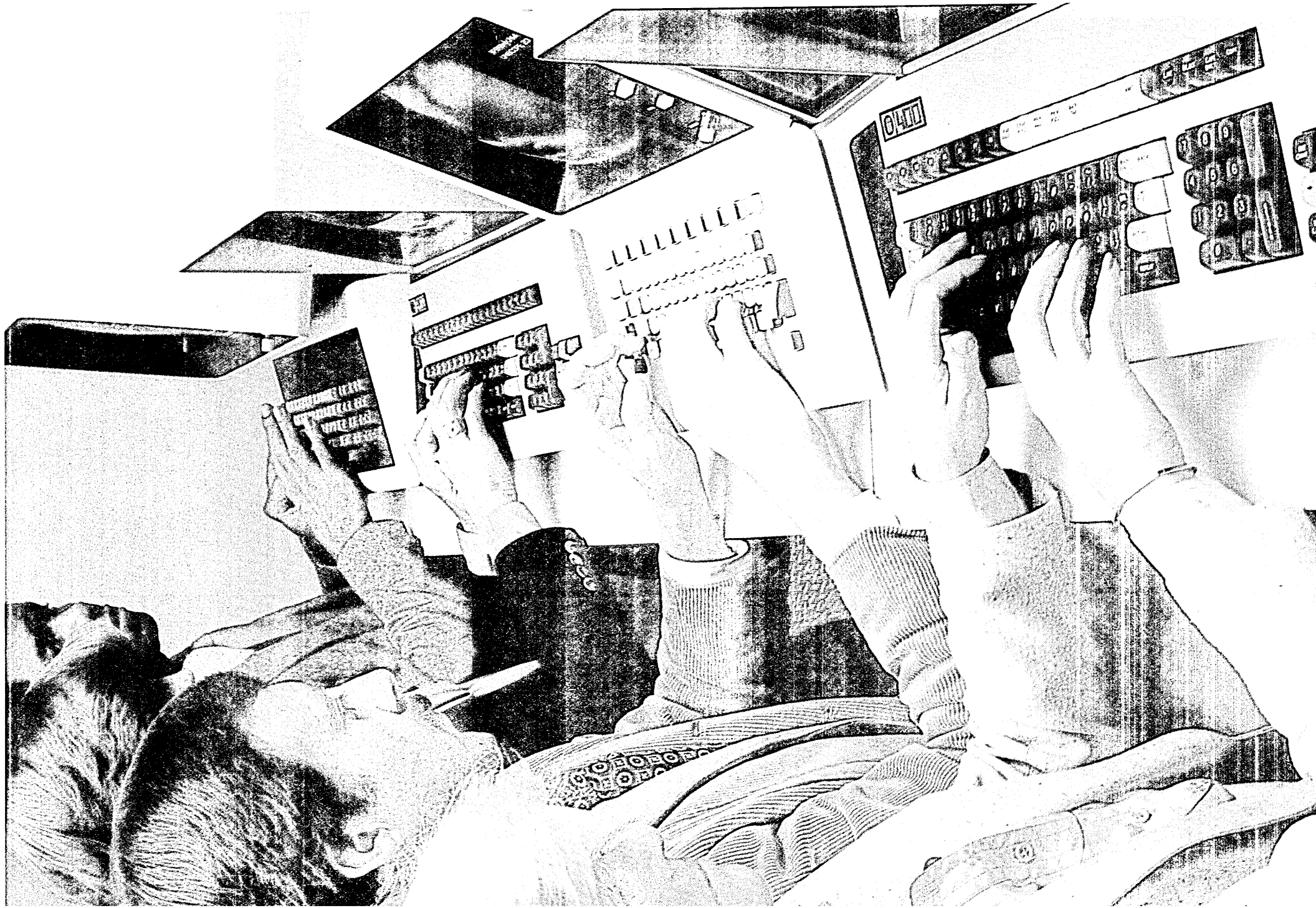
Justice Dept. sources explain that there was no coordination between the IBM trial staff and the attorneys assigned to the Antitrust Division's Regulated Industries Section (RIS), who prepared the FCC challenge to the SBS partnership—even though both are under the same divisional authority.

The first objections to the IBM-COMSAT combination, filed with the FCC in 1974, were developed independently by RIS staff assigned to oversee the FCC. The IBM trial staff was not even aware of the other proceedings, according to Justice personnel. At that stage the FCC rejected an attempt by IBM and COMSAT to use the shell of CML Satellite Corp. to jointly enter the DOMSAT market, but invited the two firms to reapply in one of several acceptable forms, specifically suggesting a three-party joint venture.

The SBS proposal was filed with the FCC in December 1975. Justice officials say that while the Antitrust Division was preparing its brief in their Clayton Act objections to this new scheme, Alan McAdams, Cornell economist and consultant to the government in the IBM trial, credited by many as a prime architect of the prosecution case, personally approached the attorneys in the Regulated Industries Section and complained that the trial staff should have been involved in all antitrust proceedings against IBM, before the FCC and elsewhere.

In April and May of 1976, according to government sources, McAdams and Kenneth Robinson, an RIS staff attorney, personally visited key FCC officials, among them Walter Hinchman, then head of the Common Carrier Bureau at the FCC, to argue informally against allowing IBM to vertically integrate into the DOMSAT communications market. McAdams reportedly stressed IBM's dominance in the dp market and argued that SBS approval would compound the problem and perhaps allow IBM to shift its lock on industry from the hardware/software link into the communications line.

The government's initial complaint about SBS had made a clean straightforward argument against the IBM-COMSAT combination citing the Clayton Act. But



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in the second RIS protest, filed in June 1976, when the actual SBS license application was before the commission, the McAdams influence was evident. Now the Antitrust Division also was demanding a full inquiry into the anticompetitive impact of IBM's DOMSAT entry on the viability of present and future data processing competition, and whether such impact would be exacerbated by its COMSAT partnership.

That brief arrived at the FCC like a flaming arrow on a thatched roof. Repercussions were soon felt back in Justice. The FCC and IBM both strongly protested that the Justice Dept. was pushing the commission back into the morass of the extended FCC computer inquiries, something the commission staff sought desperately to avoid. And within the Justice Dept., according to a senior Justice official, "politically appointed officials" made it clear to the antitrust staff that they did not want the monopoly trial dragged into regulatory proceedings.

"There were a combination of factors involved in the retreat," explained an Antitrust Division staffer recently. "At top levels of the department there was unease with that whole line of argument. Also there were complaints from the FCC that they were being forced into looking at competition in the computer industry, where they had no clear authority.

"It might also be," he chuckled, "that some of these people started to read what they had been signing."

At any rate, when Justice filed its third brief on the SBS case before the FCC in October 1976, the McAdams touch was absent. "They didn't disown the second filing. Justice never disowns itself. But it would be an understatement to say they didn't stress it," said another attorney involved in the case. "There was a very conscious awareness that they no longer were pushing that line."

The new SBS brief from Justice now declared that the FCC did not have to look into the alleged horrors of vertical integration—even though the FCC had already done so in developing their safeguard factors in the SBS system. "If you read the first and last of those papers," commented a Justice attorney, "they might as well have been written on the moon. There is no sense within them that the Justice Dept. has any ongoing dispute with IBM itself." ✲

IBM ON THE DEFENSE

It claims government's definition of the computer is too narrow today.

by Laton McCartney

U.S. District Court Judge David N. Edelstein seemed momentarily confused. "Do you have an obligation to define the market?" he asked one of the IBM attorneys.

"No, we do not," the attorney responded.

"And you don't intend to?" the judge continued.

"The answer to that question is no," said the attorney.

This recent exchange between Edelstein, who is hearing the IBM antitrust case, and Alan J. Hruska of Cravath, Swaine & Moore, IBM's law firm, underscores IBM's principal strategy in defending itself against charges that it monopolizes the computer industry.

To date the IBM defense, which began early last year when the Justice Dept. finally rested its case, has directly and indirectly attacked the market definition that was the cornerstone of the government's original antitrust complaint.

As stated in the January 17, 1969 filing that set off the suit, IBM was charged with monopolizing interstate trade and commerce in "general purpose digital computers."

As originally defined by Justice, "the general purpose digital computer is one which has general commercial applications and is offered for sale or lease in standard model configurations."

FRANK T. CARY—IBM is primarily engaged in the systems business.

General purpose computers, the government made clear, were distinct from special purpose digital computers "that are designed for particularized needs or purposes and are produced for use by a limited number of customers but not made generally available to all customers."

With most of the witnesses IBM has called to date, the giant computer firm is attempting to show that multiple markets exist today. Or as attorney Hruska explained to Judge Edelstein, ". . . we believe plaintiff's relevant market is not relevant at all. We think it is far too narrow and, therefore, we have denied plaintiff's allegations of relevant market."

To prove this contention, IBM is attempting to show, in Hruska's words, "certain products, services and companies were invalidly excluded from plaintiff's definition."

In support of this argument IBM has called five customer witnesses to the stand—major dp users like American Airlines, Union Carbide, Southern Railway, Chemical Bank, and General Motors. With each witness the focus of the testimony has been essentially the same. Users are queried extensively about their data processing installation. In certain instances, as with witnesses like John G. McGrew, director of computing and telecommunications services and operations

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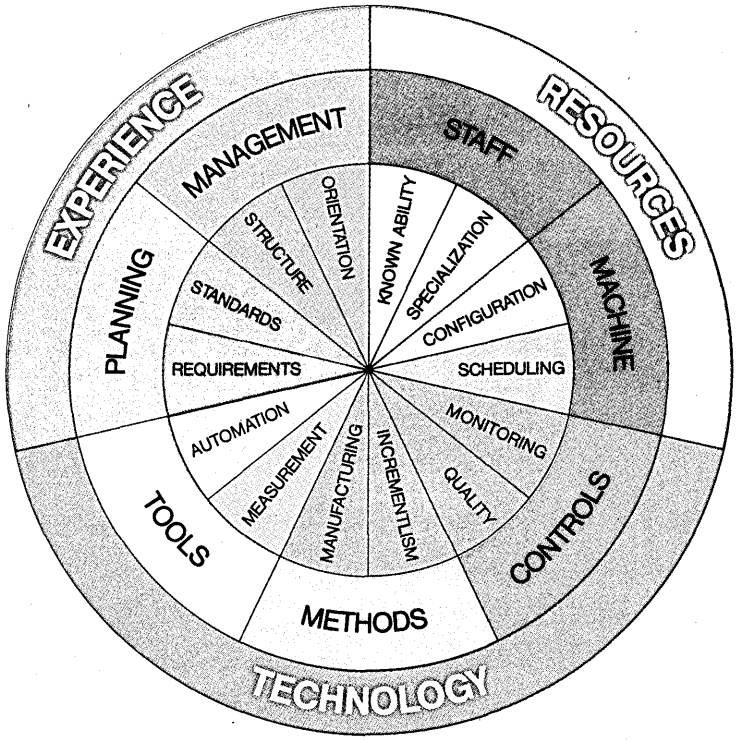

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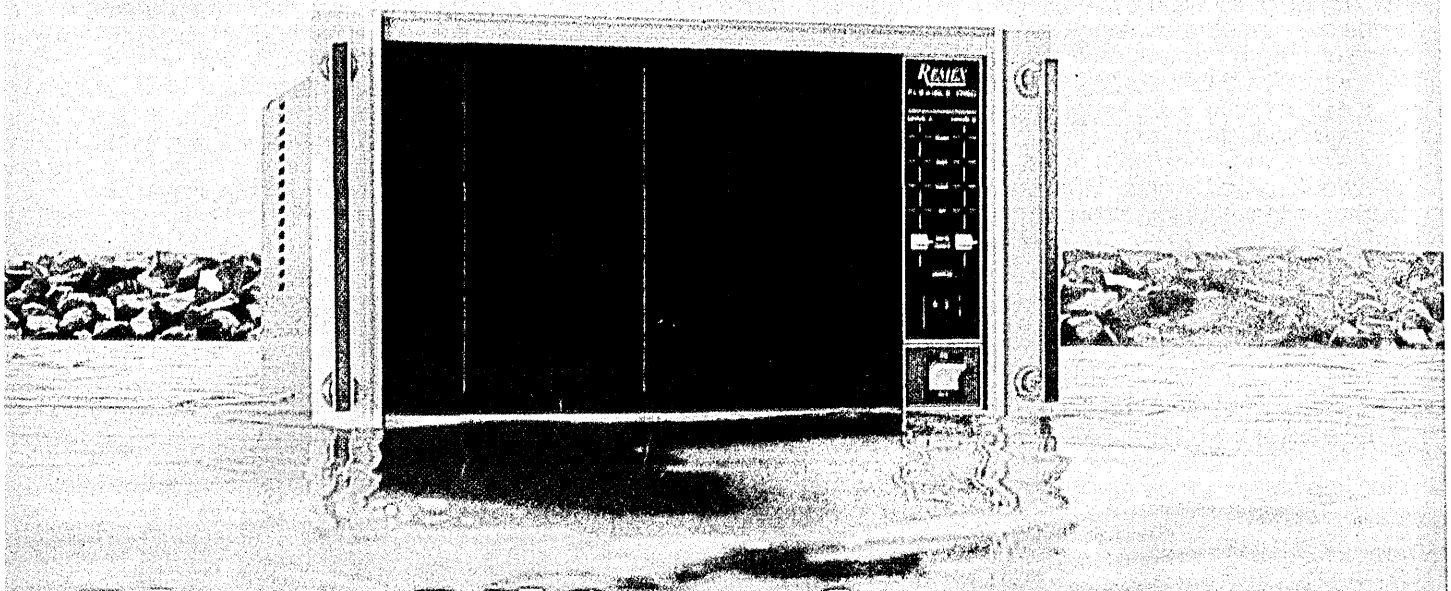

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for Union Carbide, the witness even took Edelstein and the trial lawyers and clerks on an extensive tour of the firm's computer facilities.

Significantly, each of the customer witnesses selected use IBM mainframes, but are also dependent on a variety of other equipment. Union Carbide, as an example, employs a Data General Eclipse C/300, Memorex and AMS memory, a COMTEN 3670 system, Burroughs 1728 processors and terminal equipment from both Harris and Data 100.

Similarly, James J. O'Neill, vp data processing and communications services, American Airlines, testified that the airline's flight plan, crew assignments, fuel allocation, and additional systems were built around an extensive combination of both IBM and non-IBM equipment.

He asserted that the distinction between scientific and commercial applications, which, he said, may have been valid ten or more years ago, was no longer so, noting that he considered American's 370/168 systems, for example, equally suitable for either application.

O'Neill also asserted that the dp industry was more competitive now than in the past with customers today able to benefit from the option of buying either a "box" or a system. That wasn't true in the past when vendors only sold relatively complete systems, O'Neill stated.

Today, he continued, manufacturers provide a variety of products which users can combine to their own specifications. They can replace cpu's with other processors or even additional peripheral equipment. To illustrate this point he explained how American Airlines today can increase its time-sharing capabilities either by adding a new cpu or beefing up its memory and peripherals for existing cpu's.

The IBM customer witnesses collectively registered the message IBM wanted the court to hear: there is no longer a readily definable general purpose computer market. The lines of demarcation have blurred, and today's dp environment is far more complexly structured than it was in 1969 when the government initiated its case.

And with the customer witnesses having completed their testimony, IBM is now turning to its so-called part two witnesses who are focusing on varying analyses of revenues from products and services generated by companies that IBM maintains were invalidly excluded by the government.

Among these are IBM controller and now treasurer Arthur C. Northrup, who presented revenue figures for IBM from 1952 to 1972. Price Waterhouse & Co. partner Raymond J. Dubrowsky also will offer the court his analysis of 800 court-ordered depositions relating to the size of the dp market and known unofficially as "census two." Based on his compilation of these documents, Dubrowsky is expected to assert that the dp industry consisted of more than 600 companies by 1972. Comparing Northrup's revenue figures with census two industry figures, IBM will attempt to show its market share amounted to only about 32% by 1972.

ROBERT J. STAAL—Justice's new chief trial counsel replaced Raymond Carlson last spring.

Dubrowsky is to be followed by some 45 witnesses including a host of economists, technical experts, law professors, and IBM executives, virtually all of whom will testify directly or indirectly about market definition according to what Hruska told to Judge Edelstein.

Confronted with this pending avalanche of market-related testimony, Judge Edelstein asked the IBM attorneys why they were devoting so much time and energy to this issue, particularly since they had earlier asserted IBM had no obligation to define the market. Hruska's answer: "Because it is an easier way of winning this lawsuit."

Government claims that even though customers use a variety of non-IBM equipment, they're still wedded to IBM general purpose computers.

For its part, Justice, under chief trial counsel Robert J. Staal, who replaced Raymond Carlson in April 1978, has been sticking to its guns, attempting to show in cross-examination that the IBM defense strategy is basically a smokescreen. To this end the government, for example, tried to point up the fact that, though they may be using a variety of non-IBM equipment, the IBM customer witnesses were still wedded to IBM general purpose computers—machines that were being utilized for nonscientific or nonspecialized applications like large scale accounting and financial applications.

Further, these machines in some instances were acquired in lieu of obtaining gear from competitors because IBM engaged in such predatory practices as deliberately pre-announcing a product to undercut other manufacturers. Justice sought to establish this, for example, in cross-examining IBM customer witness Donald E. Hart.

Hart, who heads the General Motors Research Labs Computer Science Dept., admitted that GM canceled delivery of a CDC Star 100 computer after learning that IBM was coming out with the 370/168. Hart denied, however, that the cancellation and subsequent purchase of IBM equipment was at all related to early knowledge of the 168.

The government also discounts IBM's contention that today's market is more oriented toward box, or modular, purchases rather than complete systems acquisitions, pointing out that IBM chairman Frank Cary, as well as its chief trial attorney, Thomas D. Barr, have both acknowledged that IBM is in fact primarily engaged in the systems business.

Justice additionally is seeking to establish that the centralized approach espoused by IBM customer witnesses necessitated they remain IBM customers in order to avoid prohibitively high software conversion costs. Further, Justice has repeatedly attempted to point up problems that IBM customers have experienced with certain IBM software and hardware products and challenged witness characterizations of IBM as "the standard of excellence."

With IBM's defensive strategy now clearly spelled out, Justice, however, seems to be facing an uphill battle in keeping its market definition from becoming muddled, especially since the scope of the trial now is inexorably focused to a major extent on the current dp industry. Indeed, several industry analysts who have followed the case since its inception now feel that IBM's attack on the government's market relevancy has moved the computer giant much closer to winning the case. They note that while IBM might have agreed to divest itself of certain business segments in the past, the company is now aiming for complete exoneration, and is already acting like a winner with its aggressive marketing and pricing policies outside the antitrust arena.

Government, in turn, is still holding out for divestiture of the Data Processing Division, asserting privately it won't settle for less. Given the extensive user commitment to IBM software—a commitment that form of divestiture would jeopardize—and IBM's increasing confidence, a voluntary divestiture of any sort now seems unlikely. ✲

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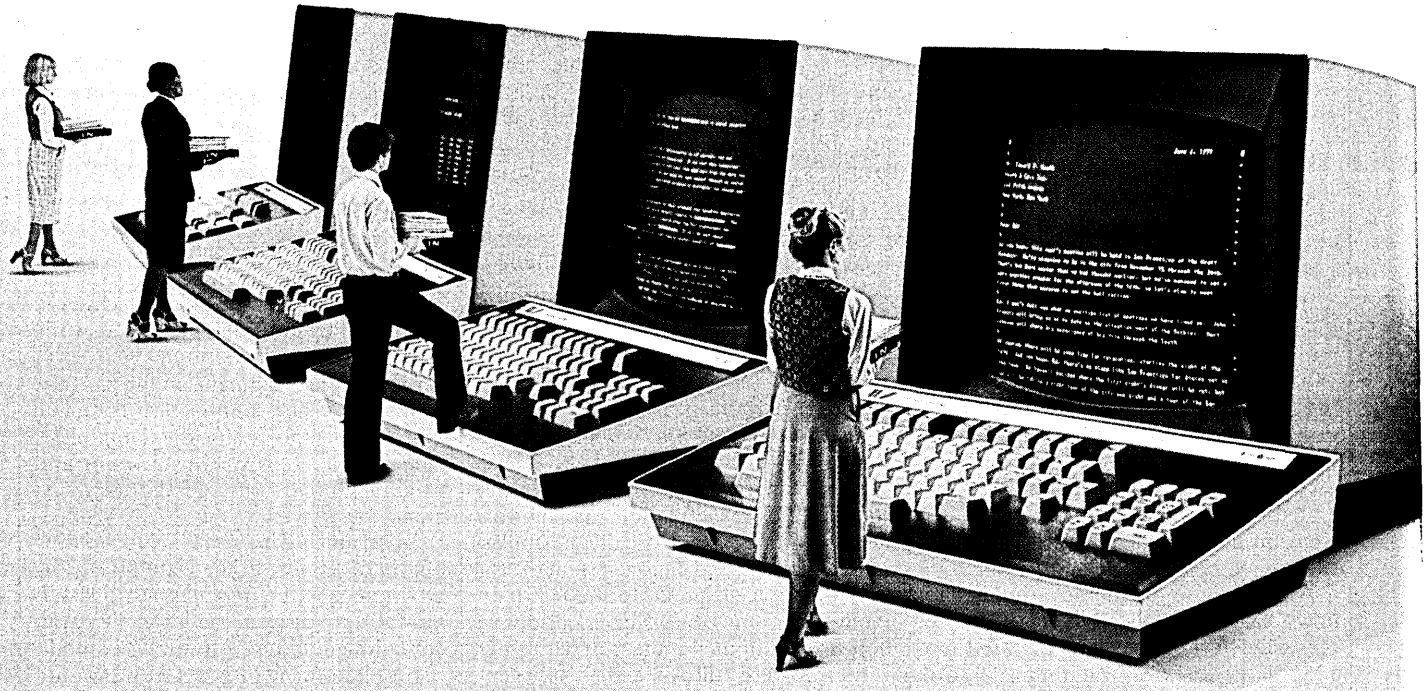

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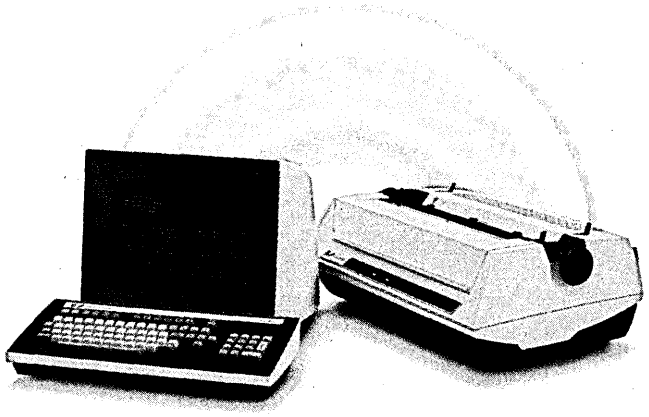

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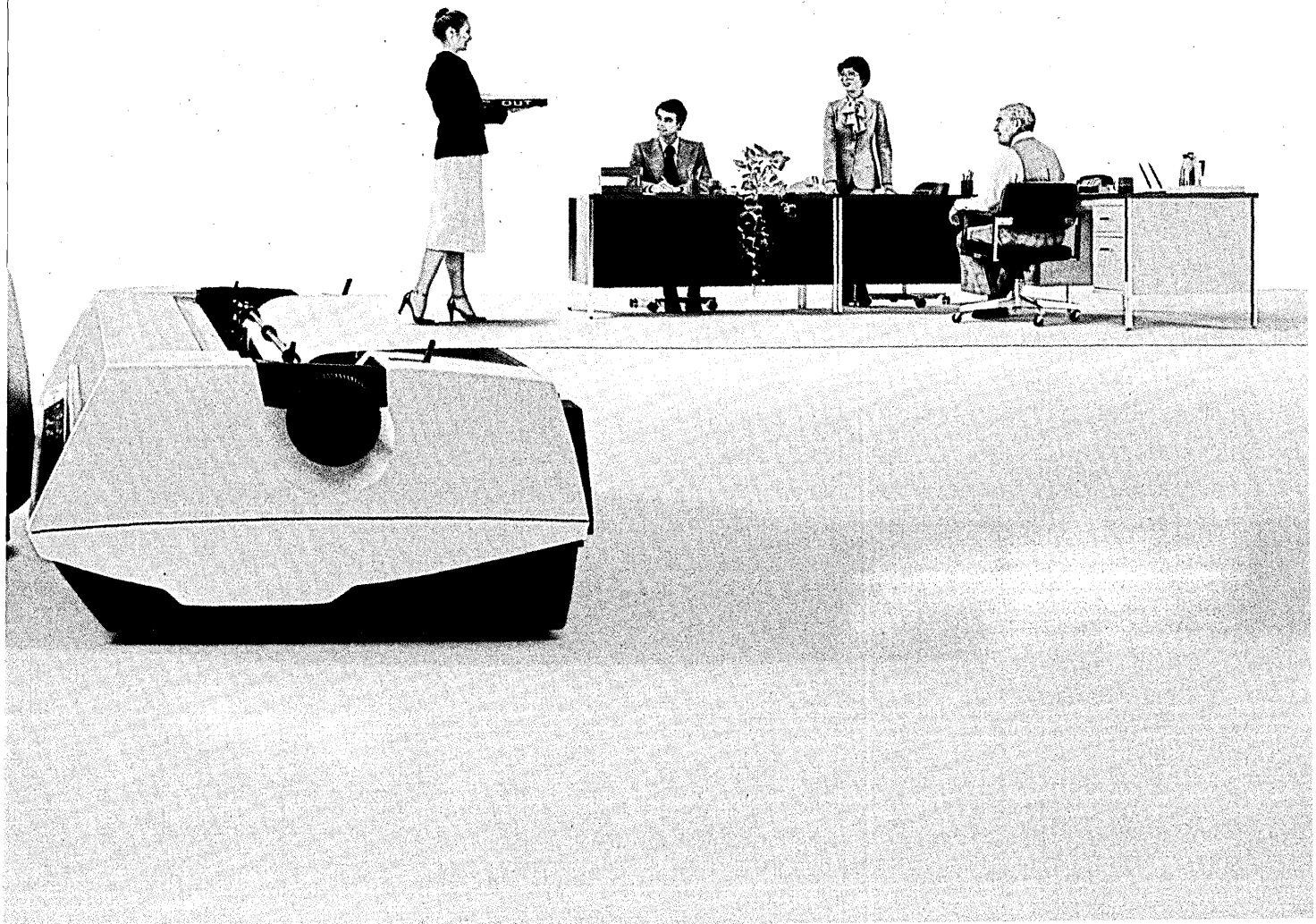
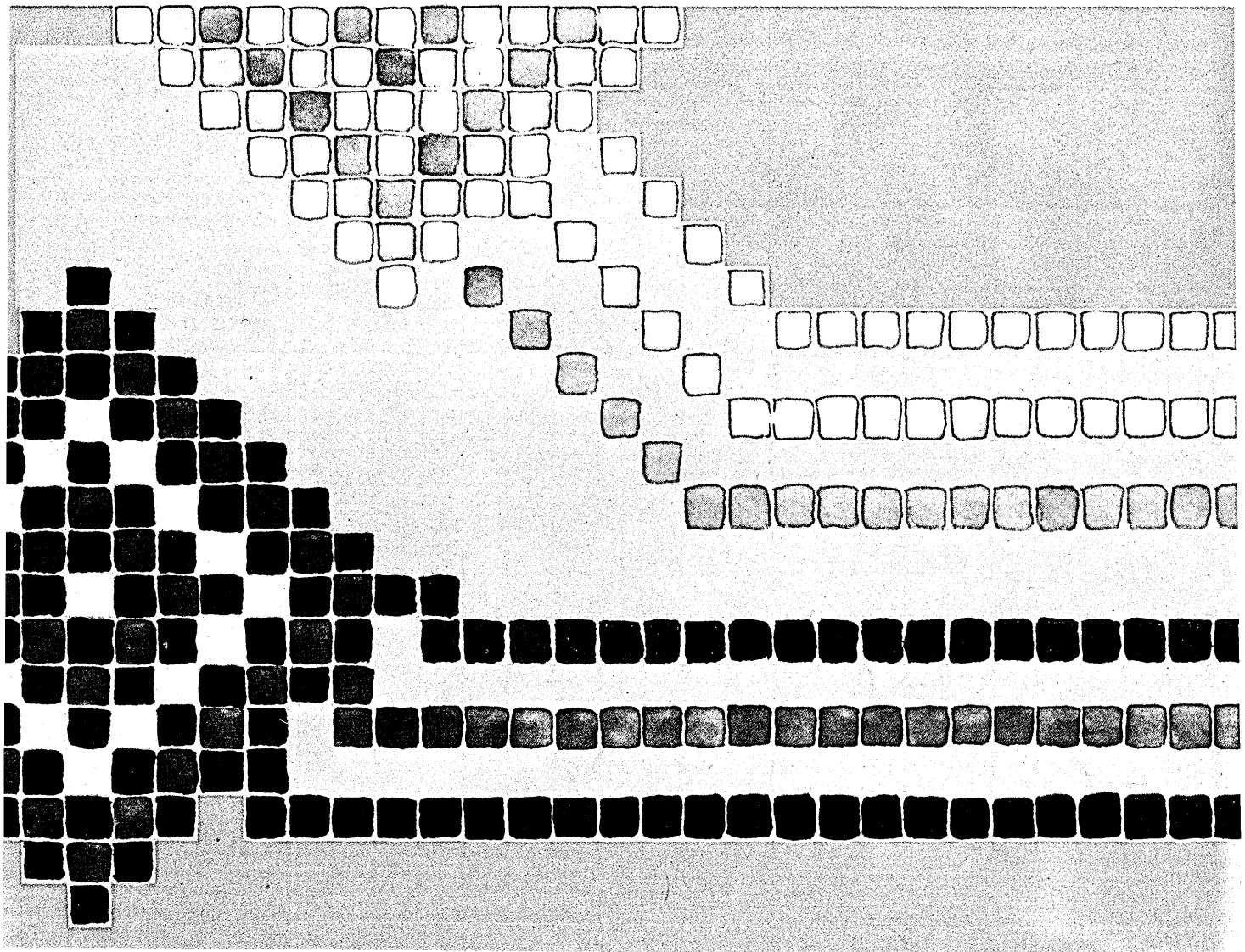


The old way was to patch, to make quick fixes, and to stumble through. This is more like software engineering.

ADOPTING A SYSTEM RELEASE DISCIPLINE



by D. H. McNeil

Can you certify the quality of the software you produce? Would you stake your reputation on the error-free reinstallation of a programming system after maintenance changes have been made? The super programmer would say he could, but "next time" . . . there were a few little mistakes last time. The computer scientist could say "no" . . . it is theoretically impossible to deliver error-free results. The user of dp services, in a fit of exasperation, might say "never." The dp manager would say "perhaps" . . . but not in my lifetime.

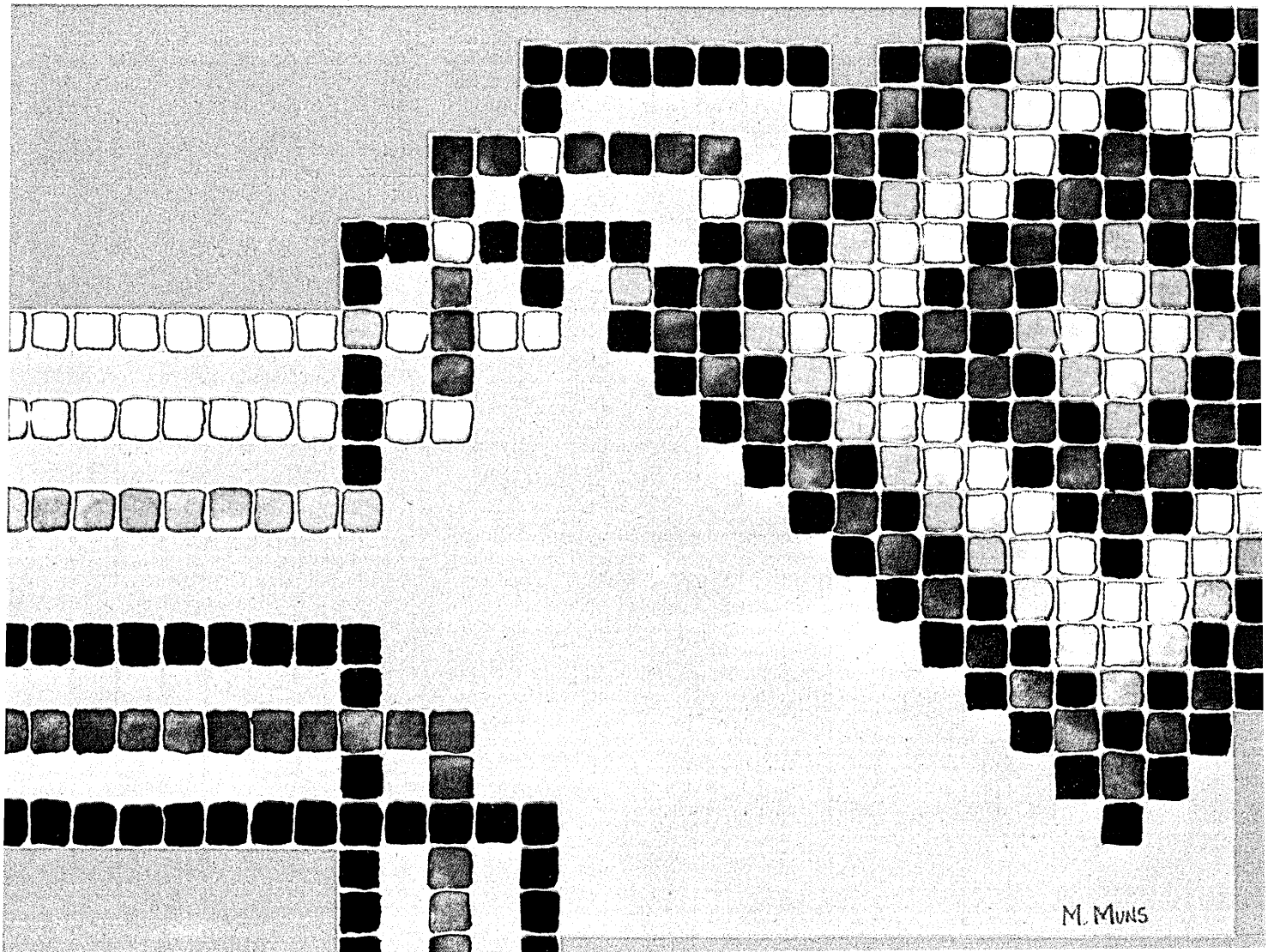
In spite of methodological improvements such as structured design and coding, chief programmer teams, on-line program development systems, high level languages and data base managers (or possibly because of all these), the delivered quality of large scale software, whether new or modified, remains disgraceful, except where the projects or the people involved are specially chosen. Pervasive cynicism about software is the justifiable consequence of the many situations where poor results follow long delays.

Things don't have to be as bad as they have been. A well-managed System Release Discipline offers a proven alternative to those old software disasters.

THE OLD MALADIES

There are several reasons that the dp industry is turning its attention to improving the quality control of software evolution:

- Failures associated in some way



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with software, including the so-called "human input errors," are sources of untold grief for the user community.

- Businesses and governments of all sizes depend heavily upon the integrity of their dp operation to stay alive.
- Continual change is the way of life for most of the industry.
- The annual expenditures for software maintenance are estimated to exceed half of the total dp budget, with some installations reporting as much as 80% of their costs pouring into maintenance.
- Technological panaceas have failed consistently in the past and promise to do so for the foreseeable future.
- The dp industry needs to mature through evolutionary change, since the $multimillion investments in the current generation of software simply cannot be tossed out by any known form of "revolution."

Afflicted with a full complement of software management woes, our installation was able to adopt a System Release Discipline (SRD) which transformed the treacherous job of software maintenance and enhancement into a steadily improving process of incremental development. The SRD was first introduced on a system having an IBM 370/168 loosely coupled to a 370/158. The two machines shared more than five billion bytes of direct access storage and supported a network of more than 200 active medium speed terminals.

Data base management software was used for quasi-interactive transaction processing of small batches of data submitted by the terminals. More than 200 bulk update and reporting jobs were run during each 24 hour period. Program testing by 50 programmer/analysts was also supported. The system was intended to be available to users around the clock except for approximately eight hours per week of scheduled maintenance, usually done on Sunday afternoons.

The number and the duration of unscheduled outages became a matter of growing management concern. The company's business was totally dependent upon the dp product. It was particularly difficult to justify the large percentage of problems which were the direct result of attempts to apply fixes for known bugs in applications and in operating system software.

THE CURE PRESCRIBED

As the system expanded to include new applications and new clients, the situation became increasingly desperate. The SRD was the medicine prescribed. After four years' experience with SRD, its role in preventing chaos and in fact putting software maintenance on a more business-like level has been proven. The installation has been able to double its processor power, direct access storage, teleprocessing load, applications offerings, and programming staff without trauma.

Before plunging into a more detailed description of SRD, we should note three implicit themes it contains: education, planning, and communication. These are trite but true continuing requirements for any installation which hopes to reap the benefits of SRD. Moreover, the education, planning, and communication activity must include not only the dp analysts and programmers but also machine operators and, above all, the end users of the system. All these groups are stakeholders in the evolution of software. The quality of the end product reflects directly on all of their jobs.

In many ways, the smooth progress of software development and maintenance is more of a management issue than a technical one. The SRD emphasizes technical freedom where possible and sets verifiable standards for discipline and responsibility where required.

The cardinal rules for SRD are quite simple: Only carefully planned, systematically developed, fully tested, and adequately documented changes are applied to production systems, and these changes are grouped in "release" levels installed at sensible intervals under prescribed tactical plans. After a brief shakedown period, *no* patches or "quick fixes" are permitted on the production system except under the most extraordinary circumstances and with the concurrence of more than one level of management.

Properly done, the SRD is *not* just another twist on the "great new release of the operating system" travesty which vendors have used for years to exchange a bag of snakes for a can of worms. The SRD represents a big philosophical step for an installation. It changes the way the whole organization operates and it alters individual habits, sometimes to the extent of modifying careers. One consequence of SRD in practice is that it puts a dp shop on the road to having a software engineering attitude, whether or not other disciplines such as structured design and programming are employed.

SRD makes explicit the policy that the existing level of software service is not to be diminished by design or by accident. Users are to see continuity and steady improvement of service.

POLITICS AND PLANNING

Having made the big step and decided to use SRD, an installation can then proceed to educate its staff and its clients to prepare them for their parts in the process. Some of the "education" may better be called "politics," since some old bad habits may die hard. Software staff may feel they are giving up control of "their" system, and indeed they must sacrifice the freedom to bomb it at will.

Users, for their part, may object to being unable to demand a new feature for the system on an overnight basis. Their payoff must wait, but at least when the feature is implemented it is more likely to work properly. Operations staff may have been getting blamed for every system problem anyhow, so they can be expected to favor *any* change in procedures which makes their lives less hectic.

While education proceeds, dp management must use all the resources it can find to begin the planning process. An outline of the design and schedule for the total hardware and software facility is needed for the extent of a planning period of not less than one year and preferably for two to five years. This plan provides a reference against which the success of SRD work can be measured. There will be alterations to the plan, of course, as new needs and new technology appear.

Most people are pleasantly surprised, however, by how well they can project dp facilities for years into the future if only they get enough of the knowledgeable stakeholders involved in the planning process. Planning, after all, involves communication as well as rehearsal for action and therefore should be continual as well as highly participative.

In light of the long range plan, detailed strategic planning for the contents of each release can begin. When the contents and installation dates for at least two releases have been established, release coordinators can be assigned. The coordinator of a release is generally chosen from among the senior, nonmanagerial, technical staff and is given full operational responsibility for the release, from preparatory stages through post-installation follow-up. For all practical purposes, the coordinator is the project team manager for the release. Insofar as programmers, analysts, and clerical workers are assigned to aspects of the release, they are accountable to the coordinator.

On the other hand, software managers certainly do not abdicate their re-

SRD PROJECT CHECKLIST

Page____ of ____

Release number _____ Install Date _____

Coordinator _____

Ass't Coordinator _____

Project _____ Completion Date _____

Item #	Description	Date	Done by	Chkd by	Notes

Fig. 1. Tactical plans for major, complex steps in readying a system release usually take the form of checklists. (Another checklist may be necessary for handling a system release abort, too.)

sponsibilities to the coordinator. They and their advisory staff people remain responsible for providing administrative and technical continuity from one release to another, as well as for representing their own areas of specialty during negotiation of strategic plans.

One of the primary duties of the coordinator is to implement the strategic plan for the release. A strategic plan contains at least the following major items:

1. Which of the functions prescribed by the total system design will be incorporated in the new release?
2. What problem areas in the current system will be changed and what "bugs" will be repaired?
3. Who are the individuals and departments responsible for making each change?
4. What is the schedule for detailed design, construction, and testing?
5. What computer system resources will be needed for development and testing, and on what schedule?

The strategic plan must, of course, be negotiated openly with the stakeholders and fully documented. Modifications will be required before the release is actually installed so the current status of the plan should always be posted for reference by all concerned. It is the nature of a properly organized SRD that project status is not something to be ashamed of. Should any part of the team fall behind, they should be free to ask for and receive help from their colleagues without stigma.

Tactical planning for complex steps along the path to completion of a release is a second major duty of the coordinator. In most cases, tactical plans take the form of detailed checklists (see Fig. 1) which indicate what is to be done, when, and by whom, together with procedures for noting when work is completed and verified. Since cutover to a new release may fail, a "release abort" checklist must also be provided.

The discipline which goes with such meticulous planning as this need not be a burden, nor should it be interpreted as a means of catching someone in a mistake. The purpose of the SRD is to catch the mistakes themselves, thus helping people know their jobs and become justifiably confident of the quality of the work they, as a group, produce.

To reduce the clerical workload for the coordinator, a dp technician should be assigned to each release. The technician is usually an especially capable graduate of dp operations or of a dp-related clerical area who is working into programming or systems analysis. Though technicians may be receiving the same formal training as junior programmers, it is their "street wisdom" about how the organization really works that makes them most valuable assistants to a coordinator.

Actual duties of the technician include maintenance of program libraries, data bases, and test data for a release; day-to-day interfacing between programming and computer operations areas; and acting as an intelligent assistant to the coordinator. The dp technician's importance as the eyes, ears, feet, and nose of the coordinator cannot be overestimated.

TOOLS AND TESTING

Up to this point we have concerned ourselves primarily with the management and human aspects of the SRD. It is not an accident that so much emphasis has been given to the nontechnical issues; in the long run the evolution of quality software depends upon people, not on systems analysis techniques, programming languages, or operating systems environments.

There is no doubt, however, that development and maintenance are more coherent, hence easier to manage, if appropriate tools are used. Though it is beyond our scope here to explore the world of helpful technology which has been applied in SRD shops, there are two technological prerequisites to a satisfactory SRD which must be considered: (1) functional modularity of the software system being developed or maintained; and (2) a parallel testing scheme which systematically validates new versions of software against live data prior to installation of a release.

Functional modularity in the context of the SRD means, at a minimum, that the logically distinct functions of a large software system have been separately packaged so that they interface one another in well defined ways. Each package constitutes a subsystem which can be modified and tested independently by individuals or teams that specialize in their

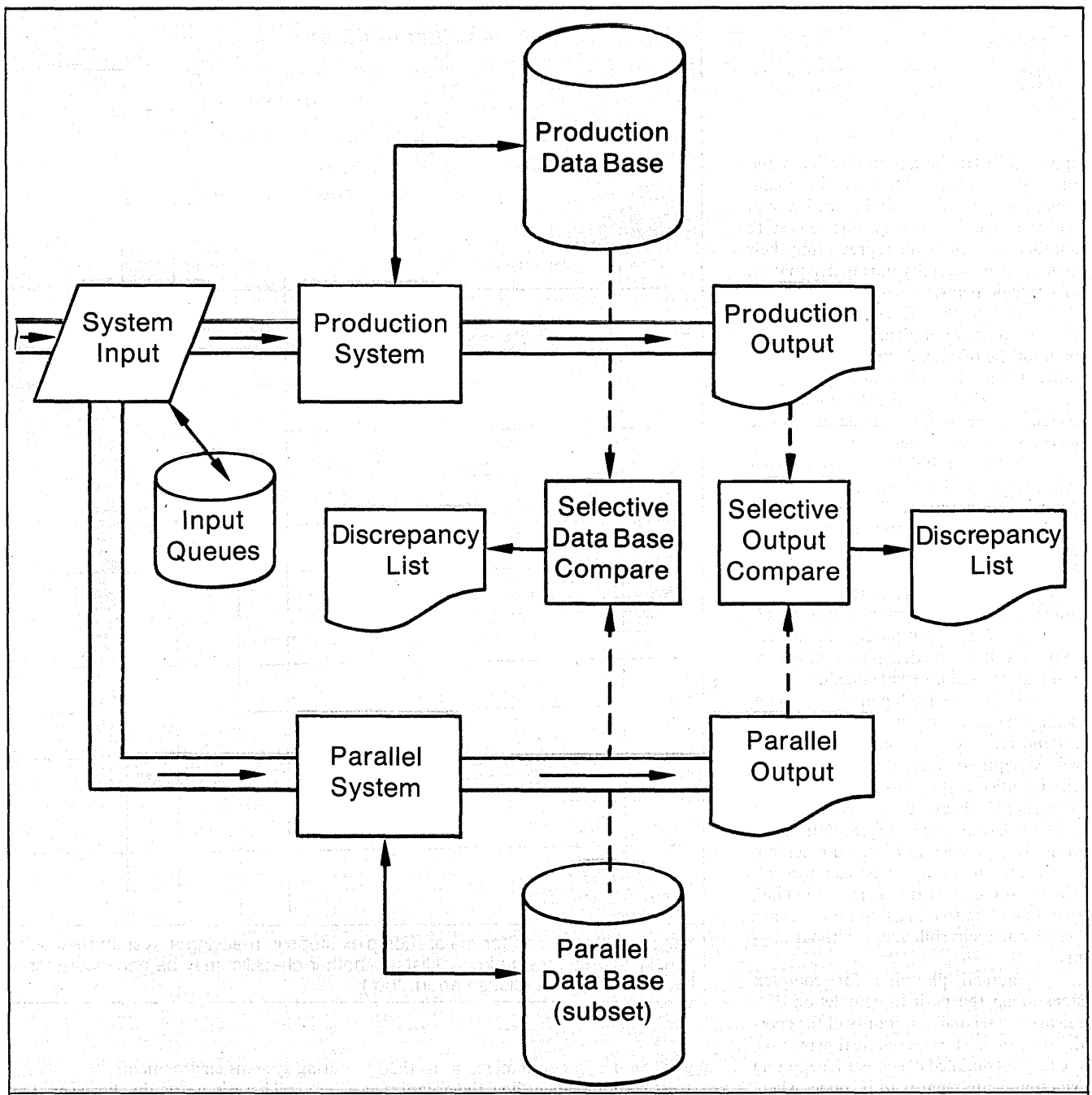


Fig. 2. Running in parallel isn't too difficult for batch systems, but on-line operation complicates the process mightily. The complications are eased by saving copies of real on-line transactions for later parallel test runs.

own areas of product responsibility.

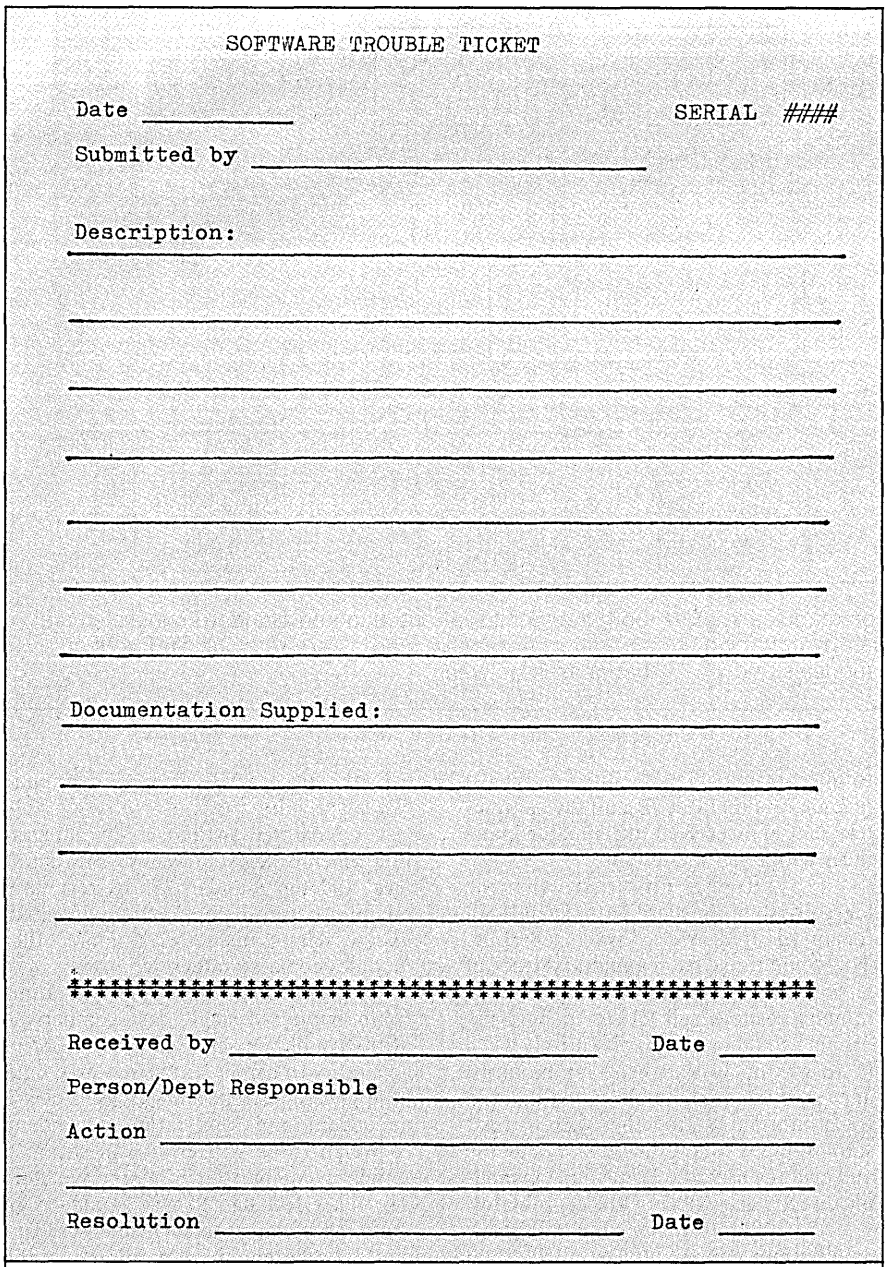
It is common for even the messiest dp shops to have achieved enough functional modularity to use SRD simply because they have divided their work into distinguishable applications such as payroll, accounts payable, etc. Of course, if a shop has adopted the practice of structured design and programming, it has undoubtedly achieved functional modularity as a result.

In any case, it is the *interfaces* between the various specialized subsystems and *integration* of the total product, not the internal details of the subsystems, with which the coordinator is most concerned during the construction of a release.

Parallel testing schemes have, in the past, received less attention than have techniques for analysis, programming and *ad hoc* debugging. Now that the high costs and unsatisfactory results of unstructured testing methods have become more widely appreciated, it may be good to examine the principal tool through which the SRD achieves its certifiable results.

During the early stages of a new release, the coordinator and the technician prepare a test system. Using a copy of the current production system as a base, they supervise the addition and modification of modules which programmers provide for the new release. The individual programmers are responsible for unit testing of modules they produce. Should that testing prove inadequate, the impact of errors is confined to the test system.

The technician uses systematically sampled production data as well as artificially generated test data to keep the test system exercised, logging all bugs and failures and reporting them to their owners for repair. When all of the changes planned for the release have been incorporated in the test system and all of the nominal tests using specially constructed data have been passed, the serious work of parallel testing can begin.



SOFTWARE TROUBLE TICKET

Date _____ SERIAL ####

Submitted by _____

Description:

Documentation Supplied:

****

Received by _____ Date _____

Person/Dept Responsible _____

Action _____

Resolution _____ Date _____

Fig. 3. Software trouble tickets are used to inform programmers of what went wrong in parallel testing. If that testing and the cut-over are well managed, the tickets won't be necessary for the production system.

The true test of the new system is whether it can handle the production data at least as well as the currently installed system does. To accomplish parallel testing, a test scaffolding consisting of transaction processing drivers, data extraction utilities, exception-tolerant data comparison programs, special purpose (selective) file update programs, and performance monitors must be developed and maintained. Once these tools have been perfected they can usually be modified to serve for each future release. Since the test tools together may grow to be a rather complex system in their own right, they should be acknowledged as part of the software which is to be tested with each release.

PROCESSING IN PARALLEL

The parallel testing scheme of the SRD (Fig. 2) can perhaps be imagined most easily if we describe it in the context of a simple batch transaction editing, file update, and reporting application. Let us suppose that the hypothetical application runs on a computer which has sufficient idle time and mass storage capacity to allow complete parallel testing. That is to say that once a new release has been put together and exercised successfully on test data, all live data can be run through both the new and the old system and the results compared.

The new system uses its own copies of all files so as not to contaminate the production data. After each parallel run, the master files (or data bases) and the reports from both systems should be identical except for the prescribed differences due to enhancements and repairs included in the new system. Rather than performing laborious manual comparison of all the results of both runs, an exception-tolerant data comparison program is used to report (in summary or in detail) each discrepancy it finds, then to resynchronize itself and continue the comparison. Manual checking of a relatively brief exception report is then all that is required to spot errors as well as to note whether the changes in the new system are working properly.

Trouble logs (Fig. 3) of all errors detected in the parallel system are used to inform programmers of what needs fixing. After a series of parallel runs which show only the intended differences, the new system can be certified as ready to replace the old one.

The first and most obvious problem with this simple parallel scheme is that it glosses over one of the primary reasons for producing the new release: adding new functions for the users. New inputs, new reports, and new kinds of records in files will usually be required. This problem can be converted into an opportunity by involving the end users of the new features in the testing process. If, with the help of the development team and the release coordinator, user representatives begin early to provide live input for the new features and check the newly produced reports, the parallel system becomes a vehicle for demonstrating not only that the programs work but also that the results are what the user ordered. What they see is what they will get, and they see it soon enough to change their mind with a minimum of damage to all parties.

At best the parallel testing scheme means that when the time comes to cut over to the new system, there is nothing to do but stop running the old. The files have already been converted and processing has been verified and approved as an integral part of the testing procedure. This "ideal world" may actually exist for many applications in small to medium sized

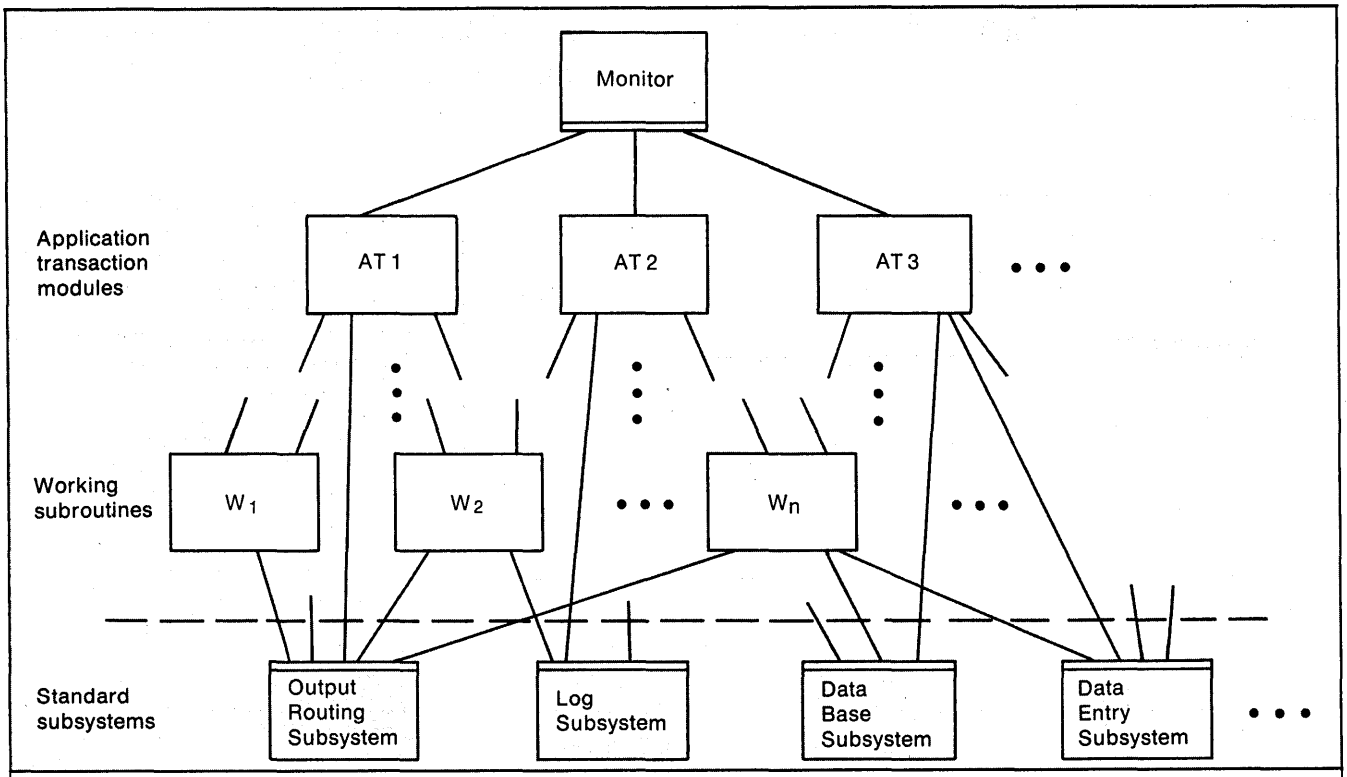


Fig. 4. Including new or changed application modules in the system is a nontrivial task. It is managed by enforcing standard interfaces between applications modules and both the monitor at one end and standard subsystems at the other. Applications areas are responsible for what happens in between.

shops. The large scale shop in which SRD was developed had other factors to consider which complicated the task of parallel testing:

Capacity limitations: There was not enough computer time or mass storage space to parallel more than 20% of the total production workload. This meant that data extraction programs had to be used to derive a representative subset of the data base for the parallel system depending upon what features were new to the release. Selective input data collection was required also.

System throughput and response time constraints: Parts of the system had to respond in a reasonable time to on-line inquiries and transactions from terminals. It was important also to keep new releases from consuming inordinate amounts of any resource. To determine the cost-effectiveness of a release before it was installed, three kinds of software probes were used.

First, the resource utilization log kept by the host operating system was analyzed to compare the cpu time, elapsed time and total I/O activity of the parallel system with those of the production system.

