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NOVEMBER/3.00 U.S.A.

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Kennedy announces the second generation of it's fixed disk drives. Series 7000 is an 8" random access Winchester Technology drive designed for mini and micro computer users.

Series 7000 is available [illegible] two or [illegible] versions, [illegible] 12 and [illegible] megabytes [illegible] maximum [illegible] time is [illegible]

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Because of it's small size (8.5" x 16.5" x 5.25") it is possible to mount 2 drives horizontally or three drives vertically in a standard 19" rack.

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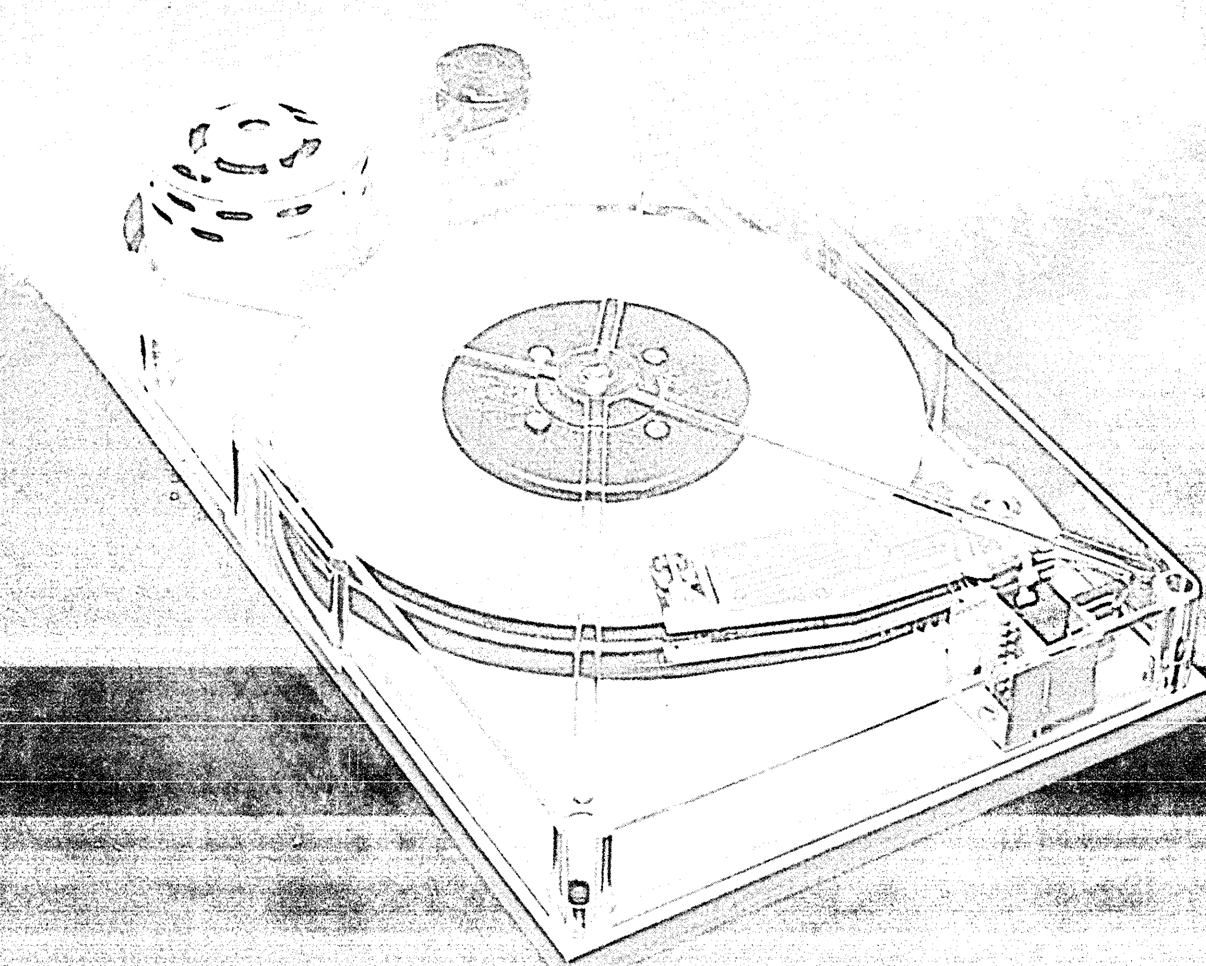

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CIRCLE 1 ON READER CARD

IBM IS ONLY HALF RIGHT.

They tell you—in seminars, magazine ads and TV spots—that today's technology enables the smallest business or smallest big business department to own a computer. And they're dead right.

What they don't tell you is that you can—and should—be doing your word processing on the same system. Frankly, their small business computer doesn't do word processing.

CADO's does.

And not just plain vanilla word processing. But an all new systems approach to text files and their use.

CADO's document-oriented word system lets you prepare or edit text files simultaneously with data processing tasks like billing, payroll, or payables. And CADO's word system lets you merge database records like customer or client files with text files. It automatically inserts names, addresses, balances or other personalized data on letters, forms or collection notices. Pagination, line numbering, page balancing, and global search & replace are all standard features! Communications? Of course.

What's more, CADO includes—free of cost—JUST ASK. It's a simple, English-language method that not only generates your own reports...it defines, enters, and utilizes data files as well!

So, for the first time, you have a system that keeps track of personnel, property, papers, and dozens of other things...writes letters or reports about them ...does it all without knowledge of programming expertise!

Finally, there is CADO software. Your nearby CADO dealer has general accounting packages and specialized industry applications...all on a turnkey basis.

The cost? Just $3.25 an hour which includes: 3 CRT terminals, a typewriter quality printer, and file capacity equivalent to 7.2 million characters of IBM formatted files. Optional high speed line printers and larger disk files are available.

Don't be half right. Write or call CADO now for your free 12-page color brochure on the system that does the whole job...at a price that's 100% right!

CADOSYSTEMS

CADO Systems Corporation
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Please rush me a free brochure on the CADO System 20/IV—the information processor designed for the 80's.

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Low-cost hard disk computers are here

11 megabytes of hard disk and 64 kilobytes of fast RAM in a Z80A computer for under $10K. Two floppy drives, too. Naturally, it's from Cromemco.

It's a reality. In Cromemco's new Model Z-2H you get all of the above and even more. With Cromemco you get it all.

In this new Model Z-2H you get not only a large-storage Winchester hard disk drive but also two floppy disk drives. In the hard disk drive you get unprecedented storage capacity at this price—11 megabytes unformatted.

You get speed—both in the 4 MHz Z80A microprocessor and in the fast 64K RAM which has a chip access time of only 150 nanoseconds. You get speed in the computer minimum instruction execution time of 1 microsecond. You get speed in the hard disk transfer rate of 5.6 megabits/sec.

EXPANDABILITY

You get expandability, too. The high-speed RAM can be expanded to 512 kilobytes if you wish.

And the computer has a full 12-slot card cage you can use for additional RAM and interface cards.

BROADEST SOFTWARE SUPPORT

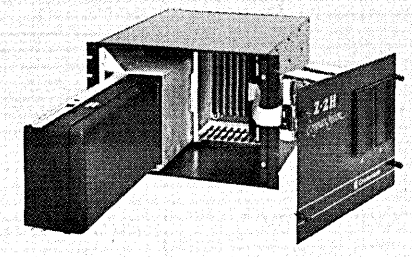
With the Z-2H you also get the broadest software support in the microcomputer field. Software Cromemco is known for. Software like this:

- **Extended BASIC**
- **FORTRAN IV**
- **RATFOR (RATional FORtran)**
- **COBOL**
- **Z80 Macro Assembler**
- **Word Processing System**
- **Data Base Management**

with more coming all the time.

SMALL, RUGGED, RELIABLE

With all its features the new Z-2H, including its hard disk drive, is still housed in just one small cabinet.



Hard disk drive at lower left can be interchanged just by sliding out and disconnecting plug. Seven free card slots are available. Z-2H includes printer interface card.

Included in that cabinet, too, is Cromemco ruggedness and reliability. Cromemco is time-proved. Our equipment is a survey winner for reliability. Of course, there's Cromemco's all-metal cabinet. Rugged, solid. And, there's the heavy-duty power supply (30A @ 8V, 15A @ +18 V, and 15A @ −18V) for circuitry you'll sooner or later want to plug into those free card slots.

CALL NOW

With its high performance and low price you KNOW this new Z-2H is going to be a smash. Look into it right now. Contact your Cromemco computer store and get our sales literature. Find out when you can see it. Many dealers will be showing the Z-2H soon—and you'll want to be there when they do.

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We've kept you in mind, too. Ask about the new Model HDD Disk Drive which can combine with your present Cromemco computer to give you up to 22 megabytes of disk storage.

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CIRCLE 5 ON READER CARD

NOVEMBER 1979/3.00 U.S.A. VOLUME 25 NUMBER 12 This issue 139,800 copies

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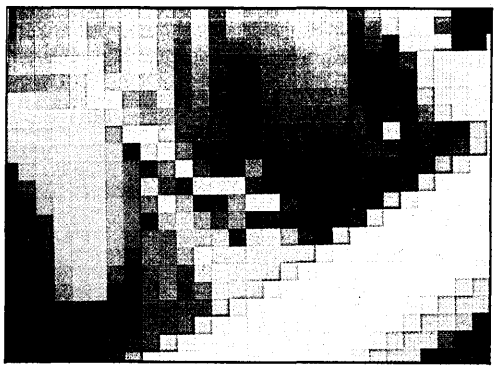
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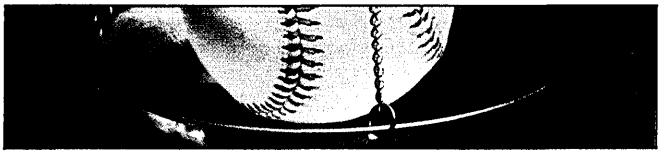
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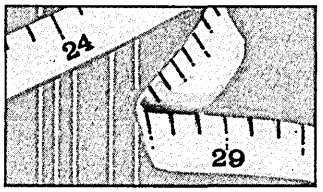

137

FEATURES

COVER
Decision support systems—special programs to produce effective, larger-than-life results. . .as the flower in our illustration by Meredith Nemirov, ©1979.

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NEWS IN PERSPECTIVE

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CIRCULATION
666 Fifth Avenue, New York, NY 10019
Circulation Manager Suzanne A. Ryan
Marketing Research Manager Deborah Dwelley
Publisher James M. Morris

Technical Publishing

a company of The Dun & Bradstreet Corporation

BPA Circulation audited by Business Publications Audit

ABP Member American Business Press, Inc.

DATAMATION (USPS 148-800) Magazine is issued monthly on or about the first day of every month, with the exception of November which is bimonthly. Published by Technical Publishing, a company of the Dun and Bradstreet Corporation, 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, 666 Fifth Ave., New York, N.Y. 10019. 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. and Possessions), $42 (Canadian). Reduced rate for qualified U.S. students: $16. Foreign subscriptions: £30:50. Additional charge for airmail: £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 HA13QT, England, (01)422-8293 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Application for Controlled Circulation is pending at Waseca, Minn. 56093.

Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Beslow Associates, Inc. POSTMASTER: Form 3579 to be sent to Technical Publishing Company Circulation Office: 666 Fifth Avenue, New York, NY 10019. Publication Number: 148800. Single copy: $3.00 in U.S.A.

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Some forward-thinking people at a leading manufacturer of nuclear pumps used SYSTEM 2000 to attack problems in inventory, purchasing, and quality control. As a result, they helped management increase the company's return on investment by increasing the turn on inventory. They solved in six weeks the purchasing problem that the company had been trying to solve with traditional methods for two years. They implemented a very thorough quality control program and a lot of other outstanding, cost-effective applications to make the company more efficient. More importantly, SYSTEM 2000 gave them the ability to expand these applications into their worldwide operations with only a very small increase in staff at the central site. And as for those central site staff members, their productivity—when compared to traditional methods—increased three to four fold! That's centsible.

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Seven years ago, Ford Motor Company's Ford Parts and Service Division installed SYSTEM 2000 to track packaging specs and bill of materials information for over 200,000 different types of parts. (These parts are stored in the Ford Parts Redistribution Center which has over 3,000,000 sq. ft. of warehouse space and in 21 Ford Parts Distribution Centers which have 6,100,000 sq. ft. and are strategically located throughout the United States.) Imagine how incredibly costly and inefficient this would have been under the old paper file method!

These are just a few of our centsible customers. We'd like to tell you about the others and what SYSTEM 2000 can do for you. Just send in the coupon—we'll be right back with a penny for our thoughts.

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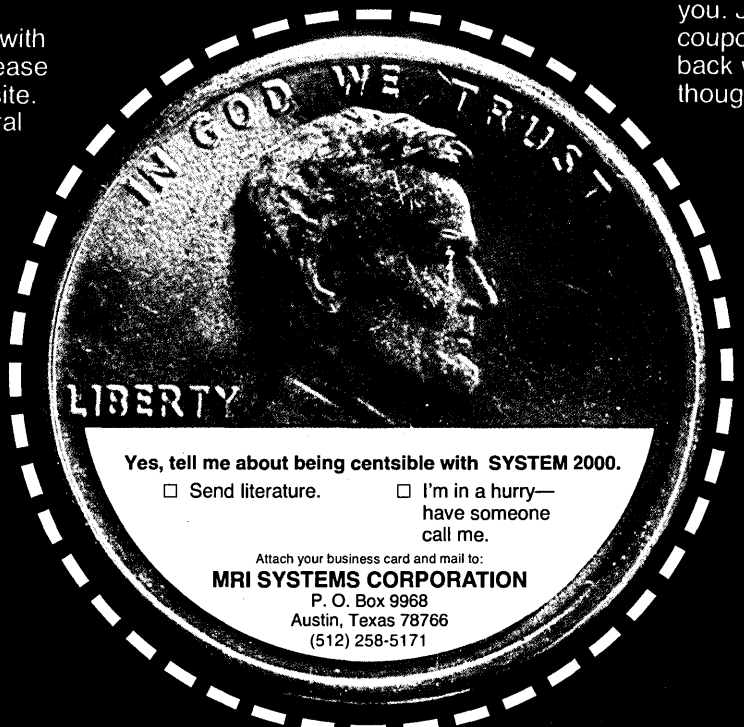

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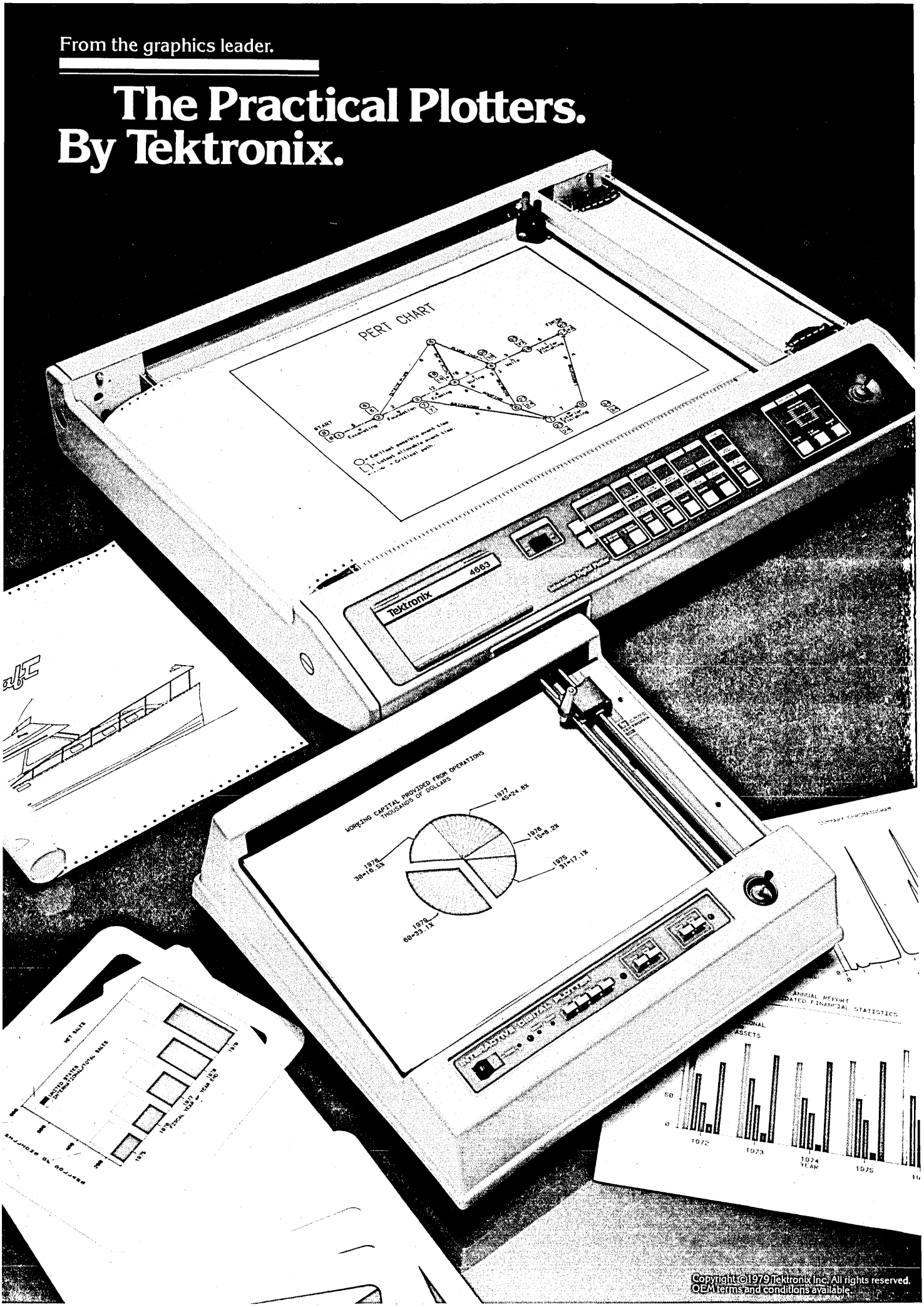
From the graphics leader.

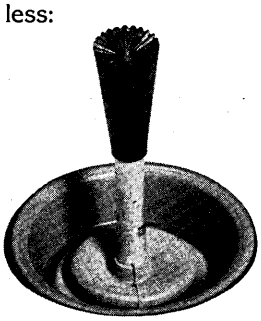
The Practical Plotters. By Tektronix.



Draw on the biggest choice of colors. But draw the line on price. That's practical!

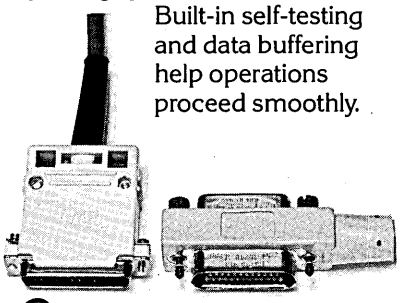
At Tektronix, we build plotters that keep your choices up and your costs down.

Practicality is why Tektronix pioneered the smart small plotter. It's why we keep your options open, with a bigger selection of ink colors, pen points and plotting media than on just about any other plotter around. Capabilities like those of our B-size (A3) 4662 prove that higher performance can actually cost less:

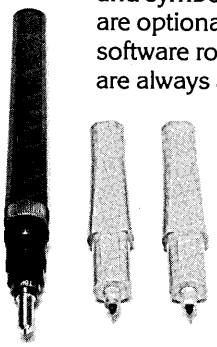


Interactivity. Plotter intelligence combined with digital technology helps you draw more realistic curve forms. Rotate and scale automatically. Digitize right from the 4662 with built-in joystick control.

Quality. In most applications, precision, repeatability and plotting speed are unsurpassed. Built-in self-testing and data buffering help operations proceed smoothly.



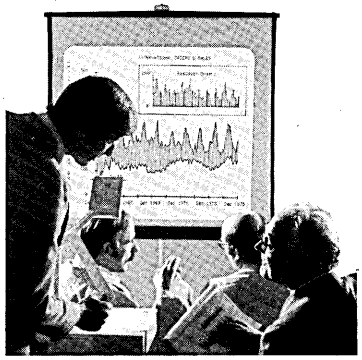
Compatibility. RS-232-C and GPIB (IEEE-488) interfaces are built-in. Foreign language and symbol fonts are optional. Easy software routines are always available.



Versatility. Select felt tip or wet ink pens. Plot on paper, film or Mylar® in up to nine colors. You can draw overhead projector presentations one minute, binder-sized reports the next.

Economy. It's not just initial cost that makes our 4662 so affordable. Simple, digital design leaves less to go wrong, makes plotting a cinch for anyone to learn.

Why pay more for a plotter that's more trouble than it's worth? Insist on capabilities that earn their keep: Call your local Tektronix representative for samples of our Practical Plotters at work. Or call our toll-free automatic answering service at 1-800-547-1512. In Oregon, call 644-9051 collect.



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The practical plotters

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CIRCLE 8 ON READER CARD

LOOKING BACK

NOVEMBER/DECEMBER 1959

Small computers—an important subject in November 1959. DATAMATION surveyed one computer by each of the following four companies: Bendix, Autonetics, Royal McBee, and IBM. Keep in mind these were the "small" computers—those units that needed many square feet of floor and desk space, and plenty of time to warm up. Let's take a fond look at the (great) grandparents of today's whiz-kid computers.

Bendix's G-15 rented for $1,350 a month, had a 2,160 word memory (drum) and a vocabulary of 100 commands (instructions). Its languages were POGO, INTERCARD, and INTERCOM, and the G-15's 450 tubes were supplied by 115v, 3,800 watts. The Bendix Computer Co. has since been bought by Control Data Corp. in March 1963. At that time, CDC purchased the equipment installed on customer bases and the maintenance organization.