Second, a commercial performance monitoring package was used to find intensive or anomalous processor and I/O utilization in particular programs.

Third, and perhaps most important, a log subsystem was provided so that programmers could easily send trace data to a central logging facility. A typical module would at least log all the parameters sent and received at its major interfaces with other modules.

By setting a software switch in the log subsystem, a coordinator could call for any desired level of trace reporting. This could range from a minimal trace of all intermodule CALLs to a detailed parameter readout suitable for debugging. Tracing could be turned off entirely when there was no further need for performance analysis. It should be noted that the trace information, together with its time stamps, made total utilization by module and average execution time of each module directly accessible by the coordinator.

Module inclusion: Including new or changed modules in the parallel system without compromising its functions or the integrity of its interfaces was a nontrivial task. Insofar as any subset of related modules belonged to one technical group, responsibility for those modules and their interfaces could be localized and kept under control.

For general purpose modules which were used systemwide, however, it was necessary to define standard interfaces and to enforce upward compatibility from one release to another. In the sample transaction processing structure shown in Fig. 4, the top level Monitor and the bottom level Standard Subsystems were required to meet systemwide standards at each of their interfaces while modules between the top and the bottom were principally the concern of their respective application specialty areas.

Note that an "outside-in" integration scheme was followed. The Monitor level and the Standard Subsystem level modules had to be changed, augmented, and working satisfactorily before other modules could be integrated.

Achieving error-tolerant data comparison: No single data comparison utility could be composed with sufficient generality to handle all the required data base and report checking tasks. Release dependent and application dependent code had to be written to run within a standard comparison program skeleton. The net effect had to be to produce an error log of unexpected field discrepancies between comparable records in the production and the parallel systems. Through parameters, where possible, and hard code where necessary, detail comparisons had to ignore fields which ought to be different rather than to flag them all. Record counts and field control totals were used also to assure general correctness of processing.

On-line transaction processing: The software for which SRD was most relevant was a mixture of on-line transaction and batch processing. Coordinating these two aspects was difficult enough in production and positively frightening for testing. Parallel testing was achieved, however, using a batch monitor test scaffolding which simulated the transaction environment and an input data extraction

utility which collected copies of all required input from terminals—which had been saved in teleprocessing queues for later processing by the parallel system running in batch mode.

Synchronization of production and test runs was designed by the release coordinators over a period of months and, after being proven, was delegated as a task for the technician.

Data base management: Much of the data being processed was not resident in simple files but was rather in complex, hierarchical data bases. The ability to perform incremental updates and specialized backup and recovery made the total system more difficult and time-consuming to test. As more was learned about the proper methods of testing, however, the powerful built-in facilities of the data base manager became alternative tools for selective data extraction and exception detection which made parallel checking easier.

The software subjected to parallel testing involved the cooperation of as many as 15 separate areas of responsibility, of which as many as 10 were operating system software.

In particular, besides a half dozen different application projects in a release, each standard subsystem such as data entry, data base, output routing, or logging might be changing. Nonprogramming areas that had to be included in release planning were systems analysis, computer operations, teleprocessing operations, education (documentation had to be delivered with the release installation), field service, marketing, and customer service. Where intelligent terminals had been installed, coordination of central site changes and distributed processing changes had to be effected.

The orchestration of all this activity was the job of the release coordinator. That job was possible only so long as everyone was reading from the same score: the planning documents for the release.

With this point we have come full circle from management issues through technological approaches and back to management, for it was the planning attitudes and release coordinator competence that made it possible to choose nonconflicting features to include in a release while being sure that, over a period of several releases, all known needs would be served.

The technology of parallel testing, then, can be seen to work, but certainly not without some development in its own right. At least one release under the SRD was dedicated primarily to installation of support for test tools. In the course of its evolution, the software products were altered to be more testable while at the same time the test tools adapted to become easier to use.

THE COST OF THE CURE

There is no formula for a successful System Release Discipline that will fit every dp shop. That is why motivated people are the most important ingredients in making SRD work; they have to plan for themselves the details of a working SRD if they want one. Quality software *can* be produced year after year with SRD, but a few cautions are in order:

- It takes from 6 to 18 months from the time an SRD policy is chosen before its benefits are consistently more important than its supposed burdens. (Of course, it is possible to foul it up so badly that it never works.) The payoff lag indicated above is typical for a conscientious shop.
- Vendors who supply hardware and software to the shop must abide by the rules of the SRD under the supervision of the installation's personnel. Since an SRD is undermined by every exception to its protocols, the integrity of the whole system depends upon the cooperation of all stakeholders.

Sometimes vendors are not too happy about having to abandon sloppy habits but they can reform if necessary to keep the business. It is essential that "product temporary fixes" and engineering changes be pretested and applied under the same rigorous standards that the installation's own work must meet.

- Installations having high reliability and availability requirements should schedule no more than four releases per year; two per year is probably more sensible. Remember that there is no incremental patchwork on the production system between releases except to repair critical and uncircumventable bugs. Any manager who cannot stand the pressure to have "little improvements" pasted onto the current release without going through the complete testing cycle should avoid SRD.
- Computer time, memory space, and mass storage capacity to handle the parallel testing load comfortably can be expected to be at least 20% above the resource requirements for normal production and testing. If that sounds too expensive, remember that a good SRD deploys resources systematically to produce measurably better results. As hardware costs become less burdensome than software costs, economics favors extra hardware for SRD support.
- SRD effectively integrates the development and maintenance of software, thus eliminating artificial distinctions between the two. The conventional "development cycle" which meanders from systems analysis to maintenance is obsoleted by a continuous, coordinated evolution. Users are involved every step of the way. There can be political consequences of changes like these, such as removal of old communication barriers, debunking of false status symbols, proof of competence, etc., so not every organization can tolerate SRD.
- People will grow tremendously. Analysts and programmers who have responsibility for subsystem "products" will learn to practice mini-management of their own realms. The quality of their work will be visible to all their peers who are concerned with the same release.

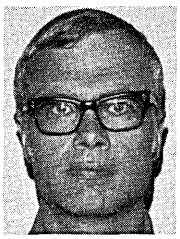
Dp technicians will develop their talents quickly.

Release coordinators will tend to advance most rapidly because they have to prove themselves under a lot of pressure. When they have done a release or two, they will be managers in fact if not in title. Those people whose abilities or preferences are not suited to the life of a manager on the firing line will have plenty of opportunity to find their own niches in other parts of the SRD team.

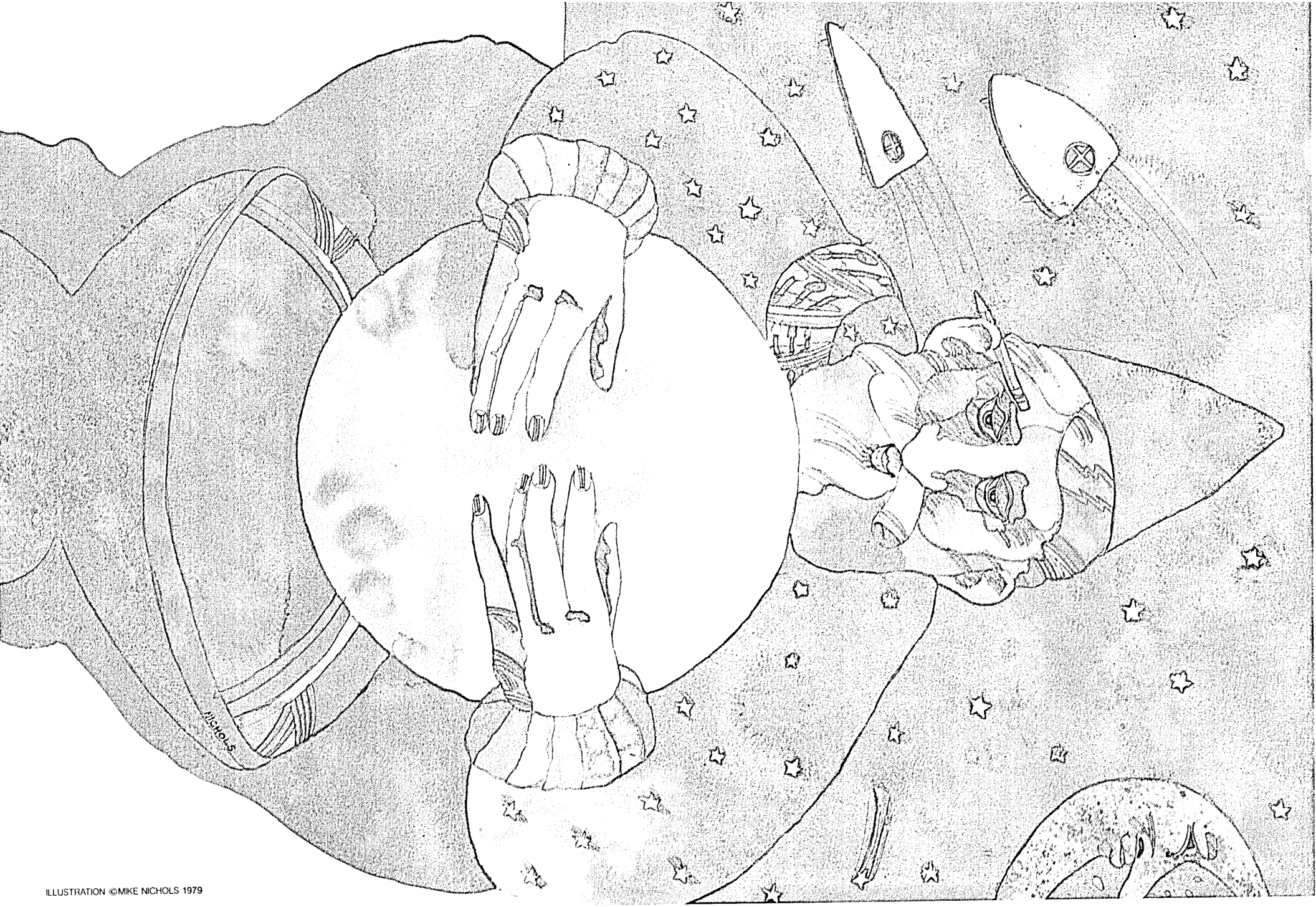
There will be a continual need to train new coordinators and technicians as their predecessors move on to new responsibilities. Everyone has a chance to grow. What will an organization do with all those powerful folks?

There has been a lot of idle talk in the data processing world about improving the quality of our work and of our working life. We have tried technological panaceas and been disappointed. We have turned to technical gurus and suffered disasters. If you have the patience and the courage to try your own version of the System Release Discipline instead of relying on miracles or miracle workers, and if you have the ability to meet the challenges it poses, then it will surely serve you well. ✱

D. H. MC NEIL



Mr. McNeil is an independent consultant in the Philadelphia area. He has worked as a programmer, analyst, system designer, and instructor in IBM's General Systems Div., and as a technical advisor for Shared Medical Systems, where he developed much of the concept of a System Release Discipline.



The more detailed the specification, the greater the chance for rewrite.

HOW SOFTWARE PROJECTS ARE REALLY MANAGED

by John H. Lehman

Software engineering was introduced in the 1970s to apply the stronger disciplines of engineering (in contrast to the "art" of computer programming) to the design of computer software. This was done in an attempt to solve the problem of, or at least reduce the severity of, software development failures.

Similar advances have not been heralded in the area of software engineering project management, however. Does this mean that the old procedures still apply? Or have management techniques somehow kept pace? Just what are the trends in managing software development today?

To get some kind of answer to these questions, we approached the members of the American Inst. of Aeronautics and Astronautics (AIAA) Technical Committee on Computer Systems. We asked if they, as representatives of major firms in the aerospace industry, would be willing to participate in a survey. They were interested, and what follows is a compilation of how those aerospace firms manage software projects.

The members' eventual response has been excellent, although it has taken nearly two years to come in. They have provided information on 57 software projects, all but two of which, to the best of our knowledge, now have reached completion.

A look at the survey form would provide the answer to why it has taken so long for many people to respond. The questionnaire—all 72 pages of it—contained 229 numbered questions, to which 1,328 responses were possible. Gathering the data was no little project in itself.

What is surprising then is not how long it has taken many to respond, but that so many have responded at all, and have obviously devoted a considerable amount of time and effort in providing complete and candid answers. Their cooperation attests to the industry's high degree of interest in the subject.

Of the companies participating, 22 are engaged primarily in manufacturing, two are software houses, four provide engineering services and technical support as well as software development, one is a pure R&D nonprofit organization, and one a utility. In addition to private firms, eight government agencies associated with aerospace contributed.

The participants are *not* representative of the dp user community at large. Their revenues ranged from between $1 and $10 million per year (two responses) to over $3 billion (one response), with an approximate mean of $425 million. And with the exception of the software houses, only a small portion of those revenues was derived from software development, usually less than 10%.

The smallest involvement in software was a 20-person staff; the largest, 8,500. The average number of persons involved in software development per firm was 628, but the government agencies unbalanced this figure greatly; with government agencies excluded, the average dropped to "only" 392 persons.

Thus the survey participants are very large organizations. They are also the ones we would have expected to employ the most highly developed software project management techniques.

As for the projects themselves, Table 1 provides a breakdown by application or function. A total of 57 projects are represented, but 21 of them spanned several areas.

The Projects Covered

Application/Function	Frequency
Commercial/business	4
Data acquisition/retrieval	10
Scientific/data reduction	11
Simulation/modeling	9
Process control/embedded cpu's	17
Command and control systems	24
Management information systems	1
Communication systems	8
Operating systems software	15

About two-thirds of these projects involved totally new software development. The remaining third were either the continuation of a previously completed system, a major modification, or both.

As would be expected for aerospace, the large majority (74%) of the projects were for government contracts. The others were for other contractors, foreign governments, and for one educational institution. The software projects themselves were large, ranging from a contract amount of $30,000 to one of $159 million. The products ranged in size from 4,000 to 1,200,000 lines of code.

The languages most used (by a wide margin) were Assembler and FORTRAN. JOVIAL was used on four projects, COBOL on three, and PL/1 on one.

MODERN PROGRAMMING PRACTICES

Practice	Used
Reviews (Black, 1977)	81%
Program manager authority (Black, 1977)	75%
Configuration management	75%
Phase testing (Black, 1977)	69%
Program modularity (Black, 1977)	67%
Naming conventions (Black, 1977)	56%
Structured design (Yourdon, 1975)	44%
Structured walk-throughs (Weinberg, 1971)	40%
Support library and facilities (Black, 1977)	40%
Chief programmer teams (Baker, 1972)	38%
Design discipline and verification (Black, 1977)	38%
Unit development folder (Ingrassia, 1976)	26%
Structured analysis (Yourdon, 1975)	17%
Structured form (Dijkstra, 1969)	17%
HIPO'S (IBM, 1975)	12%

Table 1.

Those who used crystal balls in forecasting fared no worse than the others.

A vast amount of information was solicited. Generally speaking, it fell into seven major categories: how systems were specified, planning, staffing the organization, who is the project manager, software development techniques, project control, and results achieved.

THE SPECIFICATIONS Had we been searching for someone with a perfect set of requirement specifications, we would have come away disappointed, though two cases did come close. As a general rule, the larger the system, the more detailed the specifications. But the more detailed the specification, the greater the requirement for rewrite prior to design. We asked the question: "On a scale of 1 to 7, with 1 being little more than the name of the system and 7 being complete specifications down through preliminary design, how detailed were the specifications provided?"

Combining ratings and matching them with project costs and requirements for rewriting specifications, we came up with the following data:

Specification Detail vs. Percent Rewrite

Detail level	System cost	% Rewrite
1 & 2	$ 831,000	15%
3, 4, & 5	$ 7,544,000	27%
6 & 7	$22,823,000	37%

Of the specifications prepared in-house by the project manager's own organization, an average 26% rewrite was required, whereas a 34% rewrite was called for when the user provided the specification. The customer or a customer affiliate prepared the initial specs in about 40% of the cases, the development organization did in 55%, and consultants or a third-party in the remaining 5%.

The reasons for rewriting specifications fell into three categories: (1) errors, ambiguities, inconsistencies—40%; (2) changes—38%; and (3) from a better understanding of the project—22%.

There appears to be a slight relationship between who developed the specification and the overall success of the project, with specifications prepared by the software developer having the edge. However, in only one of the four outright failures reported were the specifications produced by the user.

One of the major areas of customer concern in specifications was the documentation. A relationship was found between system size and the number of document types required. While the largest systems ($20 million or more) called for over nine document types, the "smallest" (less than $1 million) called for only six.

Documents Required

Type	Used
Source listing/deck/tape	89%
Object listing/deck/tape	77%
Functional description	77%
Program specifications	71%
Users' manual	71%
Test & implementation plan	71%
System/subsystem spec	70%
Operations manual	57%
Test analysis report	55%
Data requirements document	50%
Data base specification	48%
Program maintenance manual	39%
Software development plan	11%
One of a kind documents	18%

PLANNING Of the time available to the project manager and his staff, approximately 12½% was spent on planning and replanning. In most cases, the project manager was brought on board shortly after project inception and participated in the original planning activities. Here's how planning time was usually spent:

Allocation of Planning Time

Planning Function	Time
Developing an overall project management plan	22%
Developing control procedures	19%
Staff planning	18%
Organizational planning	16%
Quality assurance planning	12%
Administrative planning	8%
Other	5%
	100%

In 11% of the projects reporting, the firm provided the manager with a formal planning guide. In 36% of the projects he was assisted in planning activities by the customer. Though two small projects reported producing *no* planning documents at all, the range and number of plans developed by the remainder is impressive, averaging over six documents per project:

Planning Documents Prepared

Type	Used
Software development	75%
Test	66%
Change control	64%
Documentation	61%
Organization	57%
Staffing	54%
Project management	50%
Resource requirements	48%
Review and reporting	48%
Phase and/or delivery	43%
Implementation	38%
Training	23%
Data conversion	9%
Other	7%
None	4%

There are various stages into which a software development project may be divided. Our question asked: "Which of these were recognized as separate and distinct phases?" The responses indicate that dividing projects into phases is one of the major methods the manager employs in "getting a handle" on the total effort:

Software Development Phases

Phase	Used
System definition	72%
Requirements definition	85%
System design	91%
Module design	79%
Coding	94%
Module test	81%
Subsystem integration	74%
System integration	89%
System test	94%
Operation	66%

Cost estimation, as everyone has suspected for some time, is far from a science. Here are the methods employed and the percentage of projects on which they were used:

Methods of Estimating Cost & Schedules

Method	Used
Estimates based on a similar project	70%
Formula	38%
Cost and schedule dictated	21%
Provided by someone who has a knack for estimating correctly	14%
Crystal ball (or similar means)	11%
Bottom-up aggregating	4%
Simulation techniques	2%
Other	5%

Though the data is admittedly skimpy and the precise techniques involved in using crystal balls or Ouija boards in forecasting were not provided by the practitioners, those using oddball methods seemed to fare no worse than their more conventional colleagues, sharing the thrill of success and the agony of defeat in similar proportions. Nor were all the mystics involved in small projects, for three of the top six estimates were derived by this method, and whereas one is not yet completed the other two finished on time

and only one experienced a small (relative to total expenditure) cost overrun.

STAFFING A number of organizational variations were used. The overwhelming choice was some form of *project*-related organization, with only two firms holding out for a functional approach. A matrix organization, in which the members were assigned to the project manager for the duration of the task, accounted for roughly three of every five cases.

In about half the projects, software development was handled within the dp environment with functional analysts or prospective users being assigned to or attached to the development team within dp. In 14% of the projects the reverse was true, and in just over 33% of the projects the functional user employed analysts who presented system specs to the development team.

And the team concept is much in use. Over 94% of the projects were handled by teams under the direction of technical leaders of some sort, with an average of five such teams per project. The technical leaders, in turn, usually reported to the project leader. The kinds of teams usually mentioned are:

Project Teams

Type	Used
Programmer/analyst teams	75%
Analyst teams	20%
Programmer teams	18%
Test/acceptance teams	40%
Integration teams	36%
Interface teams	13%

Fully 94% of the team members were company employees, with new hires and consultants making up the other 6%. Interestingly, about 19% of the projects reported some union membership among the project personnel; however, union membership had no recognizable affect on the outcome.

Some of the motivators uncovered for encouraging schedule compliance were unexpected—at least the frequency with which they were used was a surprise. Incentive pay for early or on-time completion was given by 30% of the firms. Key personnel were usually the recipients, but two firms reported rewarding all persons involved. (In one instance, bonuses or incentives were paid only if the development was under a fixed price contract.)

Seven firms had employed procedures in which programmers or analysts bid on specific tasks within projects. Four firms reported these procedures to be "very successful," two said "moderately successful," and one had had no success at all. One manager candidly reported that bidding was very successful on some programs, but lost its effectiveness if management reduced the time bid.

Now what happens if schedules—whether dictated, agreed to, or suggested by team members—are missed? And is personnel turnover caused *by*, or the cause *of*, such slippages? We compared personnel turnover rates for projects coming in on time versus those experiencing late deliveries. In doing that comparison for our sample, we found that one very large project had a uniform 200% turnover in each position; this so badly unbalanced the other data that the tabulation below was developed with this project removed.

Yes, the turnover on 22 late delivery projects was greater than average, but it did not represent the wholesale movement which might have been expected:

Personnel Turnover

Position	Average	Late Projects
Project manager	68%	90%
Functional analyst	60%	97%
Dp analyst	20%	28%
Programmer	38%	53%
Support librarian	32%	37%
Secretary	63%	79%
Administration	33%	40%
User representative	32%	39%
Other	9%	0%

PROJECT MANAGER In about 9 out of 10 cases the project managers, too, were selected from in-house personnel, with about half coming from another software development project. More often than not, appointment to the top project position was made by a senior manager or corporate officer who was *not* in the dp line of authority.

The typical manager had 10 year's experience in dp, 7.7 in the field of the project.

Only 6% had not achieved at least a low level of proficiency in programming language. The majority had various levels of proficiency in assembly language (82%!), FORTRAN (78%), COBOL (35%), JOVIAL (24%), CMS2 (8%), and PL/1 (8%). (On the other hand, only 15% admitted to ever having been chief programmers.)

They had an extremely high level of formal education. Degrees were primarily in engineering and math, but there were four physicists, three business majors, two computer scientists, and two from the liberal arts.

Still, in all but one case it was necessary for the project manager to get additional training either prior to, or early in the development cycle:

Extra Project Manager Training

Field	Managers
Project management	58%
Project field	53%
General management	47%
General dp	44%
Modern programming techniques	30%
A programming language	28%
Other	7%

The managers' responsibilities were primarily technical. Their authority was often circumscribed when it came to hiring and firing, although this is not particularly surprising. We failed to determine if the managers had prerogatives in selecting (in or out) present employees of the firm, but it is logical to assume that they did to some extent.

Project Manager's Responsibilities

Responsibilities	%
Technical quality	96%
Hire and fire assigned personnel (within firm's policy)	40%
Evaluate performance of individual personnel	81%
Administration, budget, etc.	73%
Allocating computer resources	75%
Allocating noncomputer resources	69%
Meeting schedule commitments	98%
Negotiating specification changes with customer	87%
Making a profit (operating within budget)	44%

The matrix organization, the most prevalent form in the projects reporting, undoubtedly contributed greatly to the next statistics. In that organizational form, the line of authority generally extends directly to the line or staff manager providing the resource.

Project Manager's Authority (A Composite Picture)

Persons' reporting	%
Full-time, report to project manager	41%
Full-time, report outside project manager's organization	35%
Full-time, outside contractor/ consultant	20%
Full-time, report to customer	1%
Part-time, report to project manager	1%

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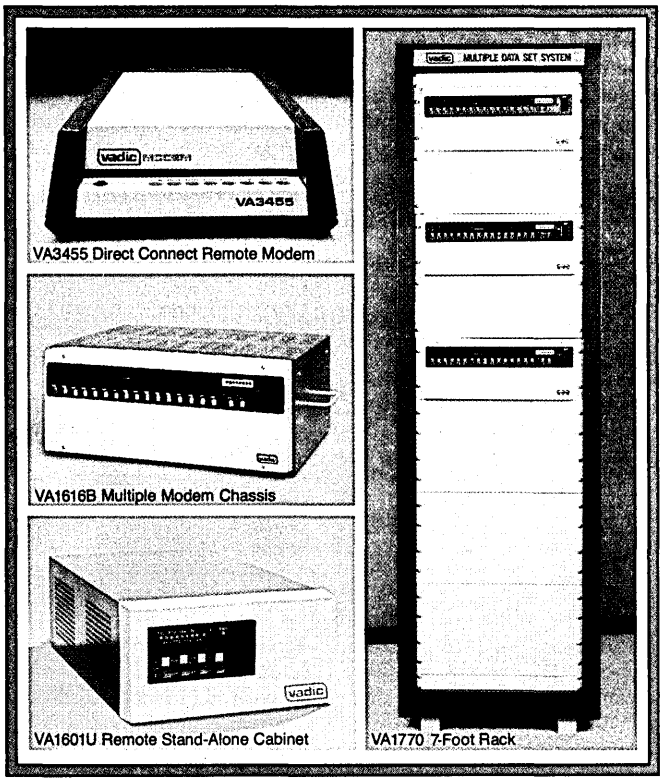

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GENERAL ELECTRIC

CIRCLE 30 ON READER CARD

The turnover on late projects was greater than agerage, but not much.

Part-time, report outside project manager's organization	2%
	100%

SOFTWARE DEVELOPMENT TECHNIQUES About two-thirds of the firms are using two or more of the modern programming practices (MPP), although only about half that number have made a substantial commitment to using them. How closely the execution of these techniques follows the procedures outlined in the references we used in formulating the survey questions is not clear, however. As an example, firms indicated that they had employed some of these methods as early as 1950 or 1960, and one firm had "always" used top-down design.

The extent to which MPP's were used on individual projects exceeds the usage reported by companies as a whole. This probably reflects our request that projects employing these techniques be selected for the survey. The "newness" of these practices prompted us to include a reference in Table 1 to assure a common understanding.

Every project reporting in this area employed some of the techniques. Their use does not seem to be accelerating, on the other hand, as we might have expected. Projects starting in 1968—or any other year—showed about the same number of MPP's per project as those begun in 1977, usually ranging between six and seven techniques per project.

Although the sample is small, these results do bring into question either the modernity of the current programmer productivity techniques referenced in this survey, or the actual application in their purest form as described by their developers, biographers, or proponents. Stated another way, are project managers doing substantially what they've always done but under a new name? HIPO's are, of course, a unique and easily identifiable art form, but then again, their reported use was not very great, reaching its zenith (according to our limited data) in 1974.

The software development tools/aids mentioned were:

Development Tools/Aids

Type	Used
On-line debugging	59%
On-line capabilities	55%
Macro programming	41%
Automatic flowcharters	27%
Library monitors	25%
Test case generators	20%
Structured precompilers	14%
No tools/aids employed	9%

The test tools/techniques/methods used are shown below. (For definition of terms see Hartwick, 1977.)

Test Tools/Techniques

Type	Used
Flowcharting	66%
Timing analysis	64%
Arithmetic tests	58%
Branch logic tests	46%
Editors	36%
Initialization tests	36%
Interaction tests	36%
Comparators	18%
Program structure analyzers	14%
Symbolic program executions	8%
Correctness proofs	6%

Design walk-throughs were used on 42% of the projects, code walk-throughs on 38%. One or the other, or both, were used on 58% of all projects. Equally interesting is who attended which kind of walk-through:

Walk-throughs

Attendance	Design	Coding
Programmer or analyst peers	41%	39%
Programmer or analyst trainees	16%	16%
Programmer or analyst supervisors	35%	22%
Project manager	31%	8%
Standards monitor	10%	6%
Top level manager	6%	0%
User or customer	16%	4%

Minutes were kept in about 35% of the design walk-throughs, 17% of the coding reviews.

PROJECT CONTROL The process of controlling a software engineering project may well be the most talked about and least understood of all the project managers' functions. Many projects have failed because of the managers' inability to adequately define where the project was in the development cycle. Other development efforts have been canceled not for inadequate programming, nor for lack of technology, but from the sheer frustration of all concerned in attempting to determine when, if ever, they would be completed.

Surprisingly, especially in light of that history, 17% of the projects had no project control mechanism. And more surprising yet, that group fared better than average relative to on-time delivery (although they did encompass two of the three 100% overruns reported).

The control of a software engineering project may be the most talked about and least understood of the manager's functions.

More than half the firms reporting use some form of automated project management system, but the size of the software development activity appeared to have no bearing on whether one is used; four of the ten largest firms report having no such capability.

Project Planning and Control

System	Planning	Control
Milestone tracking	4%	72%
Work breakdown structure code	0%	62%
Workloading charts	63%	37%
Gantt charts	41%	33%
Modified PERT	31%	28%
PERT	8%	9%
Other	10%	9%
No systems used	4%	17%

The three most frequently used manually prepared reports and the percentage of projects using them were: weekly activity (83%), project status (88%), and significant change (50%).

A number of managers reported using an automated system to monitor the development effort. In 39% of the projects this system was used to accumulate and display data such as manhours by activity, where an activity was defined as a part of a task: flow diagramming, coding, etc. A task-oriented system was used by 33% of the projects. Beyond that, system software was used to check individual programs, the most common capabilities being:

Use of System Software

Function	Use
Checking for standard data element names	19%
Checking for adherence to coding conventions	17%
Counting lines of code	13%
Counting compiles per module	11%

Usually some kind of management review meeting was used to keep track of things. In only two cases were no formal reviews held. Generally, between three and five were held over the life of the project. There were no surprises: the more costly the project, the more reviews. Here are the more common kinds of formal reviews:

Formal Reviews

Type	Used
Systems requirement review	58%
Systems design review	68%
Preliminary design review	83%
Critical design review	81%
Formal qualification review	45%
Other reviews	6%
No formal reviews	4%

Informal reviews between the manager and his supervisor were also common. In fact, 96% of the project managers engaged in these with some regularity:

Informal Reviews

Frequency	Used
Daily	12%
Weekly	45%
Monthly	10%
As required	43%
No informal reviews	4%

Finally, applying quality assurance measures was probably a major activity for every project, but the procedures were not as formal as might be expected. About one-third of all the projects employed no formally documented standards unique to those projects, just under half used any companywide standards, and a quarter used no formally documented standards at all. The size of the project and its expense seemed to make little difference.

SUCCESSES AND OTHERS

The measure of success can be an arbitrary or subjective thing, and so it was with our survey. There are, of course, degrees of success, and one man's success may well be another man's failure. We asked, "Overall, how well do you think that this project met the project manager's major goals: to deliver on time, within budget, meeting the requirements of the system, where the final software product is reliable, maintainable, and usable?" We received these replies:

Project Outcome

Goal Attainment	%
Extremely well	29%
Very well	34%
Good	17%
Fair	6%
Poor	6%
Failed	8%
	100%

Though not every project was complete, they had all reached that state of "doneness" where the managers felt confident enough to provide an on-time or months-late input. Some 54% of the projects had been, or were forecast to be, completed on time. The remaining 46% had completion delays ranging from 1 to 24 months with just under a 7-month average delay, representing a mean 33%. One on-time and one late project also had their original specifications pared down while one late project was canceled when somewhere between 51% and 75% complete. Cost overruns were more prevalent than late deliveries, with 59% of the projects costing more than originally estimated, 4% costing less, and 37% hitting it on the nose. And two of the 24 late projects still managed to come in within the original budget.

The major causes of project slippage and cost overruns in order of importance were given as: bad or unreasonable initial estimate, change in requirements, and limited authority over resources.

One-third of the firms reported using some form of productivity index. (One company used five of them.) Of those used, only "lines of code" (21%) and "number of compilable units" (11%) were used by more than one firm. The other indexes included such things as program errors, computer time used, pages of documentation, and table sizes.

The average production rate in lines of code per day was 17—with two firms admitting that their worst programmers actually produced negative numbers for their productivity!

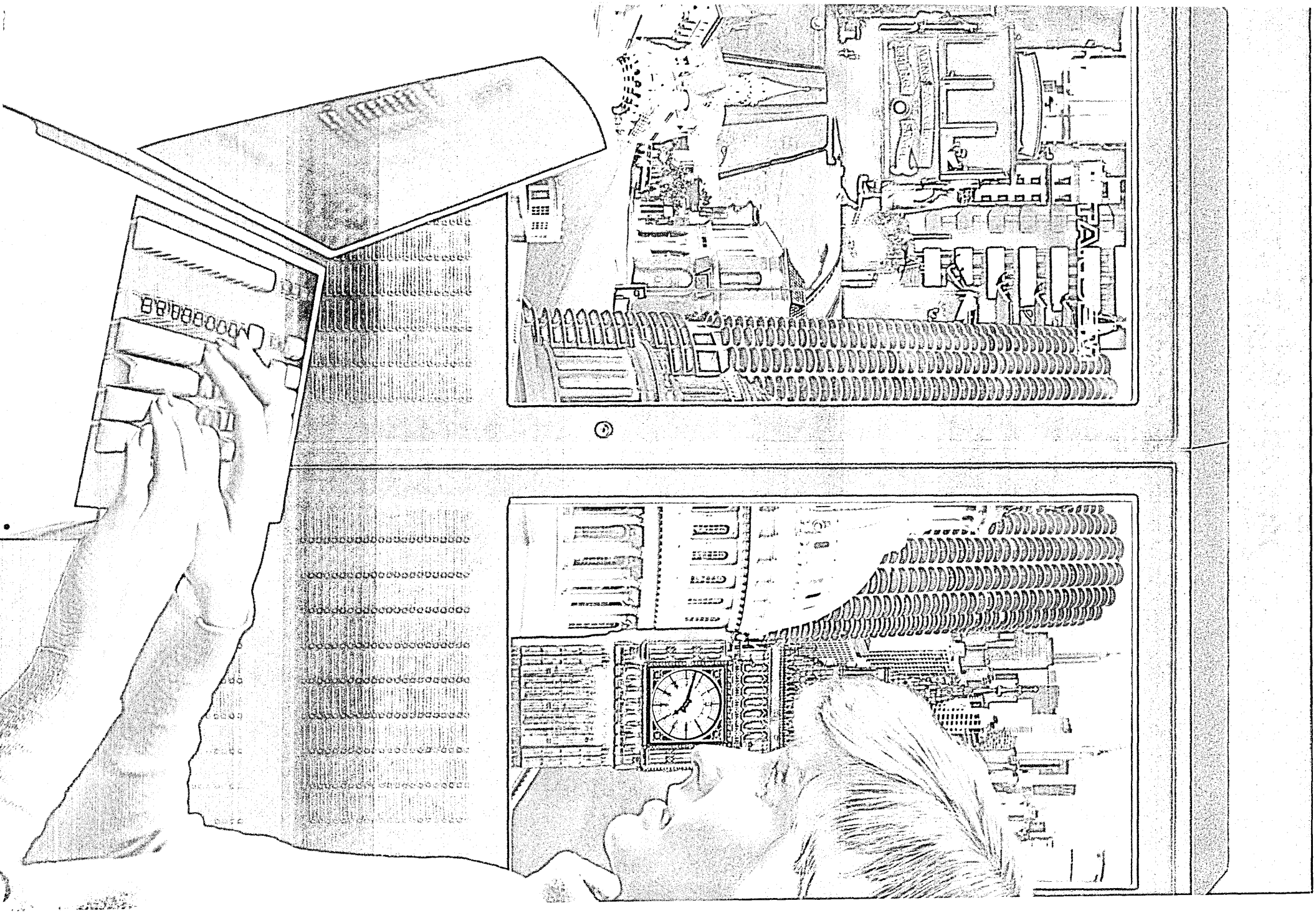
Cost per line of code is a mandatory data processing survey question, so of course it was included. Costs varied from a low of $5 to a high of $330, with an average of $49.11. Of course it is a meaningless statistic given this way, but it fills the square.

Most of the firms (81%) use online interactive programming and all but one of those (which had just begun to use it) reported improvements in programmer productivity. The degree of improvement ranged from 1.2 to 1 (three responses) up to 5 to 1 (one response); a 2 to 1 improvement was the mean. The effectiveness of interactive programming was judged highest for debugging, closely followed by new code development.

Only rarely were attempts made to establish measurable standards of reliability and maintainability, so as as a general rule these requirements were considered met when the systems produced the desired outputs. Nine projects provided *warranties* ranging in duration from one year (six projects) through three to five years (one project). In one instance an implied warranty existed as long as the firm doing the development work was in the employ of the user.

As a final question we asked: What percent of production time was spent in specific areas of the development cycle? The replies were:

At last, there is one distributed processing network which lets all of its users, whether they are in New York, San Francisco, London, Zurich or East Mule's Tooth, Missouri look at the entire data base exactly as if it were located in its entirety in New York, or San Francisco, or London, or Zurich, or East Mule's Tooth.



GUARDIAN/EXPAND
The Tandem NonStop™ Network Operating System

The differences are enormous. The system is entirely transparent.

It began with the Tandem NonStop System. First of its kind. The one multiple processor system in the world capable of continuous operation—even during the failure of a processor I/O channel, disc controller or disc. Without loss or duplication of any transaction, even those in process. And with maximum protection for the data base—at a level unprecedented in the industry. Plus phenomenal flexibility: expandable in low cost increments from a basic two processor system all the way to sixteen processors with the ability to support thousands of terminals per system. File capacity of up to four billion bytes per file, and no limit on the number of files. Extraordinary it is, all by itself, and now as many as 255 Tandem NonStop Systems can be economically interconnected in a powerful, complete and amazingly simplified network. Read on.

Announcing the 4000 processor network.

Here's how to tie together 4000 processors: Easy. Interconnected in the most beautifully simple way. Per the diagram. Point-to-point connections can be made between all centers of overlapping activities, but are not required. We can in fact tie the network together with a single continuous line. And there is no user involvement for pass-through. To get from "A" to "F," no user housekeeping penalties from "B," "C," "D," & "E."

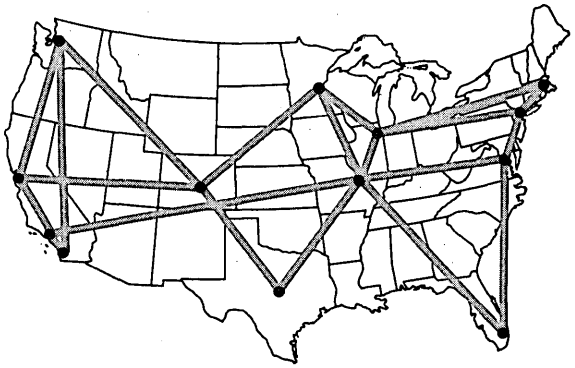
It looks exactly as if all messages were being transmitted only next door. And X25 protocol is available as well.

Introducing the distributed/ centralized data base.

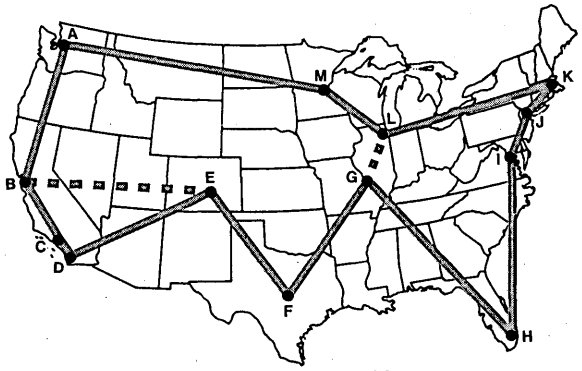
Totally transparent. With a split of geography completely invisible to the user. Not the separate interconnected data bases found in other networks but a unified data base completely and transparently accessible throughout the network. No user, and no application program, has or requires any awareness whatsoever as to the actual location of any segment of the data base in the Tandem network. With a Tandem NonStop Computer System, your data may be in Ypsilanti, but it looks for all the world like it's residing right in your own local system.

To get rid of a host of problems, get rid of the host.

Having a host system in a network is traditional. Unfortunately, it is also the traditional point of concentrated difficulties. For when the host goes down, so does the whole network. And even if the host is only suffering an intermittent difficulty, the integrity of the data base is up for grabs, not only in the host, but throughout the remote data bases as well. With Tandem's GUARDIAN/EXPAND Network, a local failure has no impact whatsoever on the rest of the



Conventional fixed network is difficult and expensive to expand and modify as needs grow. And they always do. Communication and utilization of data base records from twice removed nodes is prohibitively expensive in applications programming, so more lines are the only viable solution. And that is expensive, too.



Tandem pass-through packet switching enables "A" to communicate with "E" at no penalty in system overhead. And you can add direct lines, per "B" to "E" or "L" to "G" whenever traffic warrants without disrupting system performance or efficiency. Note that nodes can be of variable sizes, all using Tandem NonStop Systems as the common element. Efficient, powerful and extremely low cost.

system, and best-route switching automatically circumvents the trouble spot. If there is a failure in the communication link, the system will automatically go around it. The system and the network stay up and running, and best of all—the data is intact, its integrity assured.

A unique and unified operating system—free of geographic limits.

Whereas most network operating systems are created "on top" of prior operating systems, at significant penalty, Tandem's Guardian Operating System was created from day one for the multiple processor environment. It treats *all* resources within the system as files, both hardware and software, and accordingly achieves complete geographic independence, both for the user and for the user's programs. This is beautiful at any time, and it is a lifesaver when increased work loads call for an expanded system, more processors and peripherals, and perhaps a new configuration of resources. This is unique: no reprogramming is required, not even recompilation.

The long and the short of it—keeping costs down and performance up.

No one can do that like Tandem. For the differing needs at each node can be met by the expandable Tandem NonStop System in varying configurations. Single system programming works over the entire network and will continue to work regardless of growth and complexity of the system. And because this is after all a mini-based system, the costs are low to begin with and add-ons come in low-cost increments. Without one cent of penalty on the original investment.

Comprehensive software—transparent and segmented.

Under the overall supervision of GUARDIAN/EXPAND, the Network Operating System, each individual system maintains its own Guardian Operating System plus all of the multiple processor and control communications systems and a host of applications languages including industry standard ANSI '78 FORTRAN and ANSI '74 COBOL. With T/TAL, EDITOR, SORT/MERGE, DEBUG, TGAL, ENFORM Query/Report Writer, and complete remote diagnostic capabilities, the software package of the Tandem NonStop Operating Network is truly impressive. Best of all, it never requires one iota of modification as systems, nodes and the entire network expand and are modified to suit changing requirements. And any Tandem GUARDIAN/EXPAND node can communicate with IBM or any other mainframe using industry standard protocols. We've made it possible and practical to go from any industry standard system to a low cost, comprehensive and flexible network without sacrificing your original installation.

If you're from Missouri, too.

Call or write for complete information about the Tandem NonStop Operating Network. We'll be happy to demonstrate both how and why this system will cost you less to begin with, less to expand, and less to operate than any other network on the market today. And most likely for years to come.

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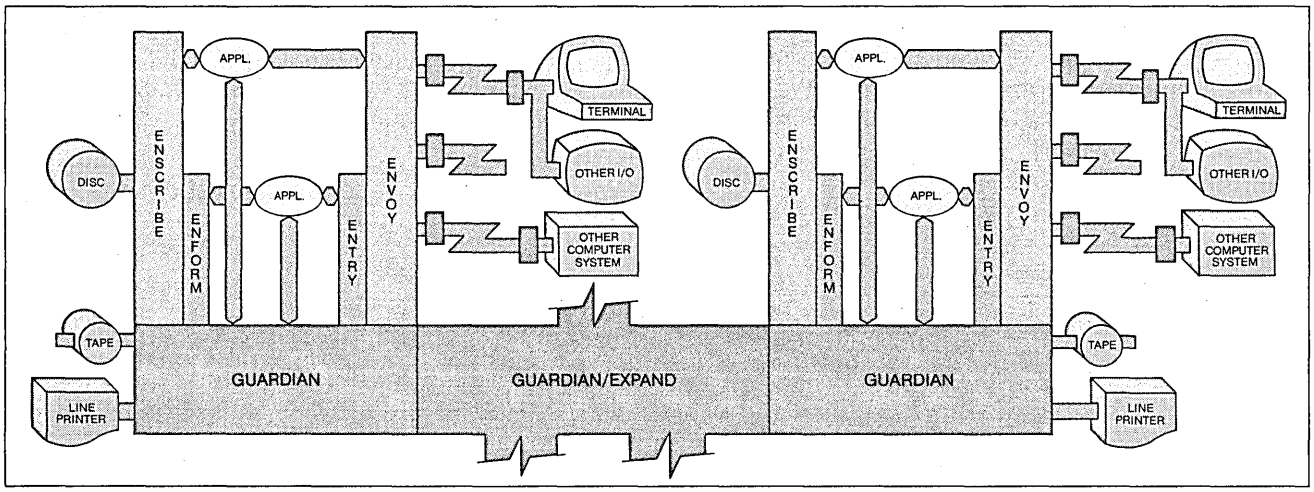

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TANDEM

Virtually every comment expressed the need for a closer relationship between user and analyst.

Production Time

Activity	Time
Requirement specification	12%
Preliminary design	12%
Detail design	20%
Programming/unit testing	23%
Integration	18%
System testing	15%
	100%

FINDING A BETTER WAY

At the end of each section of the questionnaire we asked the participants for an opinion on what could or should be done to improve the state of the art in software engineering project management. What follows is a selection of commentaries.

The proper preparation of requirement specifications was of major concern to most of the project managers. The answers given reflected the complaint that specifications are all too frequently incomplete, ambiguous, inconsistent, and plagued with seemingly arbitrary changes. In regard to this, one large manufacturer's comment was, "Make sure it (the requirement specification) is a joint commitment and effort by customers and developer." Another software development manager stated, "If possible, the system definition should be firmed up earlier and held so that changes after the start of software development are only minor adjustments rather than redirection of the effort."

In fact, virtually every comment stressed the need to establish a closer relationship between the system user and functional analyst. No requirement specification was written in a requirement specification language. However, one participant believes that the form of the requirement specification is "... relatively unimportant, unless the customer wants to impose a design. Otherwise, any readable statement of the requirement will do, as long as it is clear and complete."

We received more comments on planning than on any other management function. Many of these comments were similar to this one: "Devote more effort to planning. Involve programmers/analysts to a greater degree. Require full documentation of plan. Continue to review plan as development proceeds." Another project manager's approach was to "emphasize involvement and contribution of the people doing the work in the planning function."

We asked what changes should be made in the way technical decisions concerning programming techniques were arrived at, and a dichotomy appeared to exist. At one extreme a need was expressed for "more automated tools; more formal walk-throughs." In supporting opinions other respondents suggested: "review what's in general use and publish recommended methods as a standard. No such document currently exists," and "get dollars, survey available methods, apply and weed out losers." However one project manager stated: "I would prevent outside 'experts' from imposing their pet techniques and controls in areas where they are inappropriate, misguided, and costly."

The matrix form of organization was clearly considered the best suited to software development efforts. However, that the form of organization was not as important as a "single clear leadership role" was a sentiment often expressed. Several managers, in response to a question on how they would organize for software development in the future said "more and better planning."

Asked what action they would take if it were within their power to make changes or initiate research in the area of staffing, the project managers indicated they would: "experiment with more specialized staffing, i.e., with a number of functional roles rather than a single group of programmers/analysts," "investigate what personnel backgrounds lead or tend to lead to high performance ADP personnel," and implement studies in "how to maintain/improve communications."

Most of the project managers in responding to the subject of improved project control were in agreement with the contributor who stated: "Establish definite packages of work and effect regular reviews with milestones."

On the subject of improvements in the way projects were directed, comments were sparce. One analyst who provided us with an earlier quote firmly believes the necessity for "greater delegation of authority, responsibility," and "clearer assignment of responsibility."

Finally, the project managers were asked to list some of the lessons learned from their project. The responses to this question were voluminous and varied. However, one response clearly stands out as a summary: "Establish requirements clearly before designing; establish design clearly before programming. Give more attention to planning and to effort/cost estimates. Need greater documentation of decisions, specifications, and design."

Though our survey was massive our sample was relatively small, being limited to the aerospace industry. Just how much the results would differ were we to obtain comparable data from some other segment of the business community is a matter of considerable interest and may become the subject of the next chapter in this continuing saga. ✲

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JOHN H. LEHMAN

Mr. Lehman's background in software development ranges from programmer through project manager. He held a variety of dp management positions while in the Air Force as well as staff positions in planning, policy formulation, and requirements determination. He is currently working as a consultant and attending California State Univ., Sacramento.

With the Kodak laser printer, film is cheaper than paper.

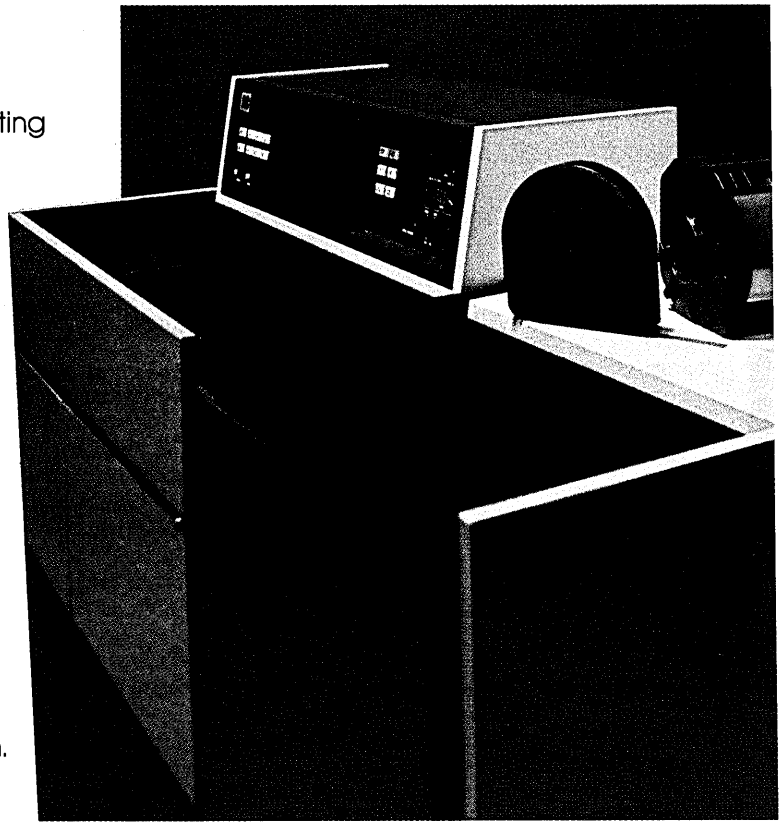
Consider the operating cost of the Kodak laser printer versus the operating cost of a paper-impact printer.

Consider, for example, the cost of generating a 1000-page, 3-copy report.

Three-part stock paper costs about $22.30* per 1000 pages. But you can put the same report on microfiche for around $1.50.

So, from the standpoint of materials alone, paper is about 15 times more expensive than microfilm.

Time and labor costs are important factors, too. Especially in a DP department. Which is why you should know that it would take almost 50 minutes to decollate, burst, bind and package a 1000-page report. It would take only 9 minutes to print, duplicate and package the same report on just 4 microfiche.



A Kodak laser printer can save you money in other ways, too. With a paper printer, you'd have to load at least 12 boxes of paper to print the equivalent of one cartridge of 16-mm film. Compared with fiche, the margin of difference is even wider. You'd need 31 boxes of paper to print the equivalent of one fiche cartridge.

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87% cheaper.

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The tools for Quality Assurance are beginning to be formed, the methods are beginning to be tried, and the time is right.

THINGS ARE LOOKING UP FOR SOFTWARE

by Robert L. Patrick

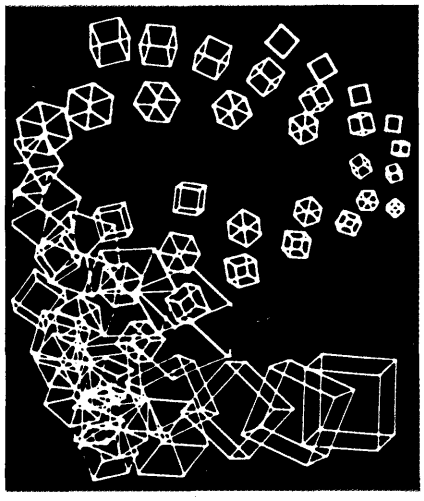
Not long ago, several Xerox software engineers were wondering what the real state of the art was in software quality assurance. Instead of beating the bushes to find out, they decided to hold a conference and bring the software QA world to their own doorstep. Since all the ringleaders were working members either of the ACM Special Interest Group on Software Engineering or the one on Measurement and Evaluation, they proposed that ACM sponsor the workshop.

All came to pass as planned, and the three-day meeting was held during mid-November in San Diego. Some 280 attendees heard 31 papers in a single string of sessions. In the audience and at the podium, large government contractors were well represented, with a smattering of computer manufacturers, commercial software developers, and researchers. Surprisingly, few software developers from industry attended, and none presented papers.

Those papers which were presented were all informative, although their quality covered the full range from good to poor.

By the end of the session there was considerable agreement that software quality assurance is different from that for hardware, principally due to the emphasis the former requires in the early part of the design and production process.

In hardware, the design-development-production cycle is mature and well tuned. Further, a production engineering step follows development and precedes any volume production. In contrast, software engineers ship their prototypes. If we are going to continue to develop software this way, we had better take steps to build in quality from the start so the prototypes we deliver will be satisfactory.



By the end of the session it was noted that the software quality assurance subject could be broken down into three pieces: product quality, the technical process which produces that product, and the administrative processes which control that production. The papers presented covered about half of the issues identified, and consisted of case studies, recommendations, and a few research reports.

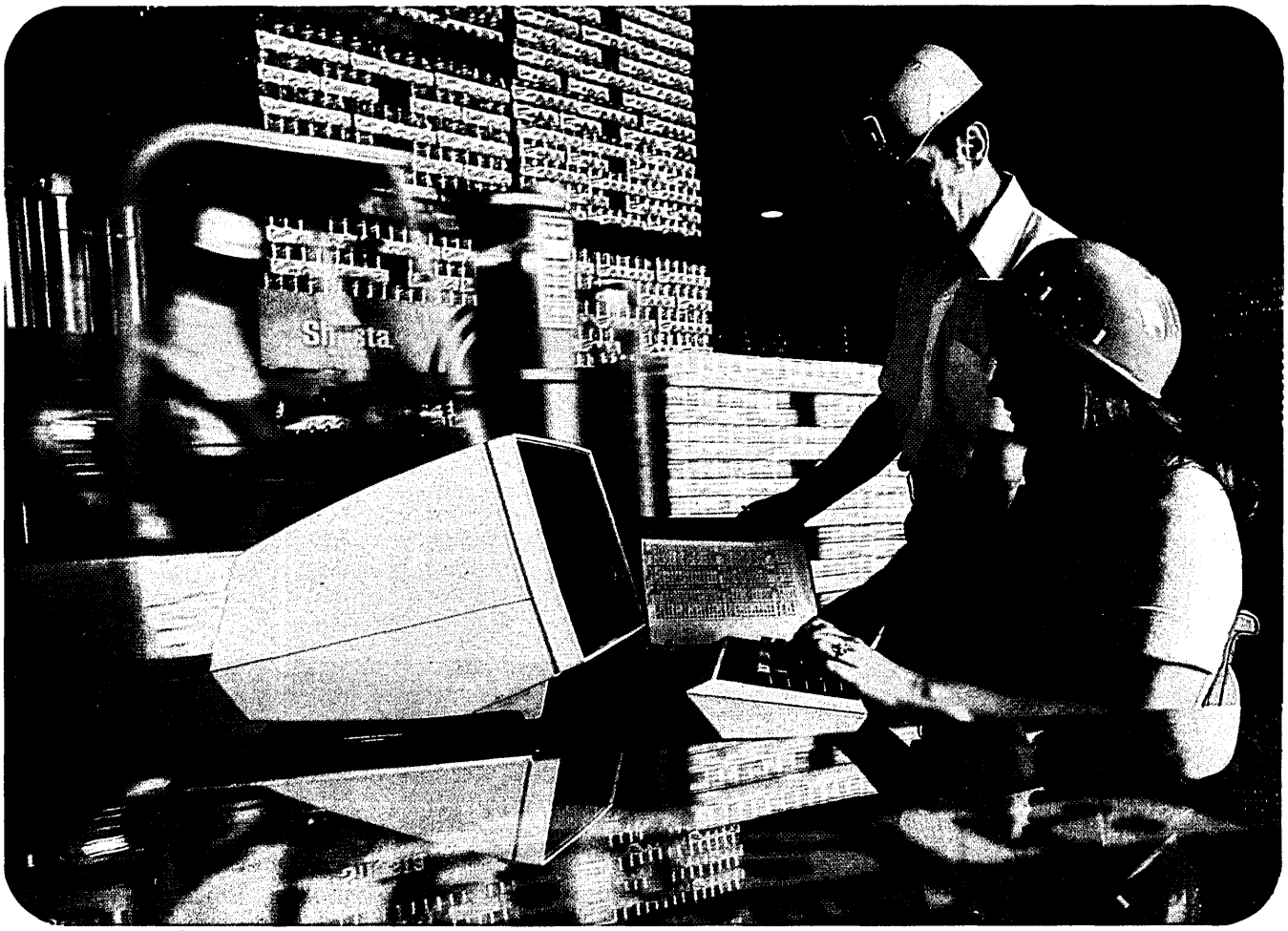
SIX NOT-SO-EASY PIECES

Together, the papers described ways to achieve almost any desired level of quality, given enough time and money. The individual techniques are really quite separate and independent, however, and can be chosen and configured to fit individual needs. For instance:

1. Work has been going on for some years in an attempt to properly draw up system requirements and to get the informed consent of the customer at start-up. A whole series of on-going activities are related to producing requirements specifications that are ordered and structured, documenting those requirements, getting customer participation in requirements reviews, and maintaining those requirements through the life of the project so they become the foundation of QA and acceptance testing.

2. Once a high quality set of requirements is drawn up, trace functions can be implemented to follow each and every requirement through the processes of design, coding, and testing. Thus, if each unique requirement is given a unique identifier, it is possible to have every document and administrative record relating to the project cite that identifier, thereby forging a strong link from what the customer said he desired in the requirements specification and what is finally delivered.

In existing large systems all this



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documentation is phrased in a highly structured language and automated. Then programs are written to edit this textual data base to make certain every requirement is addressed at least once and that all appropriate parties are alerted whenever a requirement is changed.

3. For years we've heard about how structured programming will improve the quality of our product by making it more maintainable, and more recently we have been hearing about structured analysis. To these we can now add design reviews and code inspections. All four techniques are aimed at improving the implementation process so higher quality code results.

4. From the military we have inherited configuration management. This started out as an attempt to make sure that mechanical parts fit together, and to keep a set of records so changes to one member of a mating pair would trigger review of the companion piece. In commercial shops we see a version of configuration management in change control, where the production section owns the production library and there is an official procedure for programmers to get completed jobs out of the development library, into the hands of production control personnel, and cataloged in the production library.

Several papers discussed establishing this change control earlier in the process so a development manager could know what was changed, when, and by whom. Further, the possibility of expanding the controls so that they cover documentation and test cases in addition to production programs was also discussed.

5. There was quite a bit of conversation about independent testing (sometimes called verification and validation), and some seemed to believe that this alone could assure software quality. No one disagreed that having a separate group of individuals test developed code for conformance to specs is important. In fact, three strong benefits were immediately identified: (1) that the resulting tests are uniquely defined to determine whether the specification is being met; (2) that separating into developers and testers sets up a friendly competition; and (3) that the additional labor added to the project—usually between 5% and 20%—is less likely to be eaten up in recovering from development slippages, and more likely to be spent on testing. Still, a glance at the list of identifiable components of software quality assurance will show that the subject is much more than just testing. (See box.)

6. Finally, a kit of quality assurance tools which can be adopted and adapted to almost any environment is beginning to appear. At present most of these tools aren't very portable so the big projects frequently rewrite them for every development effort. The time is not too far off when we will see tools of sufficient generality packaged for the commercial market.

COMPONENTS OF SOFTWARE QUALITY ASSURANCE

1. Product attributes
   - A. Primary
     - function
     - size
     - performance
   - B. Secondary
     - reliability
     - flexibility
     - maintainability
     - fail-softness
     - recovery modes
     - portability
     - modifiability
     - etc.
2. Technical processes
   - A. Requirements
   - B. Implementation
   - C. Service
   - D. Tools
3. Administrative Processes
   - A. Funding
   - B. Controls
   - C. Organization
   - D. Measures
   - E. Feedback to improve technical processes

One company already has a package for holding the text of requirements, editing it, and cross-referencing requirements against one another. Another company has a program which inserts counters on all the legs of branches in a compiled program. Then as a test case is being run, these counters produce a map showing which legs of the program were executed and how frequently. If one had a library of test cases, he could run all the test cases back to back and the resulting map would indicate how well the library of test cases covered all the paths in the code. Thus the thoroughness of testing could be measured and reported.

For years there have been software performance monitors which measure the performance of a module when exercised with either test or live data. One QA group runs a set of regression tests against every program that is changed and compares the performance between versions of the modules, both to detect if minor changes have had undue impact and to get new estimating coefficients for the production scheduling system.

A DRAFT STANDARD

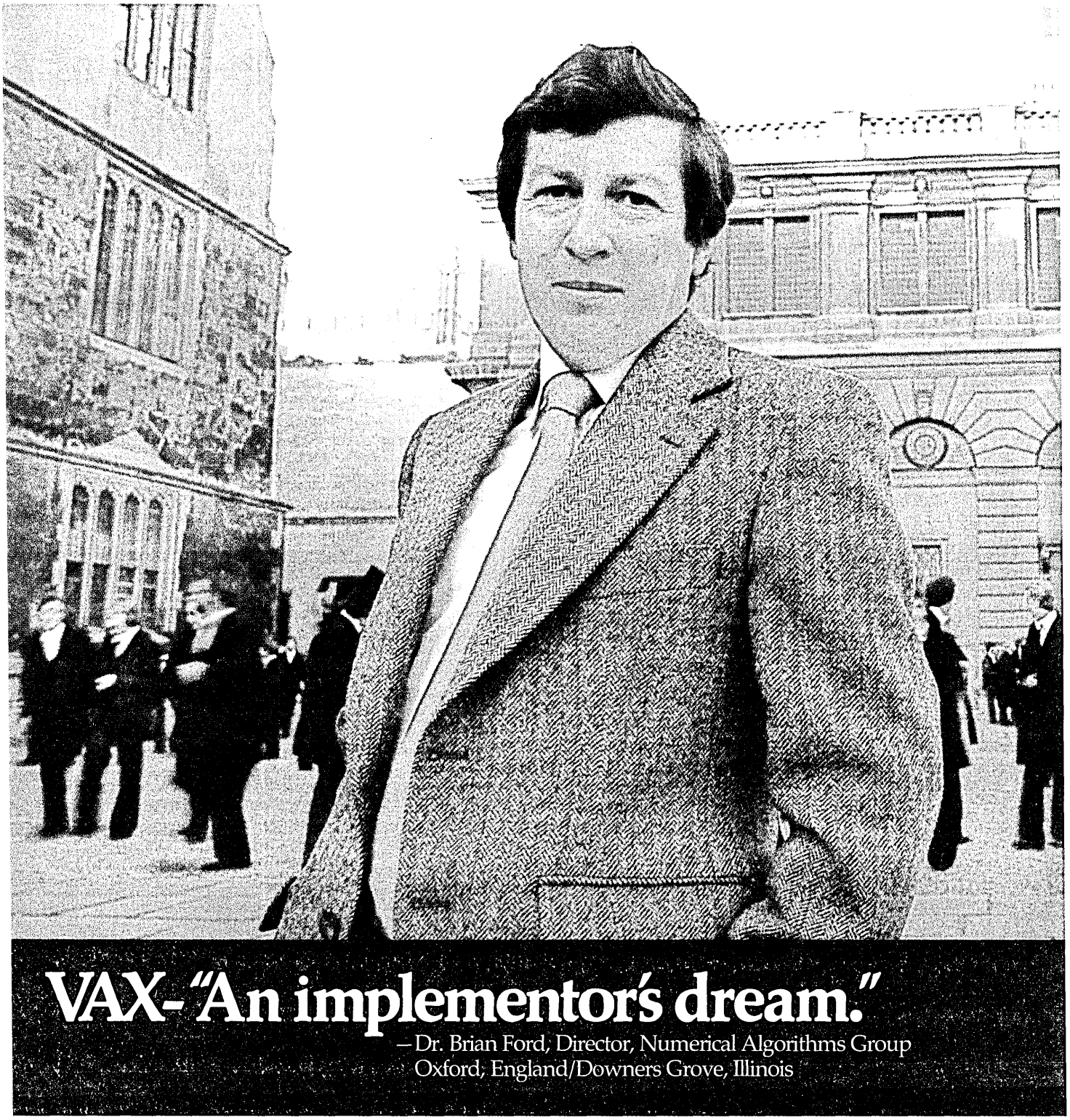
Every session seemed to have one such technique or tool to offer. And one of them was a real sleeper. It seems there is an IEEE committee that is putting together a draft standard which outlines the contents of a quality assurance plan. When this draft standard sees the light of day, it will formalize at least the *topics* a quality assurance program should address. This will be a small but important step forward to all of us, whether we are trying to build, specify, or buy high integrity systems. (The committee is looking for volunteers to help in preparing the draft. Contact F.J. Buckley, RCA, 103 Wexford Drive, Cherry Hill, NJ 08003.)

When all this is taken together, the outlook is bright. Software contractors building massive systems have pioneered QA tools, techniques, and processes. Research now being conducted in industrial settings looks promising. It won't be long before all this methodology is documented and codified. And some of the tools are already appearing as commercial packages, so we soon will be able to choose what techniques we wish to use and install them.

Unfortunately we will not soon be able to quantify the results and come up with hard cost-benefit analyses. Our acceptance of the techniques will probably come in two steps. The first step will be to implement those techniques which have low overhead and high visible results. We can only hope that by the time these are well established some justification for the second step, that of installing the more esoteric techniques, will have been worked out. At any rate, it appears we have a start toward the solution of a knotty problem. *

ROBERT L. PATRICK

Mr. Patrick is a free-lance computer specialist based in Southern California. His client list contains several *Fortune 500* companies with products in aerospace, computing, finance, and manufacturing. He has performed 28 operational audits of computer centers, and is the author of the 1974 AFIPS Security Manual. He is also the author of many books and reports including a 1978 NBS study on data integrity practices.



VAX-"An implementor's dream."

—Dr. Brian Ford, Director, Numerical Algorithms Group
Oxford, England/Downers Grove, Illinois

For the Numerical Algorithms Group, the plain fact is this: "Software implementation was faster on the VAX-11/780 than on 25 other major machines."

Before VAX, Dr. Ford's staff had implemented NAG's complex FORTRAN Mark 6 Library on 25 major machines ranging from minis to mainframes, including the Burroughs 6700, CDC 7600, Univac 1100, and IBM 370. The average implementation time was 13 man-weeks.

VAX took five.

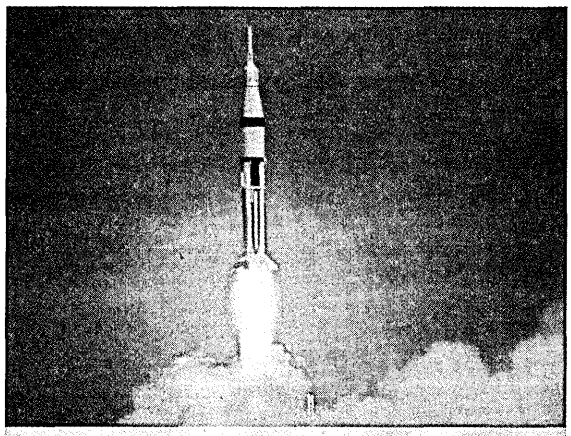
In Dr. Ford's words, "The NAG FORTRAN Mark 6 Library consists of 345 subroutines covering the major areas of numerical mathematics and statistics. It's used in applications such

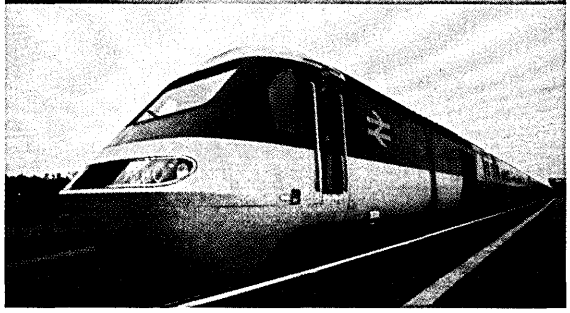
as structural design, nuclear physics, economic modeling, and academic research.

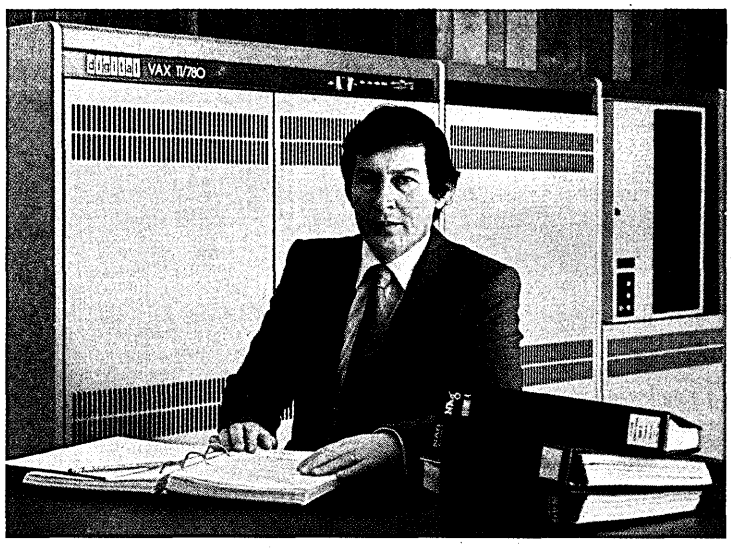
"A successful implementation requires the correct functioning of the 345 library routines to a prescribed accuracy and efficiency in execution of NAG's suite of 620 test programs. Whilst the activity is a significant examination of a machine's conformity to the ANSI standard of the FORTRAN compiler, its main technical features are file creation, file comparison, file manipulation and file maintenance."

And then there was the record of VAX reliability: "No problems were encountered in the VAX/VMS software even though approximately 3000 files were being handled. The operational availability time for the machine was close to 100%, an outstanding statistic for new hardware and a new operating system."

•What all this demonstrates is that some of the most sophisticated FORTRAN routines in the world implement easily on VAX. That VAX capability exceeds that of many machines far more expensive. That the VAX-11/780 is more







than the most powerful 32-bit computer in its price range. That VAX is truly "an implementor's dream."

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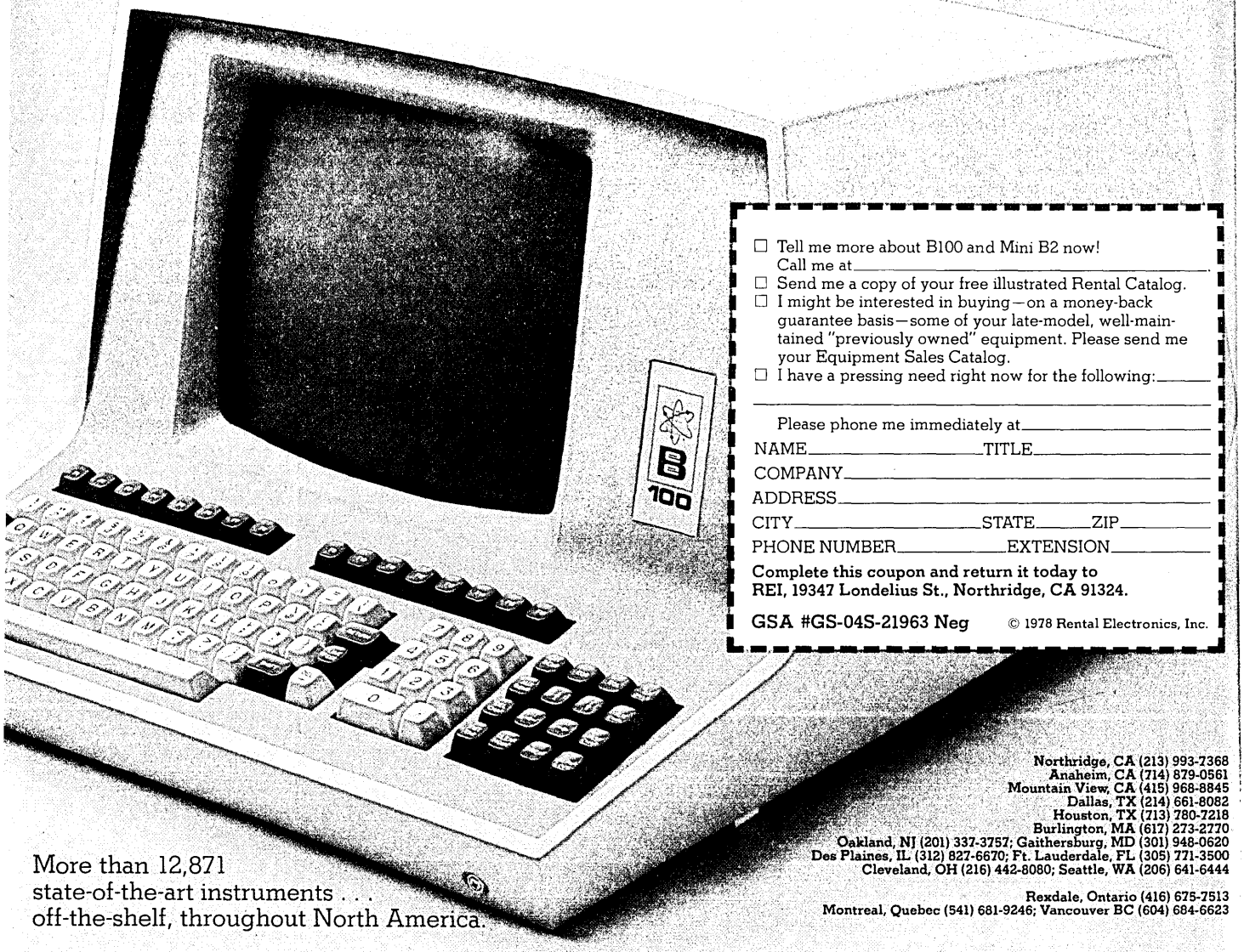

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To become rich, by hook or by crook, some of our colleagues have shown originality and a certain flair.

PROFILING COMPUTER PEOPLE: A FIRST DRAFT

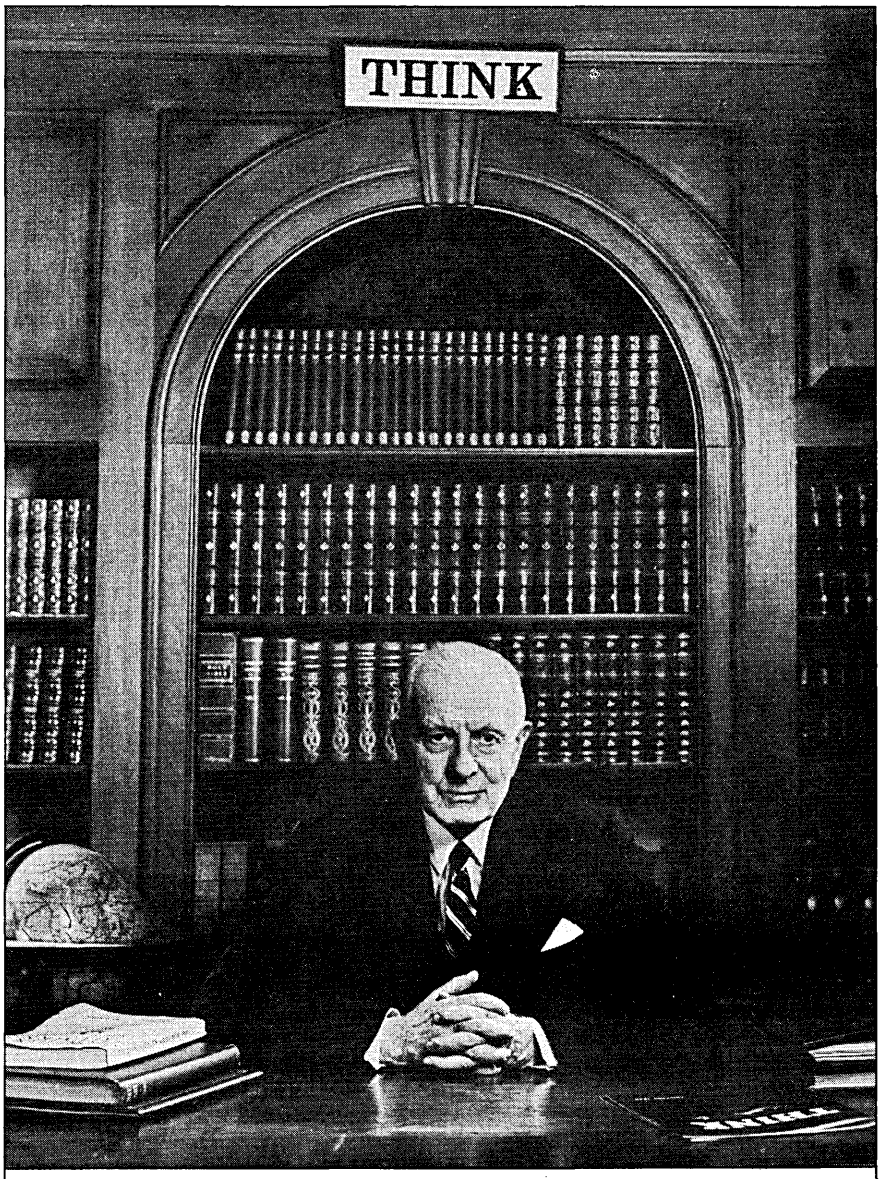
by Ann-Marie Lamb

The computer is well into its third decade of use in American industry and government. All through this period, it has been analyzed and reanalyzed for its effects on society, the economy, the nation, and its citizens. We, who make our living directly or indirectly because of the computer, are asked to comment on what it is doing to everyone else. But in the age of self-analysis, what can we say about what the computer has done for or to us?

Someone else will have to do the definitive study. My effort here more closely resembles the class reunion statistical profile—not too well organized, some facts, a few speculations, and reminiscences. My purpose is to set others thinking; I have always felt that the best way to do this is to present a first draft, no matter how rough. From this draft, you can pick and choose to build your own people profile.

We computer people are a diverse lot, but what we all have in common is a relationship with the computer industry. And it is very big business. The latest government figures (for 1976) show shipments of electronic computing equipment valued at more than $10 billion. The value of installed equipment is estimated at more than $60 billion, which is more than 10% of the value the government estimates for all currently installed industrial equipment.

Big as these numbers are, they cover only the equipment-vending segment of the industry. To this must be added the sales of software and other information services and supplies. On the buying side, it has been estimated that computers are installed at more than 95,000 sites and that their users are spending $37 billion a year to support them.



Thomas J. Watson, Sr.

Besides transfers and promotions out of dp, we have had other more radical departures—to the priesthood, to sell trampolines, to operate a chicken farm.

These economic indicators are useful for background, but this profile is concerned with people. And when we look at the people, we find it is not an industry in the classic sense. It is more like a huge fraternal organization held together by a single thread of common interest—an occupation that has some relation to a computer. And what a fantastic array of jobs: draftsman, teacher, assembler, writer, engineer, sales representative, consultant, auditor, and manager, not to mention the systems analyst, programmer, and operator we usually think about. There has never been a census, but there must be well over a million of us, and the population is growing rapidly.

The federal government reports that in 1977 employment in the computing equipment industry was 248,000, a 13% increase over the previous year. More than half of these people are in white collar jobs, a proportion significantly higher than in most manufacturing industries. Through the 1980s employment is expected to increase faster than the average for all industries.

On the computer using side of our house, the Department of Labor says in 1976 there were 160,000 systems analysts, 230,000 programmers, and 565,000 console, auxiliary equipment, and keypunch operators—almost one million people. Not surprisingly, our only employment decline is predicted for keypunch operators. Console and auxiliary equipment employment is expected to rise about as fast as the average for all occupations, and growth rates for systems analysts and programers are especially high. One government study estimates that in these categories our numbers will increase 50% faster than the average for all occupations through 1985. We are a large group and multiplying fast, but for all our size we account for less than 1% of total national employment.

YOUNG AND HEALTHY

Few new openings will result from deaths or retirements in the near future. We are still relatively young and healthy. This is especially comforting to hear because I have never forgotten the findings of a major university study presented at Congressional hearings on computers in the 1950s: programmers have the highest rate of heart attacks of any occupation. All these years I have waited for correction or confirmation of this but have never seen the subject mentioned again.

Besides being large in numbers, we are well paid. Compared to the average earnings for all nonsupervisory employees in private industry: keypunch operators earn slightly less, operators slightly more, programmers twice as much, and systems analysts well over twice as much. Or to look at it another way, in 1976 the median salary for all professional and technical workers was $13,312; according to the DATAMATION salary survey at the time, an average intermediate programmer was making more. Our average manager was making one-and-a-half to two times as much as the median of $15,020 for all managers.

Some of us have gone right to the top of the government's income tables; we have produced a large and colorful crop of millionaires. My list begins with Thomas J. Watson, Sr., who, incidentally, should be the patron saint of the over-40 crowd. After he was fired at around 40 by that other marvelous individualist, John H. Patterson of NCR, Watson, unlike most of our millionaires, did not found a company. He went to work as a paid manager for the Computing, Tabulating, and Recording Co., which he made into IBM. He did not even become a millionaire until the business boom of World War II.

Next on my list are the millionaires of the political left and right. On the left is Max Palevsky, founder of Scientific Data Systems (later acquired by Xerox), financial backer for many liberal political candidates and causes, and now in show business. On the right is Ross Perot, founder of Electronic Data Systems, purchaser of a Wall Street company, and perhaps best known nationally for his efforts on behalf of the American POW's in Vietnam.

Next I must include Sam Wyly, founder of University Computing Corp. Anyone purported to own his own railroad car has to be near the top of the list.

Our saddest entry is, of course, Fletcher Jones, founder of Computer Sciences Corp., described by *Time* magazine as the Gregory Peck of the computer business, killed at age 41 when his private plane crashed on the way to his ranch.

There are more names on this millionaire list, and there is room for more who aspire to that goal.

Some of us with those same aspirations have found another avenue to financial gain. We now have our own criminal class. This is not surprising if we accept the estimate that the average take in a computer crime is $500,000. While some of the computer crooks come from outside our ranks, many are home grown. There is no doubt that some of our colleagues have shown originality and a certain flair. My favorite was the Britisher who held the master record files for $250,000 in ransom (unsuccessfully, I should note).

We have our share of the seamier stuff, as well, like the data processing manager who used his position to get an estimated $60,000 in kickbacks from his paper supplier. A few of us are just regular white collar criminals who happen to work in computers, like the unemployed programmer arrested for filing 400 fictitious 1976 income tax returns for refunds totaling $400,000.

Capt. Grace Murray Hopper, USN

The explosion in true computer crime has also given us our first full-time sleuth and chronicler, Donn Parker.

FAT AND SASSY

Computer-related occupations offer ample financial rewards to large and growing numbers of us, but what about the security of those jobs? There is a distinction between security in *this* job and security about *a* job. With the rates of growth experienced in the past and projected for the future, most of us can feel secure about not only having a job, but also having one wherever we want to be. Keeping this job may not always be so easy.

On the selling side of the industry, there have been numerous layoffs or black Fridays, or Tuesdays, or Thursdays over the years, many unrelated to the health of the general economy at the time. At user sites, layoffs seem rare unless there is a major company-wide cutback, and even then, we are not among the first to go. In more recent times, a company switching to a facility management contract will cause a job change, even if the only thing that changes is the name of your employer.

Firing for cause in our field seems to occur most often at the managerial levels. A systems analyst colleague once told me that when he went for job interviews, he was more interested in determining his prospective manager's job security than his own. I have never seen any comparisons of dp and non-dp manager removals versus firings, but I have a suspi-

PHOTO: JULIAN WASSER

Max Palevsky & friend

cion that dp managers removed from office are seldom transferred, more often ousted from the company. Where in most companies do you find a place for an ex-dp manager?

In summary, for most of us losing this job usually means a temporary dislocation rather than long-term unemployment, but the higher up your position, the longer that dislocation may be.

Our jobs are quite stable, but how stable are we in our jobs? Significant (but unquantified) numbers of us have stayed in dp occupations with the same employer throughout our careers. This happens most frequently where longevity is prevalent throughout that industry or in that individual company or institution.

Where do we go when we leave a job? Most stay within the field, but there are defections. The most common move is probably to another job in the same company. Many entering the field today see it not as a final career destination but as a stepping-stone, offering valuable experience leading to advancement in other departments of the company.

In spite of claims that the dp manager's experience and knowledge make him or her a strong candidate for higher general management positions, promotions out of the field still seem to be the exception. Outside of our own vendors, I have heard of only one president of a major company who reached the top through dp management. Many of our managers have reached a level where dp and other corporate functions are reporting to them. The breakthrough may be coming soon.

Besides transfers and promotions out of dp, we have had other more radical departures—to the priesthood, to sell trampolines, to operate a chicken farm. We have also welcomed back many who tried the outside world and recanted.

The majority who leave are just changing jobs, not occupations. Attrition rates are rising again. Recent estimates indicate a return to the 20% levels after a drop to nearer 10% during the last recession. Many managers today are seriously concerned that the supply/demand balance is getting worse. As one manager said, "Now I am starting to lose my mediocre people to better offers."

I do not think we are basically a greedy group. When we start looking around, our primary motive is usually not money. When we move, we move for technical challenges, better opportunities for advancement in a specialty or as a manager, a more stimulating environment for learning and keeping up-to-date—all accompanied by more money, of course.

WOMEN EXECS I cannot leave the subject of employment without commenting on one of the major issues of the day, equal employment opportunity. Looking at the numbers, our record for employing minorities and women in professional level positions is probably as good as, or better than, any other sector. One recent estimate placed the percentage of women programmers and systems analysts at 16.5. But there is reason for some complaint. We should do better because we had a head start on other fields; there have always been women and minorities in the computer field. They got there 25 and more years ago during those heady days when two weeks' experience, no matter how achieved, was all that was needed to make you wanted regardless of your color, sex, or formal education.

Viewed from this perspective I can quarrel with the growth rate over more than 25 years and with the slowness in accepting minorities and women in management positions. Some women and minorities have failed in management positions, and these failures are frequently cited as reasons for waiting for perfect candidates before trying again. On the other hand, everyone concedes the overall high casualty rates for managers. Question: are the standards applied to minority and women managers unrealistically high when compared to the performance of all managers in the field?

While we have a goodly number of loners among us, we also have our joiners. The American Federation of Information Processing Societies is comprised of 14 organizations with approximately 120,000 individual members. These include our two oldest computer-based associations, ACM and DPMA, but do not include other professional groups such as the Society for Management Information Systems and the Association for Systems Management. Many complain that we have too many professional organizations and that this fragmentation prevents the industry or the profession from dealing effectively with major internal issues, such as professional ethics and standards, and from speaking out effectively on national issues. Another of my suspicions is that we are too heterogeneous to reach consensus on any of the computer-related issues except perhaps in the Anatoly Shcharansky case.

We can add significantly to the list of organizations by including trade associations and industry groups such as CBEMA, ADAPSO, the Computer and Communications Industry Association, the multitude of user groups, and subsections of groups like the American Bankers Association and the Petroleum Institute. It is a rare corporation that doesn't have two or more institutional memberships in organizations with a special interest in information systems and data processing.

One of the major activities of professional and trade associations is sponsoring conferences and seminars. In the computer field we have not only those sponsored by associations and other nonprofit organizations such as universities and government agencies, but also untold numbers of offerings from the profit-making sector. No other industry or function competes with us in quantity or expenditures. The organization and presentation of seminars and conferences is a full-time business for a specialized group. No one can say that we do not spend time, money, and effort in trying to improve our inter- and intraindustry communications.

To further help us in communicating, we have a lively publications segment. Just subscribing to all the computer-related periodicals would keep several in baskets full. In the world of books, the statement was made several years ago that there were then more than a thousand titles on computers and related topics. To all this material we must add papers available from all the conferences and seminars, the articles and papers that appear in noncomputer-related publications, the research reports and dissertations, to say nothing of all the technical material available from vendors. And I'm not sure that covers our own information explosion.

HALL OF FAMERS For such a young industry we have already produced a cadre of well-known and recognized authorities. In fact, we have some legends in their own time. While Admiral Rickover is the oldest regular naval officer on active duty, I think

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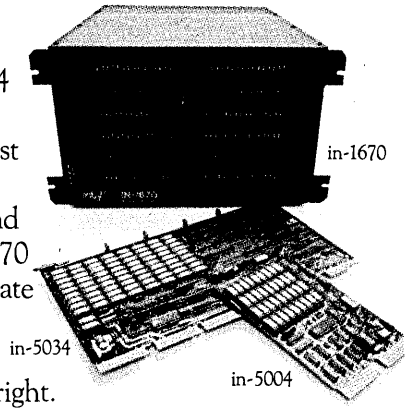

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The automation scare of the '60s was based on a combination of temporary economic conditions and the wildest projections of computers displacing labor.

our own Cap. Grace Murray Hopper is the senior reserve officer on active duty today. And if I'm right, I believe she is as pleased with that as she is with being one of our most respected elder statesmen. I expect Herb Grosch would be pleased to be called a legend in his own time, but I'm not sure he's ready yet to be dubbed an elder statesman. Our list of well-known authorities certainly wouldn't stop here, but I will leave it to you to enter your own candidates for our Hall of Fame.

One criterion for judging the maturity of an industry is the contributions of its members to public service. At the national level our members have been prominent on many Presidential commissions. Three examples come to mind immediately because the issues were substantially generated by computer technology. The first was President Kennedy's Commission on Technology. In retrospect, it is clear that the automation scare of the '60s was ill-founded and based on a combination of temporary economic conditions and acceptance by many of the wildest (or most optimistic, depending on your perspective) projections of what computers could do in displacing labor. At the time it was important that the issue be treated seriously and with reasoned analysis.

In more recent years the commissions on privacy and electronic funds transfer have been grappling with issues that will affect both our occupational and personal interests.

Another form of public service is accepting political appointments. We have had our share of cabinet officers and agency heads over the years, such a Richard Atkinson of Stanford Univ. and computer-aided-instruction fame who is now head of the National Science Foundation. Something of a record must have been set at the expiration of the previous administration when President Ford's Secretary of Transportation, William Coleman; Secretary of Housing and Urban Development, Carla Hills, and U.N. Ambassador, William Scranton joined IBM's Board of Directors, and at the same time President Carter's Secretary of State, Cyrus Vance; Secretary of Defense, Harold Brown, and Secretary of Housing and Urban Development, Patricia Harris resigned from it. Concurrently, Jane Cahill Pfeiffer, former IBM vice president, declined to become Secretary of Commerce.

At this time I know of one Congressman we can claim as an alumnus: Bud Schuster of Pennsylvania; who was with RCA back in its computer division days. I won't name the two I know who ran and were defeated. Now and then I have noted candidates for school boards and city councils who were part of our group, but further data on our record as elected officials has escaped me. Too bad, because it is an important factor in developing our profile.

I wanted to round out this first draft of the profile with some specifics on our participation in community activities, but hard data totally eluded me. My final suspicion is that we are about average in children-oriented activities, such as the PTA and Little League, and average to below average in other volunteer community activities. The latter may be due to our relative youth as a group and to the demands of our jobs, rather than lack of interest or commitment.

As with most first drafts, this one is winding down, rather than ending with a bang. I hope someone will follow up with a second and even a third attempt. I understand that major efforts are being launched to develop a computer history. I hope it will cover people and not just technology, and all the people, not just the famous few. We are an interesting group and deserving of our own historical profile. ✲

ANN-MARIE LAMB

Miss Lamb is an independent consultant in planning and control, management and organization, and management communication for information systems and dp. She most recently was manager of planning and analysis at Atlantic Richfield Co. in Los Angeles, Calif., responsible for planning, evaluation, and budgeting for information systems, dp, and accounting, in support of the Products Div. She is still based in Los Angeles.

Earlier, in the U.S. Office of Management and Budget in Washington, D.C., she was a senior management analyst, responsible for government-wide dp management policy. Miss Lamb spent the first 10 years of her career with manufacturers of major computer systems.

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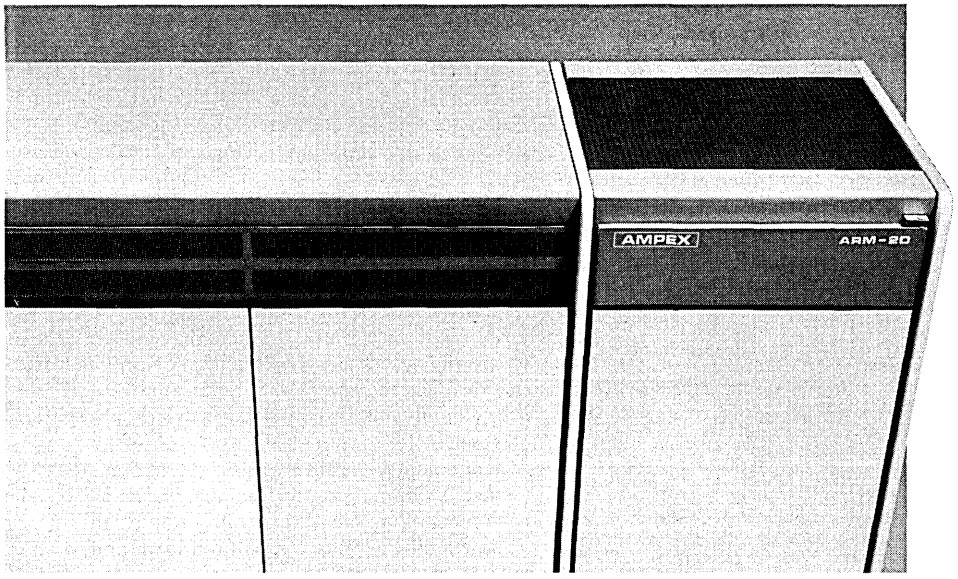

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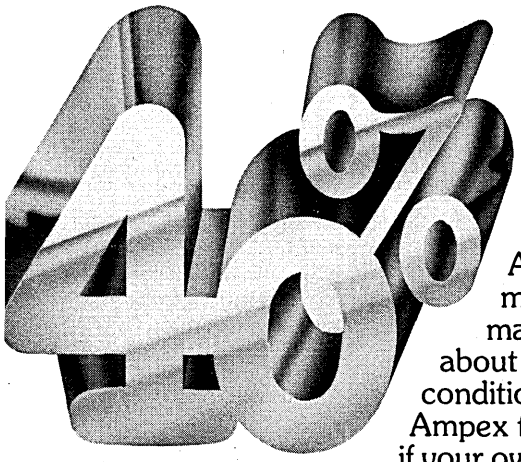

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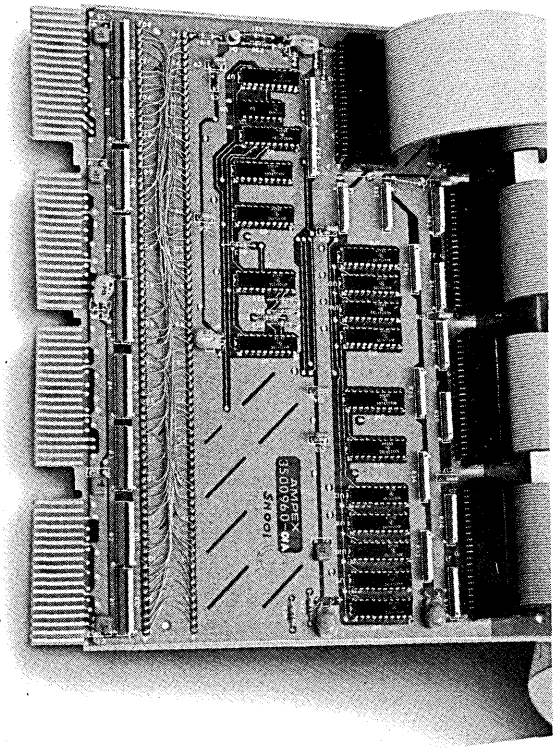


Jess Clark will cheerfully show you how to save a bundle by breaking the rules. Call him at 213/640-0150, and tell him you're tired of trying to unscramble the MB-MA-MOS hassle. Or write to him at Ampex Memory Products Division, 200 North Nash Street, El Segundo, California 90245.

AMPEX MAKES IT EASY.

CIRCLE 67 ON READER CARD

It took Basic Four to put the shovels where we dig the holes.

Each plant, warehouse or other remote location can use its own data entry, processing and communications ability. For instant answers where they count most, and no waste of high-priced mainframe time. That means distributed data processing.

We chose Basic Four.

Many of the computer needs of remote facilities are like those of small companies. And small businesses have been Basic Four's specialty for over seven years, with more than 5000 installations.

So Basic Four has the right size system for each of our facilities, matching power to needs. And they've built a repertoire of software applications just right for each location.

Basic Four® computers work the most effective way, too. They're interactive—for instant transaction processing. (We were amazed to discover how many other systems still plug along with batch processing!)

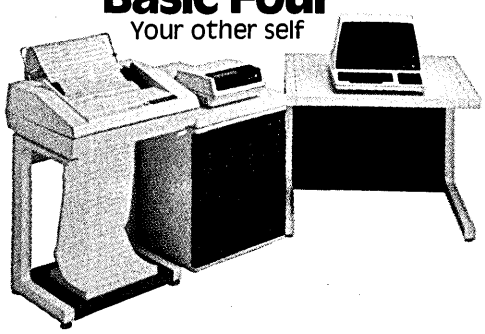
Our remote Basic Four computers communicate with our mainframe. Which makes central control simple.

Best of all, Basic Four went in and got the whole network up and running—right on time, including training—without tying up our corporate DP staff.

In all, Basic Four gave us real distributed data processing. With enough computer power at each remote location to get the job done. With communications to keep central control at home. And with no headaches for anyone!

A Basic Four distributed data processing network will do more for your company than many a mainframe would—for a lot less. To find out how, call or write now.

Basic Four
Your other self



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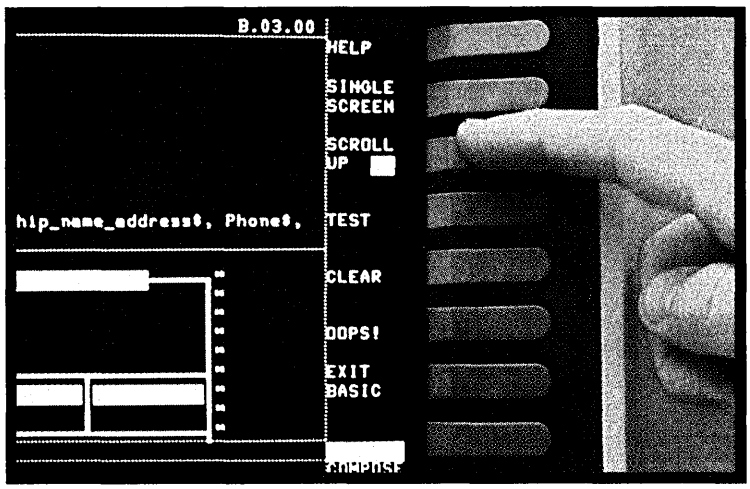
The HP 300. The small

Don't let its looks and $36,500* price tag fool you. The HP 300 packs more capability into its compact frame than computers many times its cost and size.

The secret lies in HP's proprietary silicon-on-sapphire technology and in its 'big computer' operating system, AMIGO/300. We condensed the CPU logic and circuitry on to six CMOS/SOS chips to combine high speed of execution with very low power consumption.



A very grown-up operating system.

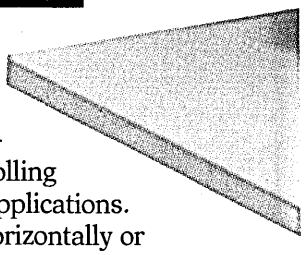
The HP 300 can be used interactively, for such things as program development and job scheduling, at the same time that it's printing reports, processing transactions, sorting files or gathering data from up to 16 terminals.

With virtual memory and as much as one megabyte of error-correcting main memory, you can manipulate large data sets and run big programs. With a full data base management capability, IMAGE/300, you can organize and access information quickly and concisely. And six different file structures, including keyed sequential, allow you to choose the structure that fits the application best.

AMIGO/300 supports two business languages—RPG II and BASIC. And the system can grow from its built-in 12 megabyte fixed disc to 260 megabytes of disc storage.

For all its big system capability, the HP 300 is remarkably simple to program and operate.

Its integrated display system (IDS) has eight soft keys at the right of the screen. These can be programmed to lead the user step-by-step through each job.



The screen itself can be split into as many as 8 'windows' for displaying and controlling various aspects of one or more applications. You can also scroll each area horizontally or vertically—up to 160 columns wide and several thousand lines long.

Another example of this simplification is a 'Test' key which gets BASIC and RPG programs running automatically without your having to take them through the various preparation stages before the computer will execute.

And you get all this in a low-cost system that fits handsomely into any office environment, plugs right into a 10 amp 115-volt outlet, and is quieter than most office copiers. Impressed? Then a hands-on demonstration will really convince you that the HP 300 is a major step forward in business computers. So call your nearest HP sales office listed in the White Pages for a closer look. Or write to Hewlett-Packard, Attn. Bob Kadarauch, Dept. 444, 11000 Wolfe Road, Cupertino CA 94015.

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computer grows up.

47901HPG-30

CIRCLE 82 ON READER CARD

Index registers, floating-point, and even virtual storage functions have been built into the hardware. Why not data base management?

WHAT'S HAPPENING WITH DATA BASE PROCESSORS?

by Olin Bray and Kenneth J. Thurber

The continuing development of data base management systems is facing a severe challenge. As the capability of a DBMS increases, so does its overhead. A way must be found to reduce this overhead without reducing—indeed while expanding—the capabilities of current systems. The use of a back-end data base processor may be the way.

The DBM'S processing and storage overhead stems from an essential incompatibility between conventional computer architecture and the requirements of data base management. Conventional hardware references data by memory position or location while data management applications address it by content or value. Significant processing and storage overhead is consumed in converting from one reference scheme to the other.

The use of back-end processors to solve the problem would be similar to the use of front-end processors for handling data communications. As users required increasingly complex communications and message processing capability, the message processing function was put on a separate processor, frequently a special purpose one. Now data base systems have approached a comparable stage of development and also might efficiently be offloaded to a special processor.

Traditionally, many other computing functions began as individual programs as well, moved to general purpose packages, and eventually into hardware. This was true of floating-point arithmetic, index registers, and virtual memory, among others. One should expect the same thing to occur with DBMS functions.

Functions which might be allocated to a data base processor (DBP) include interpreting high level user requests, checking the user's authorization level, scheduling accesses, performing content-associative addressing or searching, and managing the storage hierarchy. (For an extensive discussion of what a data base processor *might* do, see "Four Approaches to a Data Base Computer," by G.A. Champine, December, p. 101.)

No such systems are in widespread use, but a good deal of product development and research are going on.

Product development is being done by a number of vendors, primarily minicomputer vendors and DBMS software houses. In almost all cases, the DBP is being implemented on a general purpose processor, usually a mini. TOTAL is now available on the IBM System/3, NCR Century, PDP-11, and Univac MCO's V77. IDMS is available on the PDP-11. Hewlett-Packard offers IMAGE on its HP2000 and HP3000. And Prime has a CODASYL oriented DBMS on its equipment.

Once the DBMS is running on a mini, it is relatively simple to interface the mini with a larger computer and create a true DBP. MRI, for one, has been doing a great deal of work on back-end DBP's to implement its System/2000, and Honeywell and Memorex both seem to be working on DBP products as well.

Thus far, only ICL has formally announced a DBP product. In November 1977 it introduced CASF (Content Addressable File Store), a special purpose data base processor. The concept behind CASF is the application of a set of identical microprocessors in a rotating storage system to allow parallel operations on a very large data base.

The other work being done on DBP's also involves special purpose processors. Most of this work is being done in universities on a prototype or limited basis. Examples include:

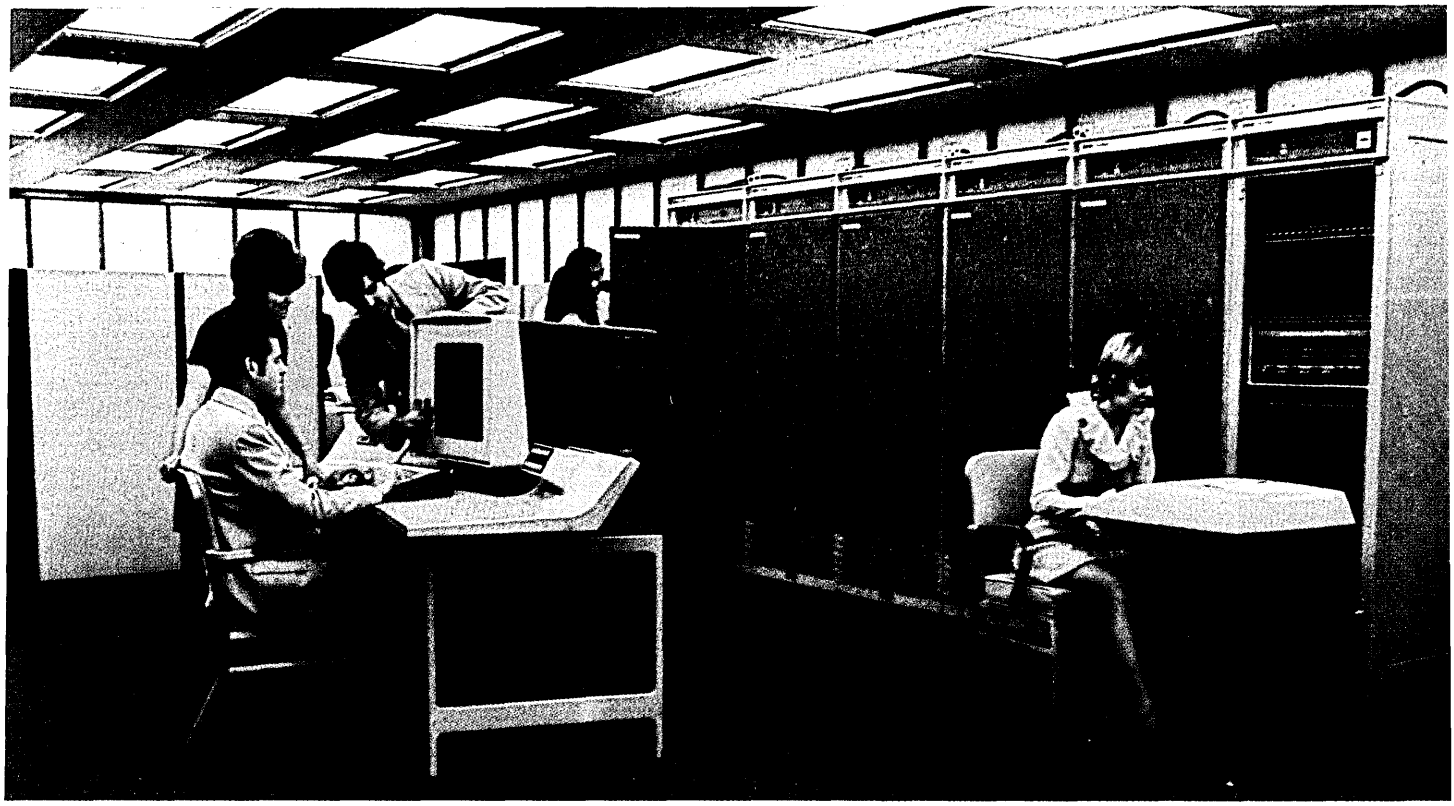
CASSM: (Context Addressable Segment Sequential Memory developed by Lipovski at the Univ. of Florida. (This one is much like ICL's CASF.)

RAP: Rotational Associative Processor, Univ. of Toronto

RARES: Rotating Associative Relational Store, Univ. of Utah

DBC: Data Base Computer, developed under David Hsiao at Ohio State Univ.

STARAN: an associative processor developed and marketed by Goodyear Aerospace. Its use as a data base proces-



Goodyear Aerospace's STARAN array processor has been marketed for number crunching on high volume scientific applications. Only the one at the Rome Air Development Command has been put to data base work, and that only as a study project.

sor is being studied jointly by Syracuse Univ. and RADC (Rome Air Development Center).

Most of the special purpose processors use an associative memory approach, which is one of the factors critical to the development of a cost effective relational data base system. (Associative processing allows data to be addressed and searched by content or value, rather than by physical address.)

All associative systems contain the same basic five elements, which are shown in Fig. 1. The data register contains the value for the search. The mask register indicates what part of the data register is to be used in searching the data array. However, frequently the entire array need not be searched. In this case the word select register indicates which words in the array are to be checked. A bit is set in the search results register corresponding to every word for which there was a match, and the multiple match resolver (MMR) points to the first word found.

Although most of the current prototype associative systems use head/track disk, technological developments will quickly change this. There are now 256KB bubble and 64KB charge-coupled chips. At this point their cost/bit will be comparable to fixed-head disk, but their access times are faster—approximately 5msec for fixed-head disk, 1 to 2msec for bub-

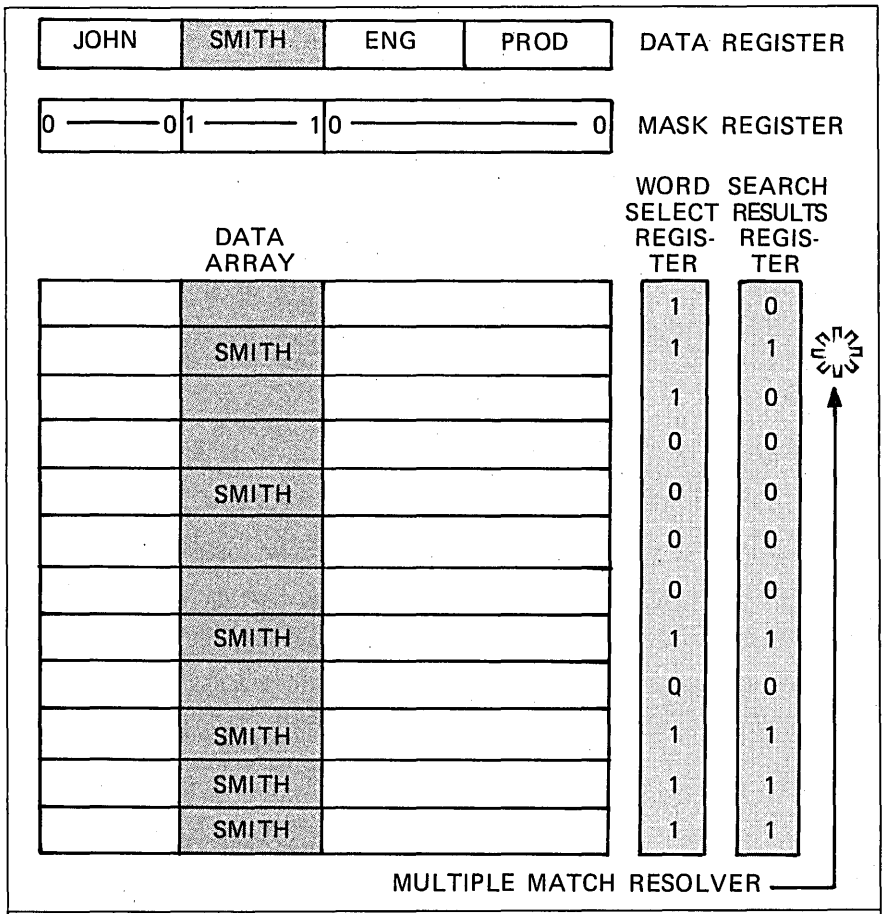


Fig. 1. Data base processors based on associative hardware all have five basic elements: (1) the data register contains the value being sought; (2) the mask register delimits which part of the value is being used as the present search parameter—in this case, "Smith"; (3) the word select register indicates which words in the data array are to be searched—here, those flagged with a "1" bit are the words which have passed some previous search criterion, perhaps "John"; (4) the search results register marks those records which satisfy both or all search criteria; and (5) the multiple match resolver points at the first occurrence satisfying all criteria.

bles, and 200 to 400usec for charge-coupled devices. Therefore, future implementations of associative devices, especially on a commercial scale, will probably use one of these newer technologies.

CLASSES OF DBP'S

There are several ways to classify DBP's: The major architectural distinction is whether the implementation is on a general purpose processor or special purpose associative processor. Although the associative approach frequently provides much greater performance benefits, the questions of functional distribution, the functional benefits, and the problems are essentially the same for all implementations. (See Table 1.)

There are three functional classes of DBP's: smart peripherals, network nodes, and host-DBP configurations.

The *smart peripheral* approach simply moves some of the data access and management functions from the host into the controller. At the low level this may include error detection and correction, device positioning, and the scheduling of the physical I/O operations. At higher levels it includes systems such as CASSM and RAP which use associative addressing and may even be capable of doing certain relational operations, such as selection, projection, and join. The host is connected to this type of DBP through an I/O channel. Special purpose hardware is required, and all of the intelligent controller approaches attack the basic position-versus-content addressing incompatability by using some form of associative processing.

CASSM, whose architecture is shown in Fig. 2, was one of the first associative approaches to a DBP. CASSM distributes processing logic on each head of a head/track disk. This allows the entire disk to be searched associatively in a single rotation. A bit map is used to identify the relative position of each data item on the track. A delimiter code allows the data items or fields to be variable length. During the associative search, each item can be tested, and if it is selected the appropriate bit in the map is set. There are two steps in this marking process— specification and qualification. Specification identifies the item or items to be retrieved or updated. Qualification identifies the item or items whose values determine if the specified data should be obtained from the current record.

RAP provides the basis for the proposed INTEL system. Although RAP was developed for a relational data base system, it can also be used with the more common hierarchical or network systems. Since RAP is not a standalone system, it requires a general purpose host to compile high level user queries into RAP commands, schedule the concurrent operations for RAP, and transmit the RAP instructions to the controller. The host is also responsible for all data base integrity and security. RAP itself consists of a controller, a set function unit, and a number of associative cells. Fig. 3 shows its overall architecture.

The associative store is read into the buffer on each revolution of the disk. If the record is selected, a mark bit is set and the record is written out. On a subsequent rotation all marked records can be retrieved and sent to the host. If the data is to be replaced or modified arithmetically, the operation is done in the buffer and the modified record with the new value is written out. If the record is to be deleted (the delete mark bit is set), then the succeeding records are moved up and the deleted record is overwritten. If certain set functions (summation, count, maximum, or minimum) are to be performed on a previously marked set of records, the set function unit integrates the results from all of the cells.

The *network node* approach involves a data node in a network, such as the DATACOMPUTER developed by the Computer Corp. of America. In this case the DBP is functionally a special purpose data management node for the entire network. However, this functional specialization could be implemented on a general purpose processor. The essential ingredient of this approach is that the DBP is an equal node in the network serving several, perhaps different, host systems to which it is loosely coupled through some communications system.