Next, the Recomp by Autonetics, the first small solid-state machine, renting at $3,000 a month (fastest I/O speed of the four, at 400 characters per second), with a drum memory of 4,096 words and a vocabulary of 49 commands including nine floating point commands. Its language was RECEIPE, and Recomp was transistorized, working on 115v, 600 watts. Autonetics was eventually acquired by North American, which was in turn acquired by Rockwell International. Autonetics is still around, however, as a military equipment division of Rockwell.

The Librascope General Precision-30 (LGP-30) by Royal McBee rented for $1,100 a month, had a memory of 4,096 words (drum) and a 16-command vocabulary. The LGP-30's languages were EASE and ACT. It operated with 113 tubes on 115v, 1,500 watts. In 1956, Royal McBee and General Precision Equipment (GPE) began a joint venture, Royal Precision, the sole function of which was to market the LGP-30. In 1962 Royal McBee sold its computer interests to GPE, and in 1965 CDC bought the communications/computer division of GPE. One facility GPE retained was the Librascope Division, which produced the LGP-30. The 1968 merger of GPE and Singer brought this division to Singer, where Librascope still exists in Glendale, Calif.

Last in our survey was the IBM 1620. The 1620 was selling at $74,500 and rented monthly at $1,600. It had a core memory of 20K digits, a vocabulary of 32 commands and offered FORTRAN and assembler languages. The unit was transistorized and operated on 115v, 2,000 watts. (Coinciding with the release on the 1620 was the announcement of IBM's 1401, a machine for "everyday" dp use. In November 1959, the 1401 had been on the market for only two months, and approximately 1,000 orders for it had been placed.)

NOVEMBER 1969

What was the competition doing when IBM unbundled? Each company reacted differently; some followed IBM's footsteps while others went in the opposite direction entirely. Many large firms raised prices slightly, and others, such as XDS (Xerox Data Systems), lowered prices to emphasize competitiveness and encourage users.

CDC went the same route as IBM, but took it a step further by charging separately for equipment maintenance on top of separate pricing for equipment, software, and services. A 5% increase on hardware was also announced by CDC, without any explanation. It must have felt its position was rather secure in the market, though the action can be explained simply by rising costs.

Honeywell, on the other hand, decided to remain bundled indefinitely, since this policy had been most beneficial financially, and boosted prices 1%. Burroughs had previously announced the unbundling of applications programs for accounting and billing, but had not come out with anything definite on the unbundling of dp systems. However, Burroughs was willing to offer customers the option of bundled or unbundled pricing, should it decide to unbundle the dp systems later on.

The situation seemed to be one of confusion as to the safest path to follow. Honeywell, GE, RCA, and Univac remained bundled, while CDC and XDS unbundled immediately. Burroughs and NCR were very cautious and said nothing definite, waiting to be certain that when they took a stand, it would be the right one. ✲

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CIRCLE 10 ON READER CARD

The more you dema
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Chances are, you'll find that the performance you need is already there.

At HP, our long experience in developing instruments for engineering and manufacturing has given us a real good idea of what's needed in computer systems for technical applications. That's why Hewlett-Packard's family of computer products can meet your needs so closely in the lab or on the factory floor.

Matching the computer to the job.

Take our 9800 Series Desktop computers. For single-station interactive computing, they're in a class by themselves. With up to 449K bytes of memory, enhanced BASIC, graphics capabilities, and a built-in keyboard and display, you get the power of a minicomputer in one complete, integrated package. And there's easy interfacing with HP instruments and peripherals for jobs like control and testing, statistical analysis, and even engineering design.

For more complex multi-processing tasks, the HP 1000 computer has the power and flexibility to meet your needs. You can choose from a broad range of computation power to process your data, from the low-cost M-Series to the high-speed floating point F-Series. All of the configurations use upward-compatible RTE operating systems, so you don't have to rewrite your programs when you change jobs or move up to another model. And if you need additional storage, you can expand the systems to two megabytes of main memory starting at only $18K/per megabyte.

The HP 1000 system also comes with a number of applications tools to minimize your programming costs. HP's new DATACAP/1000 software, for example, lets you design a real-time factory data collection system according to your shop floor needs. And to help you manage vast quantities of technical data, we developed our powerful IMAGE/1000 data base management system. Just a few simple keystrokes give you up-to-the-minute information on inventory levels or instrument check-out status. If you'd like a really clear picture of your information, HP's GRAPHICS/1000 will plot your data in a way you can understand: as a bar graph, pie chart, logarithmic graph, and more.

nd from a computer, ould look at HP.

Communication made simple.

General purpose interface cards let you adapt the HP 1000 to a variety of tasks, including A/D conversion and multi-point communications. What's more, with the plug-in HP-IB (interface bus), you can process and control data from over 200 sophisticated measurement and testing instruments.

Talking to the computers is easy, too. The HP 1000 uses BASIC and FORTRAN as well as assembly and microcode languages. And our powerful communications software, DS/1000, lets you hook HP 1000 computers together in any network configuration you want—across your plant or around the world.

A continuous growth plan.

HP's family of computer products is constantly growing to meet your scientific, engineering, and manufacturing needs. Whether it's instrumentation front ends, CRT terminals, plotters or digitizers, HP's compatible products let you add to your system at any time without writing new software. And of course, you get HP's full support, service, training and documentation.

Go ahead and ask your own computer some tough questions. Then ask ours and see the difference. For a hands-on demonstration of the HP 1000, just call your nearest HP sales office listed in the White Pages. Or for more information write Hewlett-Packard, Attn: Roger Ueltzen, Dept. 459, 11000 Wolfe Road, Cupertino, CA 95014.

Here are just a few of HP's range of products for manufacturers and engineers:

1. HP 9845 Desktop Computer.
2. HP 9825 Desktop Computer.
3. HP 1000 Model 45 Real-time System with HP 7906 Disc Drive and HP 2648A Graphics Terminal.

4-6. HP 1000 F-, E-, and M-Series Computers.

7. HP 2108 Board Computer.
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15. HP 3077 Time Reporting Terminal.
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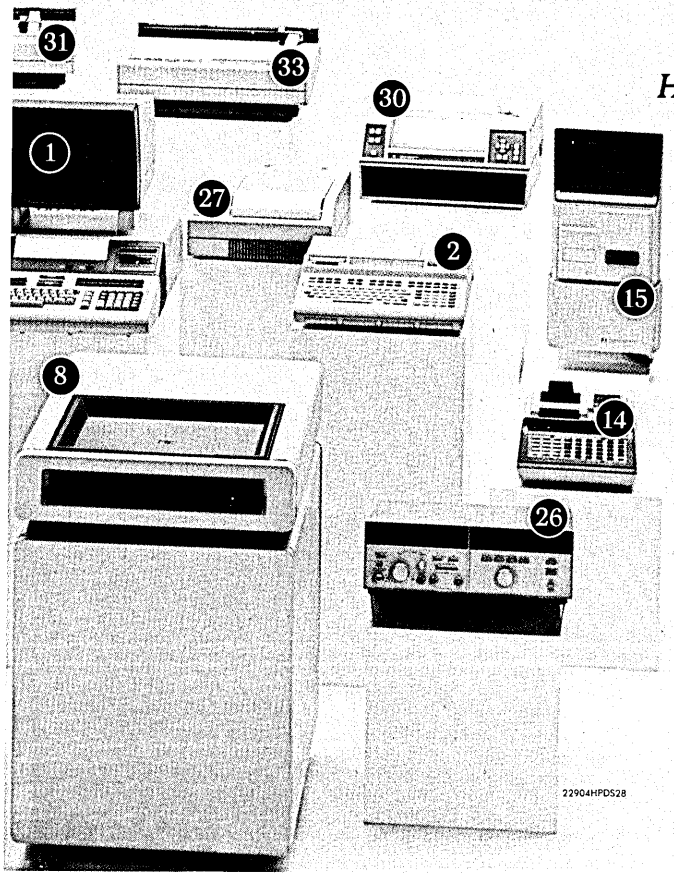

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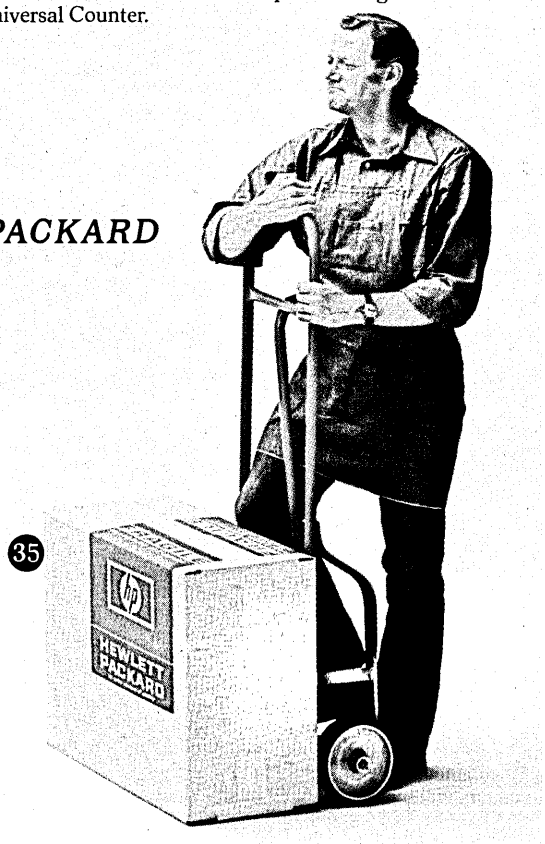
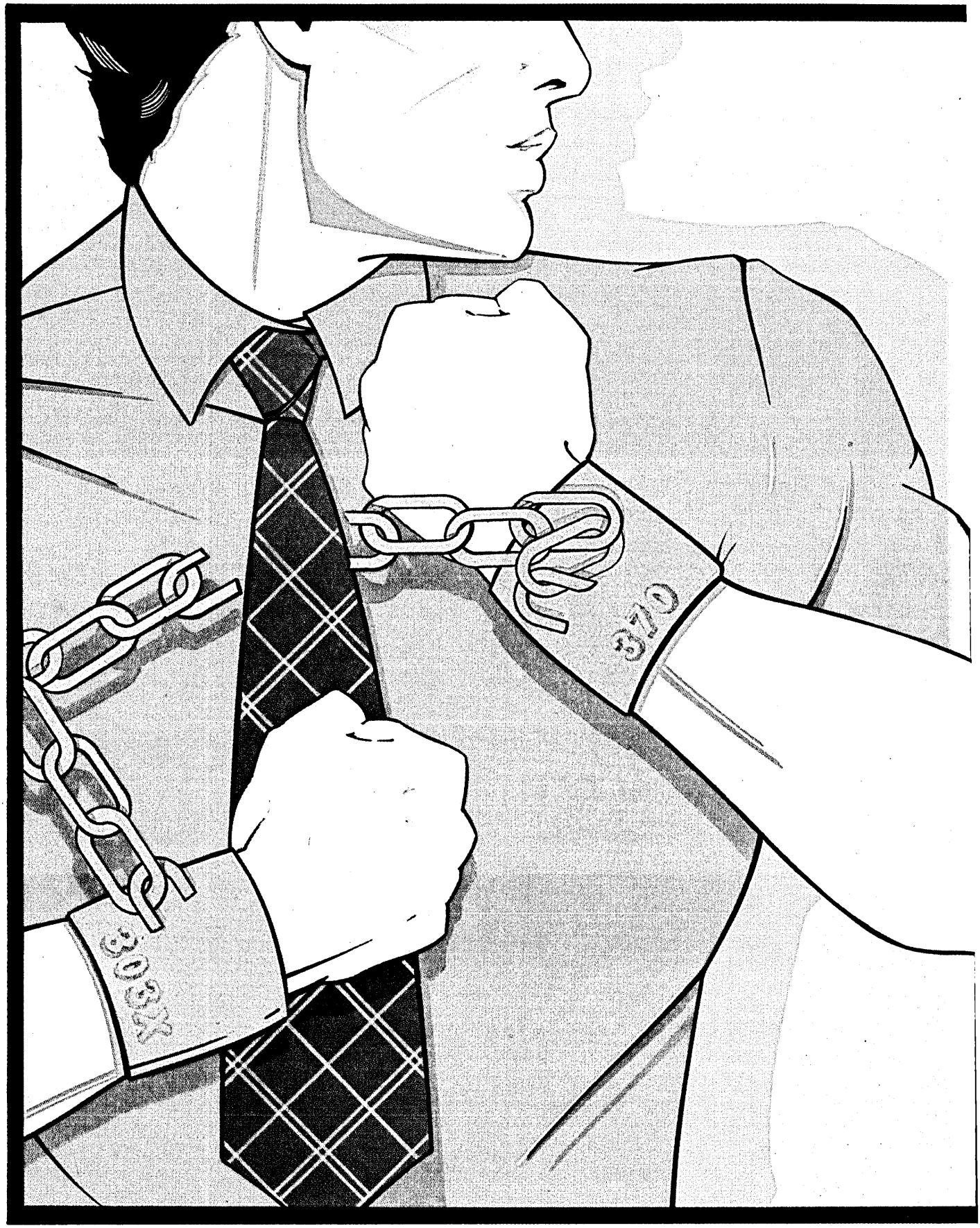