The DATACOMPUTER, developed by CCA for ARPANET, is the best known of the network node approaches. Although the node is functionally specialized, it is implemented on a general purpose processor, a PDP-10. Since the communication

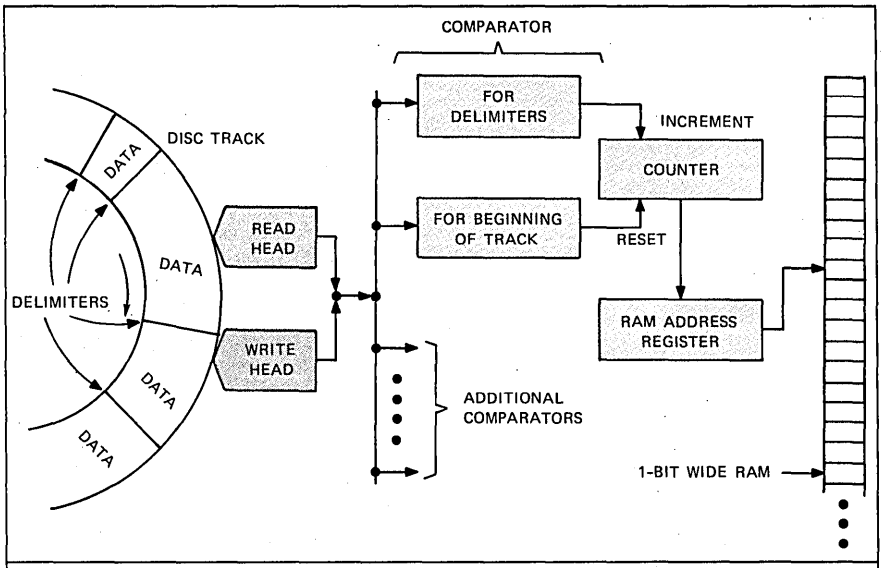
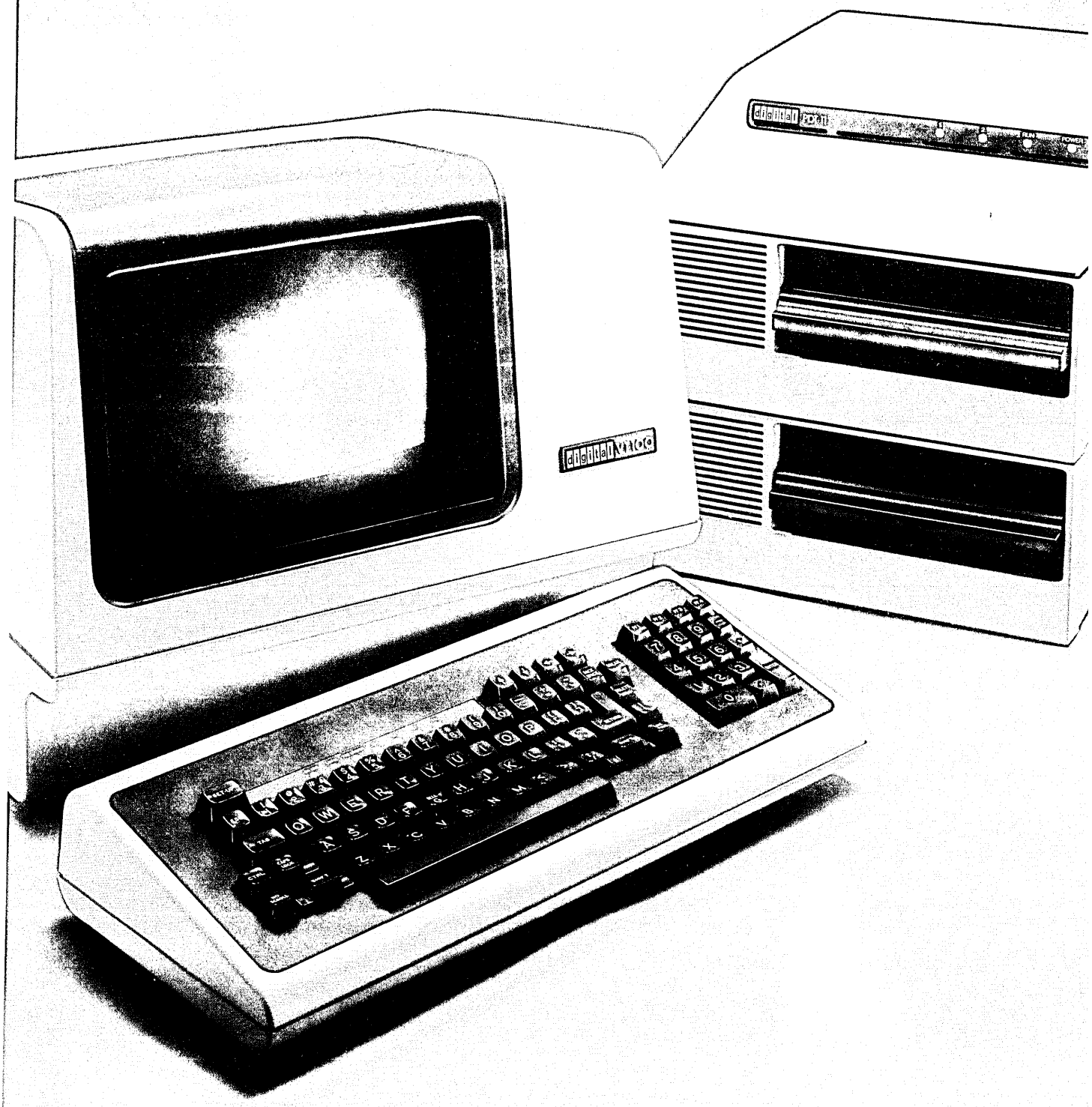


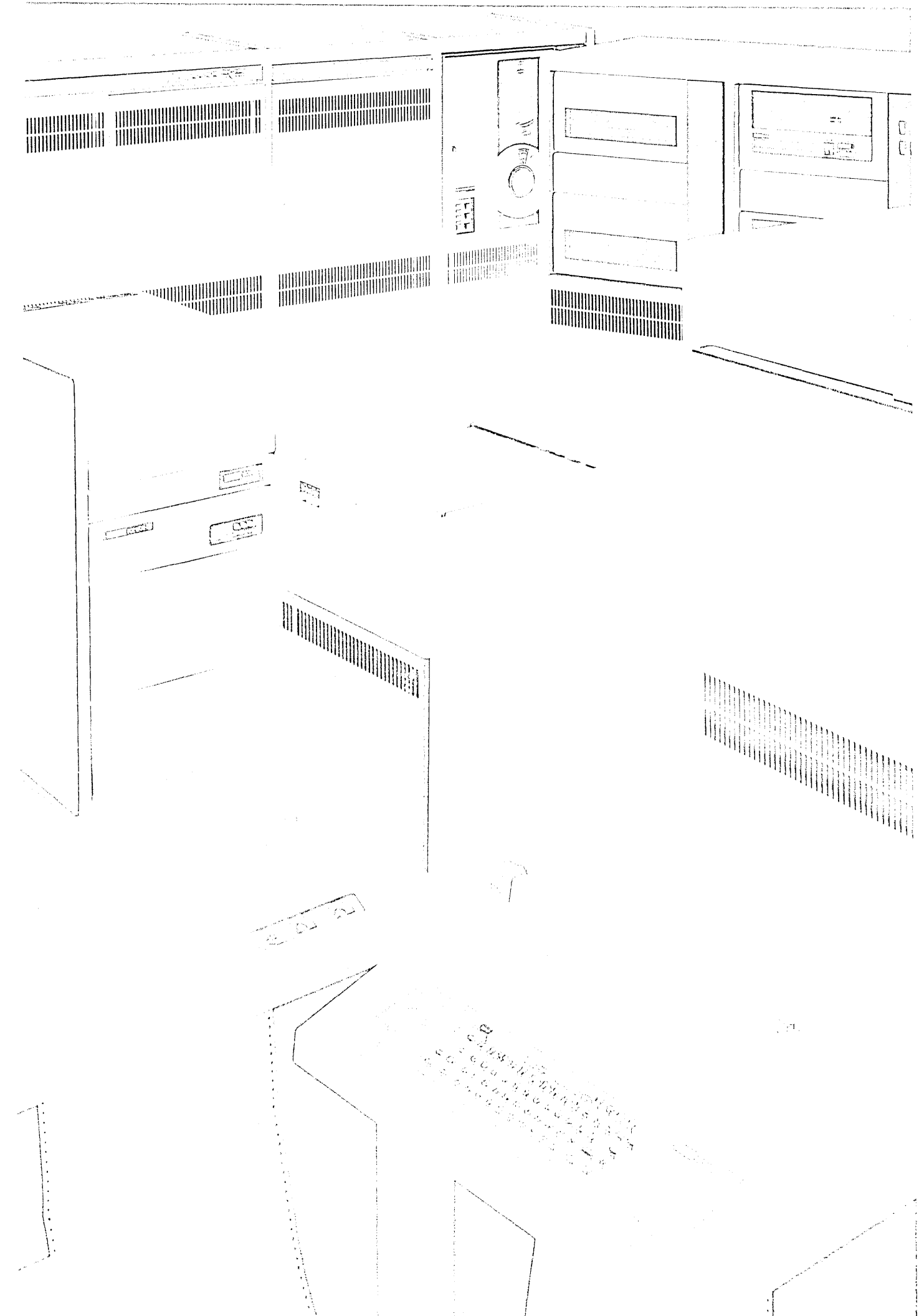
Fig. 2. CASSM (Context Addressable Segment Sequential Memory) was one of the first approaches to a data base processor. Each head on a head per track disk has sufficient logic to test the items recorded on its track, making it possible to search the entire disk in a single rotation, setting the appropriate bit in the RAM for those which meet search criteria.

FACTOR	SMART PERIPHERAL	NETWORK NODE	HOST-DBP
HARDWARE	SPECIAL PURPOSE	GENERAL OR SPECIAL PURPOSE	GENERAL OR SPECIAL PURPOSE
COUPLING	MEMORY OR TIGHT I/O CHANNEL	LOOSE/COMMUNICATION LINES	I/O CHANNEL
AUTONOMY	DBP AS SLAVE	DBP AS EQUAL	DBP AS SLAVE
HOSTS	ONE	MANY, SAME, OR DIFFERENT	MANY, SAME, OR DIFFERENT
RESPONSE TIME	FAST	SLOW	MEDIUM
FUNCTIONS TO DBP	FEW	ALL	FEW TO ALL

Table 1. No matter whether built on general purpose or associative hardware, the questions of function distribution, benefits, and obstacles are the same for the three classes of data base processor.

What separates PDT-11 intelligent terminals from all the rest?





delays and costs prohibit record-at-a-time access, a high level data management language was developed to allow users to access other nodes in the network to request files and subsets of files rather than individual records. Cullinane has also recently announced a network node configuration for IDMS. Actually, many of the DBP's developed for the host-DBP approach could also be used in this way if they have an appropriate high level data management language.

The *host-DBP* approach involves a relatively tightly coupled configuration, essentially a master-slave configuration in which the DBP fulfills the data requests passed to it. However, the DBP can reject requests which do not conform to the DBMS access controls. The DBP may or may not be a special purpose processor; in either case, the connection between host and DBP is usually an I/O channel.

Increasing work is now being done with DBP's of the host-DBP type using general purpose minicomputers. Some work involves special purpose hardware instead, frequently as an outgrowth of the associative processing work being done on intelligent controllers.

One such system is the Data Base Computer (DBC). The DBC is a back-end data base processor designed to assist a host in data base management. The DBC receives requests from the host, does the necessary search and retrieval, and returns the requested data to the host or makes the specified changes to the data base. Its architecture, which uses special purpose pipeline hardware, is shown in Fig. 4.

Essentially, the DBC is an inverted file machine, which provides parallelism in two ways. First, by using microprocessors for each track within a disk cylinder, the entire cylinder can be processed in parallel. A second type of parallelism occurs because of the pipeline organization of the DBC. There are a number of steps each query must go through. The DBC architecture provides a separate unit to do each of these steps, so many queries are being processed simultaneously, each one at a different step in the process.

The DBC consists of seven components, organized into two loops. There is the structure loop which identifies the disk cylinders containing the actual data records. There are two key components in the structure loop: the structure memory is the inversion table for the data base and identifies the logical cylinders which may contain the requested data; the structure memory information processor and the index translation unit convert these logical identifiers to physical disk addresses.

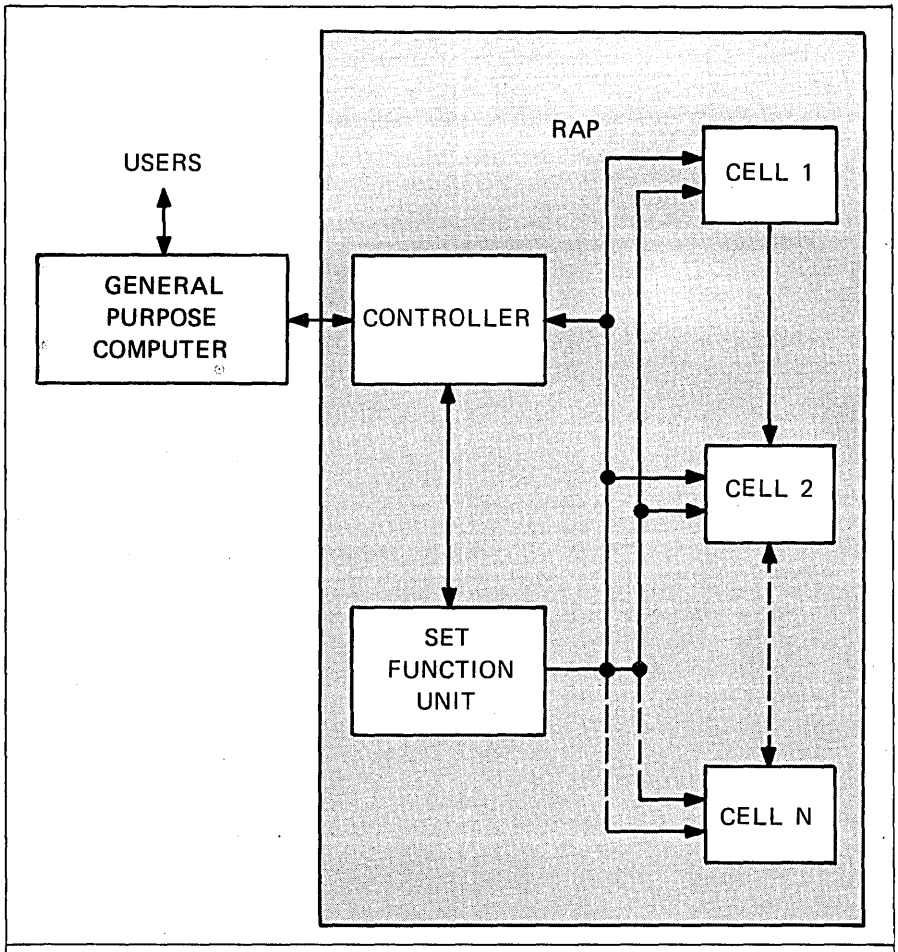


Fig. 3. RAP (Relational Associative Processor) originally was built for a relational data base system, as its name implies, but can be used in other environments as well. Its associative store (cells *1* through *N* above) is read into a buffer from disk, with mark bits set for those records selected. Records are altered as required while in the buffer, and set functions (summations, etc.) are performed before the data is transmitted to the host.

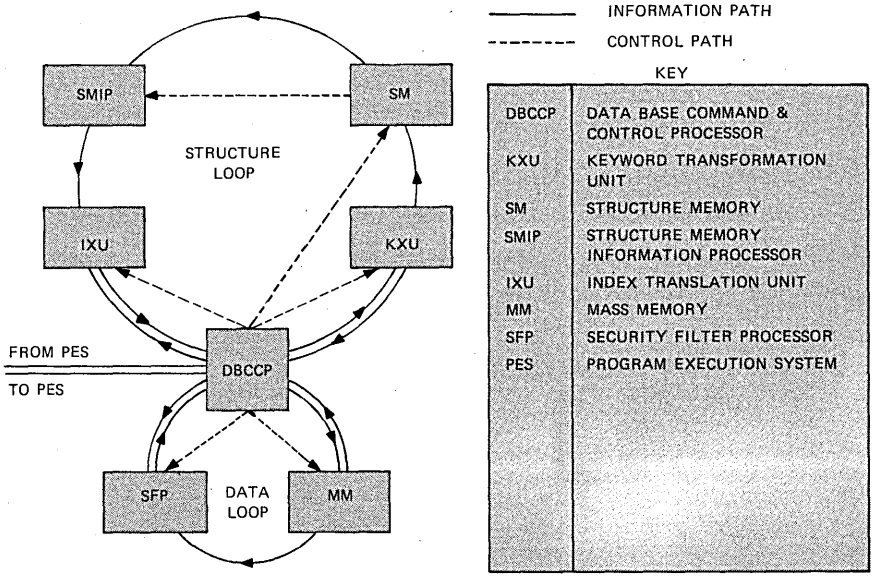


Fig. 4. The DBC (Data Base Computer) was designed to be a slave to a host cpu. It employs microprocessors for each disk track on a cylinder (one for each read head) so an entire memory may be read in parallel, and a pipeline processor architecture so that many processes may be performed on data simultaneously.

A more realistic approach would be to consider not what users need, but what they will need—including distributed data bases.

PREPARE FOR SOME CHANGES

So far, the experiments have been only experiments. Although three STARAN's have been sold, only the one at RADC has been used for data base research. Both DBC and RARES are only paper designs. Two RAP's have been constructed, the second of which was recently completed using CCD memory chips. CASSM was built as a one-off and is no longer being tested.

In spite of the lack of working examples, the concept of a DBP seems to be an idea whose time has come. This seems apparent from the number of vendors now doing product development for such systems. However, current approaches assume current DBMS function is the target and the objective is simply to improve its performance. For example, a common assumption is that DBMS functions are I/O bound and therefore could be performed on a less powerful processor, such as a minicomputer, more efficiently than by a large host. However, in many commercial applications the data base operations constitute the bulk of the processing with only a few relatively simple operations being done on the data once it has been obtained. This is particularly true with those DBMS's using high level languages rather than record-at-a-time processing.

A more realistic approach would be to reconsider the target function to be implemented on a DBP. The target should be based on the users' requirements over the next two to five years—in other words, what the users will actually need when the DBP's are being introduced and used, rather than what they now need. The major trends are toward increased use of high level languages, distributed systems, and distributed data bases.

Whichever direction is taken, as new associative architectures are implemented in DBP's and DBMS capabilities are expanded, we are in for some dramatic changes in the way we design and use data bases. ❋

OLIN BRAY

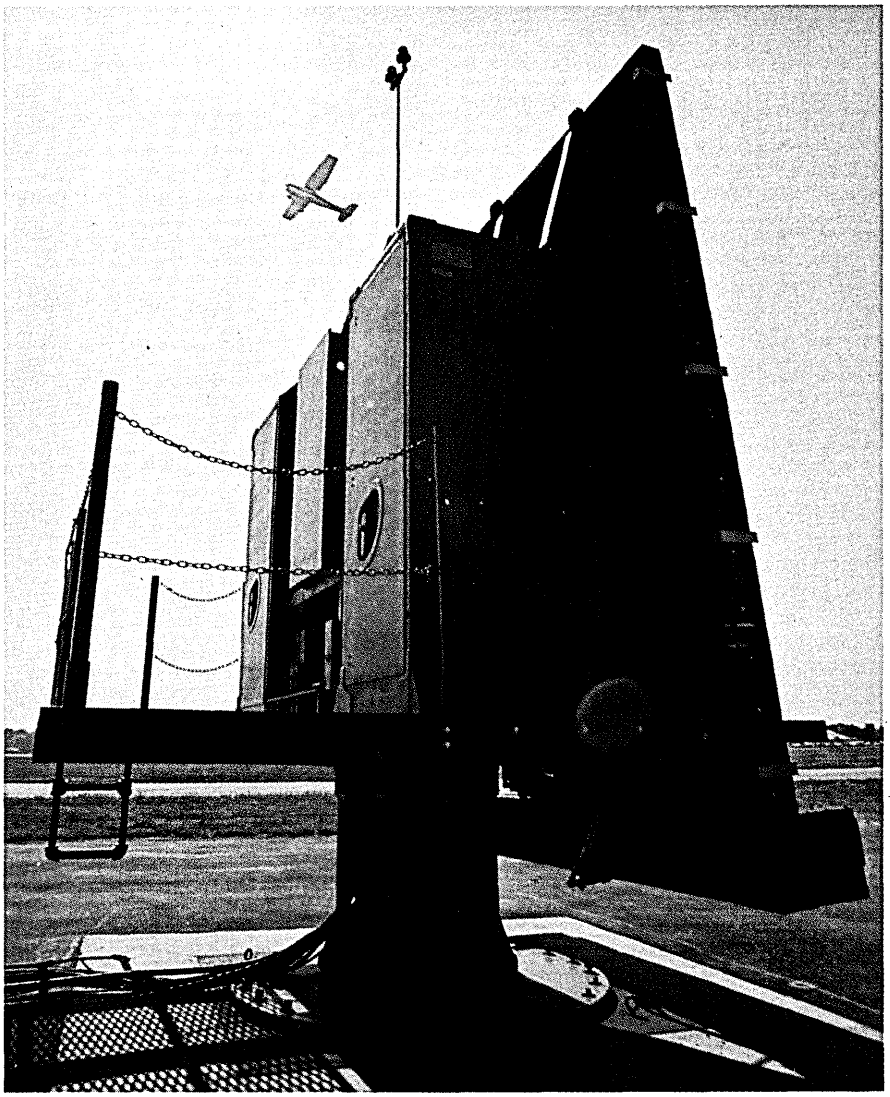
Dr. Bray is a principal systems design engineer at Sperry Univac, where he is involved in distributed data base system technology. His previous 12 years in data processing included working for Control Data Corp. on software for linking multiple CDC 6600s, as an MIS manager for a health center, and teaching dp related courses.

KENNETH J. THURBER

Dr. Thurber is a senior staff scientist at Sperry Univac. Currently acting as a consultant to the Signal Processing Dept. of the Defense Systems Div., he is involved in the definition of advanced computer system architectures. He is also an adjunct faculty member of the Computer Science Dept. of the Univ. of Minnesota.

DP Dialogue

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



Prototype model of ITT Gilfillan PAR-80 phased array radar, which guides an aircraft through 20 miles of approach to a precise touchdown. Computer simulation played a major role in its design.

Simulators Search Out Optimal Radar Designs for Gilfillan

When a search radar finds a target in the sky, a "signature" is hidden in the reflected pulse: a characteristic mix of signal phases and polarities from which the aircraft can be identified as, for example, a fighter, bomber, or commercial airliner. Systems made by ITT Gilfillan, a division of International Telephone and Telegraph Corporation, include digital filters that extract this signature from the faint microwave pulses reflected back into the radar antenna.

To design these systems, ITT Gilfillan simulates several radar functions in an IBM System/370 Model 148. "Our engineers wrote the simulator programs themselves in APL and PL/I," says Eric Berg, engineering group supervisor. "They enter parameters and run them from online computer terminals in the engineering department."

Geometry from a Photograph

In one computer model engineers can enter a geometric representation of a target. The radar return signal is simulated from an approximation of the energy that would be scattered by an ensemble of geometric shapes. A complete signal is generated by rotating the geometric representation over the angle space normally flown by an aircraft. It is difficult to distinguish the synthetic signal from measurements made on an actual target.

These simulated synthetic signals provide the engineer with the tool whereby he can design the optimum radar transmitter and receiver. Convergence to the optimum design is hastened because only the designs proven through simulation are tested in the real radar.

Computer simulation also helped ITT Gilfillan find the optimal scanning program used in the PAR-80. The sweeping motion of a radar beam in space is often more complex than the familiar side-to-side antenna movement. It may scan mechanically according to a stored program, or electronically by cycling phase relationships in the antenna. In some systems, frequency and power are modulated during the scan cycle.

"By testing scan programs against typical targets in a computer simulation, we can measure coverage, tracking accuracy, and detectability of the target," Berg adds. "In a system for landing control, for example, it's important to prevent momentary loss of an aircraft signal during its approach. Here the model finds holes in coverage of the glide path. In one recent design we simulated 66 different scan programs within a few days. The computer plotted the scan pattern of each and the systems engineer picked the one that gave the best coverage of the approaching aircraft.

"In a short period of time, a designer can make repeated trial runs, each guided by the results of the previous one. Interactive computing is a uniquely powerful tool in the search for an optimal radar system design."

Advertisement

Helping Distributors Nail Down Customer Service

Millions of nails and staples made by Duo-Fast Corporation are punched into houses, furniture, packaging, displays and a host of manufactured products. Each fastener is hammered home in a single swift stroke by a Duo-Fast hand or power tool.

Ten of the company's regional distributors use IBM 3790 Communications Systems to keep a tight rein on their inventories while responding faster to customer needs.

Says Robert Grimley, corporate secretary: "We've achieved significant benefits in control of inventory and receivables. But the most important gain has been in customer service.

"At the distributor, customer orders – from builders or industrial users – are entered into a computer terminal immediately, so that inventory records are always current. Distributors know exactly what they have on hand, and most orders today are filled from stock. We avoid a lot of expensive air freighting of emergency orders, and unnecessary rush production at the factory. Lately, we have had a major increase in sales volume, which we're handling with almost no rise in inventory."

Polled at Night

At present, eight company-owned and two independent distributorships, conducting about 50 percent of the company's business, use 3790's. During the day, each processor operates as a self-sufficient or "stand-alone" computer. At night, Duo-Fast's IBM System/370 Model 125 computer in its Franklin Park, Illinois, headquarters polls the ten 3790's, one at a time, to obtain the day's transaction data. This enables the central computer to maintain a current record of each distributor's data base, and calculate daily sales and inventory changes at each location and for the company as a whole.

Duo-Fast Corporation's Eastern Sales and Service Division distributes over a four-state area. It controls inventory separately at nine warehouses including this one at its Long Island City, New York, home location, with the help of an IBM 3790 system.

"The corporate system answers distributor inquiries," Grimley continues, "to identify the nearest location of a critically needed item, or to provide up-to-the-minute credit information."

Faster Turnover

Adds Stephen A. Leber, division manager of Duo-Fast's Eastern Sales and Service Division, a company-owned distributorship that serves a four-state area from Long Island City, New York: "The 3790 has helped us increase inventory turnover from 3½ times a year to between 4½ and 5 times. And prompt invoicing has cut days of receivables outstanding by ten percent.

"The 3790 directly aids collections: the day after we close the books on the month, our salesmen get reports on the age of receivables."

"Through better information," adds Grimley, "we've improved profitability and control of pricing. Cash flow is better for distributors and ourselves. And some of our distributors are handling higher volumes of business with no increase in staff."

Lights. Camera. Action. Data!

Along with cameras, lights, props and costumes, a production unit from Paramount Pictures Corporation takes along a computer terminal when it goes on location to film a movie.

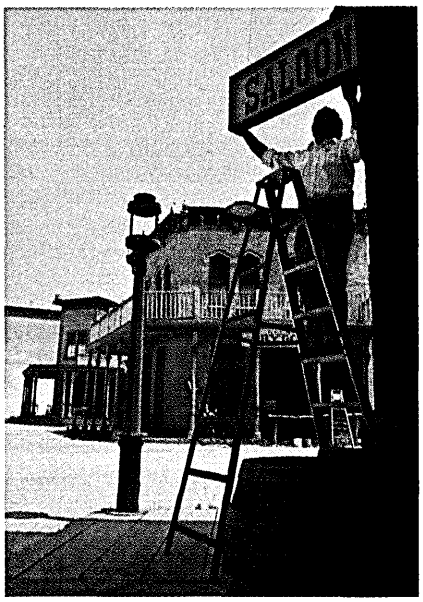
The purpose, says Thomas Pavone, director of data processing/West Coast, is to enable an auditor to monitor expenses against the budget on a daily basis.

At Paramount, a subsidiary of Gulf & Western Industries, a production unit is like an individual company with an auditor who makes all disbursements, Pavone explains. As each expense is incurred – hiring of carpenters, rentals of space and equipment, purchases of supplies and material – a clerk enters the details at the terminal. And as actors, technicians and other employees turn in time cards, the hours they have worked are also keyed into the IBM 3741 Data Station.

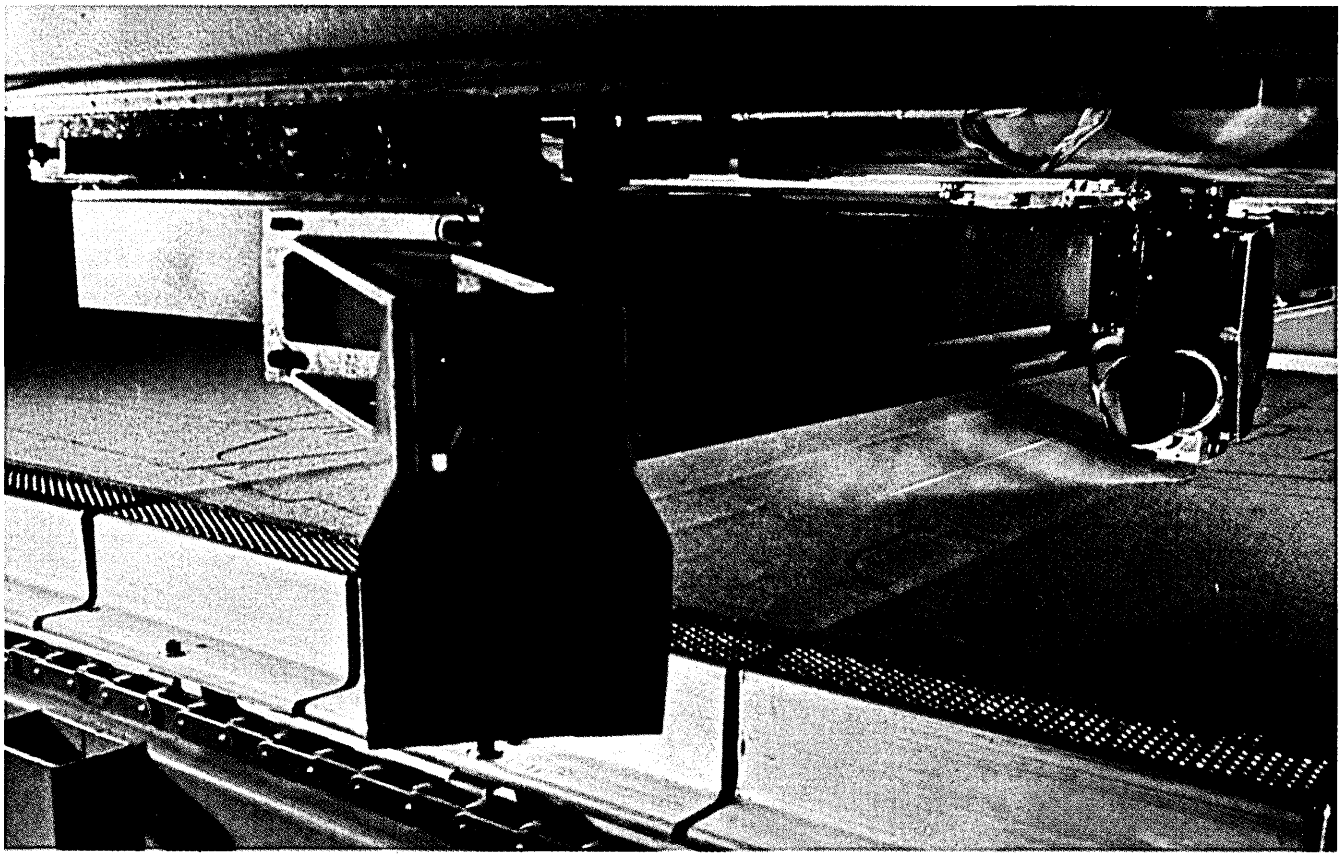
The terminal incorporates a small processor that operates as a "standalone" computer during the day, keeping a continuous account of production costs and accumulated hours worked by the crew. A payroll program in the 3741 calculates the gross pay for each employee, allowing local artisans and free-lance employees to be paid immediately. At night, the data is transmitted over the leased telephone line to a terminal in Paramount's Hollywood studios, and relayed to the company's IBM System/370 Model 148 computer in New York City, where the regular payroll checks are prepared.

Up to the Day

"The auditor now knows exactly how much money a production has spent – up to the day," Pavone points out, "and management knows it just as quickly. With a clearer picture of what has been paid to date, the auditor can do a much better job of projecting an estimated cost to finish."



On this Hollywood set, the TV series Bonanza *was filmed. Paramount uses an IBM 3741 Data Station at the studio as a powerful cost-control aid. When a production unit goes to a remote location, it takes along a similar 3741.*



High-speed laser cutter slices through fabric for men's suits. The beam is directed into the cloth by a system of mirrors on the moving arm.

Laser Tailors Men's Suits for Richman Brothers

Responding to information recorded on a magnetic tape by a computer, the mechanical arm flies over the surface of the cloth at velocities that reach 36 inches per second. The blue-white light from its end makes a fine, surgically clean cut as it moves. The beam, from a laser, is directed into the cloth by a mirror system attached to the moving arm. The cloth is destined to become a man's suit.

J. O. Burton is manager of Manufacturing Research and Development for Richman Brothers, a major men's clothing manufacturer and retailer headquartered in Cleveland. "Through the use of the computer and a laser cutter, we are saving 10 to 15 percent of cloth, which was formerly wasted by manual planning and cutting techniques," Burton says. "In addition, we receive consistent accuracy on all cut parts, which in the end means we produce a better tailored garment for our customer."

Use of the IBM System/370 Model 158 in manufacturing begins when cloth is delivered to Richman Brothers. It is first run through processing machines on which sensors – aided by an observer at an online terminal – note any blemishes or flaws. Other sensors report the position of each flaw. This information will be stored in the computer to provide instructions for automatic cutting around these damaged areas.

Another integral step in the manufacturing process occurs when the computer "grades" the designer pattern, usually a size 40 regular, to produce patterns for the full range of sizes. Working from the master pattern, which has been entered into the computer through a digitizer, each component is scaled up and down the entire size range. This is not a simple process, Burton points out; different elements of the pattern expand and contract in different, complex ways from size to size.

These components are then displayed on an IBM graphic terminal where an operator using a light pen makes the final placement of components in the cutting pattern in order to obtain maximum utilization of the material to be cut. This is the final step that provides the information for the laser cutter.

"We are working our way toward a total system concept," he continues, "using the data base to keep track of fabric, patterns, orders, and the progress of work through the plant. Very shortly the computer will automate the matching of patterns so that plaids and stripes will extend evenly across garment seams.

"These jobs, which were formerly done manually, required countless years of experience and skill. As our knowledgeable people retire, these skills are being lost. Fortunately, with the aid of the computer we will continue to turn out finely tailored suits and be able to reduce our manufacturing costs in the process."

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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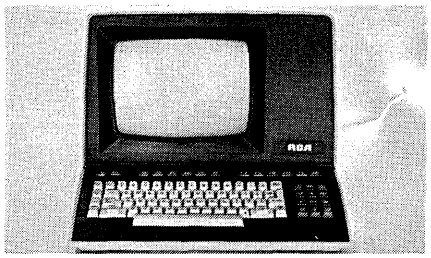

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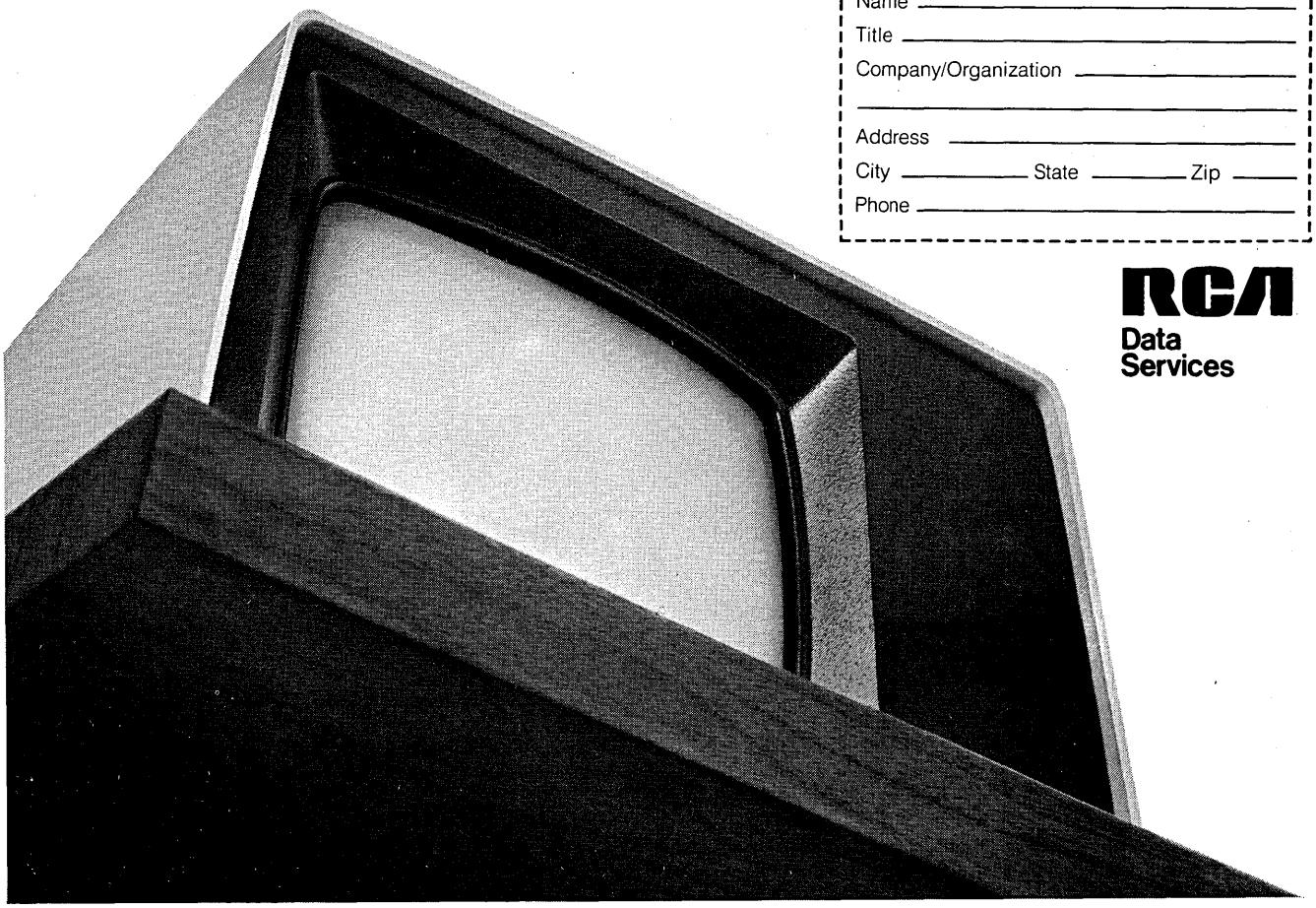

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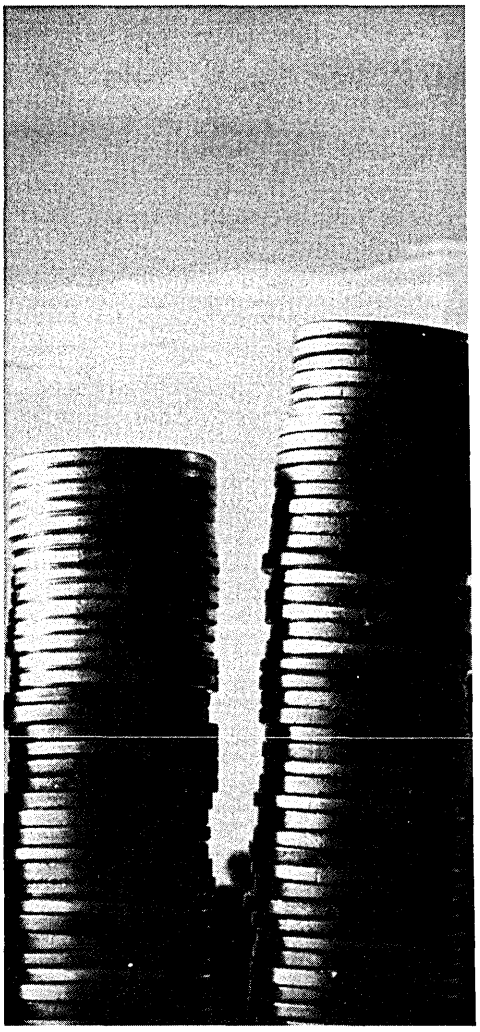
Wage guildelines and the economy make some managers "a little gloomy," but others say "the trend is up."

1979 DP BUDGET SURVEY

By Philip H. Dorn, with the DATAMATION staff



Data processing budgets for 1979 are up, down, and sideways. And it looks as though external factors are causing the gyrations: inflation, uncertainty about the President's "stop-inflation" program, and the new wage guidelines. Because of changes within the industry, the patterns of the post-1971 recession era, which have been rough guidelines for the allocation of the dp dollar, are beginning to weaken. But those changes—cheaper hardware, increased pressure for new applications, distributed processing, and the onset of office automation—are not all exerting their full force on the budget yet.

The wage guidelines have our vote for the most important factor in 1979. While smaller companies are not likely to receive much close Federal scrutiny, the large corporations are, and they are seriously worried about the impact of wage constraints in an era of shortages of high quality personnel. While one corporate dp manager hopes to slip through by giving most of the money to the "good people," another gloomily predicts that he is going to lose his good people. And that, he says, "will force the corporation to spend a great deal of money recruiting to fill the empty slots."

The general economic picture the budget planners see for 1979 varies to an extreme. "Things look a little gloomy," says a spokesman for the Ford Motor Company, "but spending in computers must go on." "We take a serious view of an impending recession in the second half of the year," says a manager in a major consumer products company. But optimism reigns at United Air Lines, where Glen W. Belden, president of the Computers & Communications Services Division, claims, "The trend is up . . . (we) are spending more and more on dp." The whole airline industry is "up a double digit percentage."

What is the overall budget increase in 1979? With a gun to our heads, we will say that 1979 dp budgets, according to the DATAMATION survey of 150 organizations, are up 12%. Admittedly, that does not tell the dp manager very much, but it is a figure to trot into top management if the dp budget is not growing smoothly.

Looking at the increases allotted across the sampling, the pattern actually tends to be quite smooth for most groups, with 12% cited for both hardware and personnel. Software spending is up a little more, just under 14%, but this is a very small part of the total budget. If the survey results are correct, the 1979 budgets should look very much like 1978 in terms of overall allocations:

Hardware	32%
Personnel	53%
Software/services	5%
Supplies	7%
All else	3%

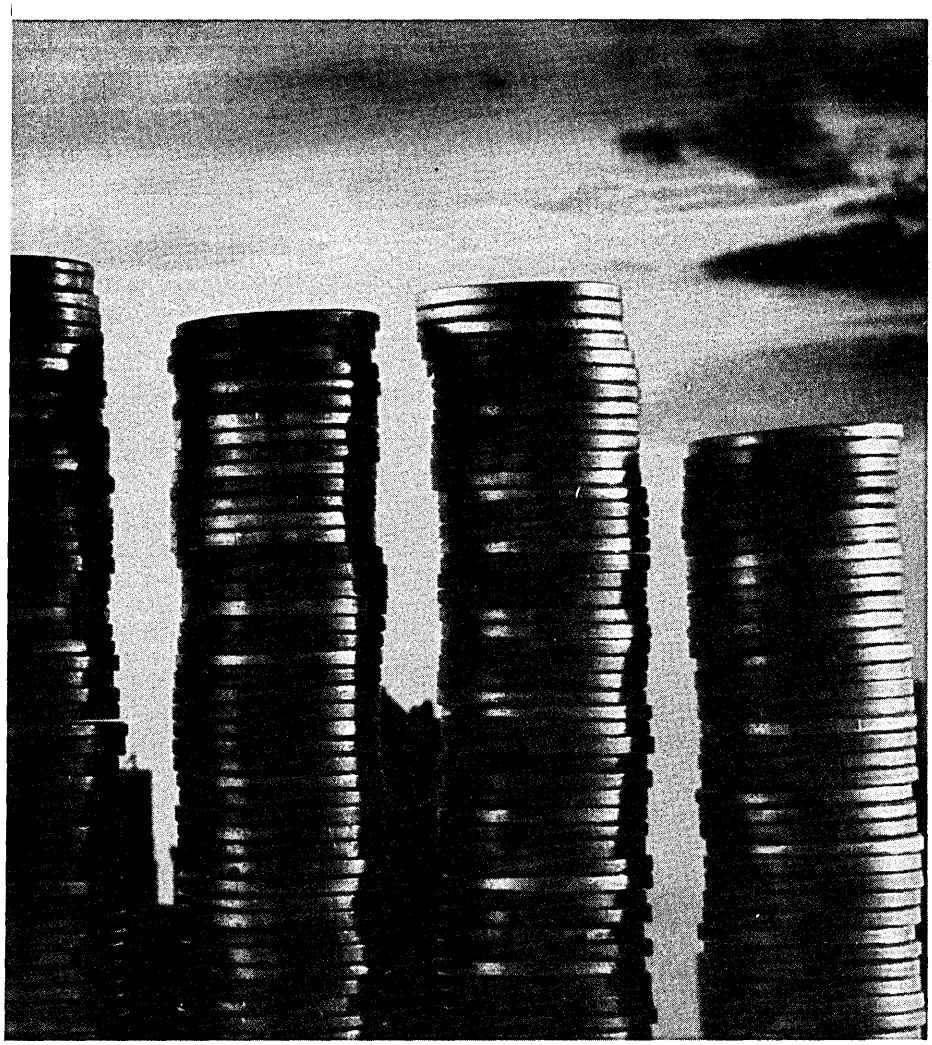
To put the increase in terms an accountant can understand: take each dollar spent on dp in 1978, and for 1979 add $0.04 for hardware, $0.06 for personnel, and $0.01 each for services and supplies. When that is balanced against inflation, at least 8% for 1979, it is quite clear that in real value dp budgets are not increasing.

One manager told us bluntly that he expects "worldwide computing budgets to stabilize and go up very slowly." This, he explained, is due to business forecasts for the coming year, with costs going up faster than income. Therefore, "it is not an expansionary trend."

A quick scan across the percentage increases in budget by industry type shows some fairly startling, although not unexpected, results (table 1). Industrial organizations seem to be planning on comparatively routine annual hardware increases of around 13%. But big spenders in government seem to average a 25% hardware jump. Whatever happened to Proposition 13? From what a few managers said, they are installing pre-tax revolt orders now.

Who is getting hurt? The smaller educational institutions are expecting a rough year. In this world, dominated by the aging IBM System 3/10, the hardware budgets are being slashed 10% in 1979. The bigger colleges and universities, however, show a more industry-like pattern for 1979.

We noted earlier that not all major industry trends or rages are significantly changing the dp budget yet. Take distributive data processing. If one believes the number of conferences held in 1978 on this subject, almost every user should be busy spewing small computer



systems across the landscape. In fact, most of the hardware is still firmly situated at the central site in all the industrial groups. What is going out to the field seems to be almost exclusively terminals.

How does one explain the difference between what people are saying and what they are actually doing in 1979? IBM is the firm that makes trends move. It was not until late in 1978 that IBM announced its real distributive system, the 8100, and the delivery lead times are nearly a year. So, while many corporations have thousands of 8100s on order (over 25,000 according to Wall Street's Oppenheimer & Co.) the bulk of the deliveries are not scheduled until 1980 and later. A chemical company dp manager told us that he has 12 8100s on order, but nevertheless, they will have little or no effect on the 1979 budget planning.

Are word processing (wp) systems showing up on data processing budgets? Not yet in the industrial world, although some of the non-profits register a small percentage of their hardware spending in this category. Wp gear may never make a major dent in dp budgets, at least in industrial organizations. It may be evaluated and selected by the dp department, but the budget authority is likely to be the end user who operates the system.

With the increasing cost of personnel and new applications pressures, is spending on outside software now a significant budget line item? For the big corporations noticeable budget percentages, 2 to 3%, are being allocated to the purchase of software. Naturally, the very small companies with small systems do not always have the chance to buy large amounts of software because of vendor marketing constraints.

The split in spending between mainframe vendor and independent software house is an interesting one. (Table 4.) While it is well known that IBM is pushing software licenses as a way of recovering some of the lost hardware profit, the growing size of the inroads made by the independents is surprising. One would expect them to have a more difficult time, considering that IBM installations start from a base of operating system, systems programs, and utilities.

Although the total software share of the budget seems small, 2 to 3%, when it is multiplied by the number and budget of the installations, the figures become impressive. Just looking at the FORTUNE 500 companies alone, software sales annually should be in the range of $240 million. Adding the rest of industry—financial and retail establishments, educational institutions, and government—it is clear software is becoming an important business.

Another major trend discussed in recent years concerns expenses that are off the dp budget. The theory goes that end users are out buying minicomputers, small business systems, consulting and educational services, software packages and "secret" microcomputers. Numbers bandied about say as much as 20% of all dp expenses are off the main budget. Many managers agree that it is happening, but their estimates vary. For example, dp veteran Herb Seidensticker at Combustion Engineering, Stamford, Conn. put the figure at more in the 5% range.

In our survey, only a tiny handful admitted that their budgets changed because hardware was moved to end user budgets (table 2).The survey did specifically try to measure the number of people that are under dp or end user budgets. The results showed clearly that the analysts and programmers are under dp department authority in almost all cases. Data entry is not quite as clear cut, but here too a large percentage of the data entry people are still listed as carried on the dp budget. We think, however, that in many cases the issue is more that off-budget items are not being measured or admitted than that they do not exist.

Getting down to the heart of the matter, just how are the dp managers slicing up their allocated monies? Are more dollars, relatively speaking, going to personnel than before? Is the spending percentage for cpu and memories dropping as fast as the raw cost of the hardware is (remember the difference between cost and price)? Is the allocation for data entry hardware being reduced as more and more installations move toward remote processing, with the data entry operation directly at the user's site?

The reader is reminded that this

1979 DP BUDGET BY INDUSTRY

IN PARENTHESES = NUMBER OF SITES REPORTING	AUTOMOTIVE (6)				DISTRIBUTORS (6)				ELECTRICAL AND ELECTRONIC (9)				HOME AND OFFICE FURNISHINGS (5)				INDUSTRIAL EQUIPMENT (6)			
	S	M	L	1976 (5)	S	M	L	1976 (0)	S	M	L	1976 (11)	S	M	L	1976 (0)	S	M	L	1976 (12)
EDP AS % OF CORPORATE REVENUE	—	.40	n/a	n/a	—	.83	—	n/a	—	.81	1.33	n/a	—	3.7	—	n/a	—	1.1	n/a	n/a
BUDGET ALLOCATIONS																				
HARDWARE	—	28	40	44	—	37	—	—	—	32	32	33	—	29	—	—	—	39	49	39
PERSONNEL	—	54	52	46	—	50	—	—	—	55	54	51	—	47	—	—	—	48	45	48
SUPPLIES	—	8	7	6	—	7	—	—	—	8	8	8	—	8	—	—	—	7	5	6
SOFTWARE/SERVICES	—	2	1	3	—	5	—	—	—	2	4	7	—	8	—	—	—	6	1	5
COMMUNICATIONS	—	0	0	1	—	1	—	—	—	2	2	1	—	1	—	—	—	0	0	2
OTHER	—	8	0	—	—	0	—	—	—	1	0	0	—	7	—	—	—	0	0	0
HARDWARE ALLOCATIONS																				
CPU & MEMORIES	—	44	—	35	—	51	—	—	—	41	33	40	—	33	—	—	—	50	44	44
PERIPHERALS	—	39	—	41	—	28	—	—	—	21	36	36	—	43	—	—	—	20	41	35
TERMINALS	—	3	—	9	—	14	—	—	—	8	14	9	—	4	—	—	—	10	5	5
DATA COMMUNICATIONS	—	2	—	0	—	2	—	—	—	3	4	3	—	0	—	—	—	6	0	6
DATA ENTRY	—	7	—	14	—	4	—	—	—	13	6	10	—	16	—	—	—	14	10	5
WORD PROCESSING	—	0	—	n/a	—	0	—	—	—	2	0	n/a	—	4	—	—	—	0	0	n/a
C-O-M	—	3	—	0	—	0	—	—	—	0	1	1	—	0	—	—	—	0	0	1
OTHER	—	1	—	0	—	2	—	—	—	12	6	1	—	0	—	—	—	0	0	4
HARDWARE LOCATION																				
LOCAL	—	86	100	—	—	95	—	—	—	88	100	—	—	86	—	—	—	95	87	—
REMOTE	—	14	0	—	—	5	—	—	—	12	0	—	—	14	—	—	—	5	13	—
% OF TOTAL EDP BUDGET																				
MAINFRAMER'S SOFTWARE	—	1.0	—	—	—	1.8	—	—	—	1.80	3.0	—	—	1.0	—	—	—	3.3	1.0	—
INDEPENDENT'S SOFTWARE	—	1.1	—	—	—	1.8	—	—	—	1.03	.0	—	—	3.0	—	—	—	1.7	.1	—
BUDGET INCREASES 1979 OVER 1978																				
IN HARDWARE	—	9.5	—	—	—	12	—	—	—	18	30	—	—	n/a	—	—	—	16	-1	—
IN PERSONNEL	—	15	—	—	—	10	—	—	—	22	23	—	—	14	—	—	—	12	10	—
IN SOFTWARE	—	10	—	—	—	12	—	—	—	27	14	—	—	n/a	—	—	—	40	—	—

SML = SMALL, UP TO $150,000 / MEDIUM, $150,000 to $1,000,000 / LARGE, OVER $1,000,000
N/A = NOT AVAILABLE — = NOT REPORTED OR CATEGORY UNREPORTED 0 = ZERO = HIGHLIGHT DATA

is not a perfect sample. There are data inadequacies, both in numbers and distribution, that skew results. Go slow before measuring your shop against these figures. Averages are always misleading because every installation is working toward a different set of objectives as defined by the organization it supports.

Generally we have elected to drop out data from installations undergoing fundamental changes. These might include a merger or acquisition, a total conversion to a new vendor, the first introduction of data base or a variety of other major overhauls that would result in percentage increases of 100% in areas where 25% is exceptional.

We have looked at two primary areas (table 1). The first concerns overall budget allocations among people, hardware, communications, supplies, and the like. Second, the hardware budget has been broken down to show allocations for cpu and memory, peripherals, COM, data communications, data entry, and other items. Perhaps the most important aid these numbers provide is showing the relative size of some of the components against the total dp budget. When a vendor is trying to sell a 10% saving in one area, the manager ought to ask just how much it amounts to in the total budget and measure that against the risks.

There are differences between industries, particularly those in an expansionist period and those in more mature industrial sectors. But the bigger differences seem to be the size-related areas. That is, the stand-alone System 3/10 shop is very much the same regardless of the industry served. We suspect this is very fundamental, particularly with older batch processing systems that have limited functional capability.

The "not for profit" world has sharp differences from the profit-making enterprises. The bigger non-profit sites seem to have written down the hardware and are spending their money on keeping personnel. This is not unexpected considering the time frame to get new equipment installed in government shops. Also, the traditionally lower paying institutions generally have trouble keeping their programmers and analysts on board. A manager in a major university told us, "It is difficult to keep quality people when I am stuck with 7% wage increases and the local public utility not only gives 20% raises, but also has a more leisurely operating environment."

Word and distributed processing have not impacted the budget...yet.

	METAL				PAPER (3)				RETAILING (6)				INSURANCE (7)				MEDICAL AND HEALTH (9)				MISCELLANEOUS SERVICES (9)				EDUCATION (7)				GOVERNMENT (15)			
	S	M	L	1976 (7)	S	M	L	1976 (3)	S	M	L	1976 (5)	S	M	L	1976 (8)	S	M	L	1976 (16)	S	M	L	1976 (0)	S	M	L	1976 (43)	S	M	L	1976 (20)
	.96	.7	n/a	n/a	—	—	.47	n/a	.35	.20	.30	n/a	—	1.7	n/a	n/a	.9	2.5	2.3	n/a	2.0	4.3	1.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	33	34	36	36	—	—	32	—	40	25	36	33	—	34	34	38	26	37	46	51	32	17	26	—	29	28	21	43	40	16	24	36
	59	54	58	52	—	—	58	—	48	48	50	51	—	50	62	52	58	29	45	34	43	70	58	—	55	56	70	46	55	56	56	51
	5	6	3	7	—	—	9	—	10	10	9	12	—	9	2	4	13	10	6	7	9	8	6	—	3	4	5	7	4	5	4	8
	3	2	4	2	—	—	1	—	2	5	4	3	—	6	2	2	3	23	3	7	8	4	8	—	13	10	2	3	1	4	1	4
	0	1	0	3	—	—	0	—	0	11	1	1	—	0	0	3	0	1	0	1	1	1	0	—	0	1	2	1	0	1	1	1
	0	2	0	0	—	—	0		0	1	0	0	—	1	0	1	0	0	0	0	6	—	2	—	0	1	0	0	0	19	14	0
	40	50	n/a	39	—	—	38	—	28	67	36	32	—	39	54	35	43	26	45	48	—	48	44	—	39	41	45	52	71	31	39	46
	43	29	n/a	32	—	—	44	—	38	28	33	41	—	34	36	37	50	15	23	31	—	22	43	—	29	26	32	28	4	28	19	31
	5	10	n/a	10	—	—	9	—	13	1	3	12	—	4	3	10	0	24	17	4	—	8	5	—	4	27	8	3	3	15	16	4
	0	3	n/a	3	—	—	1	—	5	4	8	6	—	6	0	4	0	3	8	4	—	8	3	—	0	2	2	3	7	12	7	3
	12	7	n/a	14	—	—	8	—	8	0	20	8	—	13	4	11	4	11	1	12	—	13	3	—	28	2	3	9	12	4	8	11
	0	0	n/a	n/a	—	—	0	—	0	0	0	n/a	—	0	2	n/a	0	20	1	n/a	—	—	0	—	0	0	1	n/a	0	8	0	n/a
	0	0	n/a	0	—	—	0	—	0	0	1	1	—	0	1	1	3	1	0	0	—	—	0	—	0	0	1	0	0	0	1	0
	0	1	n/a	2	—	—	0	—	8	0	1	0	—	4	0	2	0	0	4	1	—	1	2	—	0	2	7	5	3	1	8	5
	97	89	n/a	—	—	—	78	—	100	100	93	—	—	97	100	—	100	100	97	—	100	97	78	—	100	83	100	—	75	98	67	—
	3	11	n/a	—	—	—	22	—	0	0	7	—	—	3	0	—	0	0	3	—	0	3	22	—	0	17	0	—	25	2	33	—
	1.7	.5	2.0	—	—	—	0.0	—	1.0	0.0	.65	—	—	1.08	1.00	—	—	1.05	1.03	—	2.0	1.0	1.56	—	1.4	.85	1.4	—	—	.6	1.02	—
	.0	2.0	.0	—	—	—	0.5	—	5.0	3.0	1.17	—	—	2.60	1.00	—	—	.05	.10	—	—	1.0	3.65	—	.0	2.70	.74	—	—	3.0	.16	—
	7	–8	n/a	—	—	—	7	—	8	n/a	–4	—	—	13	7	—	1	46	8	—	24	14	16	—	–11	25	12	—	26	3	35	—
	24	12	n/a	—	—	—	16	—	9	n/a	14	—	—	12	7	—	14	8	5	—	13	24	21	—	10	5	17	—	–33	22	14	—
	45	–18	n/a	—	—	—	5	—	10	n/a	-17	—	—	26	60	—	—	—	–3	—	33	—	—	—	–1	–23	14	—	0	10	3	—

With our oft-repeated caveat about overall averages (they are not to be made self-fulfilling prophesies), here are some general trends by budget item.

Hardware allocations as a budget percentage seem to be continuing to drop. It was only a few years back when hardware accounted for 80% of the spending in an edp installation. Now the number is down into the 35% range. Of course part of this is the continual labor cost rise but in actuality, the steady reductions in hardware prices and the shift to lease and purchase have dropped the percentages.

Personnel account for the largest single element in a dp budget, and there is no reason to expect any change in this for the foreseeable future. Indeed, we would not be at all surprised to see the percentage cross the 55% mark in all groups in the next two years, if the managers permit it. The question is, will they? Despite survey figures to the contrary, more and more corporations are experimenting with systems analysts and even programmers on user budgets. The clever dp manager, anxious to control the type and quantity of personnel needed to do his work, is looking for ways to move certain positions out of his budget to make room for critical added personnel. Floor operations and data entry staff are being reduced, the former because of the large new systems being brought in and the latter because of the growth of on-line terminal-based systems. As we mentioned before, one thing is certain, the personnel budget will be held down in many installations by wage guidelines and other corporate economic concerns in 1979. (Very few in our survey indicated that budgets increased because of added staff.)

Supplies, tape, disc, ribbons and paper, seem to be the one eternal constant in dp budgets. Installations seem to sit in the 7% range year in and year out. There hasn't been a serious change here in years, and it is hard to see anything happening in the near future that will change this condition.

Software and outside services, as a combined category, seem to us to have been understated on these questionnaires. We have noted that software alone is growing impressively from its small base. But services get short shrift. Time-sharing, consulting, education,

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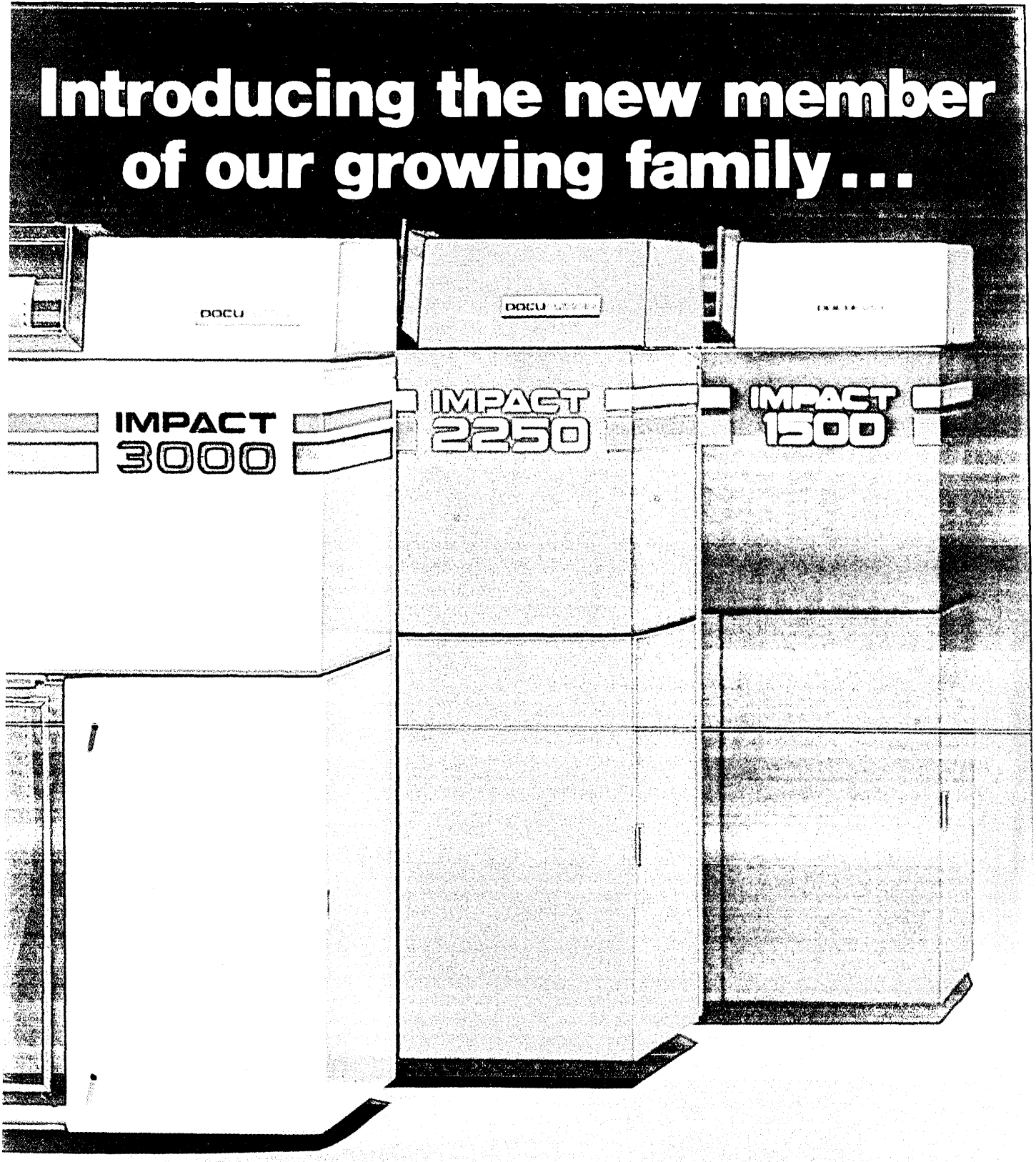

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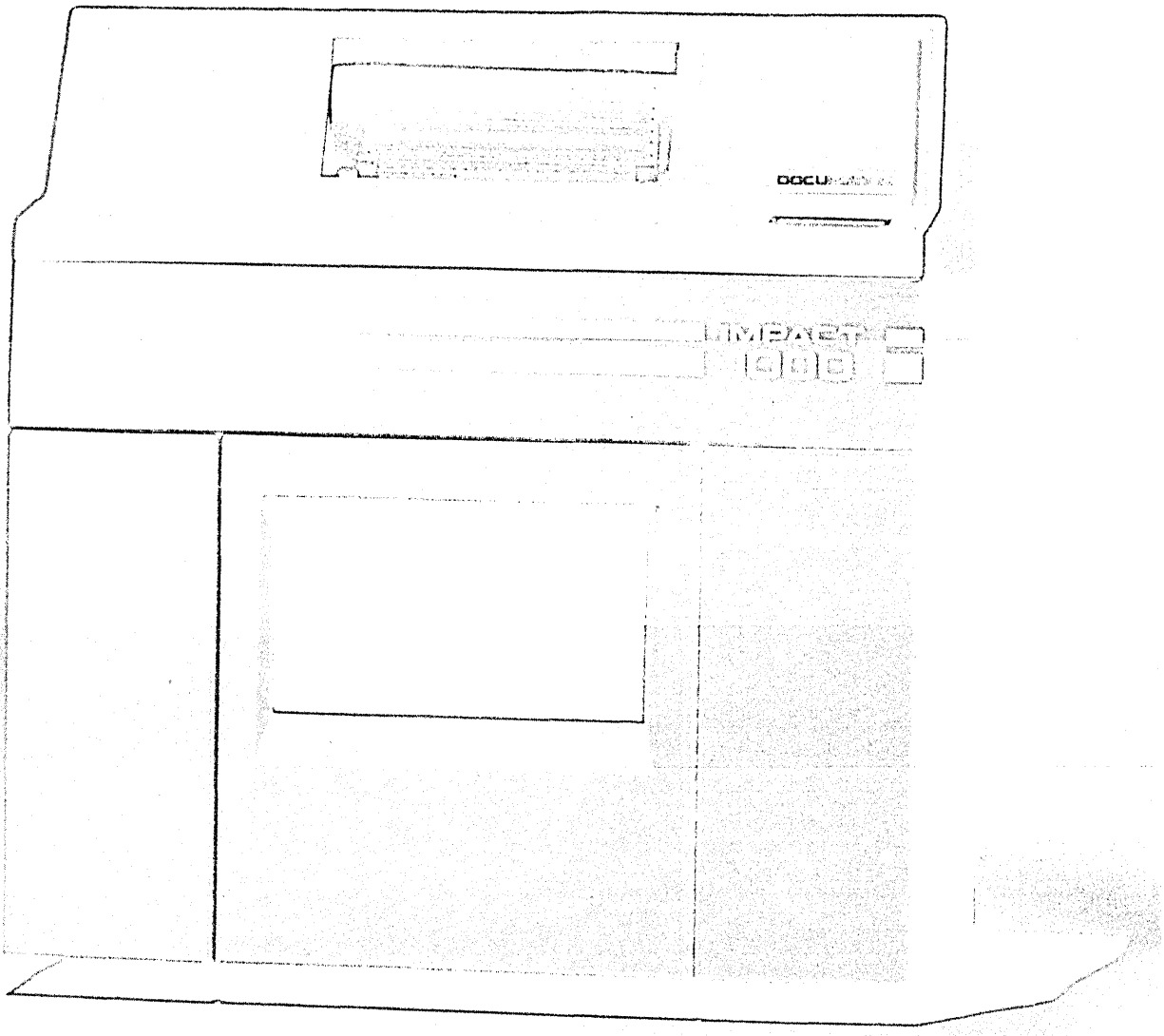

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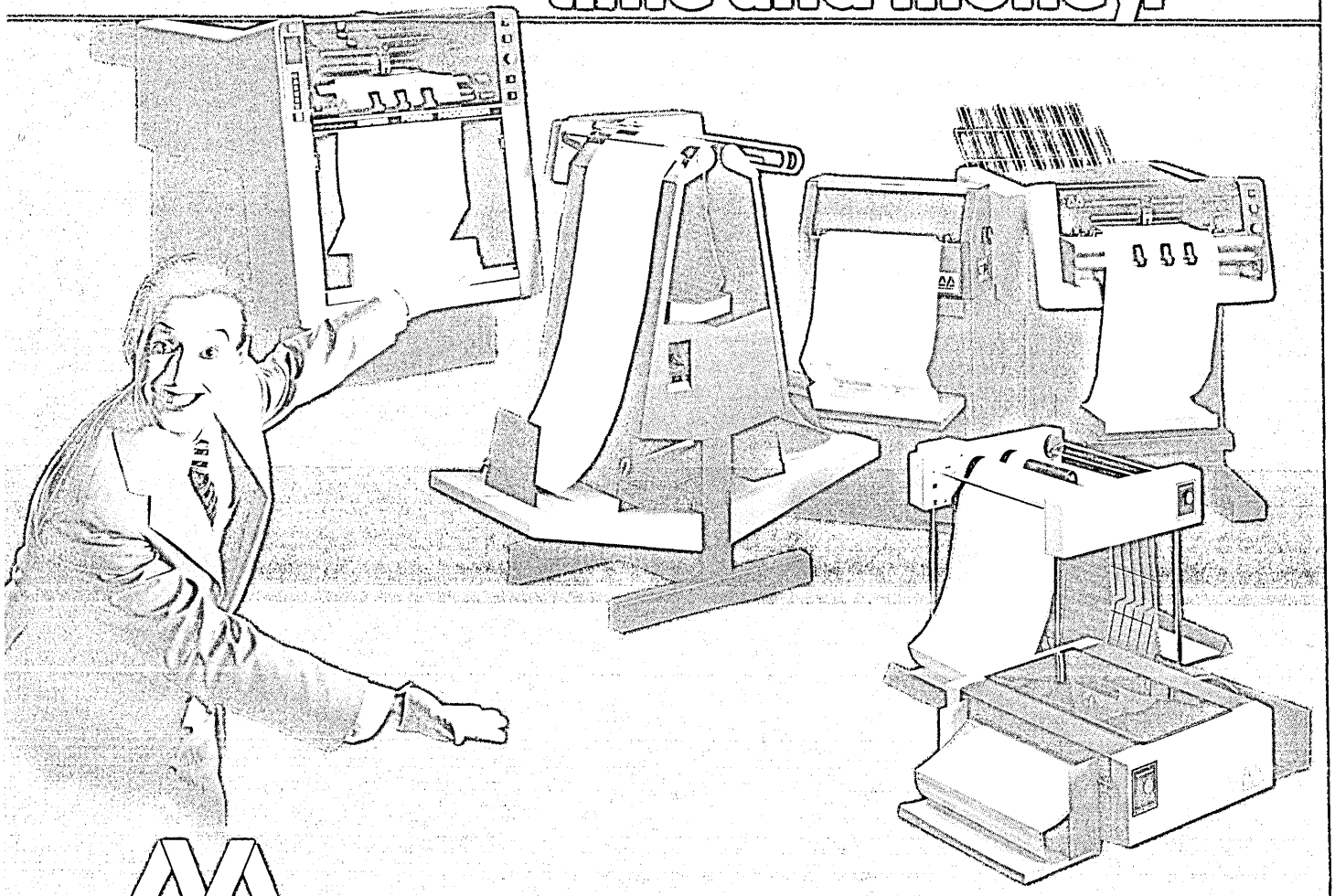

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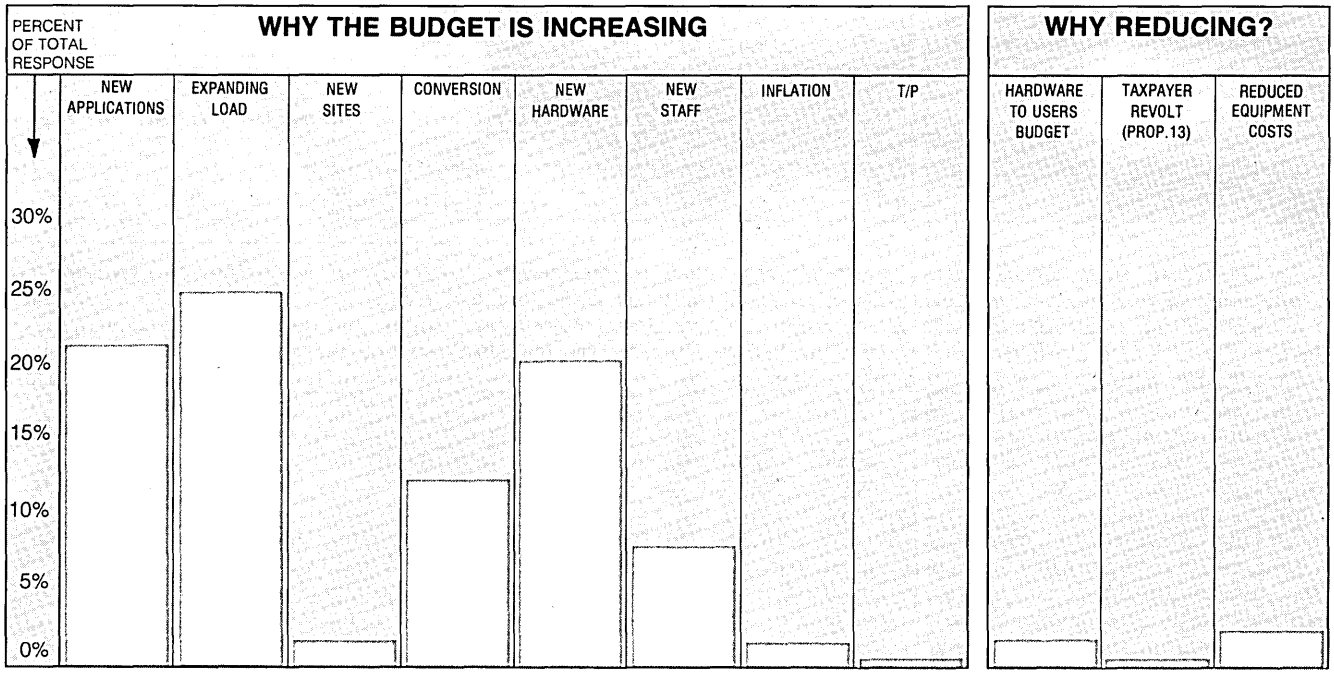
CIRCLE 28 ON READER CARD

By share of budget, hardware is dropping, personnel is climbing, and communications and services seem to be hidden in other budgets.



WHICH BUDGET PAYS FOR DP PEOPLE

INDUSTRY	SYSTEM ANALYSTS				PROGRAMMERS				DATA ENTRY PEOPLE			
	ALL UNDER EDP BUDGET	MOST UNDER EDP BUDGET	MOST UNDER USER BUDGET	MOST UNDER REMOTE BUDGET	ALL UNDER EDP BUDGET	MOST UNDER EDP BUDGET	MOST UNDER USER BUDGET	MOST UNDER REMOTE BUDGET	ALL UNDER EDP BUDGET	MOST UNDER EDP BUDGET	MOST UNDER USER BUDGET	MOST UNDER REMOTE BUDGET
AUTOMOTIVE	86	14			86	14			50	33		17
DISTRIBUTORS	100				100				100			
ELECTRICAL & ELECTRONIC	100				89	11			89			11
HOME FURNISHINGS	100				100				33		67	
INDUSTRIAL EQUIPMENT	100				100				100			
METAL PRODUCTS	91	9			100				73	27		
PAPER	100				100				100			
RETAILING	100				100				80	20		
INSURANCE	100				100				60	20	20	
MEDICAL & HEALTH	100				100				100			
MISCELLANEOUS SERVICES	100				100				87	13		
EDUCATION	76	17		7	71	21		8	64	21		15
GOVERNMENT	100				100				71	21		8

service bureaus, microfilm, etc., comprise a healthy thriving industry that is a major factor in this market. It is well known that the larger installations take advantage of such facilities more than the smaller ones. Our data does not confirm this, and our instinct is to toss it away and rely on the growth statistics of the industry itself.

Communications are also understated in the responses. Herb Seidensticker at Combustion Engineering told us what many managers of large installations echoed: communications expenses are increasing at 10 to 15% a year. So why doesn't it show up in the dp budgets?

Most corporations are quite confused about communications budgets. Some companies give the whole budget to a single group that controls both voice and data spending. Others leave the matter to local authority. Some bill the dp department for parts of shared line services, while others say it isn't worth the trouble.

When we see the low figures on

Neither the vendor nor the dp staff will net big gains in 1979.

SOFTWARE SPENDING
% OF TOTAL DP BUDGET

ELECTRICAL AND ELECTRONIC						DISTRIBUTION						GOVERNMENT						EDUCATION					
S		M		L		S		M		L		S		M		L		S		M		L	
MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND	MF	IND
—	—	1.8	1.03	3.0	0.0	—	—	1.8	1.8	—	—	0.0	0.0	.6	3.0	1.02	.16	1.4	0	.85	2.7	1.4	.74

MF = MAIN FRAME VENDOR IND = INDEPENDENT SOFTWARE HOUSE

our survey, we are sure that many, especially among larger sites, are budgets for modems, terminals and communications computers. The heavy line charges are carried elsewhere.

Hardware allocations are a subject of considerable interest in these days of growing pcm activity (see next month's DATAMATION for a series of articles on this subject.) Once upon a time, the cpu and memory together represented 80% of the total hardware charge. Now these components are a steadily decreasing percentage of the whole (35 to 45%) with terminals and peripherals taking more of the money (30 to 45%). There has been some casual theorizing over the years that the peripheral percentage will be the next candidate for reduction with the growth of minicomputers and remote terminals, but there is no evidence to date that this is happening. Of course there are differences in these allocations due to size. The smaller the shop the more likely the percentage of cpu and memory is to be higher than average. This isn't surprising when you look at the typical systems involved. While the small governmental shops show a great concentration on cpu and memory (small systems such as Wang 2200s, Hewlett Packard 3000s and IBM System 3s dominate here), we think this a rather special case not generally repeatable.

Data entry hardware allocations should be coming down, and for a majority of corporations, there is little doubt that they are being gradually reduced. As more and more work is dispersed to end user sites, there is less and less need for a giant centralized keypunch shop of the 1960's variety. But there seems to be a minimum level that will never go away, nor would it be especially desirable to see it disappear. At this time, large corporations seem to be heading toward a figure in the 7% range while their smaller brethern are still coping with double digit figures.

We included *word processing* as a test. As can be seen, there isn't much word processing gear on the dp books. We think this might change in the future with more and more dp departments purchasing the gear for use of others.

As a user stated earlier in this article, a mild increase of 12% in budgets for 1979 is "not an expansionary trend." We are inclined to agree, and think that dp vendors expecting a massive buying spree in 1979 may be guilty of wishful thinking. Certainly new hardware systems will be installed, but the resulting net dollar increases are not going to be high.

How does this square with the full vendor order books? New applications and additional work load require more hardware. But the price of a unit of computational power is coming down. Therefore, for the same money a manager spent in 1968 for a 360/65 and in 1975 for a 370/168, today he or she will get a 3033 and do a great deal more computing.

The vendor won't get very much net, and neither will the staff at the computer installation. Nationwide, regardless of size, in all industries, dp managers are going to be hard pressed to hand out massive salary increases in 1979. The 7% guidelines are apparently going to happen automatically as more and more of the budget dollar goes to holding the line, staying up with the maintenance raises and bringing in the gear necessary to handle the backlog of applications demanding to be done.

How We Did This Survey

The DATAMATION 1979 Budget Survey report is based on a readership sample of DATAMATION's User Panel and dp managers selected by title from the domestic DATAMATION mailing list. A sample of senior dp executives in all industries was surveyed during mid-November 1978, late enough for the 1979 budgets to be reasonably solid.

The sample included virtually every known industrial classification, but we have only reported on those industrial groupings where there were sufficient numbers of installations reporting to permit us to draw valid conclusions while protecting the identity of the reporting organization. This is the reason for the seeming omission of such major industrial groups as public utilities or petrochemicals; there just weren't enough responses.

Each returned questionnaire was examined before its results were included in these figures. Those which were incomplete, came in too late to be included, or had data that just didn't add up, were regrettably eliminated. While we were left with an acceptable sample, certainly we would like to have had more questionnaires included.

The organizations reporting were divided into three size classifications based on budget size:

Size	Budget Range	Typical Hardware
Small	Under $150,000	IBM S 3/10
Medium	$150,000 - $1 million	IBM 370/138
Large	Over $1 million	IBM 370/168

We have used IBM hardware as the standard to size measurement because so many of the reporting installations are IBM shops. We were surprised to find so many machines still in use that are more than a little dated, including 1401's, all kinds of 360's, Honeywell 2000 series and even a Univac (née RCA) Spectra 70/45. Rumors to the contrary, there are ICL machines in the United States! Minicomputer fans will be glad to know that DEC seems to have stuffed PDP-11's into a very high percentage of U.S. computing installations. For the micro buffs, we offer the comments that the "Day of the Apple" and "Year of the Pet" seem near at hand. There is no shortage of Motorola 6800s TRS-80s, and Intel 8080s as well.

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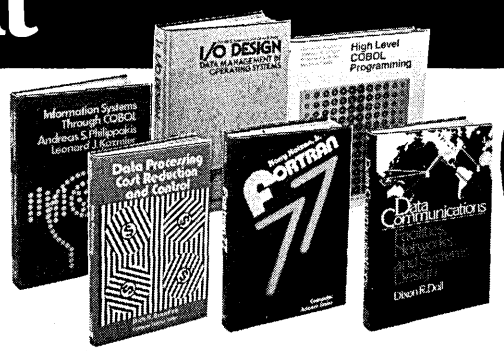

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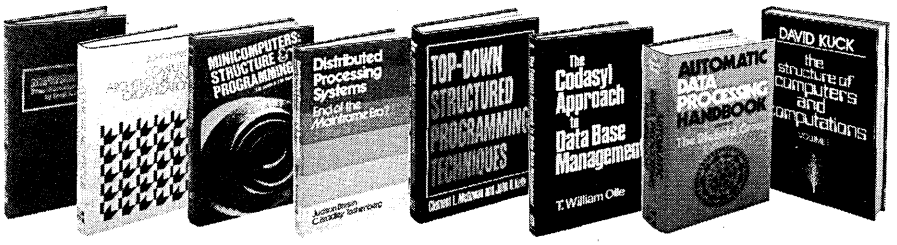

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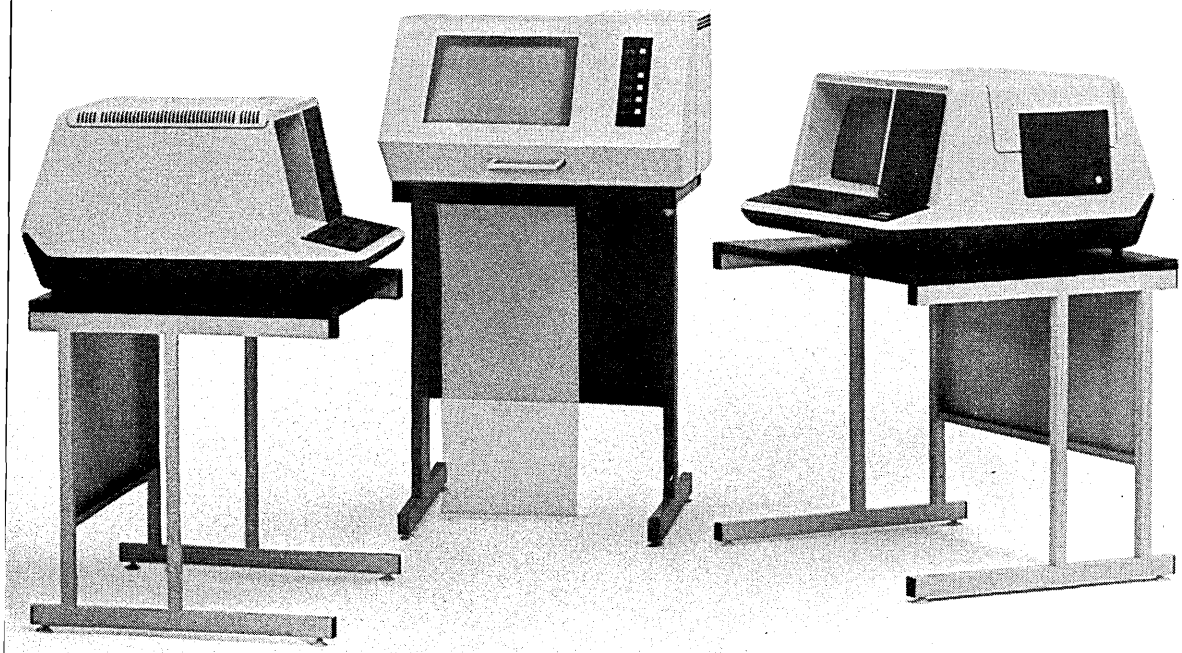

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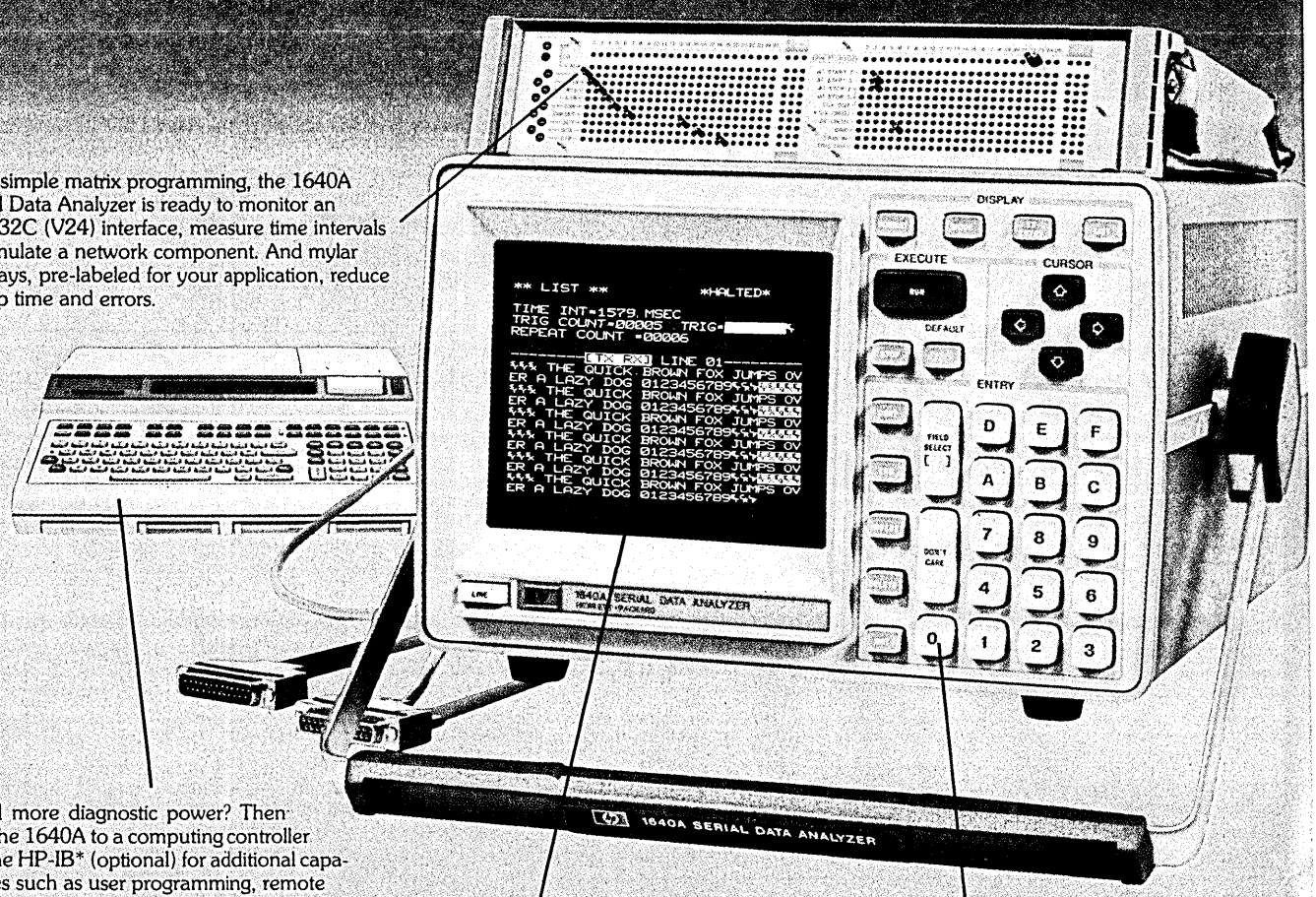

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CIRCLE 58 ON READER CARD

For a batch environment, a bad log tape can be inconvenient; for on-line systems, it can be catastrophic.

SMOOTHING DATA BASE RECOVERY

by Laurence B. LeGore

Data base log and dump tapes can determine the success or failure of a data base system. It seems to follow that a good deal of concern would be expressed about the reliability of these tapes, especially in companies where the data base is considered a major resource. Perhaps our general complacency is due to the infrequency of system crashes which require a complete reconstruction of the data base or to the high success rate of recovery when such crashes do occur.

Since any recovery process is only as good as its input, it's to our benefit to insure the validity of the input medium. While it is true that many errors will be detected during the recovery process, it is equally true that it may be impossible to correct any errors during that process. Therefore, validity should be confirmed at tape creation time, not when it's time to use the tape.

Consider what happens after a system failure occurs. A complete data base reconstruction process, which includes a load and forward recovery of the data base, may be required. If the dump is invalid, we can retreat to a previous dump generation and suffer only the minor inconvenience of degraded recovery in terms of timeliness. If things go well, our complacent attitude is reinforced.

My assumption in the aforementioned scenario was, of course, that the log tape gave no indication of problems during the forward recovery phase. Usually this will be the result, or the log tape problem will be easily corrected. This is especially true in a batch environment because the log, in most instances, can be used as the forward recovery input medium, up to the bad tape area (for example, up to a checkpoint). All batch runs represented on the bad area can then be reprocessed. Again, only the minor inconvenience of an untimely recovery is experienced.

Real-time transaction system failures, however, can be more disastrous. If such a system, which runs 8:00 a.m. to 5:00 p.m, fails at 4:00 p.m., for example, we may be forced into a data base load using the previous night's dump as input. Let's say that a successful load is followed by a forward recovery which aborts due to a log tape failure. Further, it is determined that the data base is recovered up to its 11:00 a.m. status before the log tape failure is encountered.

Now we have a dilemma, the seriousness of which is in direct correlation to the number of unrecovered transactions. It is clearly unrealistic to expect remote terminal users to remember large numbers of updating transactions. And even if they remembered them, would they be ecstatic about retransmitting them? Would the end result of retransmission be a viable data base? The data base manager's consternation is understandable.

Using another more realistic example, a transaction is received from Chicago which sells the last widget in stock. The system goes down, recovery is started, and the log tape fails. The data base manager must now decide whether to have all old transactions retransmitted before allowing new ones into the system or to let the new ones process in parallel with the old transactions. The former will prevent timely recovery and the latter may permit the last widget to be sold somewhere else. The result could be serious when we are discussing not widgets, but airplane seats or tons of steel.

Recovery problems appear to take a quantum leap in complexity as mass storage usage increases. Timeliness, for example, becomes more important and yet more difficult to achieve. Pennsylvania's Central Management Information Center (CMIC) has struggled with mass storage growth of over 500% in eight years. CMIC produces in excess of 200 dump and log tapes per week, a volume which quickly made us aware that we could not always rely on a successful recovery without consistently valid backup tapes, standards and procedures notwithstanding.

It seems contradictory that tape can be considered an important aspect of mass storage use, but the fact is recovery may be invalid or even impossible without a solid backup medium. The uncertainty of successful recovery prompted CMIC to design and write a program (DMSCK) which assures a high level of dump/log tape integrity.

A similar progam can be designed for other file handling systems and will prove to be an invaluable asset in any recovery system. (Good design will provide benefits unrelated to the actual validation, too.) Knowledge of dump and log tape layouts is vital, for it will contain all information necessary to your design. A meticulous review of these layouts will identify which information is verifiable and should be included in the design.

A complete listing of checks included in CMIC's system would be tedious to read; however, guidelines for any similar efforts can be illustrated by highlighting a few of them:

—Tape reels must be in ascending sequence.

—Most file handlers produce certain block types such as "before" and "after" images on log tapes. We ensure against a strange block type.

—Block placement is checked. For example, a start of run unit block and end of run unit block must bracket any run unit activity.

—Headers and trailers must be placed properly and contain certain specified information, such as reel numbers, date written, etc.

—Block sequence numbers must be ascending. This is an extremely important check. Duplicate or missing blocks can nullify the recovery process. Our system will attempt to find a missing block on the assumption that a tape drive problem occurred while reading tape. The op-

DUMP TAPE

FILE STATISTICS

FILE EMPLOYEES CREATED ON 041277 AT 131009 STARTED
GOOD EMPLOYEES FILE

TOTAL PGS	1087	TOTAL RCDS	35176	WDS USED	270794	WDS UNUSED	21726
AVG WDS USED/PG	249	AVG WDS UNUSED/PG	199	% FILLED	55	UNPACKED WD CNT	0
TOTAL EMPTY PGS	109						
TOTAL OFL PGS	109	TOTAL OFL RCDS	0	OFL WDS USED	1090	OFL WDS UNUSED	47742
AVG OFL WDS USED/PG	10	AVG OFL WDS UNUSED	438	% FILLED	2	OFL UNPACKED CNT	0
TOTAL EMPTY OFL PGS	109						

RCD CODE	RCD NAME	No. of RCDS	AVG SZ
521	ADDRESS	35176	6

Fig. 1. Processing the dump tape provides statistics on such entities as used and unused space, overflow, number, and average size of records.

erator is given an opportunity to remove the tape for inspection and the search will continue after he remounts the reel.

—The block size recorded on tape is reconciled with the I/O control information to ensure that our physical read is the proper size.

—Hash totals are verified.

—Standard data base page sizes have been established for our users. We detect nonstandard page sizes.

—Page numbers must be ascending.

—Sperry Univac's DMS1100 data management system allows one page size per file. When we detect a new file, the page size and other information is extracted to check for consistency of subsequent blocks.

—Many numbers can be the source of calculation inputs. For example, a calculation can be made using page header size, pointers, used space, unused space, etc., to determine that the standard page space can be accounted for.

—Proper file initialization is checked.

—Log checkpoint numbers must be in ascending sequence. Also, by CMIC's definition, a checkpoint is taken when no updates have been made by any run unit active in the system. We verify that no checkpoint has been taken which conflicts with our checkpoint definition. A corollary dictates that no run unit can be active at the end of the log tape.

—One constructed table contains a list of active run-ID's between checkpoints. All log blocks must contain a valid run-ID as recorded in this table. A table insert or delete is triggered either by a start of run or end of run block, respectively. Proper bracketing of blocks is thus assured. For example, it would be illegal for a "before" image to occur prior to a start of run unit block.

—Index entries must be accounted for and be in ascending sequence.

This sampling of existing checks should suffice to provide some ideas for the design of a similar system.

In addition to the above checks, there are many other possible features which can make a more attractive validation package. All of the following are implemented in CMIC's system:

—Data base specifications are very dynamic. A highly parameterized verification program allows for the generation of a tailor-made system as specifications change. It is possible, in lieu of parameterization, to use various control files attached to the file handler proper.

DUMP TAPE

FILE DISTRIBUTION GRAPH

WORDS	PAGES
0000**********	109
0014	0
0028	0
0042	0
0056	0
0070	0
0084	0
0098	0
0112	0
0126	0
0140	0
0154	2
0168	10
0182*	17
0196**	26
0210*****	58
0224********	89
0238*********	103
0252**********	120
0266**********	116
0280*********	104
0294**********	109
0308*******	77
0322***	43
0336***	38
0350***	38
0364*	16
0378	3
0392	6
0406	1
0420	1
0434	1
0448	0

.....10..... ....50.....60..... 100

PERCENT OF PAGES

Fig. 2. From the dump tapes, a distribution graph is produced for each file which identifies average page sizes and provides clues to inefficient layouts or distributions.

DUMP SUMMARY

GRAND TOTAL PAGES IS	5887	OVERFLOW PAGES	587
GRAND TOTAL RECORDS IS	107068	OVERFLOW RECORDS	39
GRAND TOTAL USED WORDS IS	1819002	OVERFLOW USED WORDS	7274
GRAND TOTAL UN-USED WORDS IS	2924037	OVERFLOW UN-USED WORDS	456854
PERCENT WORDS USED IS	038	OVERFLOW PERCENT USED	001
GRAND TOTAL EMPTY PAGES IS	626	OVERFLOW EMPTY PAGES	585

Fig. 3. The dump summary can be used to trace overall storage growth. In cases of throughput degradation, it can also suggest whether the loss is due to excessive use of overflow (not the case in the example above).

However, a standalone program eliminates the risk of a file handler failing when it's time to run the verification program. Without the standalone program, it may also be possible for illegal changes to control files to go undetected.

—If a file error is detected, all pertinent information can be printed. Errors may have a cascading effect on subsequent blocks; therefore, we opted to "spinup" to the next file on tape and begin verification of that file. A program abort instead of "spinup" would force the check program to be restarted for each error detected, resulting in throughput degradation. We suggest creating a system generation parameter which specifies how many errors will be tolerated before the program self-aborts. A useless attempt to verify a data base obviously in shambles can be avoided by using a realistic parameter.

—Double-buffered I/O will increase program throughput tremendously. This may be important when a recovery process is waiting for input. At CMIC, a three to four minute per reel run time is a realistic expectation with double-buffering.

—CMIC attempts to avoid excessive use of backup tapes by systems other than recovery, since their very use could destroy the tape (for example, by rewinding). We therefore provide a system generation parameter which allows user-created log records to be extracted onto a scratch output tape. Any user programs requiring the log records now can use the output tape rather than chance destruction of a log tape.

—Some users want the ability to include miscellaneous control files on their dump tape, which will be bypassed during verification.

—A very helpful feature is the annotation of incomplete transactions with an asterisk. This allows the data base manager to make more knowledgeable decisions at recovery time. A short version of this program can be written to verify suspect on-line mass storage files.

GATHERING STATISTICS

CMIC's system was not originally intended to provide data base statistics. It became apparent, however, that we could extract some very valuable information while still only passing the dump/log tape one time. The statistics have become so valuable that many users forget the original verification intent of the program and consider the statistics as the prime program output.

Our dump tape statistics (Figs. 1-3) include information about each file plus an overall data base summary. Information is provided on used and unused space, overflow usage, total number of records in a file along with the translated

LOG TAPE

STATISTICS PRODUCED FOR EACH CHECKPOINT

CHECKPOINT NUMBER 003 DAT/TIM 062378082622 ACTIVE RUN UNITS 00 REEL NUMBER 01 BLOCK NO. 5126

RUNID	FILENAME	USRCD	BEFLUK TYP 1	AFTLUK TYP 2	STRTRU TYP 4	SRULUK TYP 7	ENDRUN TYP 10	RECERU TYP 11	FREE TYP 14	RCVYAL TYP 22	CHECK TYP 40
INQ	PAYRATES	0	0	0	168	0	173	0	0	0	0
LOG	STATISTICS	168	0	0	0	0	0	0	0	0	0
INQ	ADDRESS	0	6	6	0	2	0	0	0	0	0
INQ	HISTORY	0	5	5	0	0	0	0	0	0	0
INQ	BILLING	0	5	5	0	0	0	0	0	0	0
INQ	PAYABLES	0	3	3	0	3	0	0	0	0	0
CKPT		0	0	0	0	0	0	0	0	0	1

Fig. 4. Statistics from the log tape trace the activity of the file handler by run and by file, highlighting any unusual activity. Then a log summary, which contains grand totals by run-ID and filename, can be generated.

The statistics have become so valuable that many users forget the original intent of the verification program.

English name, and the average record size. A distribution graph is produced for each file and provides many clues to inefficient layouts or distribution.

Similarly, the log tape is the source of some interesting statistics (Fig. 4). Various counts depict the activity of the file handler. These totals can be broken down by run-ID and by file to highlight unusual activity by transactions. A log summary is produced containing grand totals, by run-ID/filename, of all previous subtotals.

The data base manager requires a tool to predict possible problems such as sizing or distribution inefficiencies. He also needs to project future growth. This program provides data for both. We plan to provide an accumulation medium, for the output statistics, that will be used as input to a projection model. The proposed system will produce graphs reflecting growth and possible usage trends over time.

We would encourage other installations to build their own versions of DMSCK. The cost isn't high. Ours was designed, programmed, and debugged by one person in less than six months, a small price to pay for making the data base less vulnerable — or making data base failures less catastrophic. Once installed, the program requires few resources. We elected to use assembly language for throughput speed, reducing memory usage, and for ease of data manipulation and the decision was justified. DMSCK uses up only 10K or so of memory, and is capable of processing a reel of tape in five minutes, including tape rewind time. Further, the concept can be phased in by implementing the tape verification parts first and adding statistics gathering functions later.

The existing program (DMSCK) has proven to be an invaluable tool for CMIC. Our recovery reliability has ensured a more viable data base. The savings in time and money have been considerable. The statistics have enabled us to design a much more efficient data base. And we expect to realize even more benefits in the future. ✻

LAURENCE B. LE GORE

Mr. LeGore is the data base manager for Pennsylvania's Central Management Information Center (CMIC). He started as a programmer with McDonnell Douglas Corp. in 1963, and later worked for U.S. Steel where he wrote a forward recovery system for that firm's file handler. As a senior systems analyst for Univac, he helped install CMIC's first 1108. He has since had extensive experience as a systems software programmer in communications and data base support, and has been involved in the design of both forward and backward recovery systems.

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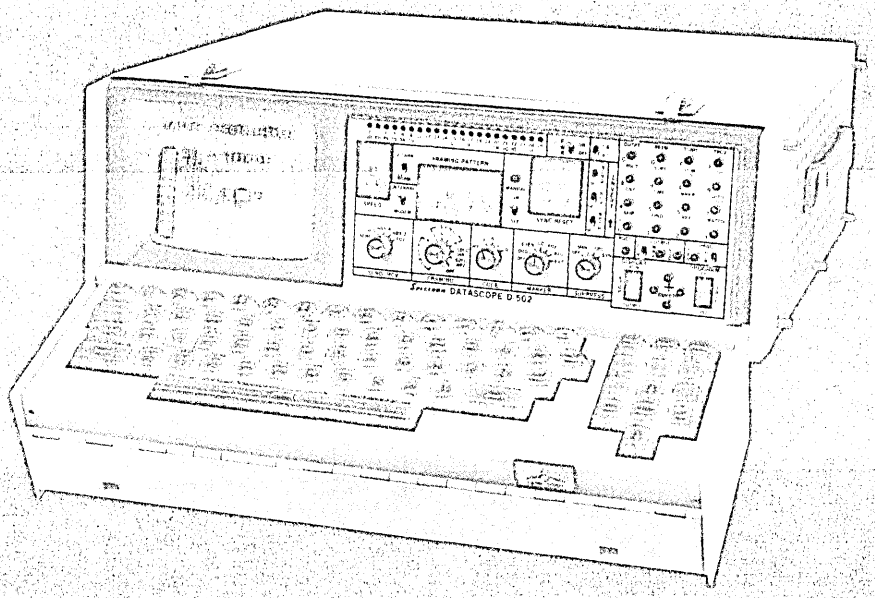

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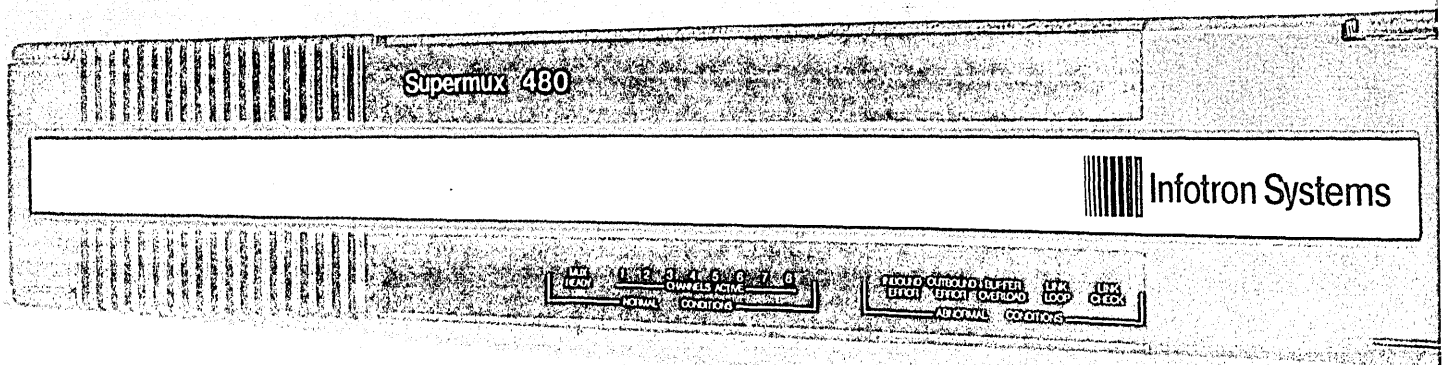

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CIRCLE 33 ON READER CARD

The programmer awakes one day to find he has *become* the documentation he never wrote.

A PRESCRIPTION FOR PROGRAMMING'S LEAST POPULAR PHASE

by John Vaughn

I first encountered user documentation in the form of an IBM manual. I don't recall what manual it was, but I remember that I disliked it and I remember why: the wooden language; the weird organization; the apparent assumption that the user had memorized all prerequisite and "corequisite" documents; the obsessive use of IBM buzzwords, of SYSLIB and SYSLMOD, BDAM and BSAM, GETCORE and GETMAIN until the mind reeled.

These and other difficulties are still present in IBM writings, but my attitude has softened since the first flush of loathing, because I have discovered over the years that IBM documentation is the best of a bad lot. Where IBM is diffuse, others are incomplete. Where IBM's indices are full of holes, others have no index at all. Where IBM's typography is merely ugly, others are often illegible. In short, where IBM is inadequate, the competition frequently fails altogether.

And this is documentation for commercial software. In-house documentation is worse yet. Often it simply does not exist. Poor commercial documentation may cost a sale, but when in-house documentation is bad, the effect is more insidious. For want of written instruction, the user turns to the programmer to find out how to run the system. This dependence continues and deepens. The programmer wakes one day to find that he has become the documentation he never wrote, and that he cannot get on to new work because he is chained to a system he should have long since turned over to the user.

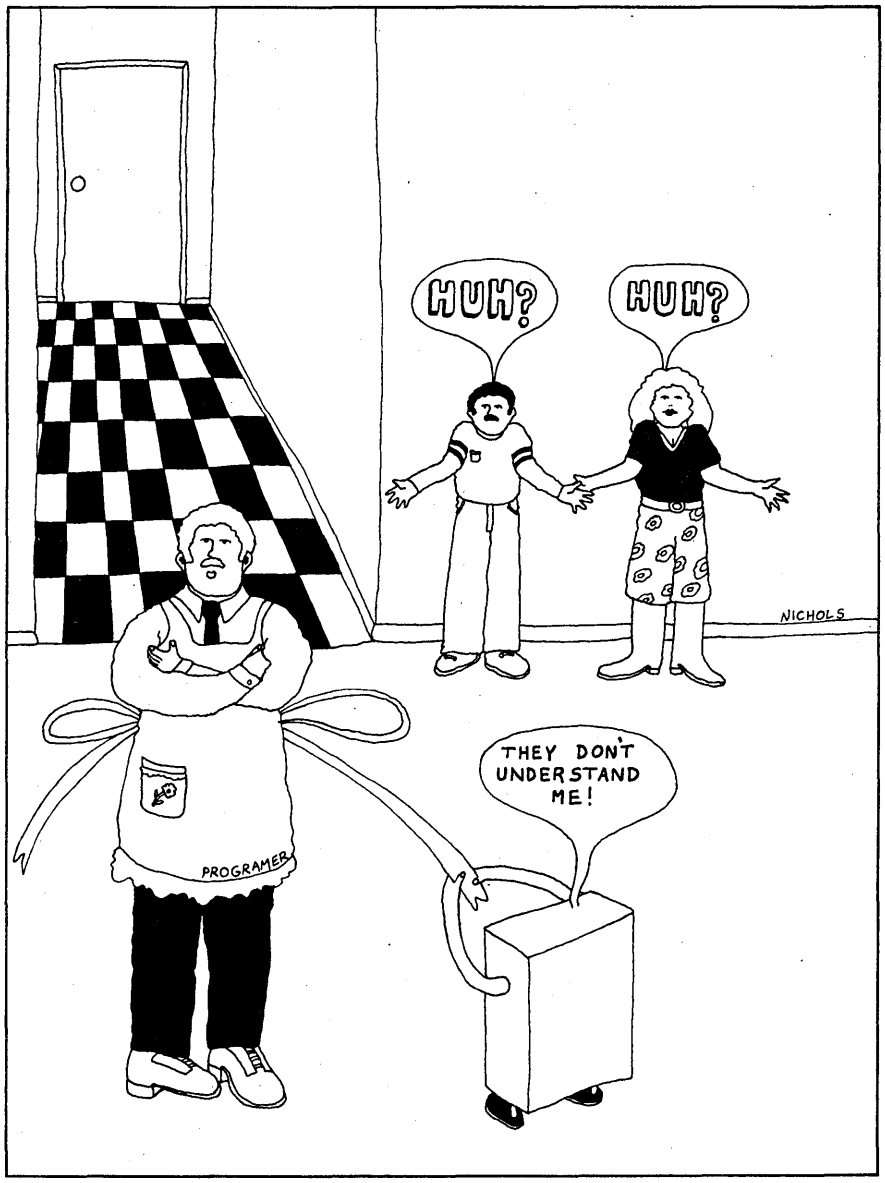
The remedy is the production of good user documentation. Simply stating this, however, is the equivalent of telling a sick man that the cure for his illness is to get well. What is needed is a prescription. Herewith mine, in five points to be taken like so many pills. Some will prove bitter, but if you get them down, your shop will be healthier for it.

Point One: Convince yourself that a need exists.

If in your heart of hearts you don't believe user documentation is all that necessary, you'll never do a good job of producing it. Try the following:

Find out what percentage of their work day the programmers in your shop spend baby-sitting production systems. Ideally this figure should be zero; if it's above 5%, you're in trouble.

Choose an in-house system you have no knowledge of. Try to learn how to use it from available documentation. As



you thrash about, bear in mind that a user without dp training would be even more at sea.

Ask your users if written instruction would be helpful. (Caution: Select individuals not given to physical violence.)

By now you should have tears of professional remorse streaming down your face. You are ready for:

Point Two: Realize that documentation takes time.

This seems obvious. Yet it is the point on which most documentation efforts founder. There is a widespread belief—perhaps hope—that documentation for a complex system can be put together quickly after the system is tested. It cannot. Allow 20% of total development time. It will be little enough.

A special warning here: The coding and debugging phases of system development always take more time than originally estimated, and the first task to be shoved aside in the scramble for manhours is documentation. This won't happen if documentation is thought of as a necessity, not a frill. (See Point One.)

Point Three: Before you begin writing, be aware of your purpose.

Much user documentation is written with one of the following aims: to sell the system to the user; to paper over some flaw in the system; to add to the language (some dp people have a seemingly all-consuming desire to coin an enduring acronym); or to produce something—anything—because the boss has been taken with the quaint notion that documentation is an aspect of professionalism—yours *and* his.

The sole legitimate purpose for writing user documentation is to help the user use the system. All else is tangential.

Point Four: Do it.

It is always perilous to offer advice to writers. However, given the special requirements of user documentation, some simple guidelines are in order.

Write in the user's language. Try to recognize and avoid dp jargon.

Write simply. Use sentence structures no more complex and words no more arcane than you do in talking.

Work from a plan. Whether or not you draw up a formal outline, you must have an idea of where you're going before you set out. (It helps at this point to keep in mind that a computer system is really nothing more than a device, like a lawn mower or a nutcracker. The new owner—the user—wants to know how to wind the thing up and make it go; he has little interest in cutting it open to find out *why* it goes. So your user manual should include a section on input, a section on output, a glossary . . . and nothing else. Any deeper delving into the workings of a system has no more place in a user manual than a treatise on internal combustion has in the operator's manual of an automobile.)

Put in lots of examples. A concrete sample of an input form or a report can often rescue a shaky abstract description.

Point Five: Open up to feedback from your users.

At this point you should have a brand new user manual in front of you. Now it must be debugged. To do so you will have to expose yourself to the unique pain of having your prose criticized. It can't be helped. The manual exists to aid the user; only the user can tell you if it is accomplishing its purpose. Use the following techniques:

Formally solicit written criticism. IBM's "Reader's Comment Form" was a good and brave idea.

Select several of your users and interview them personally on the merits of your new manual.

Observe your users. If they come to you often with questions about the system, there's something wrong with the user's manual. Find out what.

The data you've gathered can now be used to revise the manual, in much the same fashion that test runs are used to revise code. There is this difference: objective criteria can be applied to the debugging of code, whereas determining that a piece of writing is right is a subjective process verging on the mystical.

Keep your eye on your users. If they begin using your systems with greater ease and with less reliance on you, you're doing something right. ✲

JOHN VAUGHN

Mr. Vaughn is a consultant in the San Francisco area who specializes in documentation for corporate data processing installations and for service bureaus.

The Quad Squad

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All four condense onto a single quad board four times that which is on the DEC unit they are replacing. Yet there is relatively little requirement for bus repeaters and expansion boxes to increase the number of available channels. Operation is full duplex or half duplex with both the transmitter and receiver for each channel operating at the same baud rate. Each model is system software compatible with the unit it replaces.

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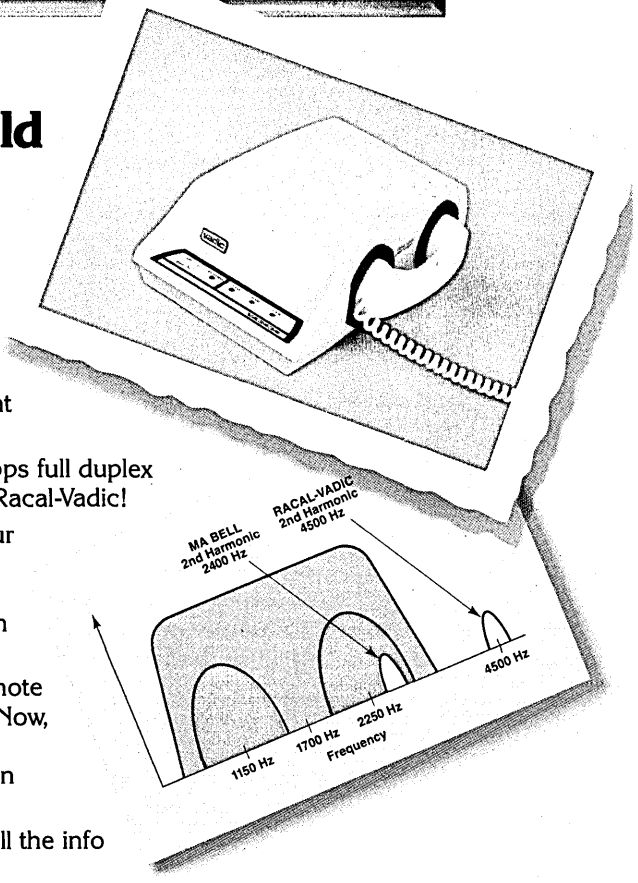
CIRCLE 75 ON READER CARD

Dear Ma:

How come Racal-Vadic can build a 1200 bps full duplex acoustic coupled modem and you can't?



When Racal-Vadic invented the VA3400 way back in 1973, they purposely chose to transmit data in the originate mode at 2250 Hz and receive data at 1150 Hz. They were really thinking ahead, Ma, because these frequencies place 2nd harmonic distortion (created by non-linearity in the telephone microphone) at 4500 Hz — well away from the coupler's received signal.

This wise choice of frequencies has made possible a 1200 bps full duplex acoustic coupler—the VA3434, which is now in full production at Racal-Vadic!

Why in the world, Ma, did you reverse the frequencies in your 212A? By transmitting at 1200 Hz and receiving at 2400 Hz, the 2nd harmonic of your transmitted signal falls right in the middle of the received signal, making the design of an acoustic coupled 212A an engineer's nightmare.

So Racal-Vadic has done it again, Ma. The real winners are remote terminal users who no longer have to settle for 300 bps operation. Now, merely by replacing their present coupler with the VA3434, they can operate at 1200 bps full duplex, while retaining the portability that an acoustic coupler provides.

Suggest that you phone or write Racal-Vadic today, Ma, for all the info on the VA3434 1200 bps full duplex acoustic coupler.

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CIRCLE 64 ON READER CARD

Problems in operations will not improve until we begin to treat operators as professionals.

THE OPERATOR'S CHANGING STATUS

by William A. Hansen

When looking for my first full-time job, I walked into the professional recruiting office of a large pharmaceutical company and announced that I was interested in a night-shift job in data processing. I didn't care if I became an analyst, a programmer, or an operator because I was also a full-time graduate student and planned to teach as soon as I received my degree.

They promptly sent me across the hall to the nonprofessional hiring office. It seems that one of their major requirements for being a professional was working 9 to 5. I was hired as an operator and never forgot that, because I worked in the operations department, the company considered me something less than professional.

HAVES AND HAVE NOTS

Historically, the data processing function has been divided into two major areas, program development and operations, with the systems programming function residing in a poorly defined area somewhere between the two.

In recent years, the program development group has received considerable attention concerning their education, career paths, organization, management, administration, certification, and psychology. And college degrees are rapidly becoming prerequisites for them.

At the same time, the tremendous need for programmers has opened the field to thousands of people who, only 10 years ago, would have considered data processing a subject reserved for the scientific elite. The combination of the need for more technically qualified people and the shortage of suitable candidates has inflated the salary of program development personnel to quite attractive levels.

Operations personnel, on the other hand, have traditionally come from the vocational ranks. Training and education have been almost nonexistent, usually of the "follow me around and do what I do" variety. Some two-year colleges and technical schools offer programs in computer operations. However, these usually concentrate on the hardware aspects of the job.

ILLUSTRATION: ©BARBARA BENSON

The lack of trained personnel hasn't affected salaries in operations as it has in the program development area. This is partly due to the belief of many dp managers (usually former programmers) that operators are glorified button pushers. The best operators have drifted to the few large installations where senior operators can earn salaries equivalent to senior programmers.

At most installations, the education and salary levels of operations personnel have remained relatively low while the turnover rate has remained high. Some installations have solved the turnover problem by hiring operators only from clerical positions within the company. These employees have a stronger loyalty to the company than to their new profession—the opposite situation is true of most programmers.