CIRCLE 11 ON READER CARD



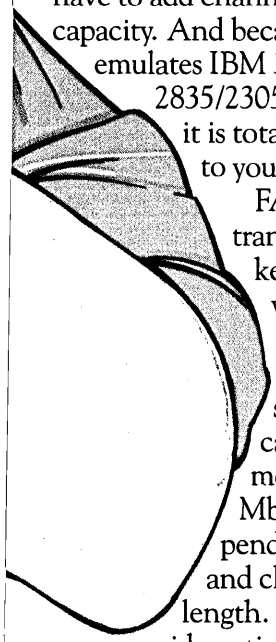
CPU Unchained

Intel introduces FAST-3805, the Semiconductor Disk that unleashes the full paging power of IBM CPUs.

Until now, the weakest link in IBM 370 and 303X systems has been the slow response of electromechanical disk drives. Today Intel delivers FAST-3805, the solid-state paging device with access speeds ten times faster than even the best performing disk.

Free I/O bound systems

Now you don't have to upgrade CPUs or main memory to increase throughput in I/O bound systems. By removing the virtual paging bottleneck, FAST-3805 can triple, even quadruple, disk traffic on your present system. You won't even have to add channel or controller capacity. And because FAST-3805 emulates IBM 3830/3350 and 2835/2305 disk subsystems, it is totally transparent to your CPU.



FAST-3805's transfer rates help keep your CPU working at full speed, too. With our standard single-byte wide capacity, you'll move 1.5-2.0 Mbytes/second, depending on the CPU and channel cable length. Our two-byte wide option will double capacity to 3.0-4.0 Mbytes/second. And since FAST-3805 can be optionally attached to as many as four channels, you can achieve optimum transfer rates to 16 Mbytes/second. Choose an overall storage capacity between 12-72 Mbytes.

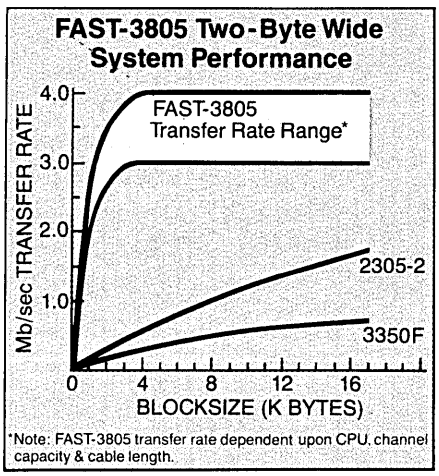
How we made it FAST

FAST means Fast Access Storage Technology—a virtual paging technique based in high speed MOS technology. Primary component in FAST-3805 is a high density, low power 16K dynamic RAM with access times far faster than disk technologies.

Dynamic RAMs have seen over a decade of service in computer memory. RAM is the primary component in the main memories of every major computer manufacturer, including IBM. Today the world's leading manufacturer of semiconductor memory applies this proven technology to high speed virtual paging.

Reliability through "self-healing"

Beyond the inherent reliability of solid state circuitry over electromechanical devices, FAST-3805 gives you unparalleled lines of defense against uncorrectable errors —all on-board. Double-bit error checking and correction (ECC) provides "self-healing" capabilities equal to those specified in the military's highest reliability systems. Additionally, a powerful iSBC 86™ single board computer performs continuous sweeping error detection and relocation of data to spare storage, if necessary. The entire FAST-3805 system is supported by motor generator sets to ensure data integrity in case of power fluctuations.



PERFORMANCE COMPARISON

	INTEL	3350F	2305-2
Avg. Seek Time (msec)	0	0	0
Avg. Latency (msec)	0.4	8.4	5.0
Transfer (Mb/s)	1.5-4.0	1.2	1.5
Capacity (Mb/s)	12-72	1	11.2

Increase throughput today

We're delivering FAST-3805 now. For more information on how it can increase virtual paging throughput in your system, contact Intel Commercial Systems, P.O. Box 35900, Phoenix, Arizona 85069. Or call (800) 528-0590.

intel® delivers.

WHAT SPERRY UNIVAC IS DOING IN THE MINICOMPUTER BUSINESS.

At Sperry Univac Mini-Computer Operations, we're making some big plans for our future and maybe yours.

The minicomputer industry has been growing by 20% - 35% every year. And as the industry grows and develops, applications for minicomputers appear virtually limitless.

We recognize that the market and the opportunities in the minicomputer industry are vast.

That's why, when we decided to enter the minicomputer market two years ago, we made the commitment to do it right.

OUR BROAD-MINDED PLANS.

Sperry Univac is one of the few companies in the world offering a complete range of data processing equipment from minis to mainframes.

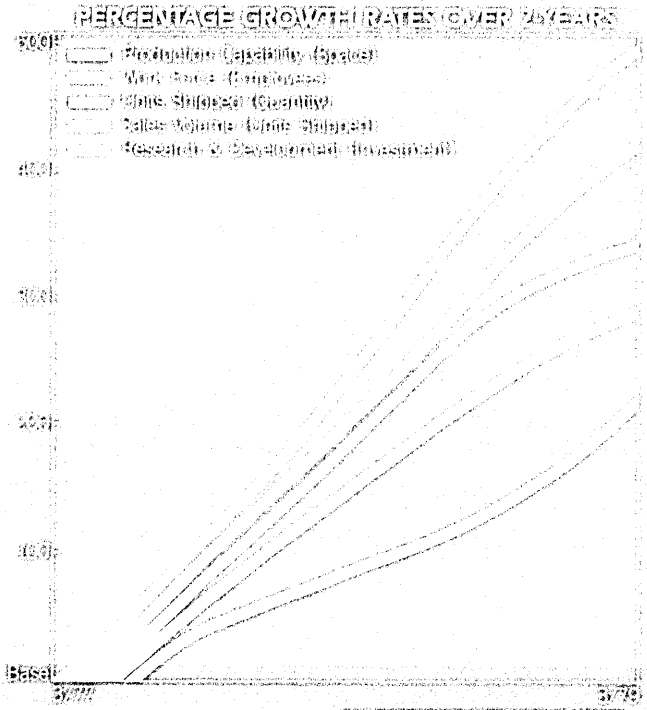
Our goal at Mini-Computer Operations has been to provide our customers with dependable, up-to-the-minute equipment. Equipment that can be readily adapted to incorporate new capabilities and give end users control advantage by standardizing their DDP systems.

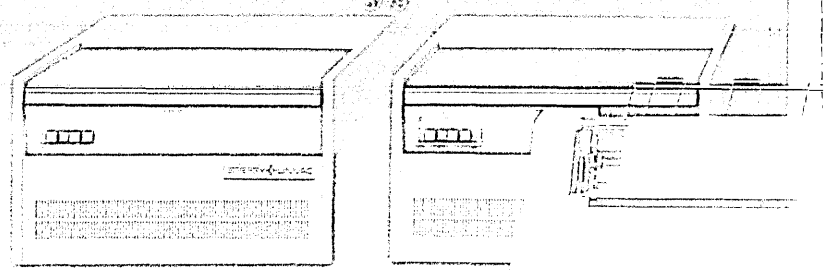
Our entire line of minis was designed to let you develop sophisticated distributed networks with Sperry Univac or IBM hosts. Or in both environments concurrently.

And we're still able to deliver our high performance, adaptable equipment with a reasonable price tag.

WE'RE NOT SMALL.

We not only build the minis, we provide complete subsystems with completely priced peripherals and software. In fact, we offer [illegible]





Sperry Univac was the company that developed SUMMIT, the operating system that allows you DDP capabilities with either IBM or Univac hosts.

And we've recently introduced an array of enhancements and peripherals which include the Sperry Univac Disk Storage System, Serial Printer and the 128KB/256KB Error Correction Memory.

WE'RE GIVING IT EVERYTHING WE'VE GOT.

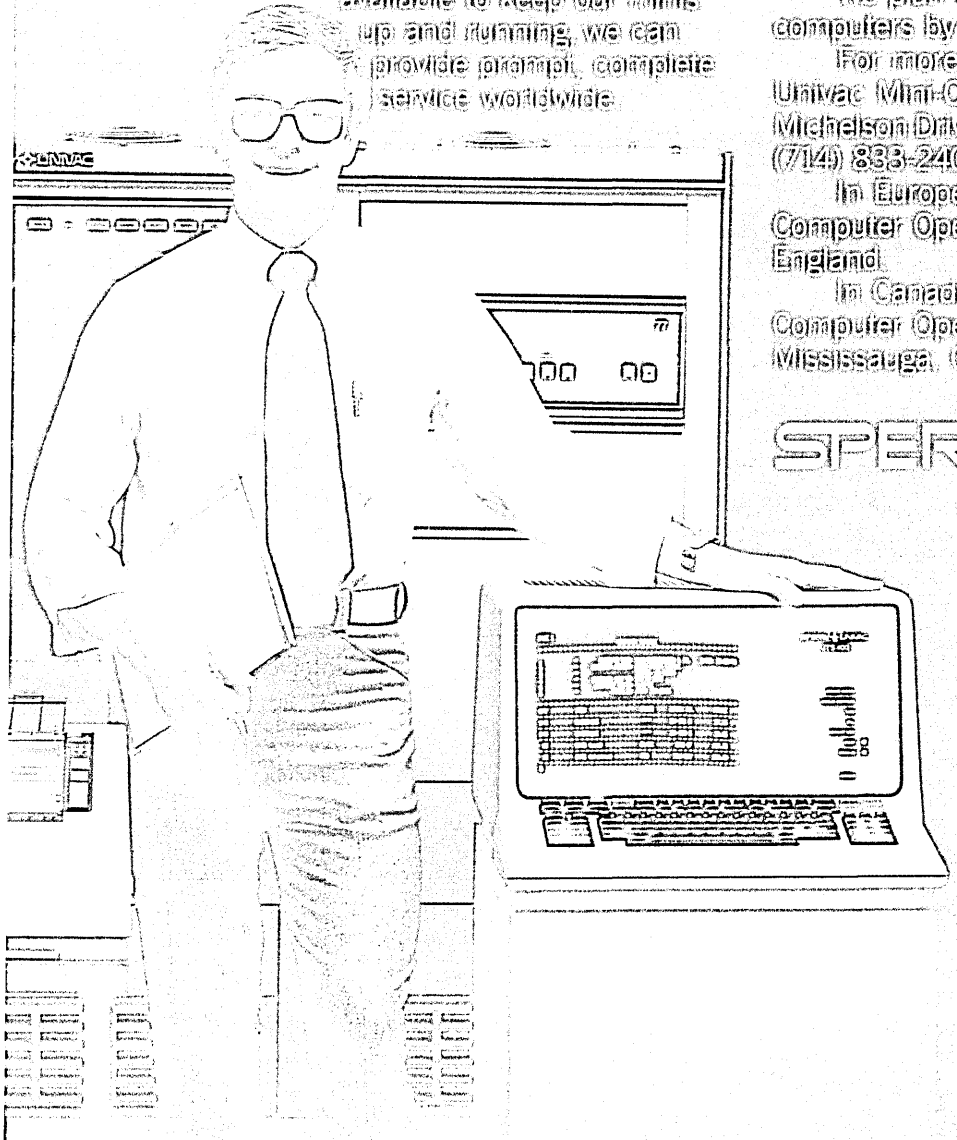
We have to. We have a reputation to uphold.

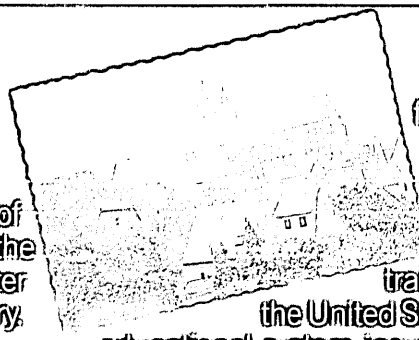
In just two years our Mini-Computer Operations production facilities have more than doubled. We've grown out of three buildings into 11 and nearly tripled our work force.

But most important to our current and future customers, our research and development budget is five times what it was just two years ago.

YOU'RE NEVER FAR FROM SERVICE.

The Sperry Univac sales and service network is one of the largest and most responsive in the world. With over 8000 customer engineers available to keep our minis up and running, we can provide prompt, complete service worldwide.





And that service is the finest available. We've established a major computer education center in Princeton, New Jersey and several regional training schools throughout the United States and Europe. Our educational system insures the degree of excellence and competency in our service staff necessary to maintain our equipment at peak performance.

PUTTING IT ALL TOGETHER.

At Sperry Univac we have a reputation for quality, performance and service in the computer industry.

That's why we've committed ourselves to a major investment in production facilities, quality control and worldwide service. Our goal is to produce a complete line of dependable, reasonably priced minicomputers and peripherals that are as respected as Sperry Univac mainframes.

We plan to become a big name in minicomputers by doing all the little things right.

For more information, write to us at Sperry Univac Mini-Computer Operations, 2722 Michelson Drive, Irvine, California 92713. Or call (714) 833-2400. Marketing Communications.

In Europe, write Headquarters, Mini-Computer Operations, London NW10 8LS, England.

In Canada, write Headquarters, Mini-Computer Operations, 55 City Centre Drive, Mississauga, Ontario, L5B 1M4.

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CIRCLE 14 ON READER CARD

LOOK AHEAD

KEY NETWORK ROLE FOR THE IBM 8100

IBM reportedly is planning to expand its communications network diagnostic and management functions for SNA users. Following the recent announcement at which it introduced error detection, alternate routing, and a series of modems with diagnostic features, IBM apparently has begun to look at the 8100 processor as a network management machine.

Several test sites are reported to be running networks in which an upgraded 8100 acts as a management and diagnostic processor to detect and correct line faults and other malfunctions before they become serious.

Lack of this type of network management function has been an IBM shortcoming for SNA users concerned with reliability and availability of communications links. Independent vendors have been supplying such features as part of their technical control centers for some time. This, coupled with the recent AT&T introduction of its Dataphone II network management system (page 70), may explain why some key IBM SNA users are being told that many of the network control functions they are shopping for will soon be available on the 8100.

A FLOOD OF 4331s

How is IBM's 4331, first model to be offered in its E Series line, coming along? Just fine in Los Angeles where the company expects to install some 700 within the next two years. And that doesn't take in such large "national accounts" as Hughes Aircraft which is said to have placed an order for 30 of the computers. IBM points out in its advertising the fact that the 4331 isn't affected by climatic conditions and could be installed on each floor of a multistory building, if necessary. In fact, a user, converting to an on-line environment with the 4331 from a batch-oriented 360/30, said he dropped in on the Los Angeles IBM data center on a very warm weekend to find a 370/158 wheezing in 90 deg. heat, while a 4331 next to it hummed along, oblivious of the climatic problems.

HONEYWELL GETTING THE WORD?

It looks as if Honeywell will be jumping into the word processing market feet first, and soon. Last month at a word processing panel discussion, Honeywell's Mike Simon began his talk with the comment, "Of course, we don't have an announced product yet, but if you want to assume we will soon, go right ahead."

OUT OF PAPER

The Social Security Administration, seeking to improve the performance of its huge network which spreads into some 1,300 U.S. locations, is looking at an automated network monitoring system. Basically, as explained by Kenneth M. Barry, who heads networking activity at the agency, it's a network alert message system that can tell headquarters what's overloaded and what isn't, and suggest graphically the alternate actions that should be taken. But what Barry

LOOK AHEAD

really loves about the system is that it can tell the network managers, when a user complains about delays in response, whether that user's only problem is "that his printer is out of paper."

COBOL TREND AMONG MINI VENDORS

Many of the small- and medium-size business computer vendors who've begun to offer COBOL support on their systems have done so because of a proliferation of programmers familiar with the business language. Apparently, it makes sense if a user needs outside help and the vendor can refer the user to many COBOL programmers. Latest vendor to consider COBOL is Basic/Four Corp., the MAI subsidiary in Tustin, Calif. --although the company refuses to confirm reports that it will add COBOL to its BASIC software support. Honeywell, General Automation, Data General and Zilog, with its Z80 COBOL, are considered leaders in the COBOL trend, while the offerings of Prime, Interdata and DEC are ranked somewhat lower by programmers who work with minicomputer software. Most follow ANSI 74 COBOL standards, but Hewlett-Packard, with the 1968 COBOL standard, is considered by programmers to be far below all of the vendors offering the business-oriented software support.

A DIGITAL RAID?

Digital Equipment Corp. appears to be going after Xerox Sigma users in a big way. The company showed up at a San Francisco meeting of Exchange, a former Xerox user group, last month and after an internal huddling session, it lavishly entertained Sigma users. These users reportedly were lured to the DEC suite by a contented DEC/Sigma user from Vanderbilt Univ.

CLEAN POWER FOR DEC

Computer Power System Corp., the Los Angeles firm which at the last National Computer Conference announced a $4 million contract with Burroughs to manufacture clean power systems for the computer firm on an oem basis, last month signed a similar agreement with Digital Equipment Corp. and was talking to NCR about a similar arrangement.

RUMORS AND RAW RANDOM DATA

Richard R. Douglas, vice president and general manager of Honeywell's Large Information System Div., had just finished answering some pretty technical questions from one journalist at a Phoenix press conference announcing a new line of large scale computers (see p. 56) when the anchorman of a local tv station asked, "What does this mean to the housewife?" Stopped cold for a moment, Douglas finally replied, "Well, someday she'll be able to shop from home with a terminal."

....John Imlay, chairman of the board and chief executive officer of Management Science America, Inc., Atlanta, was asked by a young lady at a cocktail party what he did for a living. He told her he ran a software company. "Oh, you make sweaters," she said....Latest heard perversion of what the initials I-B-M stand for came up at the Data Processing Management Assn. conference in San Diego -- I've Been Misled.

A Major Enhancement

Release 8 Is The New MARK IV.

Now you can choose a major new product that can dramatically reduce the cost of programming your business applications.

It's called MARK IV® Release 8. It offers major new improvements in throughput, graphics capabilities, on-line support, and multi-dimensional arrays.

(MARK IV is the most successful application implementation software product ever sold. Today it's in use at more than 1,400 computer sites in 44 countries.)

Release 8 has been configured to deliver optimal price/performance for your operating system, data base, and virtual memory needs, and DOS-level systems at attractive prices.

Enhancement By Committee.

Many of the advantages available to you in Release 8 are the direct result of the experience of actual MARK IV users: the System Evaluation Committee of the MARK IV User Group.

The number one priority of this experienced group was array processing.

So now the new array definition capability of Release 8 lets you process multi-dimensional arrays to quickly produce aging reports, cross-foot financial reports, and statistical summaries.

Enhanced Throughput.

You achieve it through major architectural changes in Release 8 software.

You get single-step processing capability. This simplifies execution procedures and reduces I/O channel activity for report sorting.

And since Release 8 uses sophisticated compilation techniques, execution speed is comparable to equivalent COBOL jobs.

Enhanced Data Display.

Graphics is another new feature of Release 8.

You can produce vertical or horizontal bar graphs. Scatter diagrams. Absolute or relative bar graphs. And recap summary reports.

All of this display flexibility can be extremely useful in graphic management reports, forecasting, and mathematical or trend analysis.