Operators hired within the company also have very little knowledge of the salary levels of operators elsewhere. To them, the operator's salary looks pretty good compared to what they had been earning. But by keeping the salary levels low and only hiring from within, these installations are rejecting the few technically competent operators that they'll so desperately need in the future.

A major result of these differences between operators and programmers is the complete lack of respect for the operator's job found at most installations. It's no wonder that programmers complain about not getting any cooperation from operations when they offer so little cooperation in return. Operations departments are often denied any voice in even their own affairs. During a major conversion, I once served on a committee to determine the documentation that operations would receive with new software systems. Our proposal was rejected outright by programmers who felt their JCL was more than enough documentation for operations! An outbreak of undocumented abends and JCL errors causing 2:00 a.m. phone calls was sufficient to bring them back to the real world.

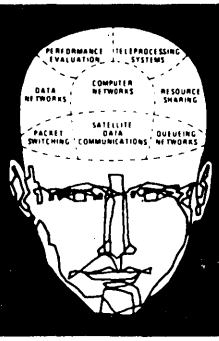
Another major problem in many installations is the total lack of career planning for operations personnel. While a programmer can look forward to promotion to project leader, analyst, or systems designer, operators are usually stuck in the same positions they achieved after a few years experience. Career planning hasn't progressed from the traditional path stretching from operator C to operator B to operator A. (Or, in more enlightened companies, operator II to operator I to lead operator). A senior operator who is denied a promotion to one of the few shift supervisor positions is bound to look elsewhere.

Some operators look to programming as a way out. This is understandable given the greater prestige discussed above. A more compelling reason is the greater options available in career advancement. It's not unusual for a senior operator to make more money than a typical programmer when you include the overtime pay that's often denied the "professional" employee. This is little consolation if the operator feels his or her chances for advancement are limited. Many operators apply for jobs as programmers at a reduced salary on the assumption that they'll be much better off in years to come.

Unfortunately, few succeed. Being a good operator doesn't qualify a person for a programming job any more than being a good programmer qualifies someone to become a systems analyst. The jobs involve completely different skills. Most programmers could never become good operators for the same reason.

OPERATIONS IS CHANGING

True, most installations have managed to survive despite the constant confrontations between program development and operations, the shortage of trained operators, and the dis-



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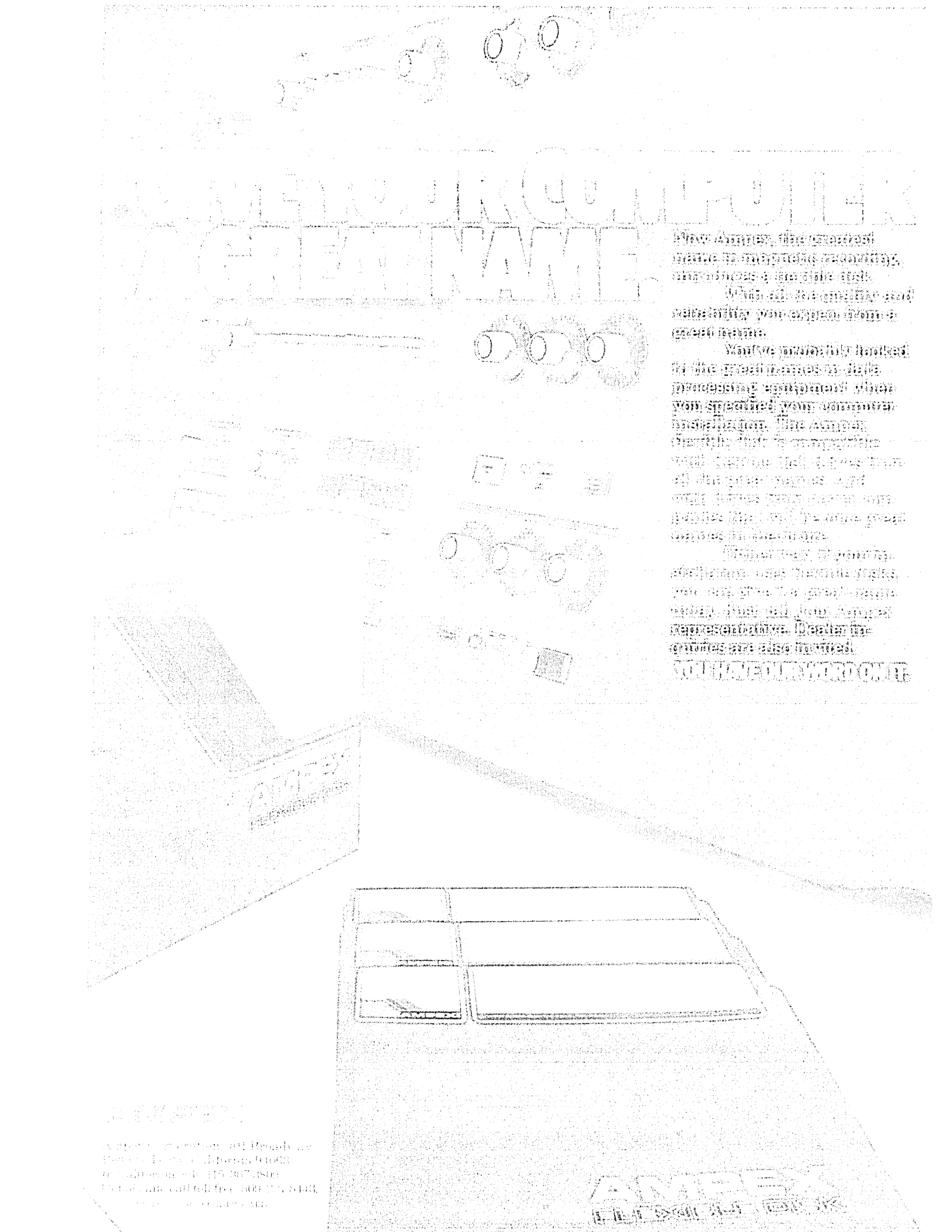

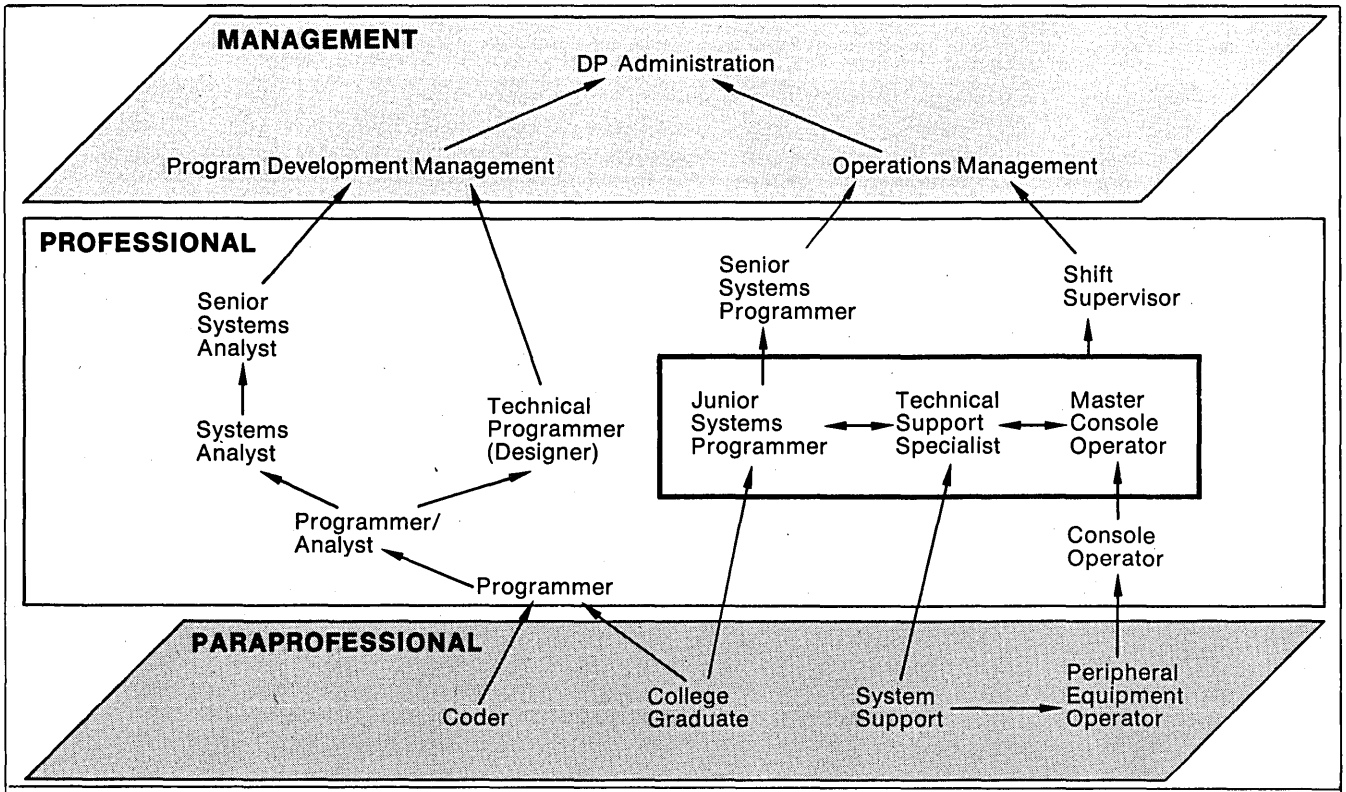

Fig. 1. This proposed career path recognizes that senior operators' skills, although different from those in program development roles, are equally complex and equally important.

content of the operations staff. However, most people making this observation have failed to notice how the operator's job has changed in the last 10 years and how it will continue to change. If the problems discussed above are not addressed, they will only become worse until they seriously impair the operation of the entire company. At that point, pressure from above will force dp management to make the necessary changes.

Many people's concept of the operator's job goes back to the days when the operations department was a huge room full of EAM equipment. They think of the operator as being completely involved with the hardware: loading cards into readers, hanging tapes, changing paper in printers. Although these aspects of operating are still with us, they are only a minor part of the job now and their importance is declining every day. On-line systems, less expensive direct access devices, and mass storage devices are rapidly reducing the operator's interface with the hardware. This is leading to a reduction in the number of operations personnel in most large installations and a corresponding increase in the skill level of those who remain.

Probably 90% of the operator's time is now spent interfacing *software*. The operator interface of most operating systems has grown from a few simple commands and messages to a complete command language as complex as JCL. Extensive training is required to learn what commands are available and when each should be used. Operators must be trained to respond to a variety of problem situations, from what to do about excessive transmission errors in a data communications line to how to correct an exceptionally slow data base response time.

The need for highly trained and adequately paid operators will become obvious to most installations. It suffices to observe that it's not uncommon for two or three operators to be in total control of $3 to $10 million worth of equipment. A single mistake can cost $thousands in rental costs, reruns, and data base reconstruction, not counting the effect that a down computer has on a nationwide computer network.

If this isn't motivation enough, consider the recent attention received by security and privacy issues. The vast majority of systems in operation today can be easily compromised by someone having the free access to files through the operators.

A problem with a less obvious solution is how to keep trained personnel around after you've corrected the salary discrepancy. Without well-defined routes for advancement, people will eventually feel they're stagnating in their present positions and look outside the company for their next promotions. To see what positions might be available to a senior operator, consider the skills he or she will have developed after years of experience.

An application programmer is concerned with one program at a time. He views the computer system as a handy device to solve a particular problem. He may try to make his program run faster or use less storage. However, any thoughts he has about efficiency involve only one program. He's usually satisfied if he receives an acceptable turnaround time for his batch jobs and a fast response time for his time-sharing work.

Operators, on the other hand, are aware that a variety of batch jobs and time-sharing users are competing for the same finite system resources. Their job is to distribute these resources among users in a way that optimizes utilization while satisfying the needs of the installation. These needs may include giving particular jobs or categories of users priority over everyone else or, conversely, running certain jobs only when no one else needs the resources they'd use. This requires a detailed knowledge of installation priorities, objectives, and standards. Success is measured in terms of average turnaround time and average response time, together with a low level of complaints from critical users.

To achieve success, operators become acutely aware of what factors influence throughput. They know from firsthand experience how throughput is affected by system generation and initialization parameters. They also know how job control language parameters can affect a job's performance. In a worst-case example, I knew of an operator who altered the production JCL for a job to move certain temporary data sets from tape to disk. The job's execution time dropped

People who succeed as master console operators are extremely competent individuals, and ought to be considered for positions beyond operations.

from 55 minutes to 5 minutes. He was fired for "exceeding his job description." The company lost a valuable employee simply because it had no procedure for implementing operator's suggestions. I have yet to find a single installation where the operators don't complain about poorly designed systems that could easily be improved if only someone would listen.

The operator's greater understanding of the effect of JCL parameters is only one example of his or her greater knowledge of the operating system in general. This greater knowledge is understandable because the operator's entire job involves communication with the operating system. Programmers using higher-level language are two steps removed from direct communication with the system except when they write JCL. Even assembly language programmers tend to use macro instructions rather than directly asking for supervisor services.

The operator's knowledge of the operating system, his experience observing the effect of system generation, initialization, and JCL parameters, and his knowledge of installation standards, procedures, and objectives are matched by only one other group in the installation, the systems programming department.

BLAZING A CAREER PATH

A career path like that shown in Fig. 1 might solve the advancement turnover problem in operations. The proposed path is intended for large installations having a combination of production and test programs for on-line and batch applications. However, it applies to any installation large enough to distinguish between the various functions in the operations and systems programming departments.

There are three major differences between Fig. 1 and the career path charts found at most installations. First, there's a planned path from senior operations positions to systems programming.

The second change involves a redefinition of "professional employee" to conform to the level of expertise needed for each job. Master console operators definitely merit professional status. On the other hand, entry level programming positions for nongraduates should rank with entry-level operations positions at the paraprofessional level.

Before describing the third change, I need to define two jobs that exist with various names at different installations. "Junior system programmers" usually have a day-to-day responsibility for the system. They monitor the utilization and error reports, perform all maintenance to the operating system, and help the master console operator diagnose and correct operating system related problems. Senior system programmers are more concerned with long-term projects such as selecting and installing new features and equipment, performing system generations, and tuning the system.

The "technical support specialists" work within the operations department. They are called first when a production job abnormally terminates. They're allowed to correct JCL errors but must contact the appropriate programming personnel when a problem is due to program error. At many installations, this group is responsible for all production program libraries and the JCL procedure library. It often has the responsibility for writing or approving the JCL for all production jobs, and sometimes acts as the official interface between operations and the user department.

The three positions—junior system programmer, technical support specialist, and master console operator—have much in common. None of these requires knowledge of a programming language, although junior system programmers do occasionally use macroassembler instructions and need assembler languages training for advancement to senior system programmer positions. All three listed positions heavily interface with the operating system, in the form of JCL, commands, or utility control statements. It should be evident that experience at one of these positions is a tremendous advantage at either of the other two. In addition, the skills acquired in these positions can be considered prerequisites for senior systems programmers.

The third proposed change to the typical career path chart then involves putting these three positions at an equal level. By encouraging lateral job changes, managers can solve several problems simultaneously. They'll be able to keep valuable employees who would otherwise leave because of the lack of advancement opportunity. Granted, extensive training is required to move from one position to another, but such cross-training will raise the skill level of personnel in all three positions and protect the installation from possible hardships caused by the loss of a key employee. By making service in all three positions mandatory for promotion to senior systems programmers, the quality of people in this high position also will be enhanced.

Individual installations may experience some problems in implementing this plan. For example, a company may have to reconsider the eligibility rules for overtime. Another problem is that a college degree is often a prerequisite for systems programmrs. This would effectively close the door to most people coming up from the operations ranks today.

It is difficult to predict where equilibrium will be reached in the movement between the three positions. It's possible that a large number of master console operators will be college graduates on their way from junior systems programmer to senior systems programmer positions. On the other hand, people who succeed in this position—with or without a degree—are very competent individuals who should be considered candidates for any other position in the department.

In short, data processing departments should:

- make a strong commitment to the training and education of operations personnel
- adjust compensation scales to reflect the operator's true value to the company
- establish procedures for operators to suggest changes to existing systems
- give operations an appropriately strong voice in the affairs of the dp department, particularly in matters that affect them directly
- delineate between professional and paraprofessional personnel within operations
- devise career paths that will stop the flow of skilled personnel away from operations and will encourage more technically qualified people to enter this field

The time has come to treat senior operations personnel as professionals. ✲

WILLIAM A. HANSEN

Dr. Hansen is the manager of quality assurance for Deltak, Inc., the world's leading vendor of multimedia training products. In addition to his product review duties, he is responsible for all operating system courses, particularly MVS. Before officially coming to Deltak, Bill was a course author, a college professor of mathematics and computer science, a data processing training coordinator, and an underpaid computer operator.

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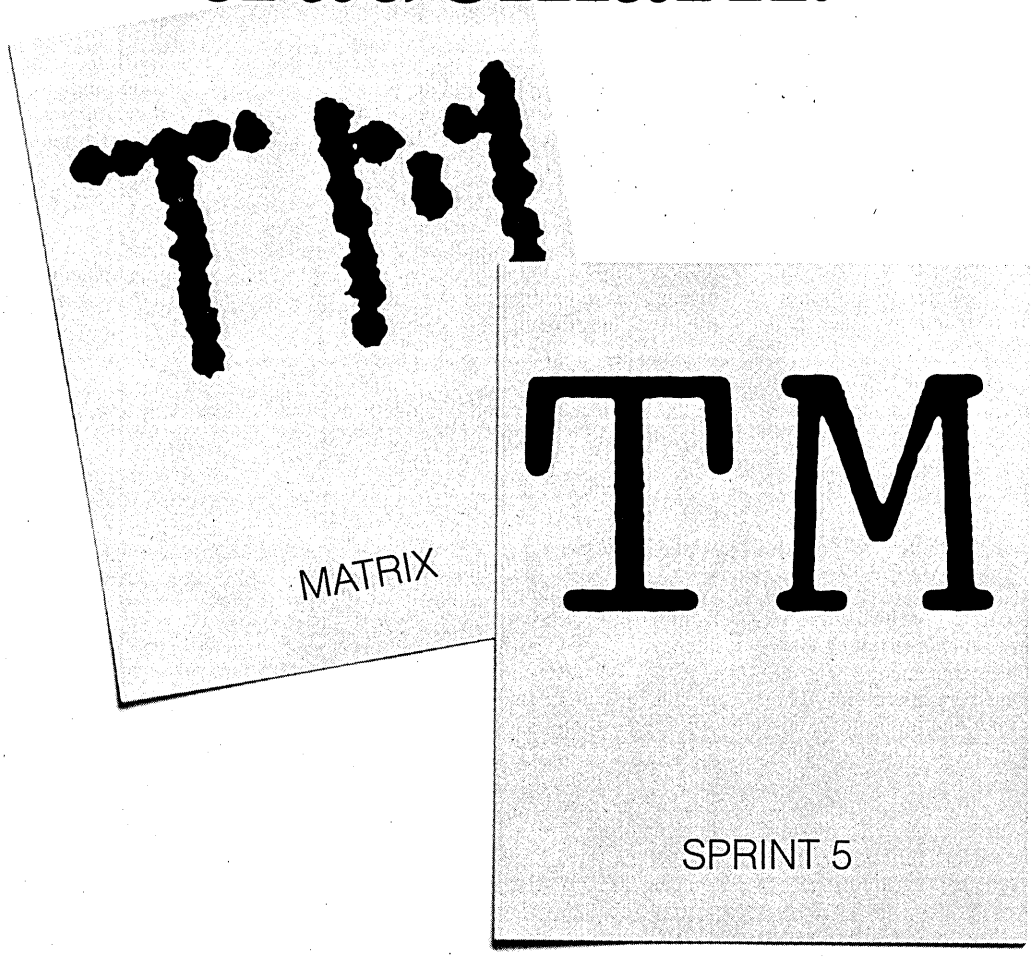

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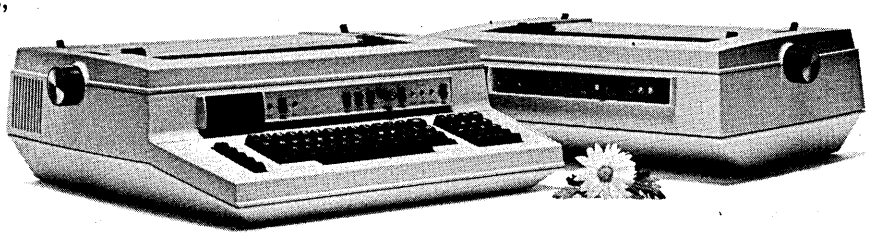

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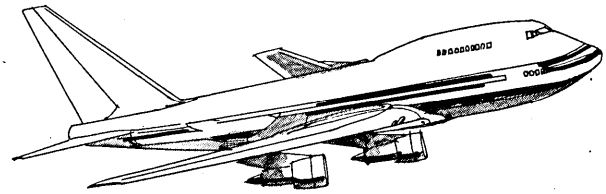

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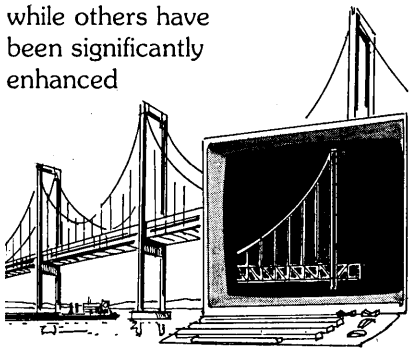

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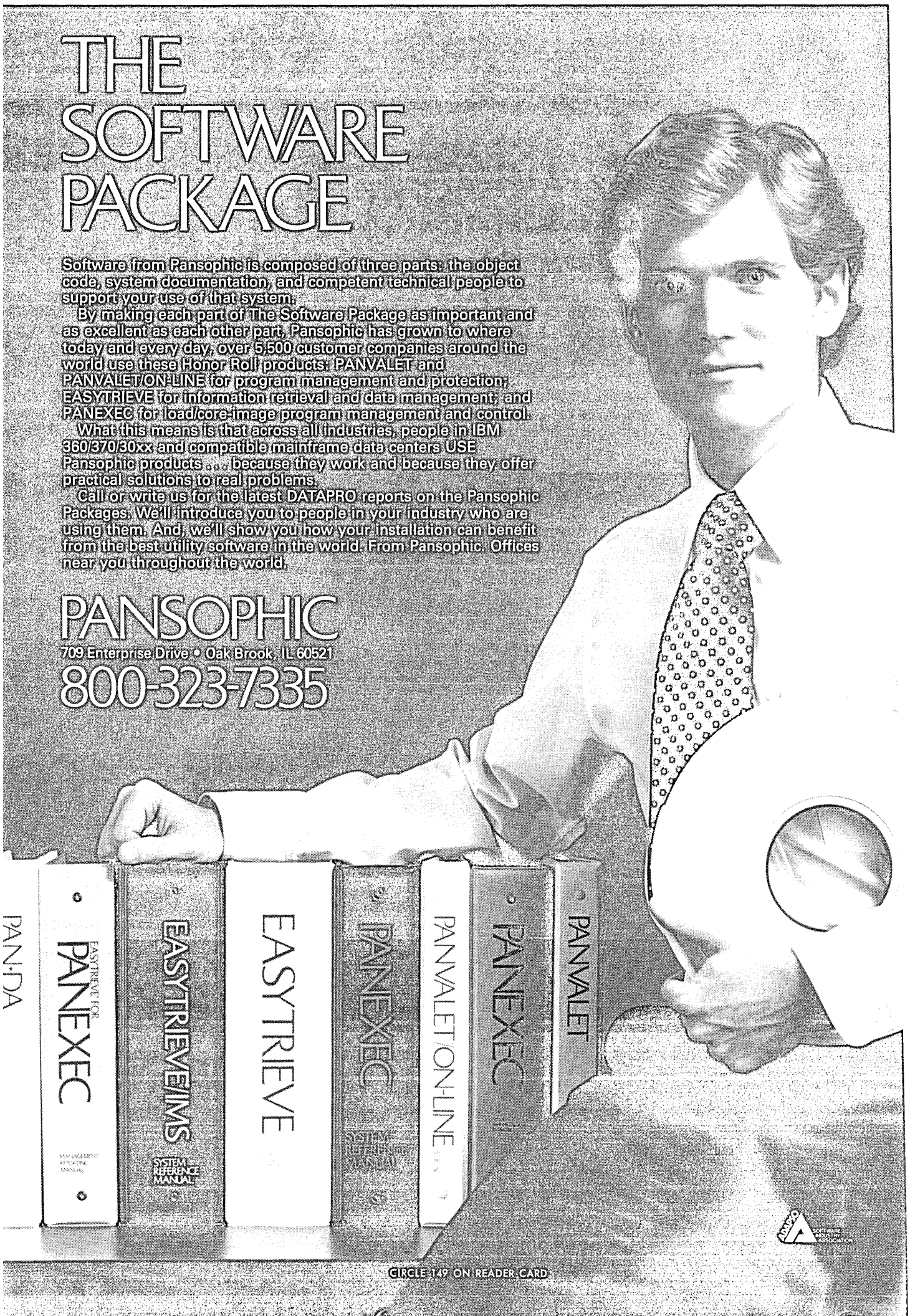

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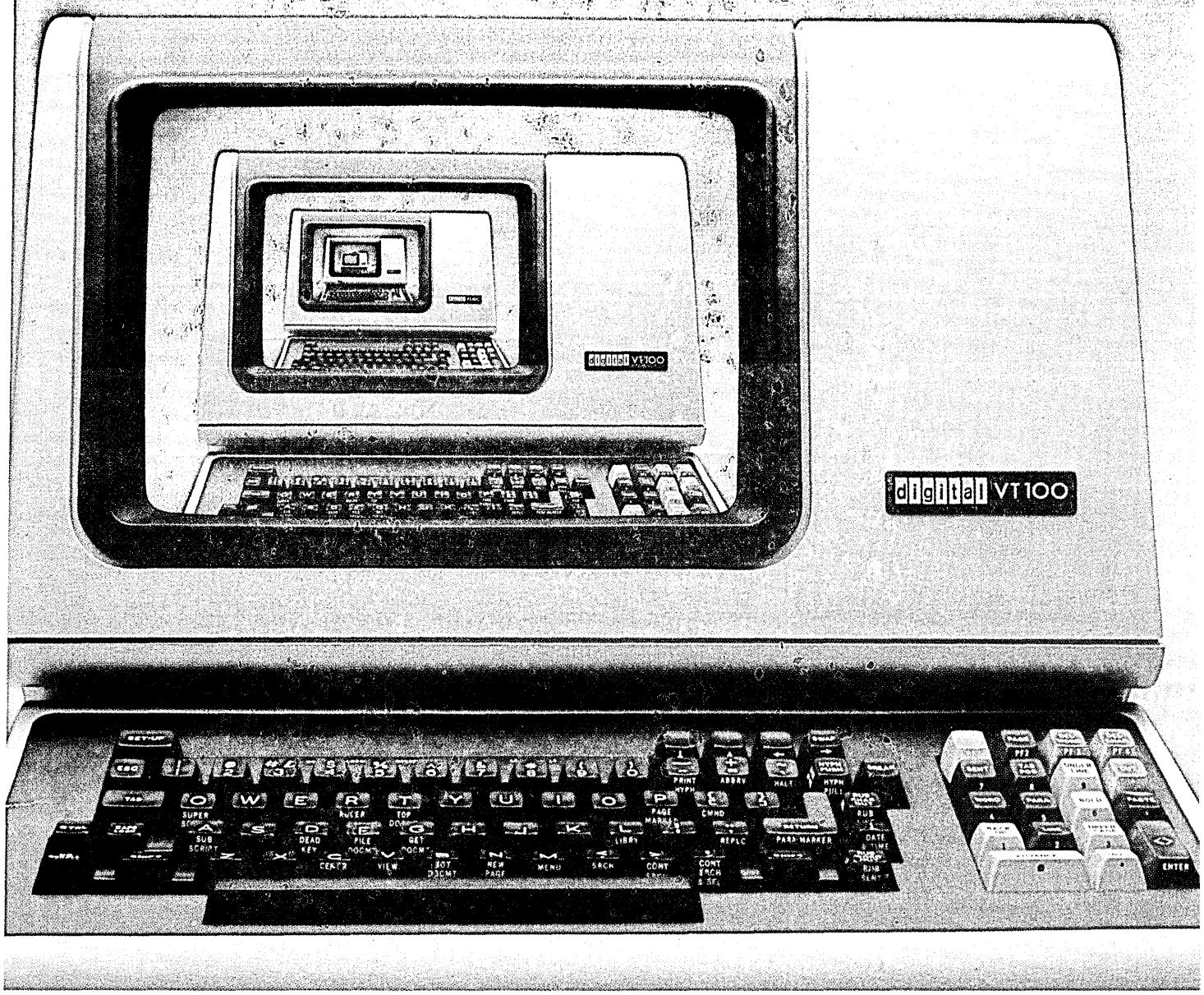

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HARDWARE

OFF-LINE

What do key chains, pets, gloves, books, and umbrellas all have in common? That's right, they all have the nasty habit of getting lost, generally at the worst possible time. Recognizing this problem, Information Retrieval Systems, Inc., of Great Neck, New York, runs a Special Emergency Service for locating misplaced personal belongings with a subscriber's registration number attached.

Then there's the Cincinnati firm of Metro Check, which operates a nationwide, toll-free answering service. Messages are entered into the ExecuCall computer, for subsequent delivery when the subscriber calls in with his password. The computer also stores a subscriber's travel itinerary, so an operator can tell callers how to get in touch with the traveler.

NCR, which just announced its largest mainframes to date (see this month's hardware section), says its COBOL VRX compiler has undergone validation by the Federal Compiler Testing Service. The firm says "only a few minor discrepencies" were found in the several thousand features tested.

I. P. Sharp Associates Ltd., the Toronto-based APL sharing company, has tied its computer network to the Telex network. This supplements the firm's current communication network, and extends coverage to areas previously not serviced. The firm runs two Telex access points: one in Rochester, the other in Amsterdam.

Citing the growing use of Micropolis Mod II floppy disk systems, Structured Systems Group of Oakland, California, now offers its CP/M compatible business software on 5 1/4-inch, high-density diskettes.

MINICOMPUTER

With 150nsec cycle times for both processor and cache, the V77-800 becomes the most powerful minicomputer in the product line this vendor acquired when it bought Varian Data Machines in June of 1977. The 16-bit V77-800 retains compatibility with earlier models in the line, and it also supports a new operating system, Summit, which includes a set of distributed processing modules. It can handle from 128KB to 2MB of 600nsec semiconductor memory; working with the cache, worst case access time, in the event of a cache miss, is 750nsec for four bytes. For scientific, and other, applications requiring many floating point operations, the 800 offers an optional floating point processor. The FPP performs arithmetic on single (32-bit) and double (64-bit) precision numbers. Writable control store, another option, provides up to 12KB of 150nsec control storage and 2KB of PROM. Users can write their own firmware, or get prewritten accelerator packages for speeding the operating system, COBOL, FORTRAN IV, and TOTAL data base management system. The Summit operating system provides communications modules for accessing the vendor's large scale Series 90 or Series 1100 mainframes, other V77s, and IBM mainframes. It supports four modes of terminal operation: asynchronous (block or character mode), bisynchronous (3270 emulation), and synchronous block mode for the vendor's Uniscope and UTS-400 terminals. Under Summit, users can use Pascal, QL/77 (an inquiry/update package for use with Total data bases), FORTRAN-77, and RPG II. Users also can run the Vortex II operating system used with smaller V77s. A typical 256KB system, selling for $135,000, includes eight asynchronous crt terminals, FPP, 60MB of disk, 300 lpm printer, 75ips, 800/1600bpi tape drive, and the Summit operating system. Summit itself is priced at $6,000, the Pascal package is another $2,000, and QL/77 is $3,000. SPERRY UNIVAC MINICOMPUTER OPERATIONS, Irvine, Calif.

FOR DATA CIRCLE 307 ON READER CARD

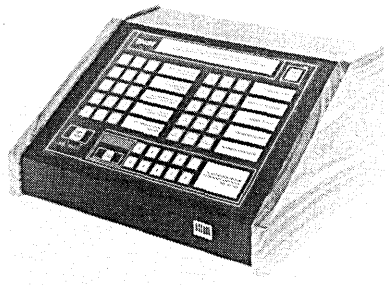
SMART HARDCOPY TERMINAL

The IPS-7326 is the latest member to join this vendor's line of "intelligent printing systems." The 150cps terminal comprises a matrix printer with eight-bit programmable microcomputer, and movable input station with ASCII keyboard and gas discharge display. By changing PROM's, the user can customize the IPS-7326 for a given application, say printing bar codes, or a new communications protocol. The unit comes with an IBM 2848-compatible serial interface as standard equipment; current loop and other serial interfaces are offered as options. The IPS-7326 sells for $4,675, quantity one, to end users; a discounted oem pricing schedule also is available. DATAROYAL, INC., Nashua, N.H.

FOR DATA CIRCLE 308 ON READER CARD

PUSHBUTTON QUESTIONNAIRE

Every get truly superb service or, more memorably, truly abominable treatment in a service establishment? "I'm going to write a letter about this," is probably one of the more common lies we tell ourselves. Ironically, most service establishments would welcome the feedback. That's why this vendor has come up with a data collection terminal called Tellus. Described as a pushbutton questionnaire, the terminal asks patrons' degree of satisfaction on ten customer specified types of service. It also can collect a zip code, or other



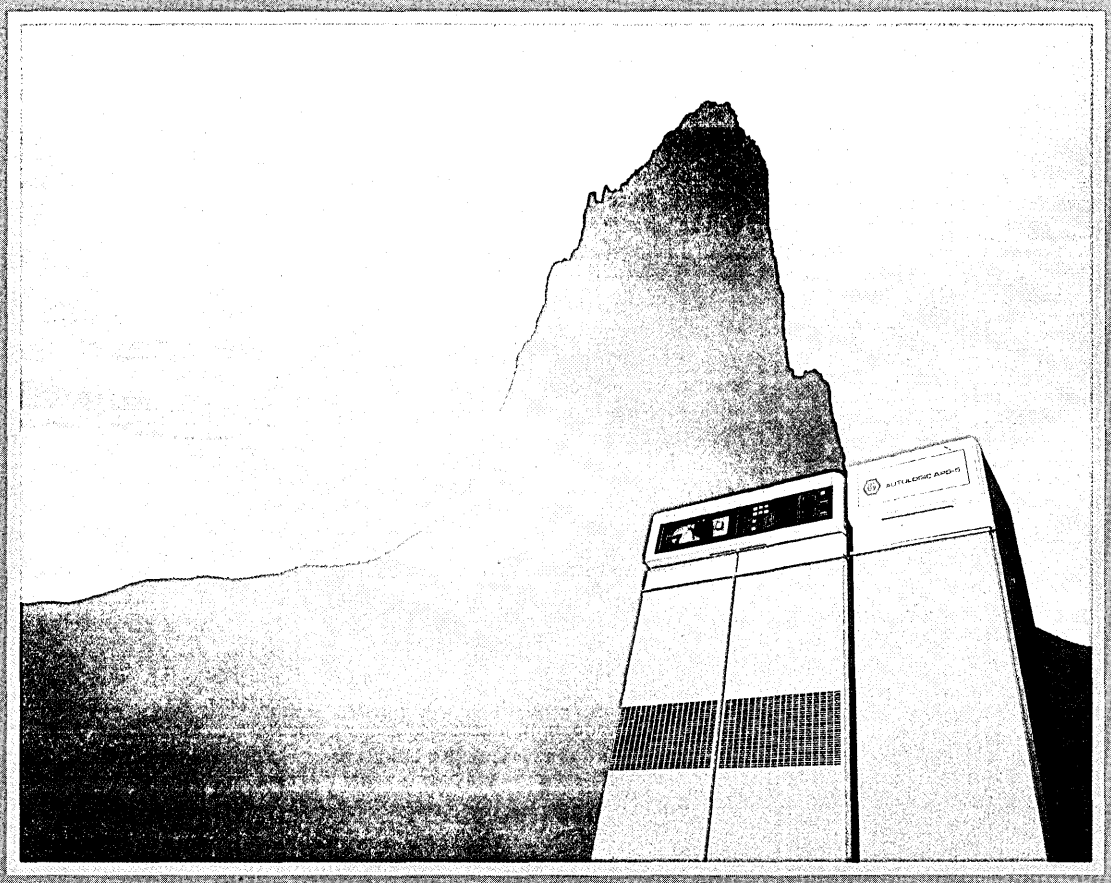
numeric information if needed. Once it has the data, the portable, battery powered unit can do several things. It can print records of the answers, along with preprogrammed reports. It can display the information. Or it can store the data for subsequent transmission to a remote computer. The basic Tellus sells for $1,500. Adding options such as a 12-column printer, extra memory, and communications capability can bring the price up to $3,000. Deliveries are slated for spring. MSI DATA CORP., Costa Mesa, Calif.

FOR DATA CIRCLE 304 ON READER CARD

TERMINAL ENHANCEMENT

We've heard of speed-up kits for DEC-writers, but this is the first one we've been told of that offers both increased speed and graphics capabilities. Dubbed the Graphics II system, the unit consists of

A new day is dawning for Phototypesetting...



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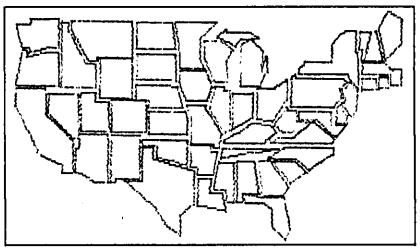
replacement electronics that plug into DEC's LA35 or LA36 30cps terminals, providing vector generated graphics, expanded character styles, and printing at an average rate of 50cps. The F8 microprocessor-based board can draw vectors between any two (of over 1-million) addressable points on a page; end-point specification is done with ASCII characters, and can come from the keyboard al-



lowing offline plotting. Two character sets, ASCII and APL, are included as standard; other sets can be installed by the user. Characters can be printed in any of four rotations; bidirectional line feeds with quarter line resolution provide superscript and subscript capability. Boldface characters and bar code printing also are supported. The buffered board allows data transmission of 1,000 character blocks at 1,200bps. The board also includes three interfaces (RS232, 20Ma current loop, and TTL), auto linefeed, top of form, and both horizontal and vertical tabs. The field installable Graphics II sells for $850; it also can be purchased factory installed with printer. SELANAR CORP., Santa Clara, Calif.

FOR DATA CIRCLE 303 ON READER CARD

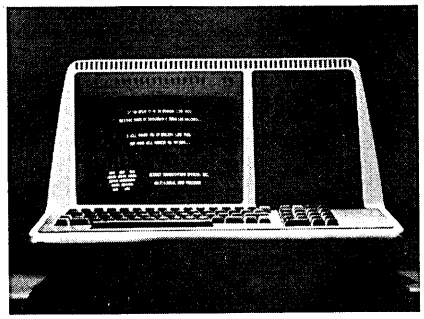
GRAPHICS IMAGING

The RGB-256 is an Intel Multibus-compatible card containing the memory and video interfacing circuitry needed to generate a 256 X 256 pixel display on a television monitor. Color or gray-scale are represented by four bits for each pixel; two boards can be used in parallel to provide 256 colors or gray levels. The microcomputer interacts with the video board first by loading its XY address registers, then by reading or writing the specified picture element. An erase command is implemented in hardware. The board's video output can be jumpered for compatibility with the American NTSC standard or the European PAL standard. The RGB-256 can be synchronized with an external video source, such as a television camera, through the use of an on-board phase lock loop. A software package for 8080-based systems provides vector plot, alphanumeric generation, and animation synchronization; the package goes for $28. The RGB-256 sells for $1,595; in oem quantities of 100 the price drops to $1,295. A frame grabber board, allowing the RGB-256 to store television pictures, reportedly is in the works. MATROX ELECTRONIC SYSTEMS LTD., Montreal, Quebec, Canada.

FOR DATA CIRCLE 305 ON READER CARD

HARDWARE SPOTLIGHT

SPANISH TO ENGLISH TRANSLATOR



Remember the brouhaha a dozen years ago about how helpful computers would be in translating from one language to another? Computer capabilities and economics were not the only stumbling blocks which tabled the work at the time. Also unsolved was the problem of how unspecific spoken languages are. This vendor claims to have found the way through all those brambles.

The Multi-Lingual Word Processing System is based on a DEC PDP-11/34 with display terminals. The user (who must also be a translator) enters the Spanish version; the bottom half of his screen fills up with the English. In cases where multiple definitions are possible, the lower portion of the screen gives the choices. Judgment is still required; it is the tedium which is supposedly eliminated.

How good is the system? "En el principio creo Dios los cielos y la tierra. Y la tierra estaba desordenada y vacia" becomes "In the beginning created God the heaven and the land. And the land was unorganized and empty." The vendor claims that verb conjugation, noun declensions and the like are no big problem, and that English to Spanish will soon follow, as well as versions for most common foreign languages.

Prices begin at $125,000 for a single terminal system with no line printer. (And by the way, the languages which make it work are FORTRAN and PL/1—who says there are no universal tongues?) Deliveries take four months. WEIDNER COMMUNICATIONS SYSTEMS, La Jolla, Calif.

FOR DATA CIRCLE 301 ON READER CARD

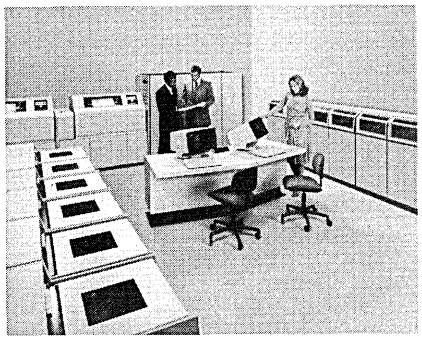
X.25 COMMUNICATIONS

Want to use an X.25 packet switched network to connect your 3270s with a 370 host? This vendor's 9100 series of communications processors and associated software allows just that. Users can take advantage of packet switched services such as Telenet, France's Transpac, and Canada's Datapac. The microprocessor-based 9101 accepts up to three input lines of bisynchronous 3270s and outputs one X.25 line that runs at up to 9600bps. The 3270 lines can be multidropped. The larger 9102 can accept from eight to 44 lines of 3270s, and provide a maximum of four X.25 lines running at up to 56Kbps. While the 9101 is a single board processor with 32KB of MOS memory, the 9102 is expandable by adding modules as needed; its memory capacity starts at 64KB and ranges up to 832KB. At the host site, a software package known as DMEP provides an X.25 interface. DMEP is said to be totally transparent, interacting with the host in the same manner as a 3270. Using 9100s in a network, any screen can communicate with any host; when one job is done, the terminal user can switch to another on a different machine, if desired. All host software systems, with the exception of VTAM/NCP, can use DMEP and 9100s. An optional facility installed with DMEP, the Network Operator Console Program/9100 (NOCP) allows a console operator to reconfigure the network and initiate remote diagnostics in 9100s. A basic 9101 sells for $7,600. Pricing for the 9102 starts at $18,500. DMEP carries a monthly license fee of $500, NOCP goes for $100 per month. CAMBRIDGE TELECOMMUNICATIONS INC., Burlington, Mass.

FOR DATA CIRCLE 302 ON READER CARD

MAINFRAMES

The two largest mainframes ever offered by this vendor sport memories using 64Kb chips, emitter coupled logic, and bus architecture. The largest of the two is said to offer roughly 15% more performance than IBM's 3033, although the systems are not 370 plug compatibles. The V-8600 series offers software compatibility with the vendor's N-mode and V-mode systems.



Both members of the family have cycle times of 28nsec. The V-8650 has a 32KB cache, and 96KB of instruction storage unit memory; the dual processor V-8670 has 128KB of cache, and 192KB of instruction memory. The instruction storage unit, loadable from diskette, can optimize the system for FORTRAN or COBOL environments. The V-8650 can have 4MB

to 8MB of memory, while the V-8670 can have as little as 4MB or as much as 16MB. A "Dynamic Channel Exchange" routes data between the system and its channel control processors. Two to four channel processors can be included in the system, and each can control eight channels at 2MBps. Both systems run the Virtual Resource Executive (VRX) which supports COBOL, FORTRAN, NEAT/VS, and RPG. A V-8650 system with 4MB, operator console, and two channel control processors, sells for $1,776,500 or rents for $39,200 on a five year plan. The V-8670, with 4MB, twin-station console, and two channel control processors, goes for $2,555,000 or $53,500 a month on a five year rental agreement. Typical system prices range from $2,400,000 to $3,500,000 for the V-8650 and $3,800,000 to $5,300,000 for the V-8670. Deliveries begin in the fourth quarter of 1980. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 309 ON READER CARD

OCR

Optical character recognition, often considered to be a rich man's technology, still isn't free. But this vendor's model 1150 OCR System costs less than many minicomputer systems; 1150 prices start at $41,000. The units read OCR-A or OCR-B and, as an option, handprinted numerics, at the rate of five 8½ by 11 inch pages a minute. The standalone system has an RS232 interface, and includes a crt terminal for on-line reject handling, automatic sheet feeder, two-pocket stacker, and mag tape drive. A programmable format controller allows users to define forms, telling the 1150 to read only selected areas of the input screen. The unit can be leased for $1,150 per month on a five year agreement; the hand print option is $190 per month more. Lease prices include maintenance. An 1150 with handprint option can be purchased for $48,000. SCAN-DATA CORP., Norristown, Penn.

FOR DATA CIRCLE 310 ON READER CARD

MULTILINE CONTROLLER

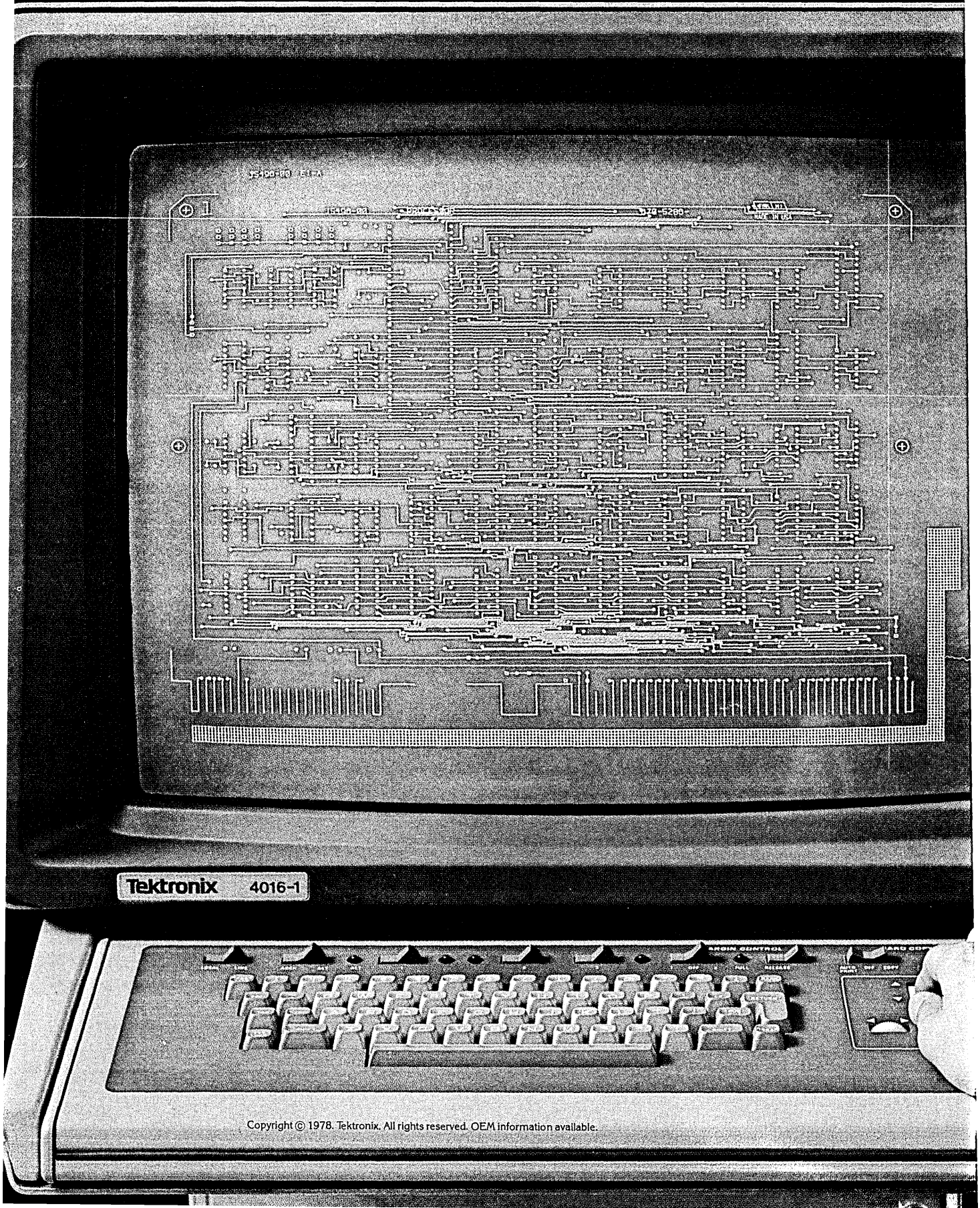
An asynchronous multiline controller (AMLC) for this vendor's larger time-sharing systems is said to significantly reduce communications overhead. On the vendor's model 400 cpu tests have shown roughly a 4 to 1 reduction on the cpu's overhead when the AMLC runs 9600bps lines. The AMLC uses a direct memory queued I/O mode, allowing the cpu to keep large transmit queues for each line, and reducing the number of processor interrupts. Regardless of line speeds, which range from 110bps to 9600bps, only 10 interrupts per second need service. The AMLC fits in all 17- and 24-board model 350, 400, and 500 chassis; it cannot work with the smaller models 100, 200, and 300. An eight-line AMLC lists for $3,500, a 16-line AMLC goes for $4,000. Maintenance is $18 per month and $21 per month, respectively. RS232 and 20Ma interfaces are supported. PRIME COMPUTER, INC., Wellesley Hills, Mass.

FOR DATA CIRCLE 311 ON READER CARD

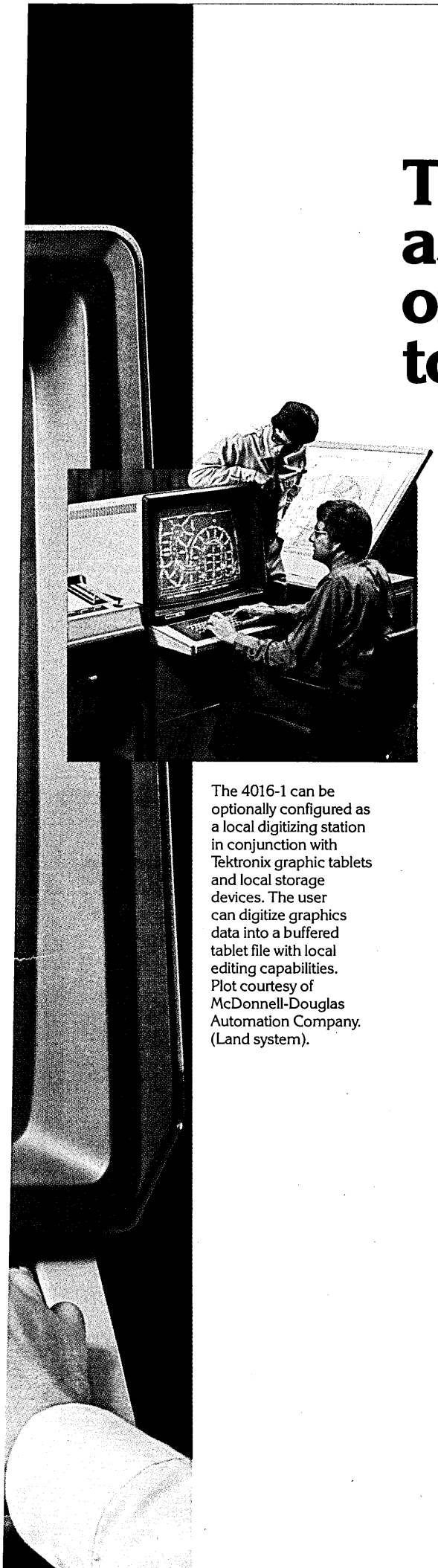
INTELLIGENT FLOPPY SUBSYSTEMS

After nearly a year of selling an intelligent floppy disk subsystem in the terminal attachment market, this vendor has widened its line with two more models tailored to specific tasks. The Comm-Stor III supports forms data entry, while the Comm-Stor IV sports an extended BASIC

From the graphics leader



25-inch Graphics. The tool the innovators asked for. From the one company with the tools to build it.



The 4016-1 can be optionally configured as a local digitizing station in conjunction with Tektronix graphic tablets and local storage devices. The user can digitize graphics data into a buffered tablet file with local editing capabilities. Plot courtesy of McDonnell-Douglas Automation Company. (Land system).

We designed the 4016-1 for professionals at the frontiers of graphics.

For years, they've relied on Tektronix graphics for unmatched resolution and information capacity. Now that they're ready to explore bigger and better ideas, we're ready with a 25-inch display.

Interact with more graphics than ever before.

Now customers in network modeling, mapping, IC design and other disciplines can design and preview complete plots of virtually unlimited complexity. They can choose from four sizes of alphanumerics and display as many as 15,000 characters at once, using a 179-character per line format.

Performance features are based on input from graphics innovators. New to the 4016-1 is an easily viewable 25" graphics workspace, detachable keyboard and display, plus optional expanded intelligence for local control of tablets, plotters, storage devices and other peripherals.

High performance graphics is all part of the family.

You'll find, too, that in software and communications support, the 4016-1 is thoroughly compatible with the rest of our 4010 graphics family, allowing an easy upgrade to 25-inch graphics. Add local graphics transformations and circle generation. Local symbol design. Hard copy capability. Select from a full complement of intelligent peripherals like tape and disc storage, B- and C-size plotters.

From 25-inch graphics on down, we'll show you performance, software, and service at the top of its class. For more information, call our toll-free automatic answering service at 1-800-547-1512 (Oregon residents call 644-9051 collect). Or contact your local Tektronix office.

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CIRCLE 61 ON READER CARD

interpreter. Comm-Stor III provides data validation features including table lookup (and automatic fill-in), range checking, and arithmetic calculations. It works with both hardcopy and crt terminals having RS232 interfaces. A second RS232 port provides an interface to a computer or modem, a third is optional, allowing connection of a printer. A basic unit with 5KB of RAM and single diskette drive sells for $3,375. Dual drives and memory expansion to 12KB are options. The Comm-Stor IV can have either single or dual floppy drives, and from 4KB to 40KB of user RAM. Two RS232 ports are standard, a third is optional. BASIC, a file system, and communications code are stored in 40KB of ROM. BASIC offers formatted I/O, binary data handling, CALL and LINK commands (for segmenting large programs), and virtual arrays that can contain as many as 83,000 integers. The smallest Comm-Stor IV, including single floppy drive, two RS232 interfaces, and 4KB of user memory, sells for $3,875. SYKES DATATRONICS, INC., Rochester, N.Y.

FOR DATA CIRCLE 312 ON READER CARD

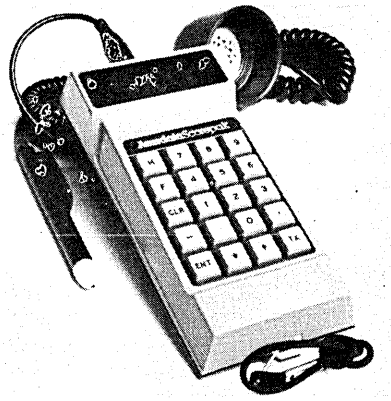
POINT-OF-SALE TERMINAL

A programmable version of its 3653 point-of-sale terminal, for use with the 3651 programmable store controller, should allow this vendor's users to customize systems to more closely fit their needs. Two applications and one programming support package also are offered. The programmable terminal allows users to check prices at the point-of-sale, print customized sales slips, handle COD and layaway transactions, perform check or credit approvals, and other functions. The Point-Of-Sale Application/Retail Environment program performs the basic functions for controlling both sales and nonsales tasks in retail stores; it licenses for $60 per month. The Point-Of-Sale Application/Store Data Management software can capture data, maintain files, and support communications between systems in chain store operations; it licenses for $15 per month. The Subsystem Program Preparation Support III package lets the retailer's programmers develop custom applications; it licenses for $260 per month and runs on host 370s. The programmable 3653 model 1P sells for $4,090; it can be leased for $106 per month on a five year agreement. Existing units can be upgraded for $425. INTERNATIONAL BUSINESS MACHINES CORP., White Plains, N.Y.

FOR DATA CIRCLE 313 ON READER CARD

HANDHELD TERMINAL

Users needing to collect data in the field may find the Scorepak handheld terminal a suitable tool. The microprocessor-based unit's 20 ounce package contains keyboard, LED display, and the electronics for bar code scanning and data transmission. It also contains a 16KB solid state memory. With primary application in the distribution industries, the Scorepak allows the user to select length of product code and option code, as well as error checking



(Mod-10, Mod-11, or none). Units are offered to read several bar codes, including Codabar, UPC, and Plessey. Users can scan through memory a line at a time or search for specific product codes or partial product codes. Pricing on the Scorepak starts at less than $1,000. AZURDATA, INC., Richland, Wash.

FOR DATA CIRCLE 314 ON READER CARD

Now for distributed data processing:

Remote job entry at bisync speeds for under $175.00 per month!

Tab's New System 700-60 Delivers Low-Cost, High-Speed Performance

Tab's single or dual station System 700-60 combines IBM 2780 compatible Binary Synchronous communications with advanced data entry and editing capabilities. The easy-to-use system 700-60 costs less than $175 per month, excluding maintenance, and transmits in speeds up to 9600 BAUD. Data can be transmitted or received in single records of 1 to 128 characters. When expanded communications are used, in 400 character blocks, Tab's System 700-60 satisfies all distributed processing requirements.

Remote Job Entry Stations Enhance Operator Productivity

Tab's System 700-60 prepares data at an originating site and transmits in a batch mode to a central computer. Data can also be received at a remote site and printed out as required. The System 700-60 is ideal for distributed processing and off-line reporting applications. Prompting messages lead operators through complicated documents. Optional printer allows remote preparation of shipping orders, invoices, monthly reports, and labels, thereby, saving costly computer time.

These System 700-60 Features Give More Throughput For Your Dollar

☐ Four Search Methods ☐ Operator Prompting ☐ 1 to 128 Character Variable Length Record ☐ Moveable Keyboard and Large Work Surface ☐ Disk Copy ☐ Crisp, Clear, Full Hex Character Display ☐ Record Insert ☐ High-Speed Diskette Data Searches ☐ Constants from Memory and Character Insert/ Delete Save Keystrokes ☐ Operator Productivity Enhanced With Six Display Lines ☐ Optional Interface Provides for a Line Printer Attachment.

For complete information, call your local Tab Representative or write Tab Products, 2690 Hanover Street, Palo Alto, California 94304. 415 493-5790

TAB
PRODUCTS CO

CIRCLE 17 ON READER CARD

HARDWARE

DISK CONTROLLER

If you'd like to use your Nova or Eclipse to process a large data base (say up to 1.2-billion bytes), the 3255 disk controller may fill the bill: it occupies one slot in the cpu's chassis and provides an interface to up to four Winchester disk drives. The controller handles drives with transfer rates ranging from 806KBps to 1.2MBps, including those from Ampex, CDC, and Memorex. Drives of different types can be intermixed. A single 3255 sells for $3,500; quantity discounts are offered to oem's. BALL COMPUTER PRODUCTS, Sunnyvale, Calif.

FOR DATA CIRCLE 315 ON READER CARD

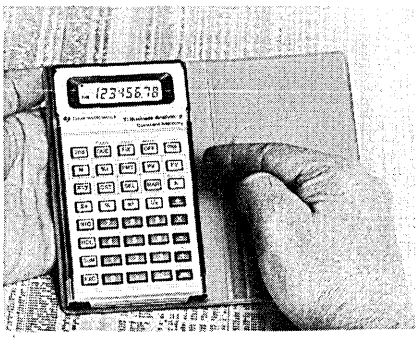
PRINTER SYSTEMS

Offered in 300 lpm, 600 lpm, and 1,000 lpm configurations, this vendor's line of minicomputer printer subsystems can be had for use with DEC PDP-11s, and Data General Novas and Eclipses. Called the Supermini Series, the printing systems include the appropriate controller and the user's choice of either a 300 lpm or 600 lpm matrix impact printer or a 600 lpm or 1,000 lpm chain printer. All have 132-character lines. The matrix printers use the 96-character ASCII set, while the chain printers use the 64-character set. Prices range from $10,200 to $29,800, and include installation. CALIFORNIA COMPUTER PRODUCTS, INC., Anaheim, Calif.

FOR DATA CIRCLE 316 ON READER CARD

FINANCIAL CALCULATOR

The Slimline Business Analyst-II pocket calculator offers separate modes for financial, statistical, and profit margin calculations. The calculator has an eight digit liquid crystal display, nonvolitile memory, and automatic shutdown if left idle for roughly 10 minutes. Depending on the mode selected, function keys invoke



calculations of compound interest, annuity payments, mortgage loans, amortization schedules, profit margins, means, standard deviations, and variances. The $45 Business Analyst-II is powered by a pair of miniature silver-oxide batteries with an estimated lifetime of 1,000 hours of normal operation. TEXAS INSTRUMENTS INC., Lubbock, Texas.

FOR DATA CIRCLE 317 ON READER CARD

PERSONAL COMPUTER MEMORY

The S-100 bus compatible SuperRam 32K provides two independently addressable and protectable 16KB blocks of static memory. The board can run with 2MHz or 4MHz clocks, allowing use with 8080 or Z-80-based microcomputers. In kit form it sells for $649; the fully assembled price is $699. THINKER TOYS, Berkeley, Calif.

FOR DATA CIRCLE 318 ON READER CARD

DIGITIZER

Just about a year ago this vendor announced its Bit Pad digitizer (see January 1978, p. 212), an inexpensive unit primarily for use with microcomputers. But that unit needed an external interface, seen as a drawback by some. Now, answering that objection, there's Bit Pad One, a single unit combining digitizer and support electronics. The 11-inch square active area provides resolutions as fine as 0.1mm (that's nearly 3,000 lines per tablet). The unit can interface to microcomputers via an eight-bit parallel output, RS232 serial

OUR NEW 80 COLUMN PORTABLE. IT WEIGHS 15 LBS., BUT IT HAS A TON OF FEATURES.

Our new Execuport 4080 portable printing data terminal weighs only 15 lbs., yet it offers some features you won't find in any other portable terminal. Horizontal tabbing, a built-in self test routine, print head position indicator, plotting with one quarter line bidirectional stepping are but a few of the more useful ones.

In fact, this new standard width portable has all the features of our wide carriage Execuport 4000: built-in coupler and modem, embedded numeric pad, a variety of keyboard styles, upper and lower characters, and much more. It prints the full ASCII and/or APL character sets at true 10 or 30 CPS.

Important too, the thermal printer helps make the Execuport 4080 extra quiet. Ideally suited for office, home, or hotel use.

Of course, you get Execuport's justifiably famous reputation for reliability, plus proven design performance and nationwide service. All for $2395.

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CIRCLE 19 ON READER CARD

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☐ Send me information on the new Execuport 4080.

☐ Have salesman call and demonstrate the Execuport 4080.

Name_____

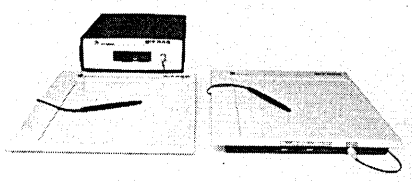
Title_____

Address_____

City_____ State_____ Zip_____

Phone_____

interface, or IEEE-488 standard interface. An external power supply is required. Including its interface, the Bit Pad One sells

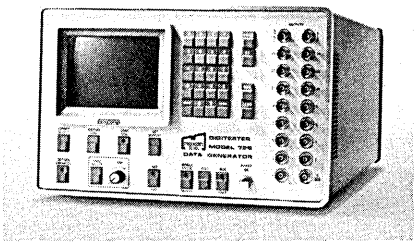


for $666. SUMMAGRAPHICS CORP., Fairfield, Conn.

FOR DATA CIRCLE 319 ON READER CARD

DATA GENERATOR

For testing digital circuits, downloading microcode, and other applications requiring the generation of digital data, the model 725 Data Generator allows the user to define and output appropriate data patterns. From a front panel keypad, the user can enter data in binary, octal or hexadecimal; an integral crt allows data dis-

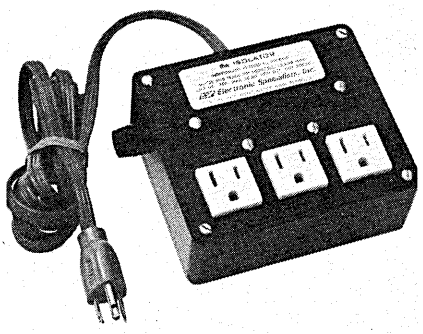


play in these formats. The unit can treat the data as either 16K bits in series or as 1K of 16-bit words. The unit outputs TTL levels at any of 15 preselected crystal-controled data rates; external clocking and a variable frequency mode (ranging from 30Hz to 20MHz) can also be used. The 725 sells for $5,500. MOXON, INC., Irvine, Calif.

FOR DATA CIRCLE 321 ON READER CARD

POWER CONDITIONER

The Isolator provides three independently filtered grounded AC sockets with surge suppression. The unit takes a 15 amp fuse,



and is said to handle a maximum load of 1,875 watts. Each socket can deliver 1,000 watts. The vendor sees a prime application in isolating microcomputers from line noise generated by their peripherals. The Isolator sells for $49.95. ELECTRONIC SPECIALISTS, INC., Natick, Mass.

FOR DATA CIRCLE 324 ON READER CARD

HYBRID COMPUTER

It's been a long time since we've heard anything on hybrid computers. It's not that there aren't users with large-scale simulation and scientific computation problems, but their applications aren't widely publicized. Looking at a list of some of this vendor's customers leads us to suspect that many applications are either proprietary or classified; customers such as the U.S. Army, Beech Aircraft, General Electric, and the British Royal Naval College may not be at liberty to explain their projects.

The hybrid computer combines both digital and analog computers. This vendor's Hyshare 600 uses a modified 32-bit SEL 32XX computer, and up to six of the vendor's analog processors. The analog processors, used for solving differential equations and the like, let the system operate at digital equivalent speeds in the 500-million operations per second range.

Software includes a real-time monitor, FORTRAN IV compiler, BASIC interpreter, symbolic assembler, and a program generation-compilation system which lets the user input the definition for problems to be solved on an analog processor and outputs instructions for setting up the analog unit's program. Scientific and mathematical run-time libraries also are included. The total hardware/ software combination provides for concurrent interrupt-driven hybrid simulation, time-shared digital computation, analog-only operations (after digitally assisted setup), setup, check-out, and debug of analog or hybrid programs, and program development using the generation-compilation system.

Pricing on the Hyshare line ranges from $300,000 to $2,000,000. ELECTRONIC ASSOCIATES, INC., West Long Branch, N.J.

FOR DATA CIRCLE 299 ON READER CARD

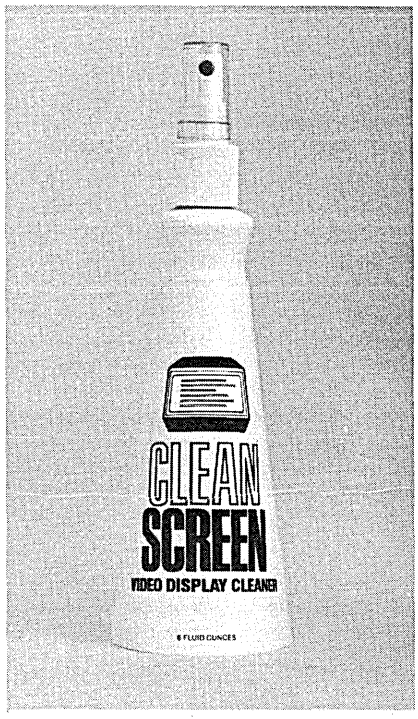
FIBER OPTIC LINK

A fiber optic data link, useful in high-speed applications such as large computer installations or distributed processing systems, or harsh environments such as power plants, can be had in any of five standard lengths up to 100 meters. Capable of communications at up to 10 megabits per second, the HFBR-0010 consists of a digital transmitter, digital receiver, a single fiber 10 meter connector/cable assembly, and technical documentation. Input and output to the unidirectional link are at TTL logic levels. A "link monitor" in the receiver detects when the data flow is interrupted. The complete HFBR-0010 system sells for $570; packaged with a 100 meter fiber optic link, the system sells for $750. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 300 ON READER CARD

CRT SCREEN CLEANER

Clean Screen, an ammoniated cleaner intended for use on crt screens, is said to have been "developed specifically for business and industrial use." The cleaner reportedly contains an antistatic fluid and dyes intended to reduce reflected glare.



Additionally, the nonaerosol bottle is said to deliver a very fine spray to prevent the cleaner from running down the face of the screen. A single six ounce bottle sells for $3 postpaid; a case of 12 bottles goes for $24, plus shipping. CLEAN SCREEN PRODUCTS, INC., Chicago, Ill.

FOR DATA CIRCLE 325 ON READER CARD

CARTRIDGE TAPE CONTROLLER

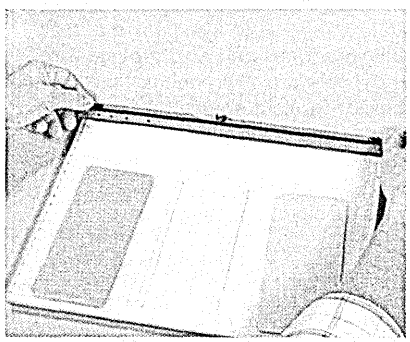
LSI-11 microcomputers can be interfaced to 3M-type cartridge tape drives via the TC-160 controller. Occupying two adjacent quad slots in the LSI-11, the TC-160 handles from one to eight drives; 1600bpi and 6400bpi drives can be used. The unit emulates DEC's TM-11/TU-11 half-inch tape systems. The TC-160 works with data cartridge drives manufactured by DEI, Kennedy, Qantex, Tandberg, and 3M. In singles, it sells for $2,500. WESTERN PERIPHERALS, Anaheim, Calif.

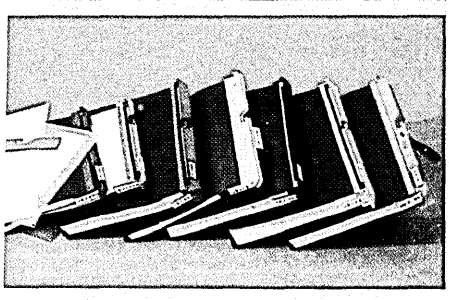
FOR DATA CIRCLE 320 ON READER CARD ✲

how DOCU-MATE™ and the structured filing concept improve systems and programming productivity

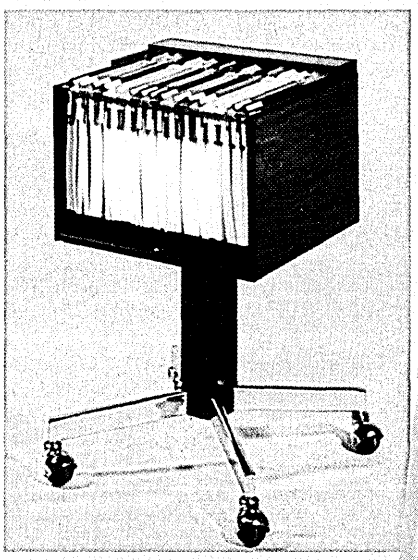
A thorough and complete data processing documentation library is like motherhood and the flag. Everyone is in favor of it. The real problem lies in organizing it and making it work. That's where our DOCU-MATE System comes in. Starting with the problems, we designed solutions in the form of products that make it easy to file and access virtually every size and shape of documentation . . . to intermix different sizes and shapes in the same filing equipment . . . to move documentation from filing to reference mode and vice-versa while keeping it in the same filing device . . . and to structure workable standards for managing and controlling all documentation.

The heart of the DOCU-MATE System is the hanging cartridge. It provides center hook lateral filing or end hook drop filing . . . snaps open or closed with the flick of a finger . . . and has highly visible end and top labeling areas.





Along with other DOCU-MATE filing devices, cartridges fit compatibly into a wide variety of filing and referencing equipment that allows almost unlimited flexibility in the planning of central documentation libraries and development support libraries, and individual work stations.



The DOCU-MATE System is the key you are looking for to make your documentation library system work. It will help you to improve project control, increase systems and programming productivity, improve interdepartmental communications and reduce the cost of maintaining your documentation system. In less than two years since its introduction, it is now in use by over 3,000 companies in the U.S.

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CIRCLE 108 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Ever wonder how the new breed of roller coaster gets designed? One firm that comes up with super scary designs uses STRUDL, the structural design system, and a graphics package called Fastdraw. The San Jose, California-based architectural and engineering firm of Ruth and Going uses MCAUTO's computer services to model and analyze designs. In a comment that scares the stuffings out of us, Dennes Furia, a Ruth and Going structural designer, notes "that these moving vehicles are traveling at speeds of 60 or 70 miles per hour. The cars weigh about 15,000 pounds. A tremendous force is being generated in a very short time, forces of 4 to 5 G's on this 15,000 pounds. Suddenly, in specific areas of the ride, you have nearly 75,000 pounds of force being exerted on the structure." Furia concludes, "The computer is the only way to do it. We really couldn't get involved in this type of work without it."

An experimental system at Bell Telephone Laboratories cuts the middleperson out of an automated directory assistance system. Callers need only spell the first five letters of the last name and give the initials. The system's speech recognition equipment, also Bell-developed, is said to comprehend most American dialects and some foreign accents. It does this by having 12 reference patterns for each letter; accuracy is said to be roughly 97%. Don't expect your local operating company to install the system next week: it takes about five seconds to recognize each spoken letter. Additionally, the people at Bell Labs want to get the system working with more accents and with the ability to work for callers with speech impediments.

TRS-80 FORTRAN

Bundled software, as far as microcomputers are concerned, seems to mean the customer buys a collection of compilers and utilities in one clump. Now this vendor has produced one of the first FORTRAN's, for the Radio Shack TRS-80 system, and bundles it with a macroassembler, text editor, runtime library, and linking loader. All compatible with the TRSDOS monitor, the routines are supplied on two minidiskettes, for $350, and require a minimum of 32K plus disk to play with.

The FORTRAN-80 is claimed to include all of the ANSI 66 FORTRAN features except provision for Complex data types, plus enhancements for mixed mode arithmetic, logical operations on integers, encode/decode for memory formatting, end of file and error condition trapping for read/write. MICROSOFT, Bellevue, Wash.

FOR DATA CIRCLE 326 ON READER CARD

NCR COBOL TRANSLATOR

According to NCR, a user with 50 old COBOL 68 programs to convert to COBOL 74 might expect to invest 480 programmer hours in the job. Fortunately for the programmers who might get tagged with the task, NCR's translator should cut the work to about 75 hours worth. From input of punched cards, mag tape, or disk, the translator grinds out new source, with listings indicating which statements have been altered. From each old file specification it produces 25 to 30 new statements in the new language.

The software operates on an NCR Century 101 or larger machine, needs 64KB, two disks, and a printer. It costs $6,000 and is called ANSWER, for Automatic NCR Source Word Evaluation Routine (which sugests they started with the acronym and had to come up with a name to match it). NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 327 ON READER CARD

PERFORMANCE ENHANCEMENT

Virtual Memory/Performance Enhancement (VM/PE) lets users of Amdahl 470 series mainframes run several operating on the same processor with little increase in overhead. Foreshadowing the announcement at the Federal Computer Conference last November, Dr. Amdahl commented in a speech: "The first copy of an operating system has, in the case of our own computing center, a reduction of the production throughput of less than 3%." VM/PE is said to be able to improve throughput for users running MVS under VM/370. Depending on environment, users can experience throughput of greater than 90% of MVS native state from MVS running under VM/370. The software becomes available next month; it will be licensed to Amdahl users for $1,500 per month per system. AMDAHL CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 328 ON READER CARD

DISPLAY FORMS DESIGN

Someday paperwork may disappear, but only because we will be filling out the same forms on crt screens instead. To make it all easier for us, DEC is providing what it calls a Forms Management System, the purpose of which is to allow for translating paper forms to use on a screen and for designing new electronic (?) forms.

FMS is a series of utilities which make use of key features of the VT100 and PDT terminal lines, including reverse video, blinking, underscoring, scrolling, etc. The utilities operate under the RT-11 operating system, allow for simply typing the forms onto the screen, and remember fields by name—for easy alteration.

The utilities may be accessed through BASIC, FORTRAN, or macroassembler programs and also provide a reverse twist—that of producing hardcopy versions of forms designed on the screen. Scheduled for deliveries early this year, the set costs $1,350. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 329 ON READER CARD

FILE DUMP UTILITY

TSDUMP is a time-sharing utility for operation under TSO in OS or OS/VS shops. It provides for displaying the contents of sequential, indexed sequential, or partitioned files of fixed or variable length records up to 10,000 bytes long (although getting 10KB on a screen at one time might be tough). Directing the output to a printer is also permitted. Users may specify the lowest and highest keys to be selected, and may use a decimal, alpha, packed or binary field control key. A lifetime lease runs $1,750. GENERAL DATA SYSTEMS, Culver City, Calif.

FOR DATA CIRCLE 331 ON READER CARD

asi/inquiry

The IMS DB/DC QUERY LANGUAGE

USED BY MORE IMS INSTALLATIONS THAN ANY COMPETING PRODUCT

ASI/INQUIRY is an IMS DB/DC query language that operates completely as an interactive Message Processing Program. The design of ASI/INQUIRY is such that the *structure of the data base is transparent to the user*. Moreover, one need not have familiarity with DL/1 segment logic or the complexities of multi-pathing. Extremely rapid response time is assured.

MAJOR HIGHLIGHTS

- ☐ End-user oriented
  - —Easy-to-use language
  - —Requires no knowledge of IMS
  - —Comprehensive diagnostic messages
- ☐ Rapid response time for even the most complex queries
- ☐ Dynamic priority scheduling to maximize system performance
- ☐ Availability of default as well as user-defined screen formatting

Additional features and functions include:

- Supported under both IMS DB/DC and TSO
- Full support of IMS/VS secondary indexing
- Open-ended computation facilities
- Ability to SORT display output
- Complete security through password protection
- Comprehensive log of all session and run statistics
- Unlimited data base concatenation and referencing
- Optional usage of qualified SSA's

In summary, ASI/INQUIRY represents the state-of-the-art product in an IMS/DC or TSO-supported environment. Contact us and learn why organizations such as *Hughes Aircraft, Standard Oil of Indiana, Hydro-Quebec* and *EXXON* are processing queries like "What if . . . . " and obtaining a return on their investment many times over.

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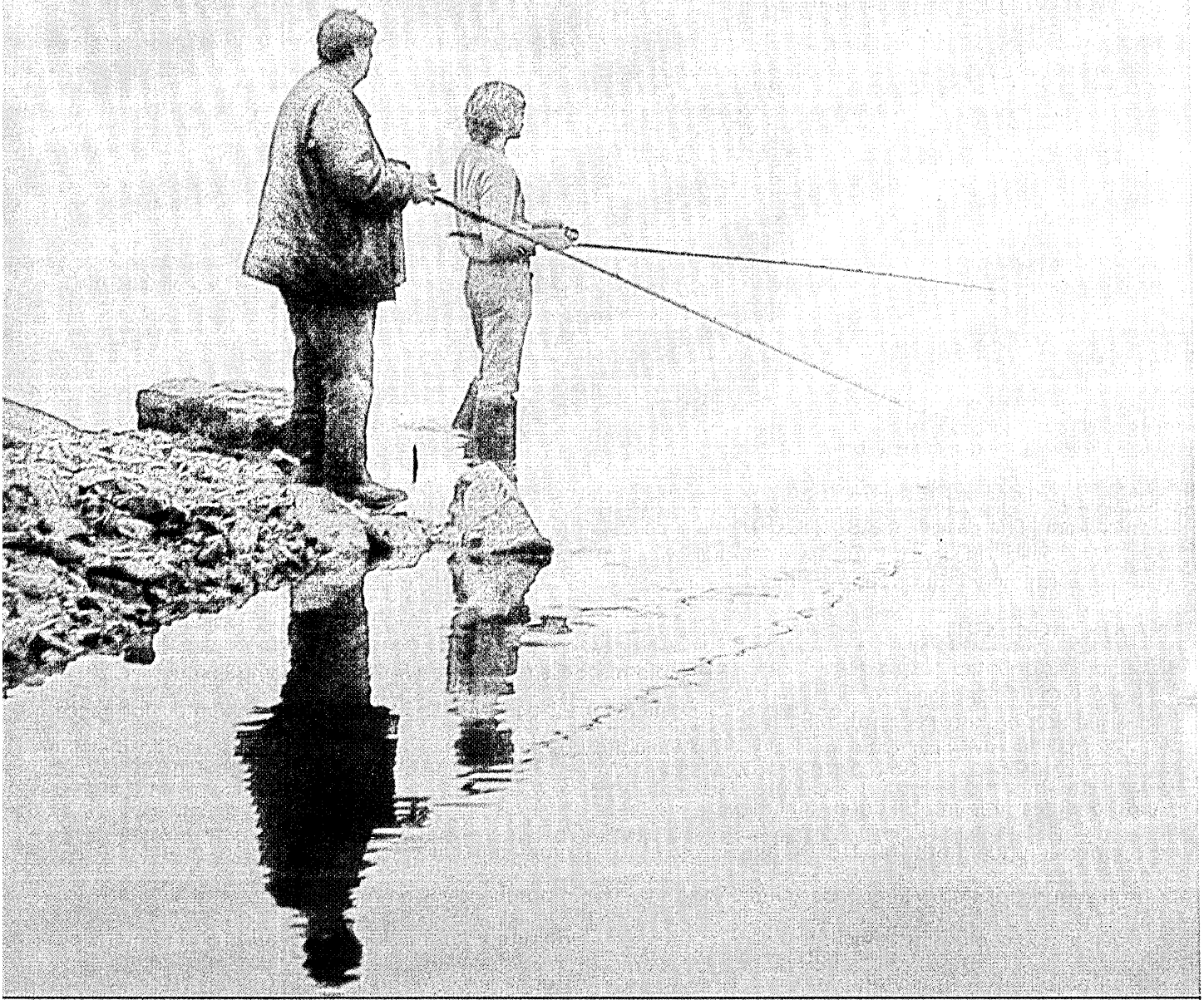
CIRCLE 77 ON READER CARD

A Place in the Rain



It rains here. Not as much as in many places, but more than in some. Out here you'll hear stories about rain. But better yet, you'll see what the rain means for our life. Dark forests on our mountain ranges. Fishing streams flowing down clear from the high lakes. Wildflowers, from alpine meadows to city woods. A clean metropolitan skyline on the Willamette River just minutes away. Yes, it rains here in Oregon. And it means life to us. We've found a place in the rain—we're Tektronix, a Fortune 500 leader in electronics test and measurement, and computer graphics. There's a quiet excitement to our enterprise. If you have experienced research, engineering, marketing or software development skills, write to Bill Eppick, Professional Placement. He'll answer your letter and send you a color print of this scene if you request it. No obligation.

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SOFTWARE AND SERVICES

MICRO SOFTWARE

A three-diskette package brings the user of Ohio Scientific microcomputers: Digital Research's CP/M operating system, a text editor, Intel 8080 assembler and dynamic debugger, Microsoft's 8080 macroassembler, Extended Disk BASIC, ANSI FORTRAN 68, and ANSI COBOL 74—in short, a collection of some of the most popular software from a couple of different vendors. What's more, it runs on the Zilog-Z80 imbedded in the vendor's computers. (It's all rather like a stereo album labeled "Hits of the '70s" featuring several artists who record on different labels.) Called OS-CP/M and meant to run in 48K, the collection is priced at $600. OHIO SCIENTIFIC, Aurora, Ohio.

FOR DATA CIRCLE 332 ON READER CARD

PRINT LOAD MEASUREMENT

The printing load has usually been measured by how many cartons of forms are chewed up during a given period. More specific information has usually been gathered by operators or someone standing near the printer in question. No more. This Field Developed Program, called the Print Load Analyzer, works off of SMF records to determine how much of any type of form is used, how much each printer is used, which jobs take longest to print, which system in a multisystem environment produces the most paper output, which site in a multisite environment, etc. (The remote site data doesn't work under VS1, however.)

The program requires an OS/VS system, one tape, one disk, one printer, and 256K. As all FDP's, it comes without a warranty, but it's written in COBOL and updates will be shipped at no extra charge until November 1979. After 12 monthly payments of $90, its license is paid up. INTERNATIONAL BUSINESS MACHINES CORP., White Plains, New York.

FOR DATA CIRCLE 333 ON READER CARD

PASCAL

Blaise Pascal (1623-1662) invented some small calculators which he called Arithmetic Engines just about at the time the British Colonies were being established in the new world. He'd be surprised to learn how much his name is being bandied about with today's miniature devices, the micros. This version of the compiler is built for use on the vendor's CommFile 130 floppy disk systems to produce code for execution on Intel 8080 or Zilog Z80 processors. It requires 44KB and a floppy for code generation, but produces programs which may operate in smaller memories. The license fee for it is $500. DMC, Santa Clara, Calif.

FOR DATA CIRCLE 334 ON READER CARD

SOFTWARE SPOTLIGHT

SHIPPING COST CONTROL

There's a traffic consulting firm out Illinois-way. One of the services they provide is auditing customers' freight bills. They find errors, "commonly manifested as overcharges," averaging 3% to 5% of their clients' shipping bills. They also find cases where a customer mistakenly receives, and pays, the same bill twice. Unfortunately, auditing is labor intensive, and mistakes are most often discovered after the bill has been paid.

So the traffic consulting firm rounded up some dp talent and formed a subsidiary to provide computer based auditing. At first they planned only to tackle motor freight, but later realized their data base could accommodate any rating schedule they'd seen.

The system, First Rate, will be offered as both a service and as a package for PDP-11's under RSTS and 370s with CICS/VSAM. It is expected that First Rate's initial application will still be auditing, although the package has another, potentially more valuable capability: given point of origin, destination, and data about the cargo, it can calculate the least expensive shipping strategy. The vendor estimates this feature could shave 10% of a user's freight bill. Additionally, the system can maintain a historical data base, and generate reports showing management where the shipping budget went. For those who worry about the future, we're told the system will be able to cope with deregulation of shipping, if and when it happens.

The system's first outside installation is on a 512KB PDP-11/70 that also is used for other applications processing. The vendor expects to be able to install First Rate on 11/34s. Data bases are unique to each customer. The vendor will tailor the customer's data base after analyzing the user's needs. Data bases are expected to average $30,000; an update service will operate on a subscription basis. The First Rate software carries a base price of $150,000. TRANSPORTATION DATA MANAGEMENT, South Holland, Ill.

FOR DATA CIRCLE 330 ON READER CARD

SYSTEM/3 UTILITY

IBM's utility $LABEL has always made it possible to print out VTOC data to see what's going on with data sets and to get some measure of how much unused space is available. This utility provides the capability of displaying such data on an IBM 3270-2 or on the system console. Users may specify a starting location or get the full VTOC, or may specify generic or specific file names, or may elect to ask for a display of space available.

The current version is offered for the S/3 model 15D, but support for other model 15s and 12s using IBM 3340 or 3344 disks will soon be supported. A perpetual license fee is considered paid up after 12 monthly payments of $20, and a 24 month warranty is part of the package. BM SYSTEMS SOFTWARE, Nashville, Tenn.

FOR DATA CIRCLE 335 ON READER CARD

ALGOL 68

Any machine which can support the IBM 370 problem state instruction set and provide a 1MB region to play in may now have ALGOL 68 as well. A version of the compiler called FLACC (Full Language ALGOL 68 Checkout Compiler) is said to implement the complete revised language, without exception. It is billed as a "checkout" compiler because it includes features for program development and debugging, including providing fully symbolic dumps, a trace function, profile gathering, and identification of code active at the time of termination.

A number of code and data checks are also implemented, including use of uninitialized or undeclared values, arithmetic overflows, out of bound subscripts, etc. Versions are available for OS/VS, MVS, and MTS. Prices start at $287/month (Canadian). CHION CORP., Edmonton, Alberta, Canada.

FOR DATA CIRCLE 336 ON READER CARD

DBMS

Available for use on Data General minis running AOS or RDOS, this vendor's data base management system offers full inversion. Full inversion allows indexing on any field(s) in a file; users can access indexed fields across multiple files. The system handles screen formatting. Screen formats and data definitions are maintained independent of applications programs, so they can be modified without rewriting the application. A data input module provides interactive data entry and validation. The DBMS also includes a query language, report writer, data dictionary, and intelligent print spooler. A memory size of 96KB or greater is recommended when running the $10,000 package. Application packages for manufacturing, accounting, and word processing are available for use with the DBMS. DISC/310 CORP., Santa Monica, Calif.

FOR DATA CIRCLE 337 ON READER CARD

IMS UTILITIES

BDRAID is an IMS utility package intended to help users debug IMS/CICS applica-

tions. The Data Base Access Facility (DBAF) can create and load data bases, provide access to data bases and segments, and print or modify segments. Its command language allows access at the segment and logical record level. DBR-FRESH can refresh a data base, allowing the user to make a test run, then return the data base to its initial state. It also can save the results of a test run, and subsequently recall them for another test. The last element of the utility package, Logical/Compare Utility (LCP) is a COBOL program for sorting and comparing "before" and "after" data bases. The entire package runs on any system running IMS. It carries a perpetual license fee of $18,500. BDR, INC., New York, N.Y.

FOR DATA CIRCLE 338 ON READER CARD

COMMUNICATIONS EMULATORS

The Exchange remote job entry subsystem lets this vendor's NonStop computer systems emulate IBM 2780s or 3780s. It handles batch I/O to and from all devices, including terminals, tape drives, discs, and line printers. Input, list, and punch files can be defined by commands entered conversationally at a terminal or from a command file, or generated by a program. The Exchange software can transmit and receive ASCII or EBCDIC code, horizontal tabs, vertical forms control codes, EBCDIC transparent code, and blocked data link messages. Files may be transfered between workstations. The software package is priced at $2,000. TANDEM COMPUTERS, Cupertino, Calif.

FOR DATA CIRCLE 339 ON READER CARD

FAST TRANSIENT LOADER

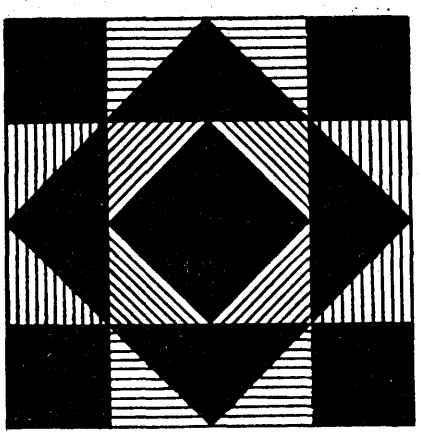
FTL, this firm's fast transient loader for DOS/VS systems, lets users put B-transients of crt-transients in either virtual or real main memory. Doing so is said to reduce contention on the system residence volume and significantly increase throughput. With crt-transients in memory, the 125D or 3277 system console is said to output messages at three to five times the normal rate. FTL maintains statistics on transient usage, and includes a monitoring function to provide information needed for fine tuning the system. The package requires no modifications to DOS/VS and does not require an IPL to become functional. FTL leases for $50 per month, with a 10% discount for payment annually. GOAL SYSTEMS CORP., Columbus, Ohio.

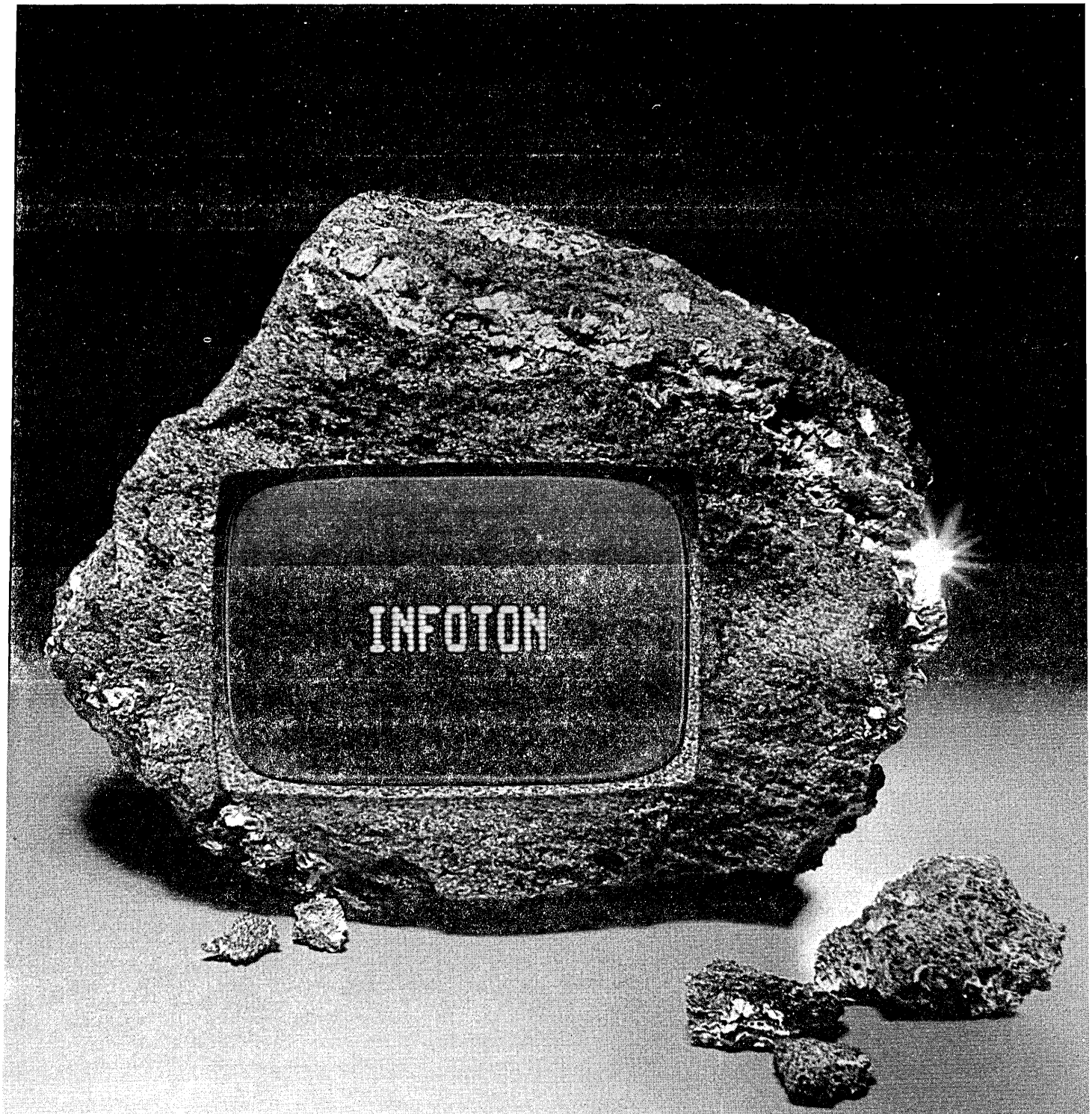
FOR DATA CIRCLE 340 ON READER CARD

5110 APPLICATIONS

A selection of seven business application programs should help IBM 5110 users computerize their business operations. Written in BASIC, the programs can be used standalone, or integrated into a total system. The packages, which require 16KB of memory, two diskette drives, and a printer, are order entry and invoicing, inventory, accounts receivable, accounts payable, job costing, sales analysis, and general ledger. Each package carries a price in the $1,500 neighborhood (some variation may occur due to currency fluctuations). Support, including telephone assistance and update service, goes for $30 per month per package. COMPUTER METHODS CANADA, Toronto, Ontario, Canada.

FOR DATA CIRCLE 341 ON READER CARD ✲





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CIRCLE 72 ON READER CARD

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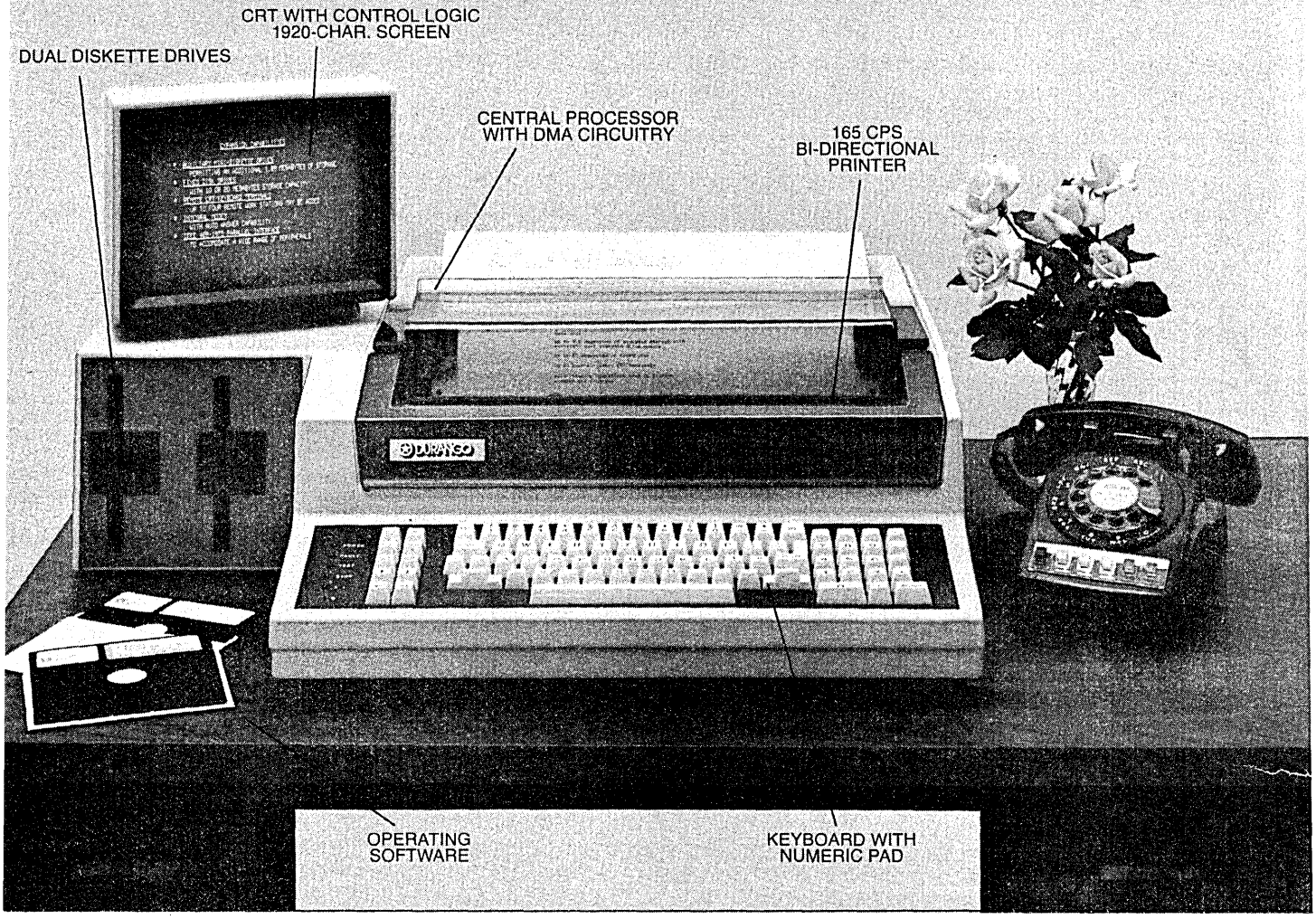

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Durango's processor and all peripherals including the printer are integrated into a single, plug-in unit not much larger than a typewriter. The complete basic system is currently $13,520 — several thousand under its bulkier competitors.

Durango's sophisticated hardware and powerful software options enable you to handle a wide variety of data processing and communications tasks at departmental and branch levels. To provide for expansion, the F-85 is designed so modules of equipment and software can be added to the basic system, thus eliminating delays and costly changes.

For present and future needs, there is simply no other computer system that offers you the F-85's combination of advantages. Including:

- ☐ ADVANCED PROCESSOR ... high speed 8 bit microprocessor, DMA circuitry and up to 65K bytes of main memory.
- ☐ HIGH THROUGHPUT PRINTER ... bi-directional at 165 CPS ... separate microprocessor based controller.
- ☐ PORTABILITY... Only 65 pounds; easy to move from department to department — wherever there's a 110V outlet.
- ☐ OPERATING ECONOMY ... Runs on 50% less energy; has up to 40% fewer parts to cause downtime.
- ☐ EXPANDABILITY... Provides for up to four remote terminal work stations; auto-answer modem; communications software supporting asynchronous ASC II and 2780/3780 protocols.

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CIRCLE 24 ON READER CARD

PORTIA ISAACSON, CONTRIBUTING EDITOR

PERSONAL COMPUTING

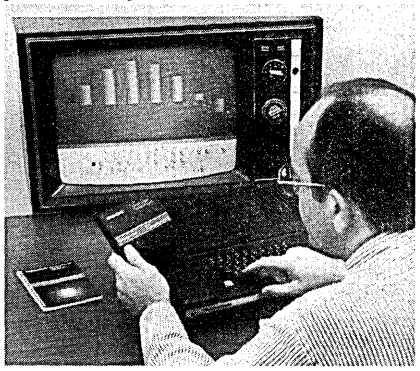
1979—THE YEAR OF THE HOME COMPUTER

Last year several companies thought they were in the home computer business. They all have learned that their strategy is not yet right to develop a massive consumer market.

A number of lessons were learned in 1978. Apple learned that the price should be under $1,000. Commodore learned that a standard typewriter keyboard is required. Radio Shack learned that color graphics is desirable. VideoBrain learned that home computers should be programmable. Everyone learned that software and education are the keys to the consumer market. We also realized that because of accelerating technology the life of a product is little more than a year.

In 1978, everyone watched with envy as Radio Shack sold nearly one-half of the 200,000 (estimate) personal computers sold. The importance of Radio Shack's powerful distribution channels (about 7,000 stores) became apparent.

The 1979 version of the home computer will take its features from today's products. Fig. 1 shows the features of selected would-be home computers on the market today beside a guess at what 1979 may bring.



Some features of future home computers are particularly controversial. Leading the controversy list is the issue of programming language. Just when we thought all home computers had standardized on BASIC, VideoBrain (Fig. 2) came out with a structured language that is a little cousin of APL. The language called APL/S was designed and implemented by Robert G. Brown. Educators will be pleased by VideoBrain's defiance of the ubiquitous BASIC in their use of structured control structures and APL vector operators. The structure and readability of APL/S, as shown in Fig. 3, clearly benefits the first-time programmer—an important point when designing computers for people who have never programmed before. These benefits must be weighed against the pervasiveness of BASIC. This issue will be argued for years to come. We should expect languages to proliferate. There will certainly be BASIC. There will be languages for beginners,

FUTURE FACTS?

1979 TI enters the market in June with a home computer having resident BASIC, ROM program cartridges, and voice output with optional TI-developed disks.
Japanese companies capture the personal computer disk market.
TI captures the personal computer printer market with a very aggressively priced product.
Radio Shack introduces several new product lines ranging from low-end consumer computers to small business computers.
Xerox opens a chain of computer stores selling Xerox brand small business computers.
Hitachi home computer is sold in U.S.
A major school district orders thousands of personal computers for use in computer-assisted instruction applications.
Sears features a home computer in its Christmas catalog.

1980 Radio Shack sells DEC computers.
A time-sharing company allows logging on with a Master Charge credit card number.
A 30-million-byte Winchester disk retails for $3,000.

1981 The home computer industry standardizes on the Radio Shack audio cassette format for program distribution.
The first software store opens—sells no hardware, just programs—like record store.
Radio Shack sells its one millionth computer.

1982 The first gold software package—1,000,000 copies sold.
In order to combat the home computer traffic on local telephone lines, the telephone companies lobby for a local rate structure based on the length of time the telephone is used.
The first class-action suit is filed because of a program bug in a birth control program.
Personal Computing (this feature) is moved to the middle of DATAMATION.

1983 IBM establishes a consumer products division.
Cray Research builds a large scale computer from 100,000 cooperating microprocessors.
The microprocessor-based intelligent Teddy Bear is the best selling Christmas toy.

1984 Radio Shack sells IBM computers.
The S/360 cpu is available on a chip.
One million bytes of memory is priced at $400.
Personal Computing (this feature) is moved to the front of DATAMATION.

1990 A best selling book is *Why Johnny Can't Program.*
Computer programs are rated P, PG, R, X, etc.
A powerful portable personal computer the size of a book is available for $300.
Personal Computing (this feature) expands to fill 98% of this magazine: DATAMATION reduced to column in this position.

	Apple	Radio Shack TRS-80	VideoBrain	Guess at Somebody's 1979 Home Computer
Microprocessor	6502	Z80	F8	Z80
Resident language	BASIC	BASIC	No	Microsoft BASIC
Nonresident language	Microsoft BASIC	Microsoft BASIC	APL/S	Pascal and Animated Graphics
Resident ROM	8K	4K	4K	12K
Resident RAM	4K	4K	1K	8K
Program supplied on	Audio cassette	Audio cassette	ROM/RAM cartridges	ROM/RAM cartridges
Keyboard	Typewriter	Typewriter	Unique 36-key Typewriter	Typewriter
Game Sticks	Optional	No	Standard	Optional
Display	16 colors on user-supplied color tv	Black/white monitor supplied	16 colors on user-supplied color tv	16 colors on built-in color monitor
Tv Connection FCC Approved	No	Not required	Yes	Not required
Text Format (chars x lines)	40 x 24	64 x 16	24 x 16	80 x 24
Graphics resolution	1,920	6,144	92,736	92,736
Graphics configuration	40 x 48	128 x 48	192 x 483	192 x 483
Sound	Standard	No	Standard	Standard (also voice output)
Printer	Optional	Optional	Optional	Optional ($250)
Telephone	Optional	Optional	Optional	Optional
Audio cassette	Standard	Standard	Optional	Standard
Disk	Optional	Optional	No	Optional ($300, second drive $250)
Price	$970	$600	$300	$500

such as APL/S. There will be a wealth of application languages: a language for graphics, a language for music, a language for the teacher, a language for the accountant, and a language for the tailor. These application-specific languages are the tools needed to bring computers to the masses.

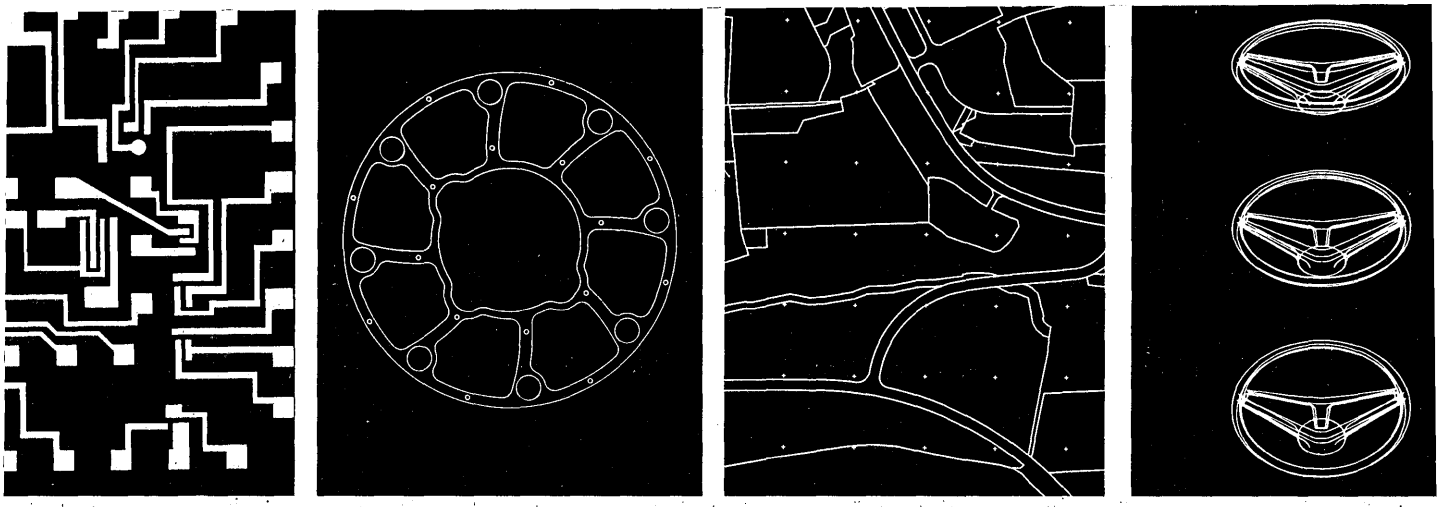
Making the home computer happen is a complex task. The product definition is tricky. What is a home computer? Is it a toy, a teacher, or an accountant? Is it a friend, an entertainer, or a counselor? Is it a secretary or a competitor? How do we sell a product that is all these things and more? The greatest advantage of the computer—its universality—makes it difficult to sell. How can a clerk at Macy's answer the question, "What will a home computer do?"

The home computer software industry is in its infancy. It is clearly a chicken and egg problem. Without hundreds of canned programs, home computers are, to most people, worthless. Before thousands of compatible home computers have been sold, there is no mass-market for software. The answer to this problem might be a computer company that supplies large numbers of canned programs. There is presently no evidence of such a strategy being used by companies already in the arena. Perhaps there is some company in the wings (Texas Instruments, perhaps) with just this strategy. If no such company materializes, the home computer market will be left to bootstrap itself from those people willing to learn to program. (The bootstrap process can be greatly expedited by the application-specific languages mentioned earlier.)

The most powerful scenario for making home computers happen by the millions in the near future is based on their educational uses. A significant portion of the home computers sold to date (20% to 30%) have been to educational institutions. These computers are not just being used to teach computer science. They are being used in a broad range of areas from teaching left to right scan in kindergarten to computer-assisted instruction in elementary history to the simulation of chemical experiments. The personal computer is likely to become familiar in classrooms at all levels. When this happens, what parent wouldn't spend $500 to give his/her child the educational advantage of having a personal computer at home? At this time, the personal computer will have the sales appeal of the encyclopedia, the typewriter, and the calculator all rolled into one, not to mention its entertainment appeal.

The home computer industry has taken its first faltering steps. It will probably not be in 1979, but there will soon be a year in which we will sit around and recall those days when computers were only found locked behind doors in huge corporations and how really strange it was when programming was done by only a few. ✲

```
PROG MOON
BARC 0 2 4 2 5 2 14          Set bar colors
V=0                          Velocity
D=6000                       Elevation
G=32                         Gravitational constant
FUEL=1000                    Available Fuel
CLOCK=0                      Clock
WHILE D GT 0
DO B=KEYB                    Set burn rate
   T=KEYB                    Set burn duration
   IF B GT 0                 If burn rate is greater than zero
      THEN BT=FUEL÷B MIN T   The set burn time according to
                               available fuel
      ELSE BT=T              Else set burn time to input value
   ENDIF
   D=C-(VxT+T*2xG÷2-BT*2xB÷2)  Update elevation
   V=V+GxT-BxBT              Update velocity
   FUEL=FUEL-BTxB            Update fuel gauge
   CLOC=CLOC+T               Update clock
   BARH(D,0,V,0,FUEL,0,CLOCx100)÷6000x64  Set bars and scale
ENDWHILE
IF V LT 15                   If terminal velocity is less than
   THEN "SUCCESS"            15 ft/sec, then success
   ELSE "CRASH"
ENDIF
V,CLOC,1000-FUEL             Display terminal velocity, clock,
                               and fuel used
ENDP
```



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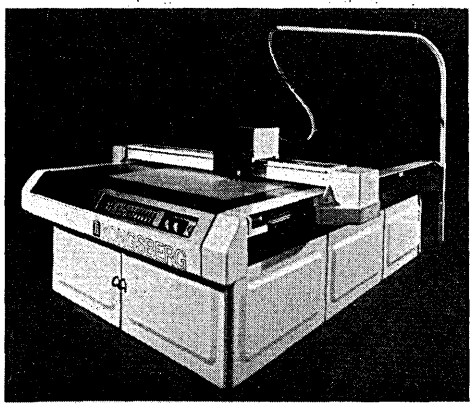

The New KS5200

The Kongsberg 5200 high speed drafting system creates high quality graphic plots quickly and precisely. The way true automated drafting machines (some call them "plotters") should.

The 5200 is so advanced it can rapidly produce precision liquid ink, ball point and scribe plots with a simple tool change. And, the finest quality photo plotting. Virtually any graphic design. Cartography. Ship building. Aerospace. Schematic and design drawings. Even cartoons.

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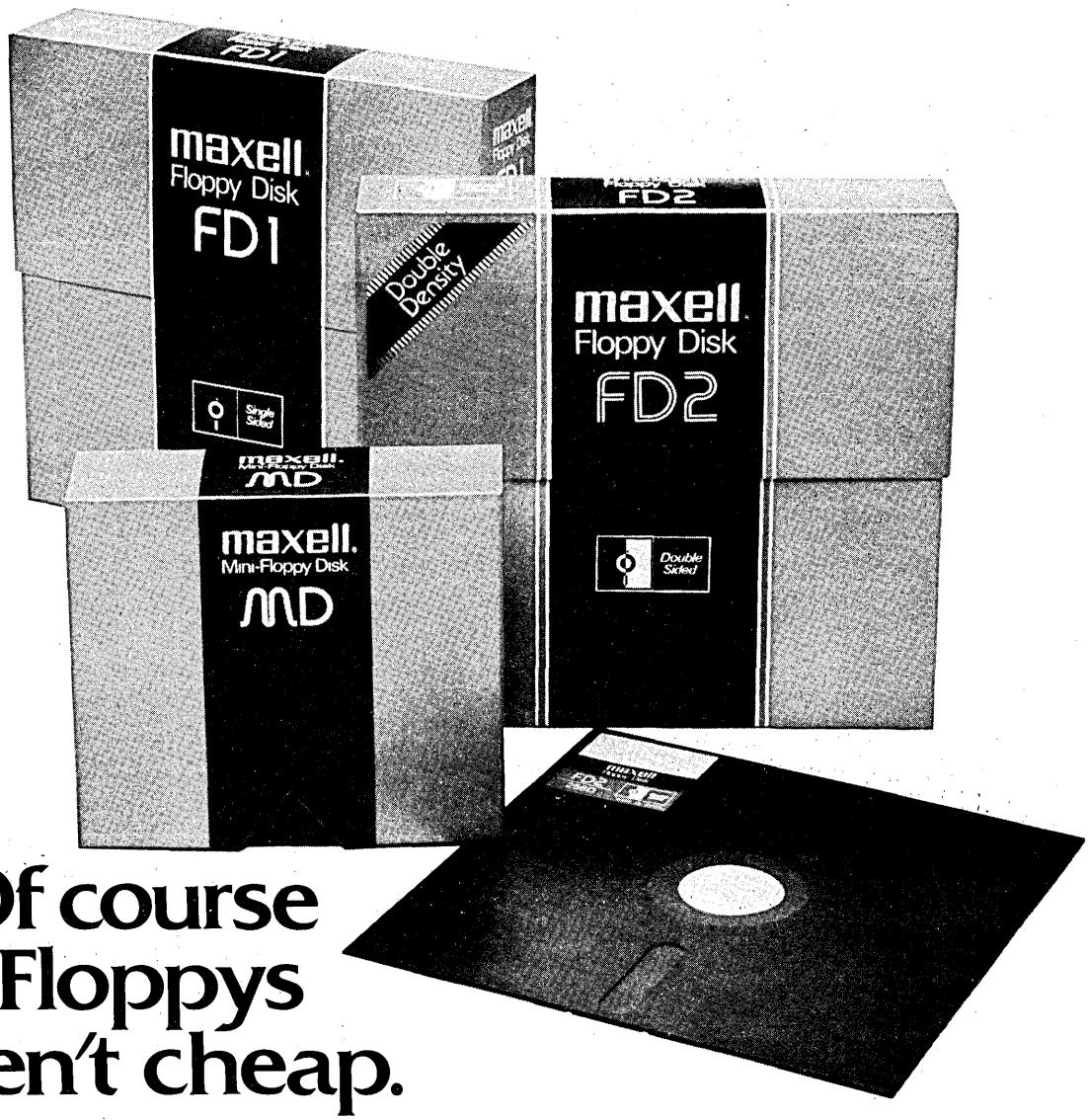

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The Marketplace...

advertisers' index

DP MARKETPLACE

DATAMATION® magazine

1978/1979 MINI/MICROCOMPUTER SURVEY AVAILABLE NOW.

The second annual DATAMATION magazine Mini/Microcomputer Market Survey has just been completed. Encompassing small business systems, intelligent terminals and data entry systems as well as traditional minicomputers, this analysis is essential reading for industry watchers, market planners, sales executives and users themselves.

Available November 15, 1978 the report is being offered at a $40 savings for prepaid orders off the regular price of $445 in North America and $475 elsewhere. Additional reports are $150.

A complimentary Profile of the Survey Respondents and/or more information can be had by calling Dorothy Chamberlin (203) 661-0055.

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JOB MARKETPLACE

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Look again.

Take this quick quiz:

Look closely.

Very closely at our new Model 85 remote information system.

How many functions do you see?

There are more than meet the eye.

Batch communications and volume data entry should be easy to spot.