Enhanced On-Line Support.

Release 8 now makes the MARK IV data inquiry language available for CICS and INTERCOMM environments—together with several query language extensions and enhanced IMS/DC support.

And Release 8 now provides a compatible query language for use with all of these operating systems and monitors:

OS, OS/VS, DOS, DOS/VS, IMS/DC, CICS, INTERCOMM, TSO, and CMS—among others.

Enhancement Of The Mind.

MARK IV Release 8 is a new Implementation System from Informatics. It is a working tool. A system specifically designed to expand the problem-solving power of the human mind.

Discover all of the ways it can help you realize the maximum potential of your programming staff.

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21050 Vanowen Street, Canoga Park,
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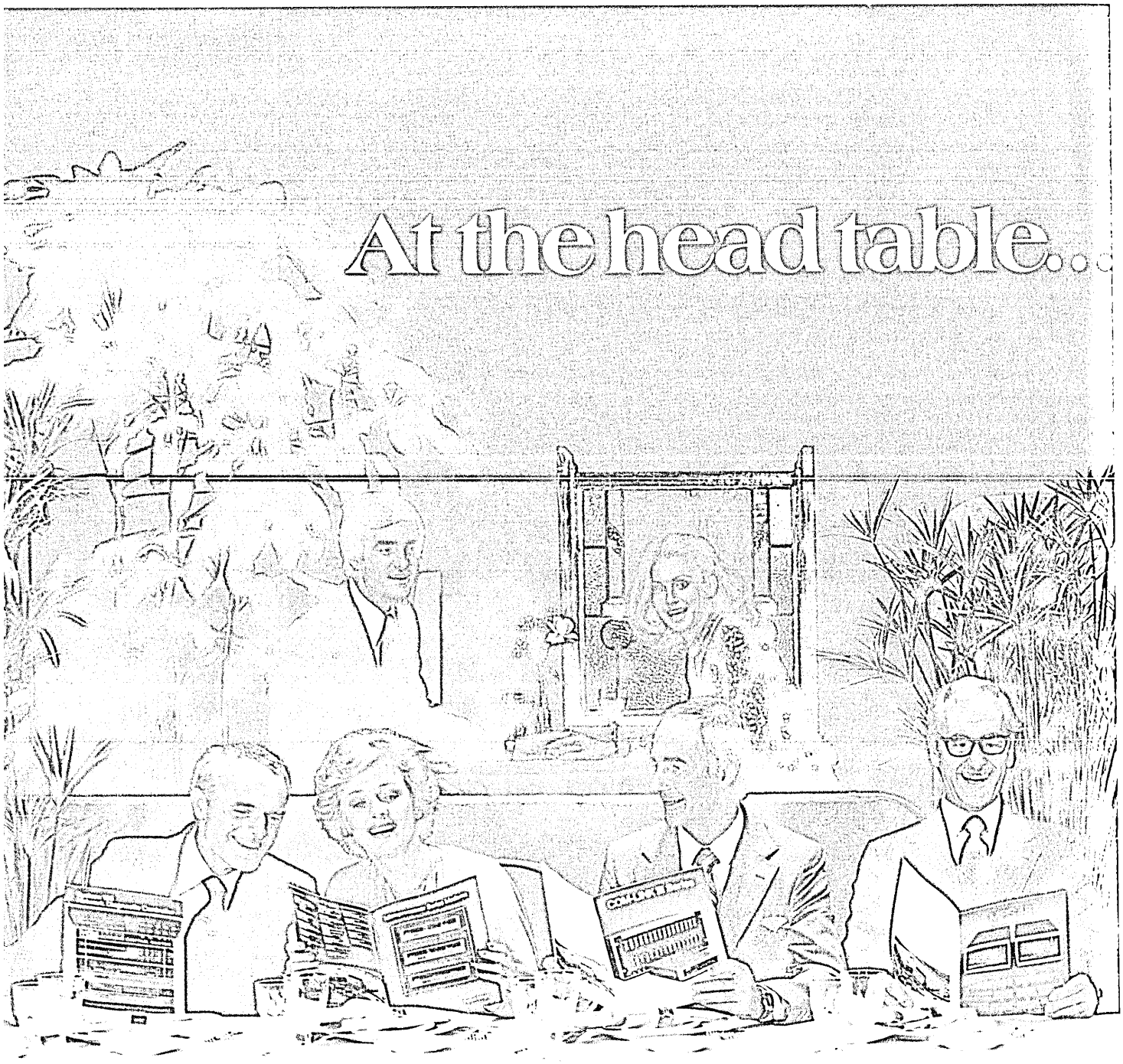
AMPSO REMOTE PROCESSING SERVICES SECTION

CIRCLE 15 ON READER CARD



Successful data communications people know exactly who to look for when they need equipment. Before they evaluate products they evaluate manufacturers. They insist on a supplier who has the integrity and the resources to fully support his products. With a broad product range, and the technical expertise to continually develop and improve those products. That's why so many of the leading data communication users name Racal-Milgo as their first choice. And why you'll find Racal-Milgo equipment in so many of the world's largest, most sophisticated data communications systems...and in smaller systems on their way up.

In 1980, Racal-Milgo marks its 25th year. Data communications has been a significant part of the company's business right from the beginning. Today, that involvement has become a total dedication toward providing a full range of reliable products and systems. We think of every one of our customers—large or small—as one of the data communications leaders.

Racal-Milgo™ **Racal-Milgo Information Systems, Inc.**

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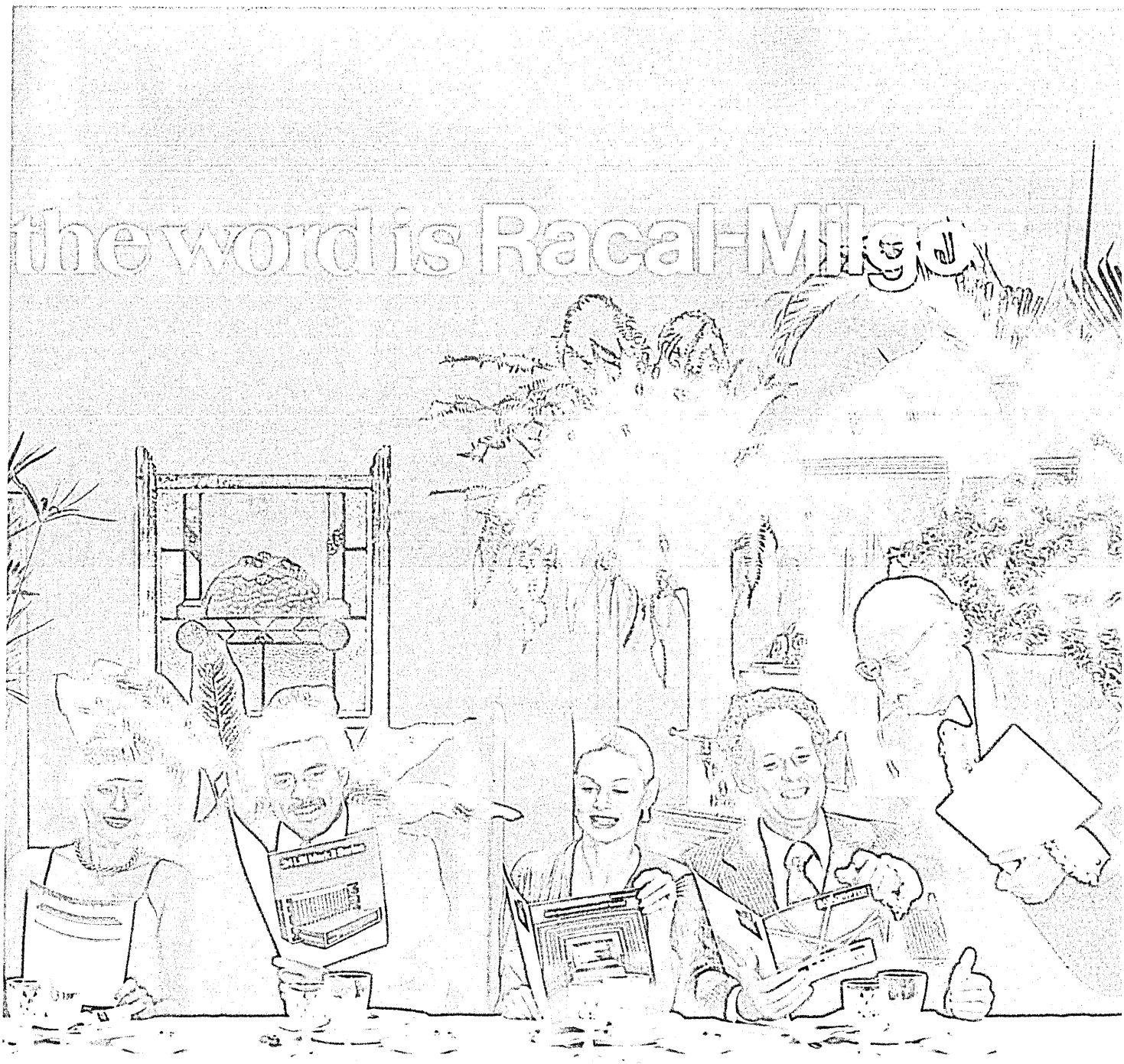

We'll send you a portfolio of brochures to help you evaluate our qualifications, and our products. It brings you up to date on the latest selection of Racal-Milgo equipment, including network diagnostic controllers, microprocessor based and LSI modems, special modems for short-haul transmission and for loop systems, data security products, and a line of data terminals.