And on-line file management and stand-alone processing should be apparent to those who've kept up with Data 100's continuous progress in distributed processing.

But your needs keep growing.

And so does our commitment to fulfill those needs.

Our Model 85 remote information system introduces the functions of remote file management and high level language processing at your remote sites efficiently and economically.

Model 85 is a display based system featuring up to 100MB disk storage, 15 interactive work stations, a multi-tasking operating system and concurrent communications.

For ease of use, two disk based high level languages are available: RPGII and COBOL. With COBOL, a *local* compiler lets you compile programs on your Model 85. And a *cross* compiler allows stronger central site control by permitting you to compile and debug COBOL programs on the mainframe for execution on your Model 85.

The Model 85 gives your network the best of both worlds. The degree of central site control you need *and* remote processing capabilities to reduce communications costs and mainframe processing time.

And the Model 85 can communicate with our other proven Data 100 multifunction data processing products.

Now look closely at *your* growing needs for multifunction data processing.

Then call your nearest Data 100 sales office or one of the numbers listed below.

DATA 100
CORPORATION
multifunction data processing

Is our expanded Model 85 system in your future?

(WARNING: there may be more than one right answer to each question)

1. Model 85 is:

(a) a remote information system we first introduced in 1978.

(b) a distributed data processing product.

(c) a multifunction data processing product.

2. Its features include:

(a) multitasking for up to four applications.

(b) large disk capacity.

(c) modular configuration.

(d) more than these.

3. New improvements are:

(a) increased processor memory to 256K bytes.

(b) the addition of remote workstations and printers.

(c) increased disk storage to 100 MB.

4. Model 85 functions are:

(a) remote file management and high level language processing.

(b) on-line file management and stand-alone processing.

(c) batch communications and volume data entry.

5. Available languages are:

(a) RPG II.

(b) COBOL.

(c) ESPERANTO.

6. Model 85 saves users money as an alternative to:

(a) enlarging mainframes overburdened by network interactive applications.

(b) adding communications lines with greater capacities.

(c) maintaining a mainframe configuration only fully used at peak time periods.

(d) losing time and money due to mainframe downtime.

7. For more details on Model 85, you should:

(a) phone your nearest Data 100 sales office or one of the numbers we've listed.

Now check your answers.

All answers but these three are correct.

2a: Model 85 offers multitasking for up to *eight* applications.

3c: 100 MB is old figure; Model 85 is now *245.6 MB* disk storage.

5c: No, Model 85 doesn't speak it. Yet.

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CIRCLE 88 ON READER CARD

SOURCE DATA

BOOKS

NCR DATA COMMUNICATIONS CONCEPTS
edited by Titus, et al.

This basic text (part of the Bugbook series) is meant to address the needs of dp technicians, students of communications engineering, and computer hobbyists. It begins at approximately the third grade level with an unnecessary and highly dubious history of verbal and visual communication—from prehistory to the present day. From there we progress to simple mechanical computers—beginning with those original digits on the human hand and, of course, the abacus—and before we know it we have been briefly introduced to the garden variety cpu and whisked into the world of computer communications.

Chapter two is on telephone systems. After that we finally come upon the promised introduction to the principles, characteristics, and testing of data transmission circuits. Signals, modulation methods, basic carrier systems, the decibel, transmission problems, circuit specs, and modems in data transmission are discussed. There are eight appendices, including an ASCII code chart, wire gauges, common logarithms, standard interface connections, and a glossary. The book contains many clear, simple diagrams. E&L Instruments, Derby, Conn. (1971, revised 1978, 220 pp., $6.95).

INTERNAL CONTROLS FOR COMPUTERIZED SYSTEMS
by Jerry FitzGerald

This book would probably be better if it were presented as a simple workbook. As it is we must plod through more than one explanation of what we are going to be treated to, namely, the "matrix approach"—in other words, making tables.

There are instructions for making a new table in each chapter. Each chapter addresses security of a basic aspect of the on-line dp system: general organizational controls, input controls, data communication controls, output controls, on-line terminal/distributed systems controls, physical security controls, data base controls, and system software controls. The elements of the matrix are, vertically, resources/assets, and, horizontally, concerns/exposures. In a given chapter, specific conditions are listed for both of these categories, followed by a list of 50 to 100 recommended safeguards.

By lining these elements up in the table, one arrives at a tool with which to perform an internal control review. The matrix is not to be confused with a review methodology, however; it is assumed that the organization has already established such a system. E.M. Underwood, San Leandro, Calif. (1978, 93 pp., $9.95). Distributed by Jerry FitzGerald & Associates, Redwood City, Calif.

MODELING AND ANALYSIS: AN INTRODUCTION TO SYSTEM PERFORMANCE EVALUATION METHODOLOGY
by Hisashi Kobayashi

This text/reference book is part of the Systems Programming Series sponsored by IBM, "... a long term project to collect, organize, and publish principles and techniques that would have lasting value throughout the industry." The book is designed for graduate level university courses in system performance evaluation, modeling and simulation, and for operations research curricula consistent with the IEEE Computer Society recommendations.

Major subjects include performance evaluation, probability theory, queueing analysis, simulation and data analysis. The book is carefully and compactly written. There are extensive references, a glosssary, plus author and subject indexes. Addison Wesley, Reading, Mass. (1978, 446 pp., $18.95).

MEASURING, MODELLING AND EVALUATING COMPUTER SYSTEMS: PROCEEDINGS OF THE THIRD INTERNATIONAL SYMPOSIUM
edited by H. Beilner and E. Gelenbe

Twenty-two papers by 43 authors as presented at the October 1977 symposium in Germany, are included covering simulation, queueing, program behavior and memory management, measurement and control problems, and fault-tolerant computing. The technical presentations are on current research and are by and large dense and concise. The book should be primarily of interest to active specialists already knowledgeable in the field. North-Holland Elsevier, The Netherlands and New York (1977, 470 pp., $55.50).

REPORTS AND REFERENCES

OEM MINI MARKET

The newly available *Directory of Systems Houses & Minicomputer OEM's* should be useful to large users in finding sources for their systems engineering needs as well as helping minicomputer and peripheral suppliers market their wares to dealers, systems houses and turnkey suppliers.

Firms are indexed by name, by geographic location, by application specialties, and by the name of the mini supplier. The main alphabetic listing includes name, address, phone number, top executives, number of employees, annual sales, description of products, end user industries served, and minicomputer models employed. The 500-page directory, which will be issued annually, sells for $347. Sentry Publishing Div., Sentry Computer Services, Inc., 5 Kane Industrial Drive, Hudson, MA 01749 (617) 562-9308.

COBOL SPECS

The most recent version of the *Journal of Development* (JOD) specifications for COBOL have been announced by the CODASYL COBOL Committee. CODASYL COBOL 1978 JOD is $10. Subscription services (includes periodic updates) for 1978 or 1979 is $15; for both years, $25. Order from Dept. of Supply & Services, Material Data Management Centre, 4/B1 Place du Portage, Phase 111, 11 Laurier St., Hull, Quebec, Canada K1AOS5. Orders must be accompanied by payment (in either Canadian or U.S. dollars). Make checks payable to "The Receiver General for Canada." Prices include packing and postage.

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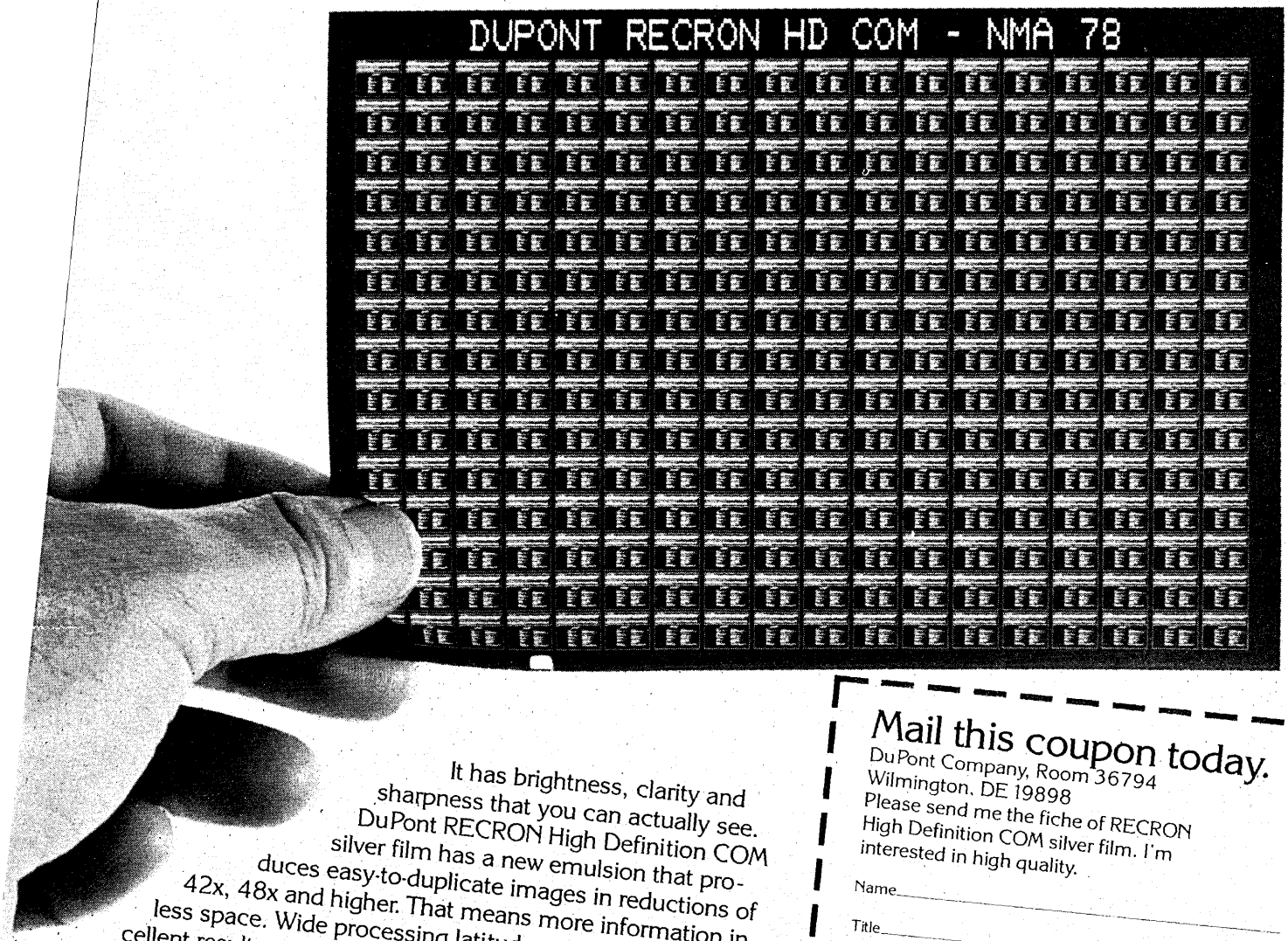

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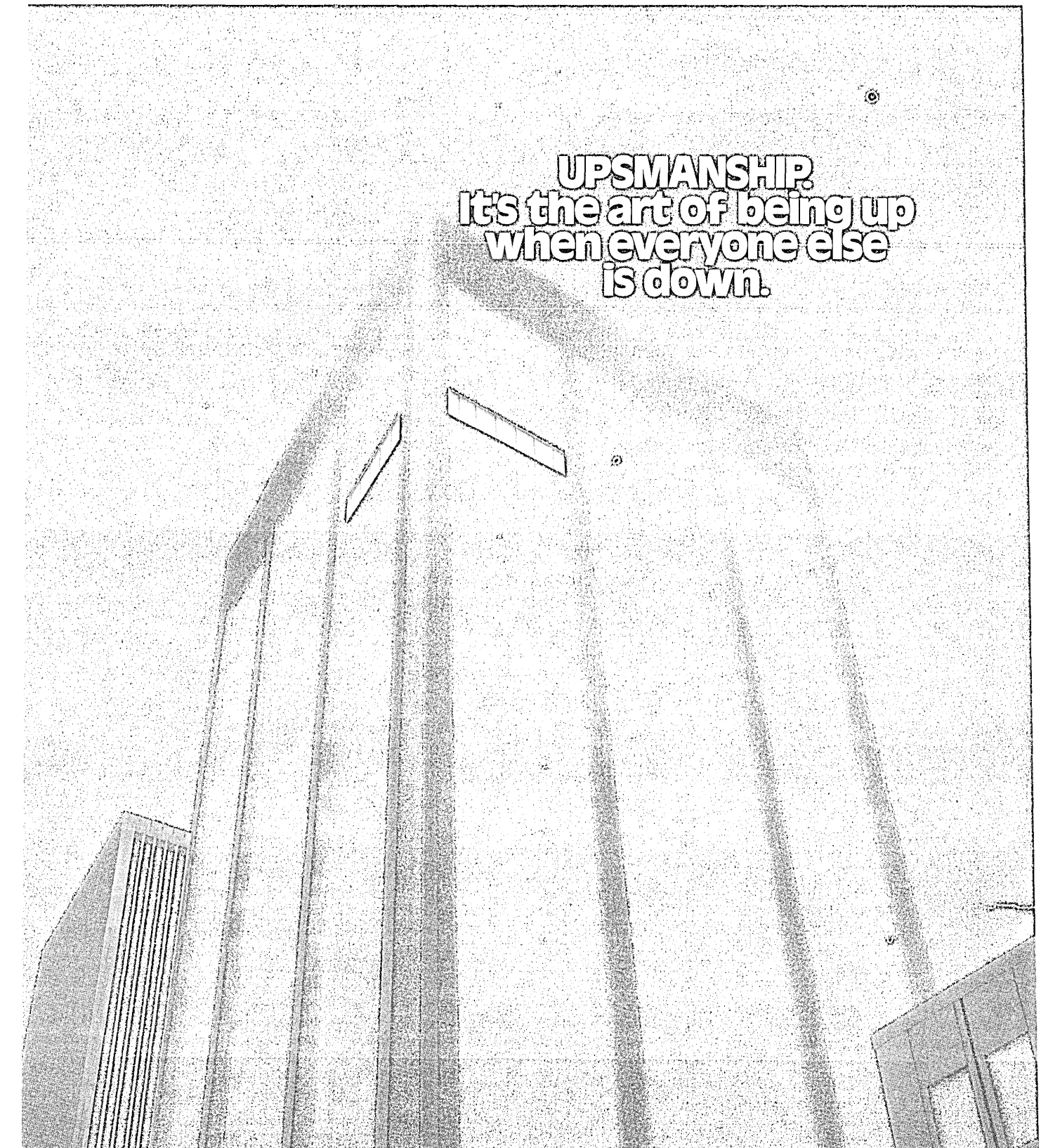

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REPORTS AND REFERENCES

RIGID DISK DRIVES

The 1978 Disk Trend Report gives individual revenue and unit shipment projections for rigid disk drives in nine product groups—disk cartridge drives, less than 12MB; disk cartridge drives, more than 12MB; disk pack drives, 29-58MB; storage module drives, 25-80MB; disk pack drives, more than 100MB; data module drives, 35-70MB; and fixed disk drives of less than 30MB, 30-200MB, and more than 200MB.

The report provides statistics and analysis on installed drive populations, average oem selling prices, competitive market shares of manufacturers, and a review of competing technologies. Basic specifications are given for 278 rigid disk drives and manufacturer profiles are provided on 28 U.S. firms.

The individual report sells for $500. Subscription to the annual report, which includes a volume on flexible disk drives as well, is $750. James N. Porter, 1224 Arbor Court, Mountain View, CA 94040 (415) 961-6209.

MICROGRAPHICS GUIDE

The National Micrographics Association is offering their *Guide to Micrographic Equipment* series at a special price. Originally $50, the five-volume set totaling 789 pages is now $20. NMA, 8728 Colesville Rd., Silver Spring, MD 20910 (301) 587-8444.

DATA ENTRY

Management Information Corp., publishers of the *Data Entry Awareness Report*, have introduced a new series of publications under the title *Pathways Through Data Processing*. The comprehensive paperback publications are being called textbooks, because their aim is education of users, particularly first time business users. The first volume, however, *Data Entry*, is really a report, because while it does aim to "instruct people in the intricacies of the data entry system" (from the Introduction), emphasis is on product description and market analysis.

Data entry systems covered are: keypunch, keyboard-to-storage, portable data recorders, alphanumeric display terminals, optical readers, magnetic readers, mixed- or multi-media systems, industrial data collection, voice data entry, pushbutton telephone, and direct hand entry.

Suggestions for equipment evaluation and selection are given and there is a section devoted to telling how to perform an economic analysis to select the proper system. Suggestions are given for determining one's particular needs, and formulas are presented for determining associated costs. Examples of the calculations required are given (fortunately), including instructions as to how to find cost/volume curves.

There are quite a few illustrations, mostly product shots and configuration charts. Also featured are a listing of data entry manufacturers (including addresses and phone numbers) and a short glossary; $45 ($56 outside the U.S.).

Also available from MIC are the results of a user survey on data entry equipment, which showed a dramatic increase in keyboard to storage data entry at the expense of keypunching usage. The survey also showed that service and support seem to be the weakest area in every equipment division. The survey results, including equipment effectiveness ratings by almost 900 users, were published in the October *Data Entry Awareness Report*. Single copy, $7.50. Management Information Corp., 140 Barclay Center, Cherry Hill, NJ 08034 (609) 428-1020.

INDEPENDENT TELCOS GOING DIGITAL

While digital switching technology is being used by the phone company for transit connections, the U.S. independent telephone companies and the French telephone & telegraph administration are the first major users to tackle digital for local exchanges.

REPORTS AND REFERENCES

But, "Digital is still a marketing effort (as far as we're concerned) not backed up by proven performance and cost. It's here and should be good for the industry, but to date it's more talk than performance," says one independent telephone company spokesman in a 67-page study of that segment of the industry, entitled, "Digital Switching: A Survey of Commitment."

Companies were questioned as to whether they have performed engineering cost studies to determine the relative merits of digital versus analog, and whether a procurement plan has been decided upon. Other issues covered in the report include toll settlements, standards (and lack thereof), time schedules for integrated digital trunk and local networks, equipment evaluation, and maintenance concerns. $40, from Market Research Dept., Telephony Publishing Corp., 55 East Jackson Blvd., Chicago, IL 60604 (312) 922-2435.

HARDWARE CONTRACTS

Brandon has a checklist for hardware contracts, which are necessarily, in their view, the most complex of contracts. Some items to be considered in obtaining Brandon's recommended "goal-oriented contracts" include holdbacks for contract compliance, pass through of investment tax credit, backup availability, and disaster protection.

The checklist is free of charge. Send a self-addressed stamped envelope to BRANDON CONSULTING GROUP, INC., 505 Park Ave., New York, NY 10022 (212) 935-6290.

NTIS REPORTS

The National Technical Information Service (NTIS) offers useful sources through its weekly catalog. Recent offerings include: "Computer Systems Design Using a Hierarchical Approach to Performance Evaluation." Covers the concept, characteristics, and construction of a hierarchy of system models for computer performance evaluation. A procedure is introduced that uses the hierarchy to trade off cost and accuracy of system performance predictions. $8; microfiche, $3. Cite AD-A057 646 2WC.

"Forecasting Methods for Computer Technology, from the Los Alamos Scientific Lab." An 18-page paper reviewing both subjective and objective methods of technology projection, giving examples of each. A framework for technology projection is proposed for an integrated view of future prospects. $4; microfiche, $3. LA-UR-78-1180.

An annual subscription to the weekly abstract newsletter is $75. NTIS, U.S. Dept. of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (703) 557-4730 (editorial), -4630 (subscriptions).

SOFTWARE GUIDE

Auerbach is offering a low-cost buyer's guide to data base and data communications software aimed at helping the user select the right combination of the two. Aspects covered by the report include datacomm control, data base management, and information storage and retrieval. Product reports and charts and graphs are featured, as is a directory of suppliers. $24.95. Auerbach Publishers Inc., 6560 N. Park Dr., Pennsauken, NJ 08109 (609) 662-2070.

SYSTEM RELIABILITY

The second report in Infotech's 1978 State-of-the Art Report Series is "System Reliability and Integrity." Presented in two volumes, the first devoted to analysis and the second to invited papers, the report concentrates on cost benefits of reliability techniques in general purpose computer systems, the state of current research in fault-tolerant computing, architectural design, maintainability, and security and privacy.

From the introduction by the editor, C.H. White: "The state of the art in building reliable computer systems is currently highly dynamic. Accelerating progress in both theory and implementation has enabled designers to build systems that tolerate and recover from a wide variety of hardware failures, often using techniques evolved in the early days of computing. The development of the disciplines for building equally resilient software systems is less advanced, but is the subject of considerable research which gives hope of progress."

A feature of each report in the series is an annotated bibliography providing a review of current articles and papers on relevant subjects.

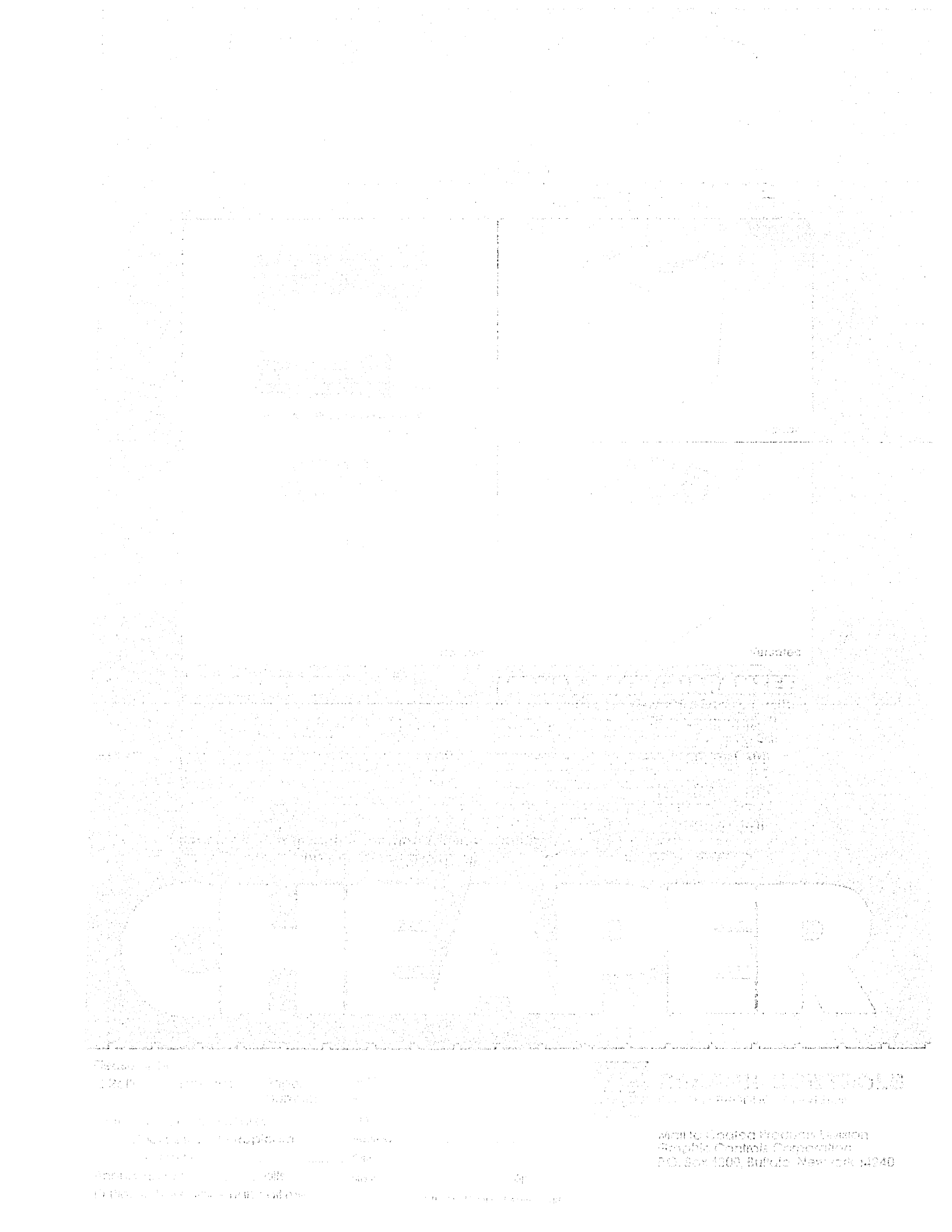
Individual reports sell for $260. The entire 1978 series which includes "Structured Analysis and Design," "Minis Versus Mainframes," "Data Base Technology," "Future Programming," "IBM," and "Microcomputer Systems," sells for $1,470. A free 28-page catalog is available.

From Auerbach Publishers, Inc., Dept. 101, 6560 North Park Dr., Pennsauken, NJ 08109 (609) 662-2070.

FINANCIAL WORD PROCESSING

SBS Publishing has issued a report about word processing applications in the banking and financial sector. The first half of the 107-page report details key wp applications (such as correspondence, directories, fund transfers, mass mailings, statistical work, etc.) and key wp departments (accounting, credit card, international, stock transfer, etc.).

A chapter on word processing directions includes discussion of general



REPORTS AND REFERENCES

needs and preferences and specific analysis of action in automation by large commercial banks, savings institutions, credit unions, and other financial institutions. A limited discussion of selling to the banking industry is included.

The final chapter, "Industry Information Sources," contains names, addresses and phone numbers of relevant trade associations, publications, consultants, and a list of upcoming conventions, conferences, exhibits and meetings. $600. SBS Publishing, 4320 Stevens Creek Blvd., Suite 190, San Jose, CA 95129 (408) 243-8121.

EUROPEAN DATACOMM

The data communications equipment and services sector has become a battleground between the computer and telecomm industries, according to a Frost & Sullivan report "Data Communications Equipment Market in Europe," aimed at both suppliers and manufacturers and at users. The report includes analysis of each of the European national economies and of the dp and communications markets in principal countries. The discussion includes national attitudes to indigenous suppliers, government support for the industry, and purchasing policies.

The report also covers usage considerations, including speculation about future markets; a review of technology with respect to basic telecomm elements —logic and memory circuits, microprocessors, and random access storage devices; discussion of the PTT (Post, Telephone and Telegraph) organizations in Europe; an analysis of line protocols, standards, compatibility and emerging network architectures; consideration of IBM's plans; examination of the datacomm equipment marketplace; and discussion of market strategies. $875. Cite report #E220. Frost & Sullivan, Inc., 106 Fulton St., New York, NY 10038 (212) 233-1080.

INFORMATION DYNAMICS

"Information dynamics" has been used by Online Conferences Ltd. to mean the convergence of computer and communications technologies. This was the subject of Eurocomp 78, a recent conference held in London. The proceedings is now available. A hugh volume (1,077 pp.), it contains a wide variety of papers, some examples being, "Information interchange: will we be able to cope?" "Maintenance of multi-vendor systems," "Dp professionals: personalities and attitudes towards distributed networks," "Integrity in distributed database systems," and "Routing in TYMNET." $98. ONLINE CONFERENCES LTD., Cleveland Road, Oxbridge, Middlesex, England UB8 2DD.

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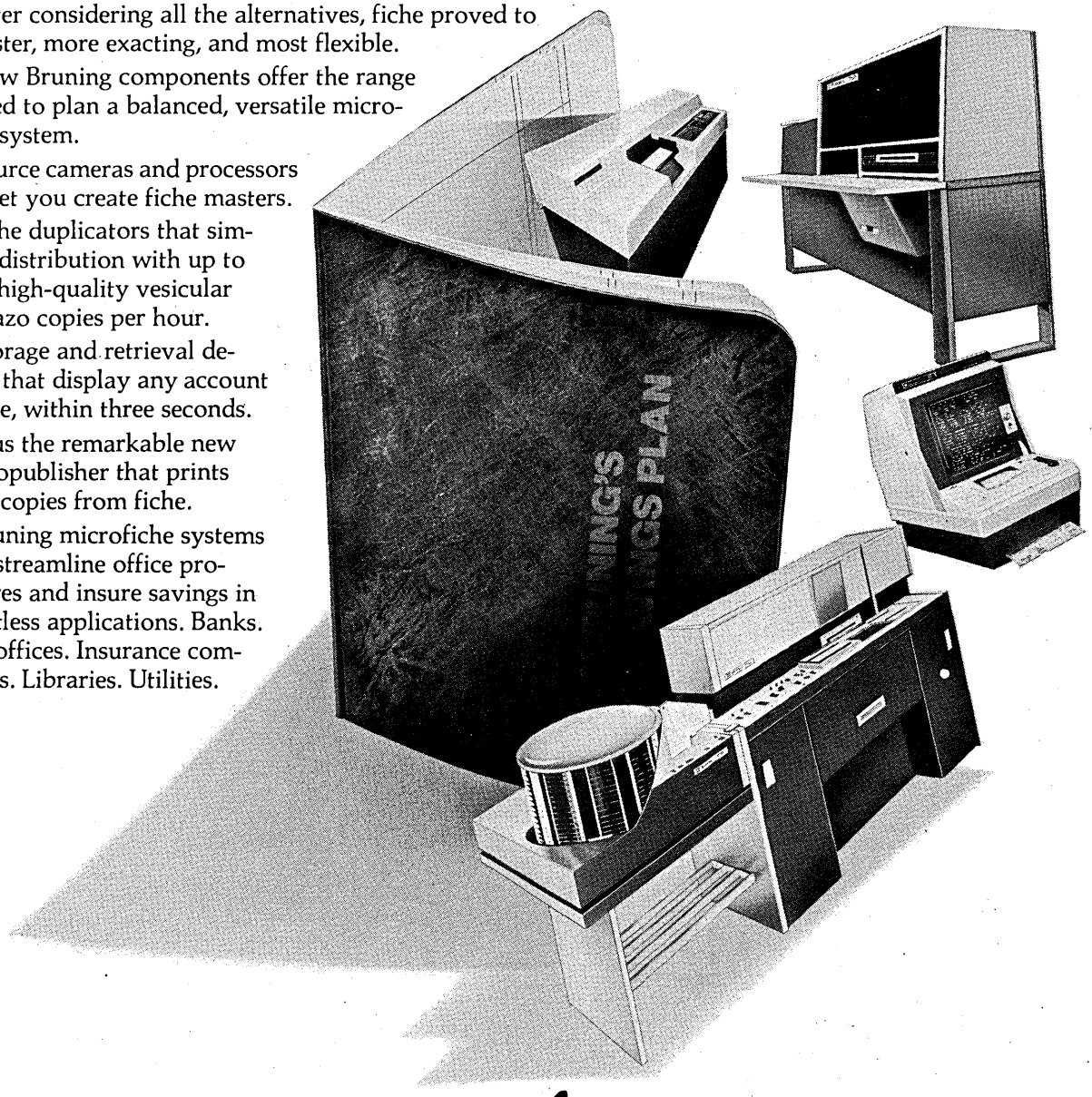

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CIRCLE 84 ON READER CARD

SEMINARS

SOFTWARE ENGINEERING

Two-day seminars on "Automated Tools for Software Engineering" will be offered on a regular basis in San Francisco, this firm's home town, with additional presentations in Washington, D.C., and in Europe during 1979. The meetings are said to cover tools for software requirements specifications, design, implementation, testing, maintenance, and management. Both commercial and noncommercial tools are to be described and discussed.

The regularly scheduled Bay Area meetings are to be: Jan. 25 and 26, April 12 and 13, June 8 and 9, Sept. 13 and 14, and Dec. 13 and 14. The price of admission is $425. Software Research Associates, Box 2432, San Francisco, CA 94126 (415) 957-1441.

THE NEXT FIVE YEARS

About three years ago, Infotech diversified from offering only its large "State of the Art" volumes (with contributed papers from top authors in nearly every dp related field) to go into training. It seems to be splitting off one more venture in 1979 with the hosting of several three-day conferences across the country. "IBM—The Next Five Years" will be held in San Francisco, March 5-7; "Beyond Structured Programming" will be in Washington, D.C. during April 23-25; "Data Base —The Next Five Years" in San Francisco again, May 7-9; and "Convergence—Computers, Communications and Office Automation" in Chicago, June 18-20. Registration for each is $750.

The firm will continue its regular tutorials on improved programming technologies in those cities plus Los Angeles. Offerings range from three-day overview meetings to 10-day workshops, at prices from $575 to $1,650.

Special tutorials on SNA, software management, information analysis, and the office of the future also are offered, but on a one-time basis for 1979. Infotech International Inc., 234 E. Colorado Blvd., Pasadena, CA 91101 (213) 793-0687.

PERSONNEL MANAGEMENT

Not specifically targeted to a dp audience, but of interest due to the subject matter, are a series of courses offered in many major U.S. cities by New York Univ. Titles include: "Compensating Executives," "Fundamentals of Equal Employment Opportunity Programs: A Guide to Compliance," "Interpersonal Skills for Women Supervisors and Managers," and many others covering interviewing, hiring, etc. The two-day courses are pegged at $560; three-day versions at $610. New York Univ., School of Continuing Education, 326 Shimkin Hall, New York, NY 10003 (212) 953-7266.

THE BASICS

"What Managers Ought to Know About Minicomputers" and "The Data Base Course" seem to be aimed at bringing managers and potential users up to speed in the technologies. The minicomputer course, for example, spends three days describing terms, and going over such things as hardware and software components, case studies, and pitfalls. Attendance costs $400 and classes are set for Washington, D.C. (Jan. 29-31), San Francisco (Feb. 26-28), Houston (March 14-16), Atlanta (April 25-27), and Stamford (May 21-23).

The data base course begins by asking "what is a data base" and "does my organization need one." It may go somewhat deeper than the course on minis, as time is scheduled for comparing IMS, IDMS, ABABAS, SYSTEM 2000, TOTAL, and IDS. The price is the same and sessions will be held in Houston (Jan. 31-Feb. 2), Washington (March 19-21), San Francisco (April 18-20), and Stamford (June 11-13). Management Resources International, 6621 Electronic Drive, Springfield, VA 22151 (703) 750-2614.

WELL BEYOND THE BASICS

We had occasion to sit in on a portion of

SEMINARS

this firm's seminar on microprocessors, and came away impressed. If its other titles are handled as exhaustively, the attendees will quickly gain a good background in the subjects.

Its microprocessor series includes: (1) a two-day management introduction (not to be confused with a basic level overview—it quickly gets into evaluating performance, selecting test equipment, and planning field service) which runs $390; (2) a four day engineering design workshop (where everyone receives a microcomputer and an interfacing board as part of the study materials) for $595; (3) two follow-on self-study courses in software/hardware training for $590 and in interfacing for $445 (both of which are also available separately); plus (4) one for industrial applications (sponsored by *Control Engineering* magazine); plus several others.

The company offers a dozen other titles, including some on signal processing, fiberoptics, graphics, distributed processing, and structured programming. For schedules and cities, contact Integrated Computer Systems, Inc., Box 5339, Santa Monica, CA 90405 (213) 450-2060.

AUDITING SEMINARS

AUDITING FOR EVERYMAN

Honeywell's three-day seminars on auditing attempt to cover the subject from the ground up. Beginning with discussions of computer systems in general, the program works through security and privacy, internal controls, audit test techniques, mechanized logging techniques, and auditor involvement in system design. It's an ambitious undertaking, especially since seminar participants may include everyone from dp auditors to financial managers.

Sessions will be held in: Phoenix in the middle of Feb., March, Oct., Nov., and Dec.; Nashville in April; Boston in May; Denver in June; Seattle in July; Detroit in August; Los Angeles in Sept. Registration runs $425 with substantial discounts for early payment or group partcipation.

Also on the company's calendar is the fifth national Computer Security and Privacy Symposium, "Top Secrets '79," April 2 and 3 in Phoenix; it's $450, with discounts available. Honeywell Information Systems, Inc., Box 6000, Phoenix, AZ 85005 (602) 249-7313.

THE SOFTWARE SIDE OF AUDITING

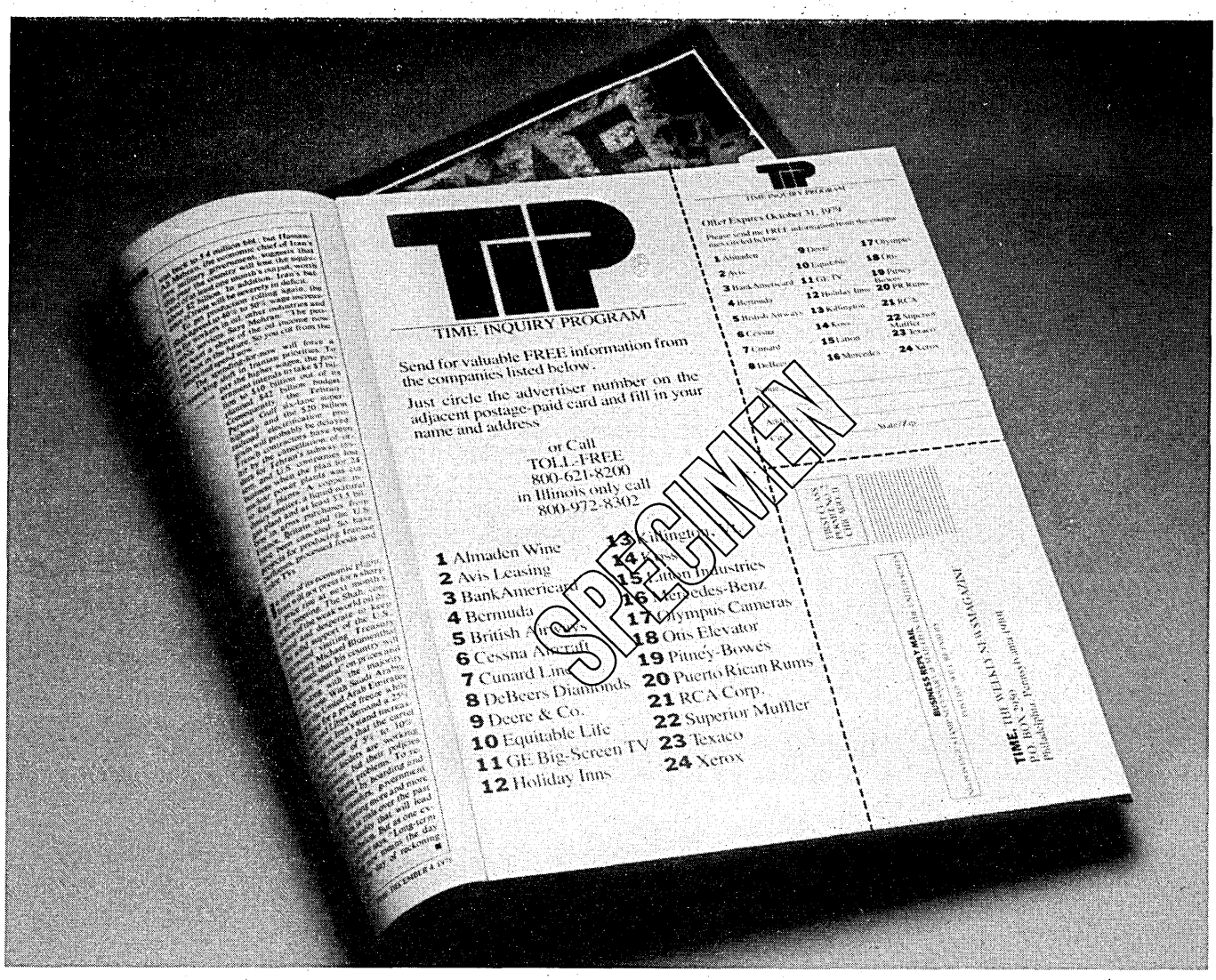
Another mainframer in the audit seminars field in CDC. Its program is based on: (1) first-hand experience in auditing operating systems and applications software; (2) methodologies developed by the RISOS project under contract to ARPA; and (3) a review of criminal and civil litigation involving computer systems. Techniques covered include tiger teams, change control, and "attack" methods, among others. Tools discussed include test data generators, standards verifiers, run time analyzers, etc.

Courses are scheduled for Feb. 14 - 16 in Denver, March 19 - 21 in Washington, D.C., April 30 - May 2 in New York.

Also available is a catalog of dp courses offered throughout the country. Inst. for Advanced Technology, Control Data Education Co., 6003 Executive Blvd., Rockville, MD 20852 (301) 468-8576.

PERFORMANCE AUDITING

The four modules of the workshop on "How to Conduct a Performance Audit of Your Computer System," cover establishing computer performance measures, evaluating effectiveness versus efficiency, improving performance and reducing costs, and how to put together a performance improvement program. The ground covered includes everything from peak load analysis, to buying from third-party



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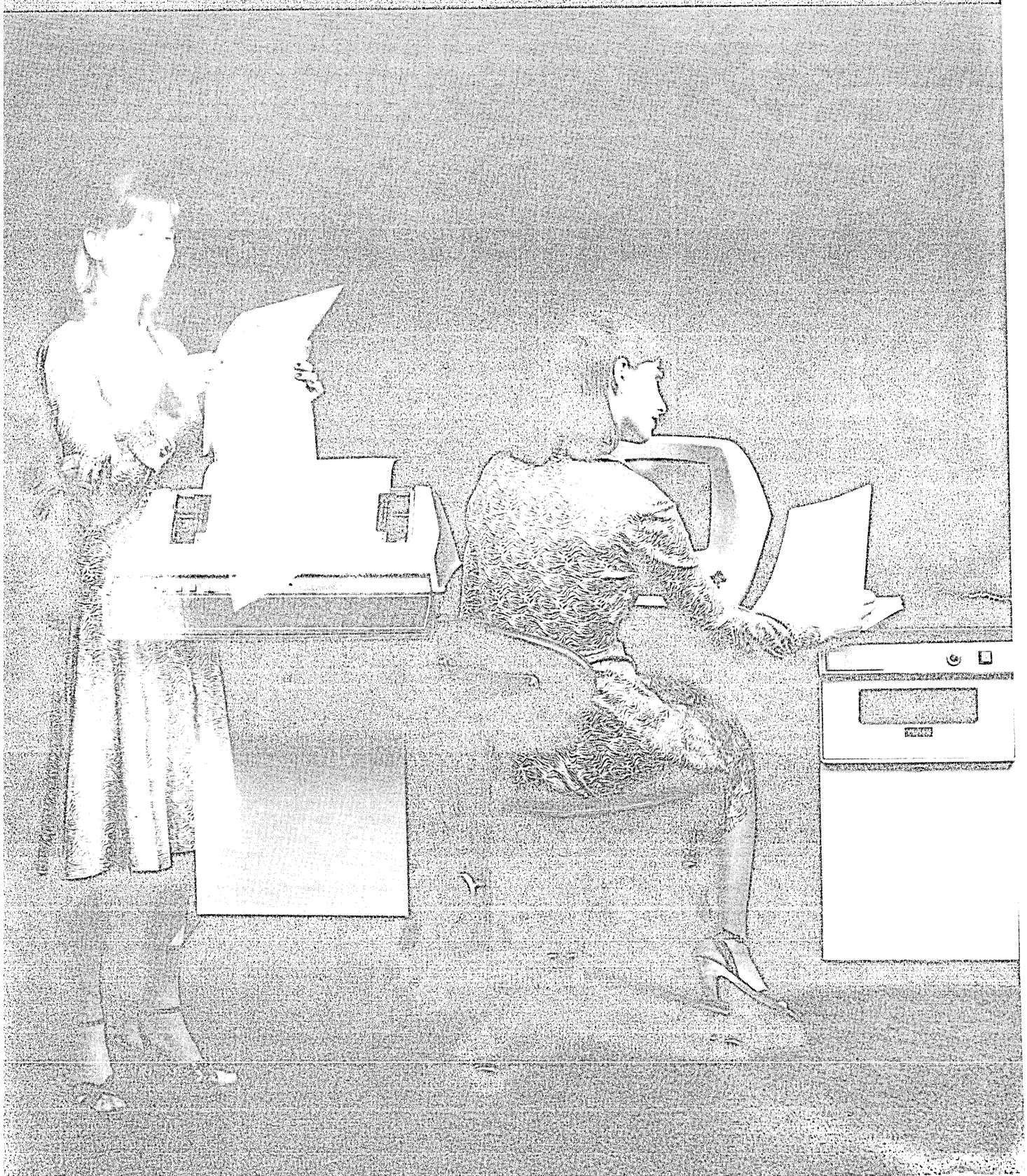

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CIRCLE 65 ON READER CARD

AUDITING SEMINARS

vendors, charging users, and scheduling changes.

It takes five days to go around all those bases, and the initiation fee is $695. School opens Feb. 26 - March 2 in Clearwater, Fla. (nicely scheduled for midwinter sun), March 19 - 23 and May 21 - 25 in Washington, D.C., April 23 - 27 in San Francisco, and June 18 - 22 in Vail, Colo.

The firm also offers seminars on personnel productivity and long range dp planning. Keston Associates, 11317 Old Club Road, Rockville, MD 20852 (301) 881-7666.

MORE ON SYSTEM CONTROLS

According to the brochure, the objectives of "On-Line Systems Audit Controls" is to provide enough practical descriptions and case study analyses to enable participants to design and evaluate their own controls for systems with multiple security/privacy levels and rigid failure recovery requirements. The course seems more narrowly defined, being more oriented toward on-line systems and recovery than the other seminars, but still lists about 100 individual topics for its three days of 9 to 5 attendance. It runs $425 for prepaid registration, and will be held in San Francisco during Feb. 7 - 9, Arlington, Virginia March 7 - 9.

Also in the company's curriculum are "Applied Data Communications Systems," "Effective Leadership of DP Projects," and "Distributed Minicomputer Networks." Inst. for Professional Education, Suite 601, 1901 North Fort Myer Drive, Arlington, VA 22209 (703) 527-8702.

DATA SECURITY

Dp auditing is only one of the subjects covered in the seminars offered by this firm. Also on the 29-session agenda for their 3½-day meetings are secure operating systems, cryptography, risk management, dp insurance, contingency planning, records protection, computer controlled building monitors, and even privacy legislation. Another aspect setting these programs apart in their emphasis on a team approach to solving dp security problems.

The company does have a rather odd way of titling their courses: the one to be held Feb. 19 - 22 in Orlando is called the 23rd International Operational Data Security Workshop, the one for April 9 - 12 in Arlington is the 24th International, etc. (Overseas professionals interested in the subject may be logging a lot of hours in the air.) Attendance costs $525, not counting air fare. Operational Data Security Corp., 6 Swarthmore Lane, Dix Hills, Long Island, NY 11746 (516) 499-1616. *

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System Performance Analysis

Define and establish performance monitoring facilities for measuring response, resource utilization and congestion in a widely distributed transaction processing network. Models and empirical techniques will be developed for configuration planning and cost/performance analysis. Data reduction and statistical analysis programs will be developed.

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Design, develop, and support on-line applications which provide consumer-oriented financial services through delivery points at both bank and retail locations. These applications cover the full spectrum of consumer banking services. A background in operating systems, real-time systems, or related on-line applications is desired.

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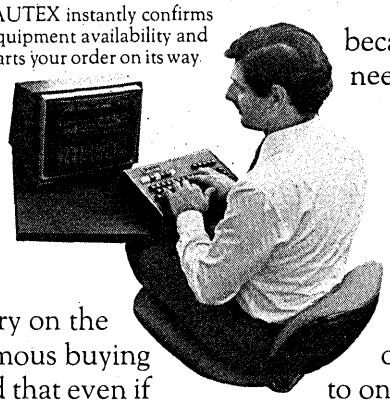

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CIRCLE 128 ON READER CARD

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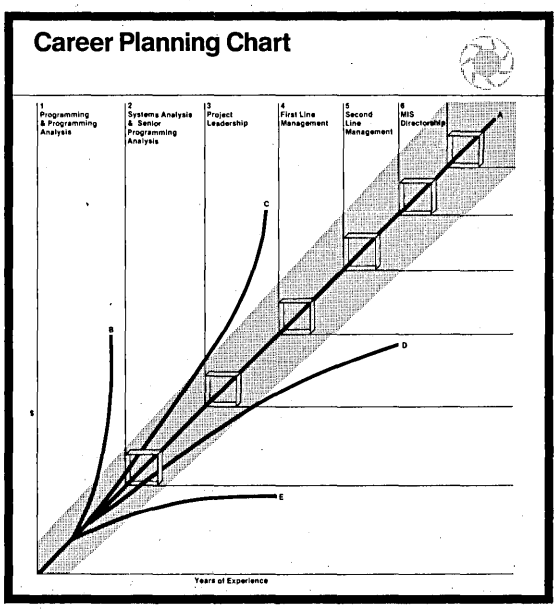

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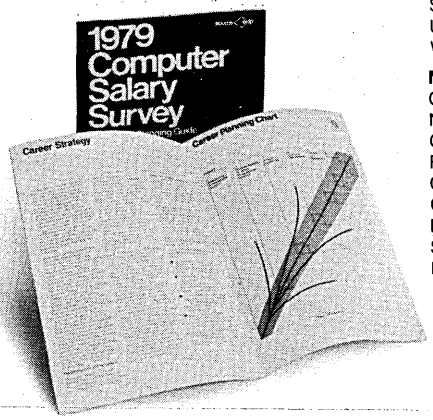

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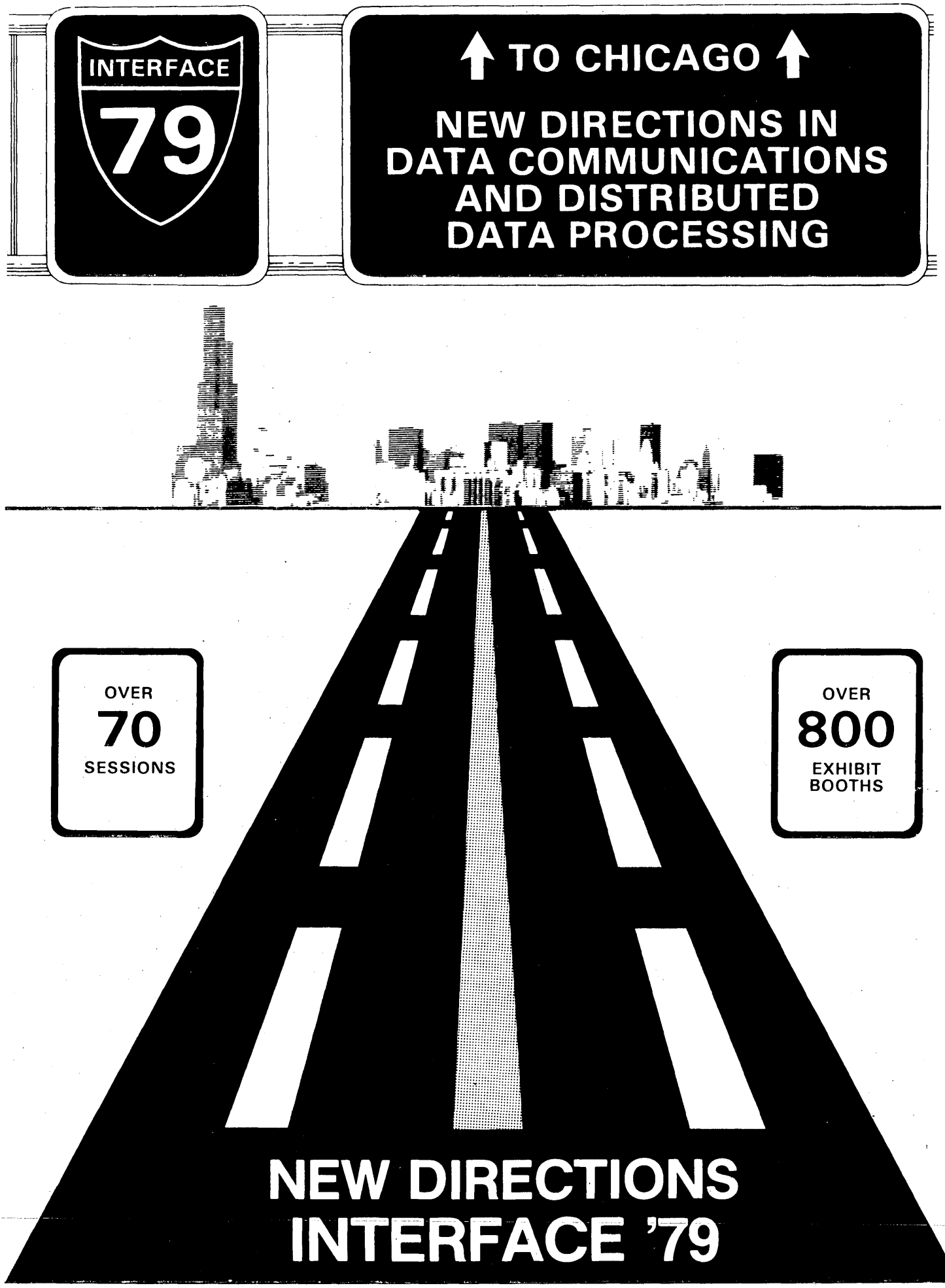
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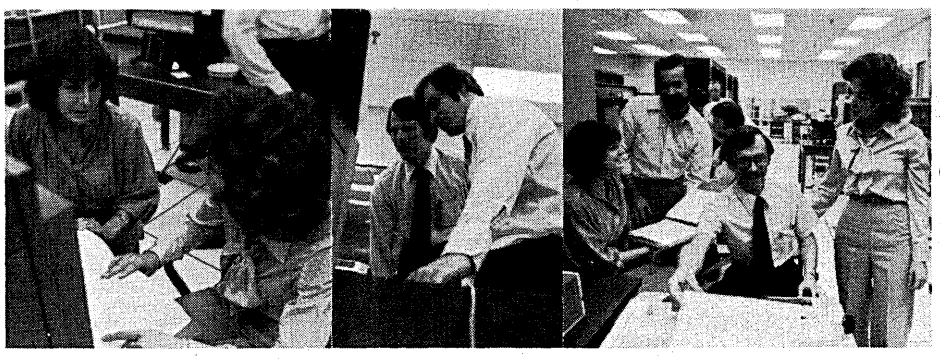

technology is our environment

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CHARLOTTE, NC 28202—J. Schwab, 1742 Southern Nat'l Ctr., 704/375-0600
CLEVELAND, OH 44131—A. Thomas, 5755 Granger Rd., 216/749-6030
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You should be familiar with current data models such as BSTG and Relational model, as well as issues of data base semantics. A Ph.D. or equivalent in computer science is required. Proven ability in data base systems modelling and/or commercial data base systems experience would be a plus.

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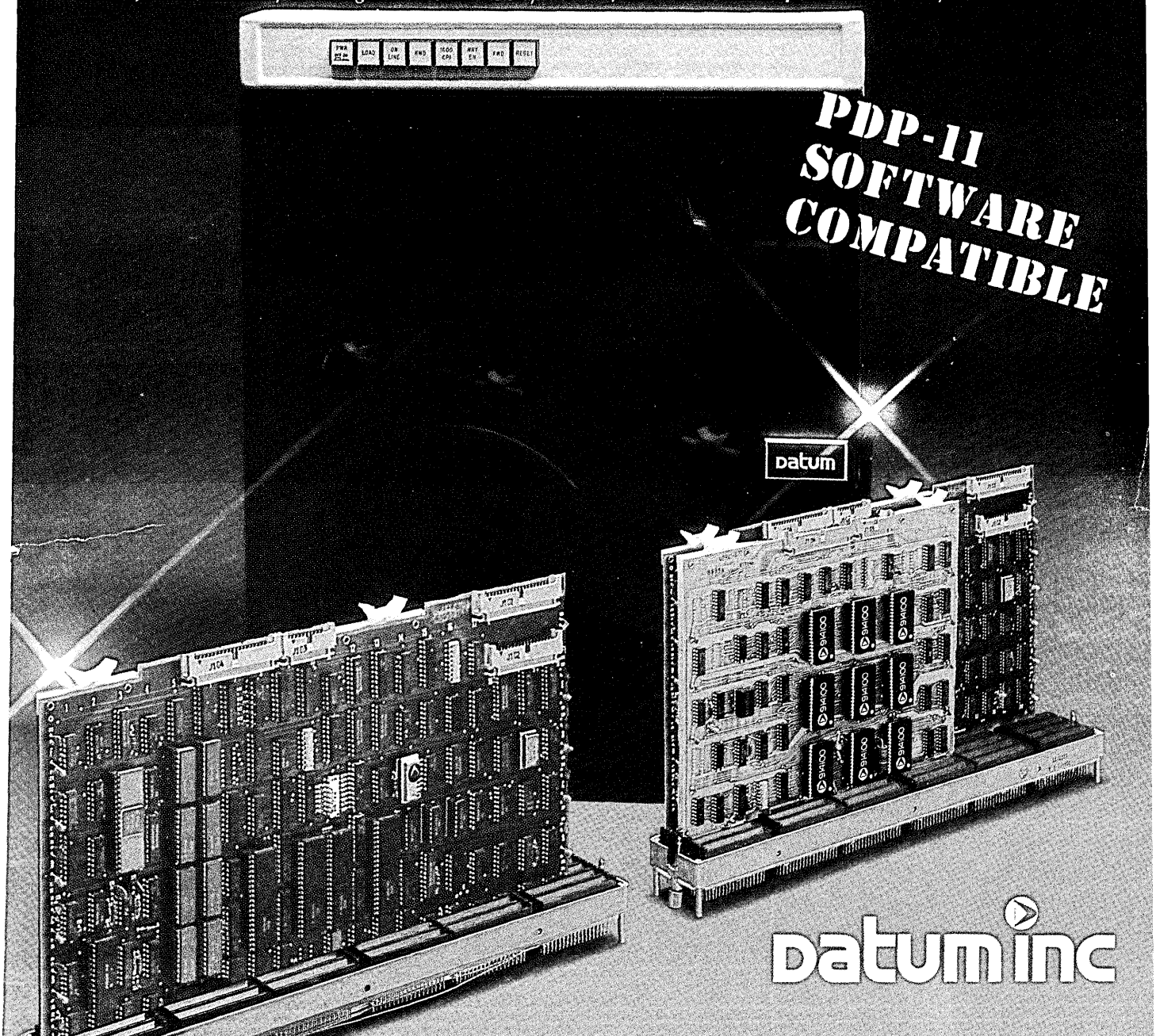

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PPD 103

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The basic model 43 series operates on-line at 10 or 30 cps in either the half- or full-duplex mode and prints multiple copies using the 96 character ASCII code set. A wide choice of interfaces, including EIA RS232C and DC 20-60ma, are available for easy system integration.

With the automatic send-receive configuration, messages can be prepared off-line via the paper tape punch, edited, combined with a master tape, then sent at maximum terminal speed—automatically and unattended—when line rates are lowest.

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Just like its predecessor, the legendary model 33, our model 43 family is designed for extreme reliability. The reason is simple: simplicity. Our model 43's use only five major pluggable components (six, counting the paper tape module on the ASR), along with extensive use of LSI circuitry.

So when you think of our model 43 family, think of it as the beginning of a new legend.

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