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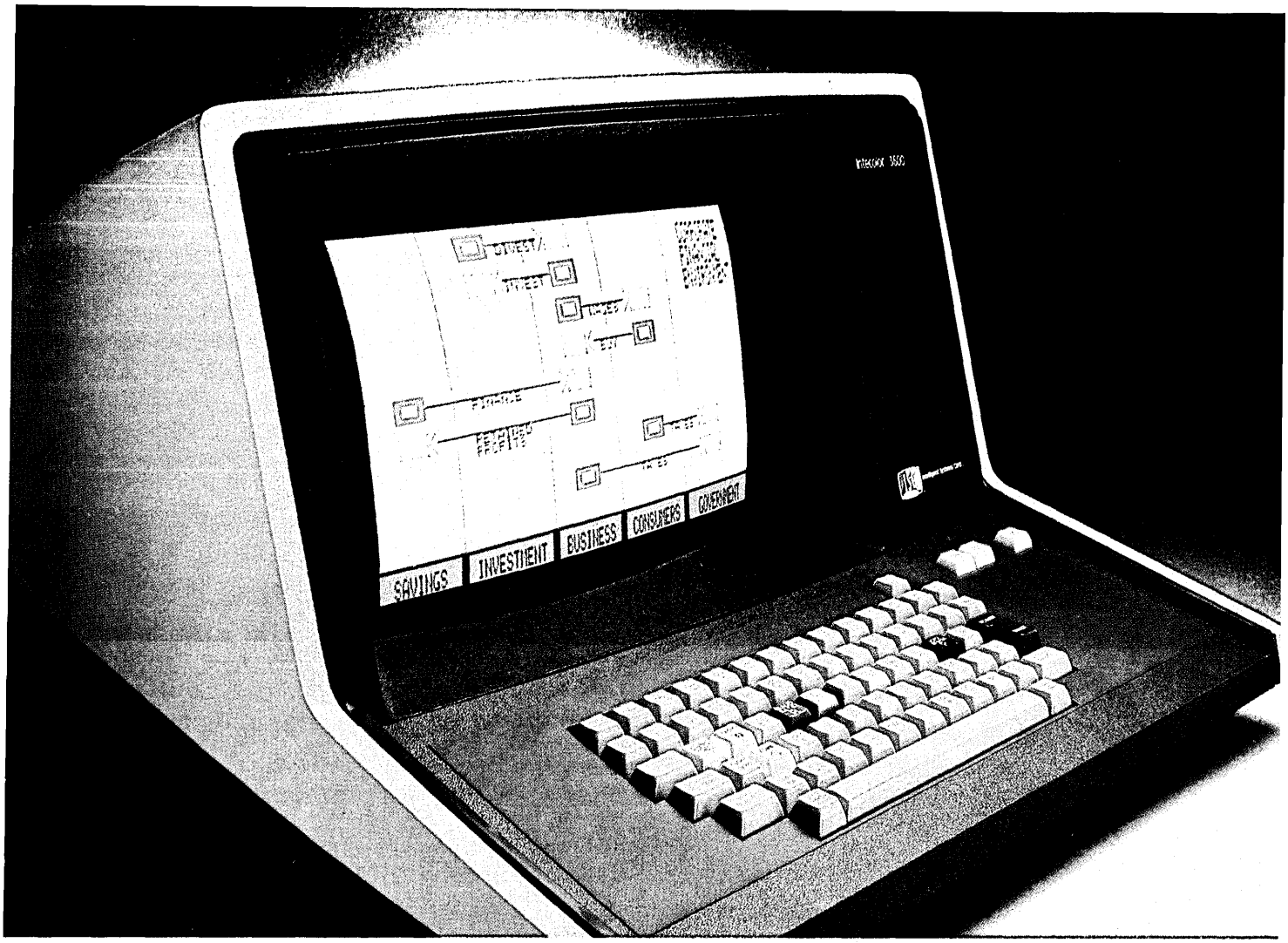
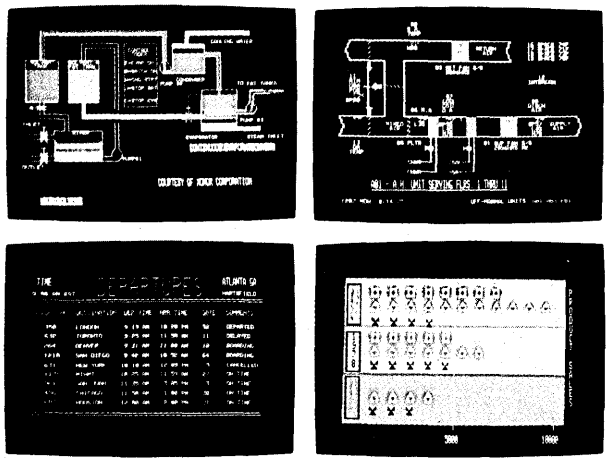


Color communicates better. That's why Intecolor makes other terminals obsolete.



Enterprising companies use Intecolor terminals because they know color conveys information faster. More effectively. And as the world's largest supplier of color terminals, our prices prove color doesn't have to be expensive. The color graphics terminal shown above, Intecolor's 3601, is just $1995* for a single unit. For details on the complete Intecolor line, contact your ISC sales rep. You'll discover what thousands of DP users already know: Color Communicates Better.

Unretouched photo of screen.

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CALENDAR

NOVEMBER

Canadian Computer Show, November 13–15, Toronto.

Last year's attendance was 15,159. This year's show will celebrate the 10th anniversary of the Canadian Computer Show. Contact Reg Leckie, Show Manager, Canadian Computer Show, 36 Butterick Rd., Toronto, Canada M8W 3Z8, (416) 252-7791, or Bill Robertson at (416) 444-0321.

American Bankers Assn. Western Regional Workshop, November 14–16, San Francisco.

Contact the Meetings Coordinator, Operations & Automation Div., American Bankers Assn., 1120 Connecticut Ave., N.W., Washington, DC 20036 or call William Moroney at (202) 467-4332.

The Third Western Educational Computing Conference, November 15–16, San Francisco.

Sponsored by the California Educational Computing Consortium (CECC). For further information contact Ron Langley, Director, Computer Center, California State Univ., Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840, (213) 498-5459.

INTELEC 79, November 27–29, Washington, D.C.

The International Telecommunications Energy Conference is sponsored by the IEEE Communications Society. Contact R. H. Jones, Publicity, 1979 INTELEC Committee, ITT North Electric Co., Power Systems Div., P.O. Box 688, Galion, OH 44833, (419) 468-8100.

DECEMBER

The New Energy Legislation, December 3–4, Chicago.

The conference will focus on the Energy Mobilization Board and its "fast track" provisions, as well as the remaining portions of President Carter's energy legislation as they stand at conference time. For further information contact Robert W. Nash, Executive Director, The Energy Bureau, Inc., 41 East 42 St., New York, NY 10017, (212) 687-3177.

Winter Simulation Conference, December 3–5, San Diego.

Cosponsoring WSC 79 are the National Bureau of Standards and six leading organizations sharing an interest in computer simulation. For further information contact Stan Lichtenstein, National Bureau of Standards, Washington, DC 20234, (301) 921-3181.

TDCC Forum and Exhibit Plan, December 4–5, Washington, D.C.

The theme will feature the state of the art of planning for electronic data interchange for applications in transportation. For further information contact TDCC Coordinating Committee, 1101 17th St., Washington, DC 20036, (202) 293-5514.

American Institute of Industrial Engineers (AIIE), December 10–12, San Francisco.

Distributed Data Processing, Data Communications and Networks, and Minicomputers are the subjects to be presented by AIIE. For further information contact Linda Fasulo, Computer and Information Systems Div., P.O. Box 3727, San Monica, CA 90403, (213) 450-0500.

American Institute of Industrial Engineers (AIIE), December 10–12, Washington, D.C.

"Word/Text Processing" will be the subject of the conference presented by the Computer and Information Systems Division of the AIIE. Conference brochures are available from Dept. PR, AIIE Seminars, P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

JANUARY

Sixth Semi-Annual ATE Seminar/Exhibit, January 7–10, Pasadena.

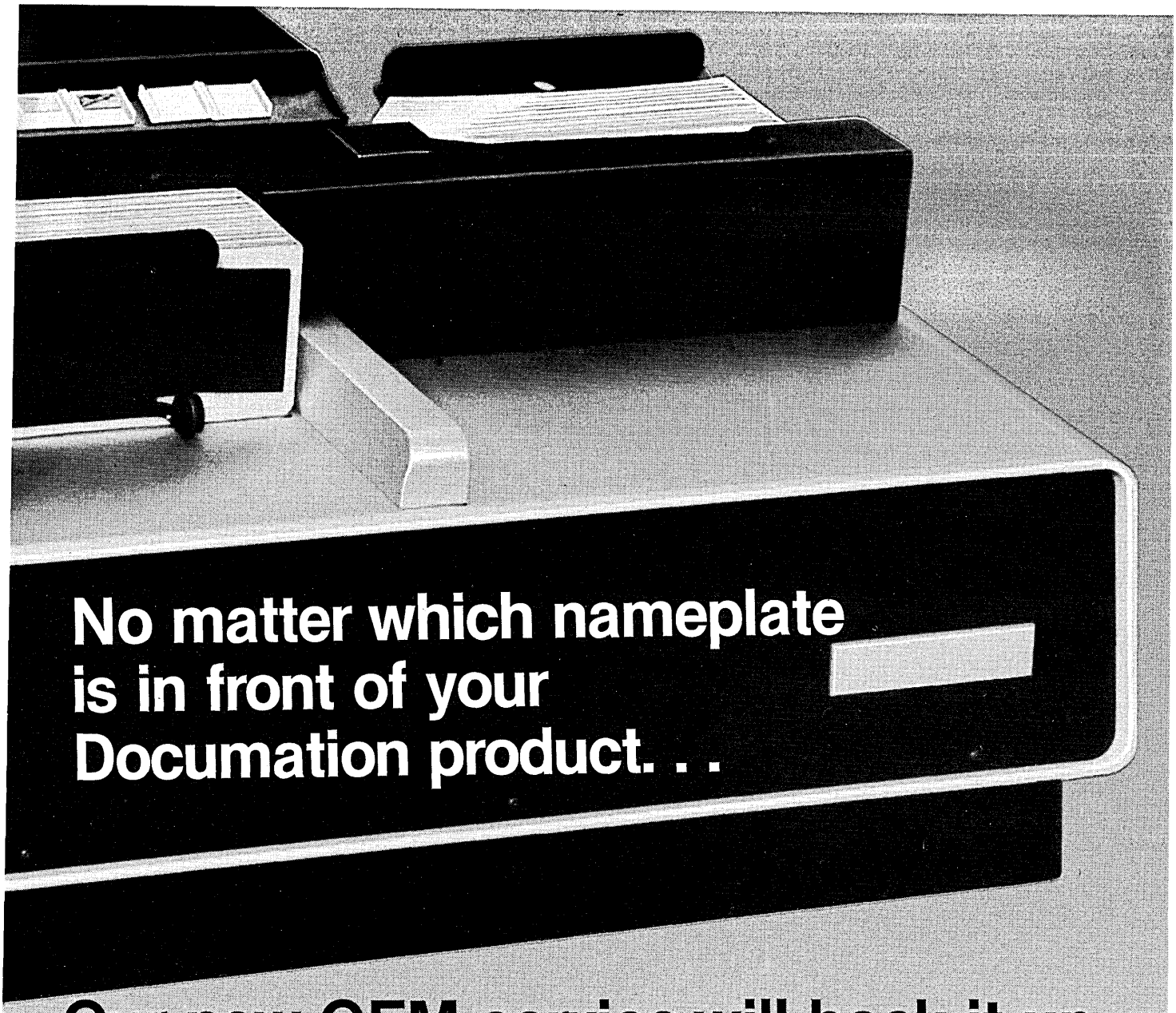
The seminar/exhibit will feature a comprehensive technical program of workshops, technical papers, and courses that will span the four days of the conference, in tandem with the three-day exhibit. For further information contact Karen Knope, ATE Seminar/Exhibit and Test Instrument Conference, 1050 Commonwealth Ave., Boston, MA 02215, (617) 232-5470.

Communication Networks '80, January 28–30, Washington, D.C.

Communication Networks '80 is the national business communication conference and exposition. For further information contact William Leitch, Conference Company, 60 Austin St., Newton, MA 02160, (617) 964-4550.

WINCON 80, January 29–31, Los Angeles.

Officials predict more than 500 scientists and engineers from government, military, and industry will attend to probe new technology and developments in electronics and aerospace. For more information contact Richard L. Harmon (714) 557-4700.



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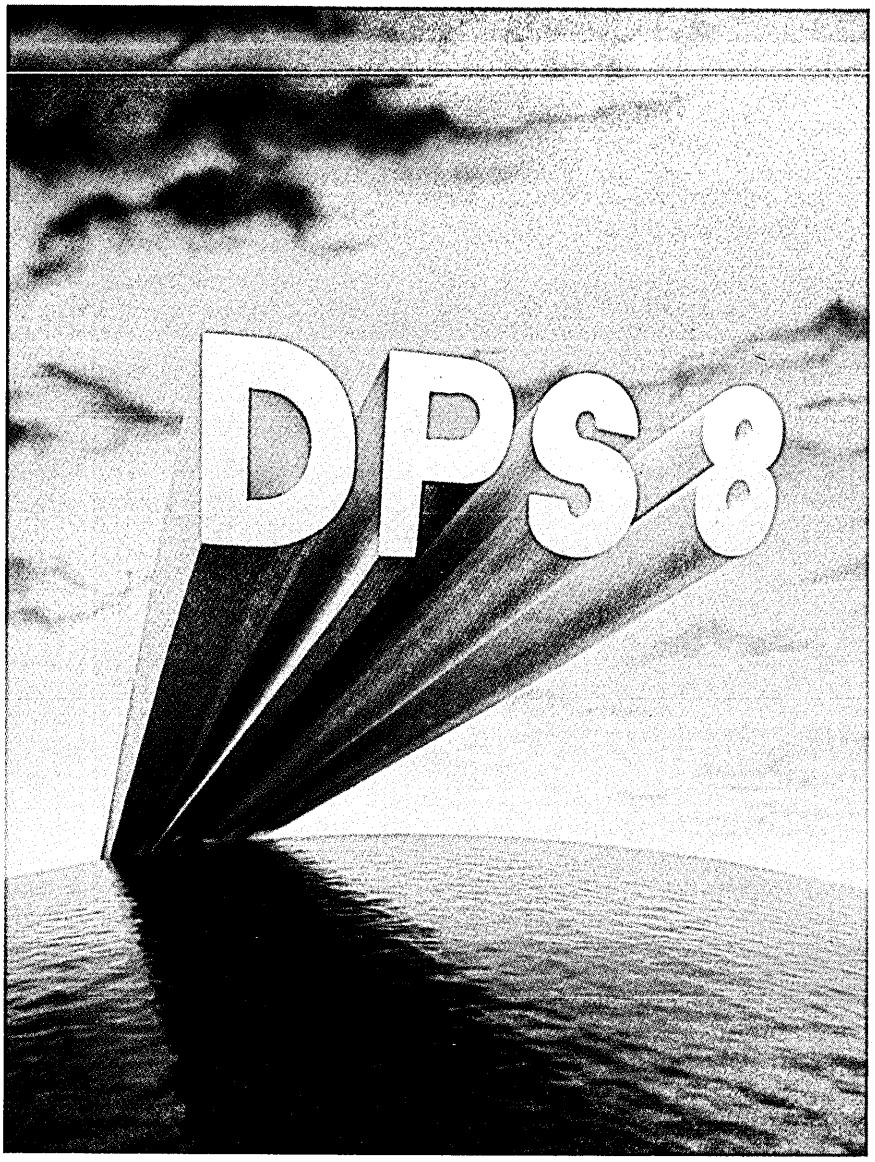


Honeywell announces DPS 8: large-scale Distributed Processing Systems for the 80s.

Honeywell's added a new dimension to its Distributed Systems Environment. A new operating system and four new computers—including a fully compatible remote-host and a new top-of-the-line processor.

Growing power today. For tomorrow's changing needs.

An operating system for the 80s.

GCOS 8. A distributed processing operating system that does more work for more users at more locations. It features transaction processing across multiple processors, improved multiprogramming and time-sharing, and new data security.

GCOS 8 is modular, so you can use what you need to use now, and add what you need to add later.

A remote host for the 80s.

DPS 8/20. A fully compatible large-scale entry-level system that can serve as a remote host or stand on its own. A convenient growth path to the new, larger DPS 8/44.

More power at the top for the 80s.

DPS 8/70. The largest of Honeywell's distributed processing systems. It can deliver up to twice the power of any previous single Honeywell processor. And multiple-unit configurations of up to four processors offer still more power and fail-safe back-up.

And you can get there easily from the new DPS 8/52, a single processor that can be upgraded to the 8/70 in the field.

Investment protection for the 80s.

Honeywell large-scale users can run existing programs on the new DPS 8 processors under either GCOS III or the new GCOS 8 operating system—and can continue to use existing peripherals.

Bring on the 80s.

DPS 8. Computer systems with horizontal and vertical growing power to help you ease into the 80s. Systems that feature state-of-the-art microprocessors and LSI circuitry.

A new operating system. And an expanded support capability, called Distributed Maintenance Services (DMS). All designed to lead the way into the growing world of distributed systems.

For more details, contact your Honeywell representative, or write: Honeywell, 200 Smith Street (MS 487), Waltham, Massachusetts 02154.

Honeywell

CIRCLE 20 ON READER CARD

CALENDAR

MARCH

Conference on Application Development Systems, March 9–11, Santa Clara.
For further information contact Mitch Zolliker, IBM Research, San Jose, CA 95121, (408) 256-7582.

Fifth West Coast Computer Faire, March 14–16, San Francisco.
The Computer Faire Conferences and Exposition will focus on inexpensive computing power for home, business, and industry. For further information contact Computer Faire, 333 Swett Rd., Woodside, CA 94062, (415) 851-7075.

APRIL

Peripherals 80, April 16–17, London.
An exhibition for professional purchasers of computer equipment. Details are available from Iliffe Promotions Ltd., Dorset House, Stamford St., London SE1 9LU, Tel. 01-261-8437/8.

Tenth Conference on Computer Audit, Control, and Security, April 28–May 2, San Francisco.
Jointly sponsored by IIA and ATC. Contact John Sheehan, The Institute of Internal Auditors, Inc., 249 Maitland Ave., Altomonte Springs, FL 32701, (305) 830-7600.

MAY

The Seventh Int'l Symposium on Computer Architecture, May 6–8, La Baule, France.
Contact Jacques Andre, Campus de Beaulieu, Avenue du General leclerc, 35042-Rennes, Cedex, France (99) 36 48 15.

JULY

SIGGRAPH '80, July 14–18, Seattle.
The Seventh Annual Conference on Computer Graphics and Interactive Techniques will include several technical sessions, introductory through advanced tutorials, a multimillion-dollar graphics equipment exhibition. For further details contact Harvey Krilloff or Bob Ellis, Conference Cochairman, SIGGRAPH '80, P.O. Box 88203, Seattle, WA 98188, (206) 453-0599.

OCR Expo '80, July 20–23, San Francisco.
The exposition will feature all types of scanners from desktop to standalone, point-of-sale devices, handheld wands, and associated supplies and services. Contact OCR Users Assn., 10 Banta Place, Hackensack, NJ 07601, (201) 343-4935.

SEPTEMBER

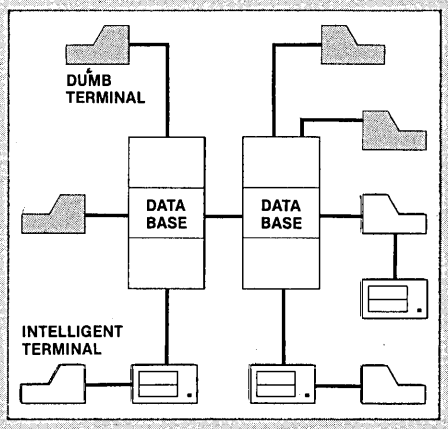
Eastern European Electronics Catalogue Exhibit, September 16–October 16, Warsaw, Bucharest, Sofia, Budapest, Prague.
A five-week, five-nation caravan. Exhibits will focus on production tools, test instrumentations, electronic components and hardware, computers for production, chemicals, and other materials. For complete information contact Harry Lepinske, Project Director, East-West Operations, ISCM, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

NOVEMBER

NEPCON Northwest, November 19–21, San Jose.
Leading authorities will present state-of-the-art developments in printed circuit, microelectronic, and semiconductor technolo-

Microcomputing comes of age.

Ohio Scientific's OS-65U Level 3 operating system software brings new networking and distributed processing capabilities to microprocessor based computer systems.



Until now, the only alternative for low cost multiple-user computer applications was time-shared systems. However, a serious drawback of microcomputer or mini-computer multi-user time-share systems is the fact that under heavy work loads they slow down to a crawl since the central processor time in such a system is shared by all of the users.

In a microprocessor based distributed processing system, using floppy based microcomputers as intelligent terminals (local systems) most of the work load is handled locally. Overall system performance does not degrade under heavy job loads. Each local system performs entry, editing and execution while utilizing the central data base for disk storage, printer output, and other shared resources.

For more demanding applications it is desirable to have several data bases, each with its own collection of local systems. Such an inter-connected set of data bases is called a network. Each data base and its local intelligent and dumb terminals is called a cluster.

Level III

OS-65U Level 3 now supports this advanced networking and distributed processing capability as well as conventional single user operation and time-sharing. Level 3 now supports local clusters of intelligent microcomputer systems as well as dumb terminals for the purpose of utilizing a central Winchester disk data base and other shared resources. The system also has full communications capability with other Level 3 data bases providing full network capability.

The system utilizes Ohio Scientific's low cost, ultra high performance computer systems throughout for intelligent terminals as well as data bases. This general systems configuration provides a cost/ performance ratio never before attained in this class of computer power.

Level 3 resides in each network data base. A subset system resides in each intelligent terminal. Each data base supports up to 16 intelligent systems and up to 16 dumb terminals. However, since dumb terminals can heavily load the system, they should be kept to a minimum. Level 3 also supports a real time clock, printer management, and other shared peripherals.

Data Base Requirements

Minimal requirements for a Level 3 network data base are a C3-C or C3-B computer system with 23 or 74 megabytes respectively, console terminal, 100K bytes RAM and a CA-10X 16 port I/O board for network and cluster communications.

Intelligent Terminal Requirements

Any Ohio Scientific 8″ floppy based computer with 56K RAM and one data base communications port.

Connections

Intelligent terminals and networked data bases are connected by low-cost cabling. Each link can be up to 10,000 feet long at a transfer rate of 500K bits per second, and will cost typically 30¢ a foot (plus installation).

Syntax

Existing OS-65U based software can be directly installed on the network with only *one* statement change! Level 3 has the most elegantly simple programming syntax ever offered on a computer network.

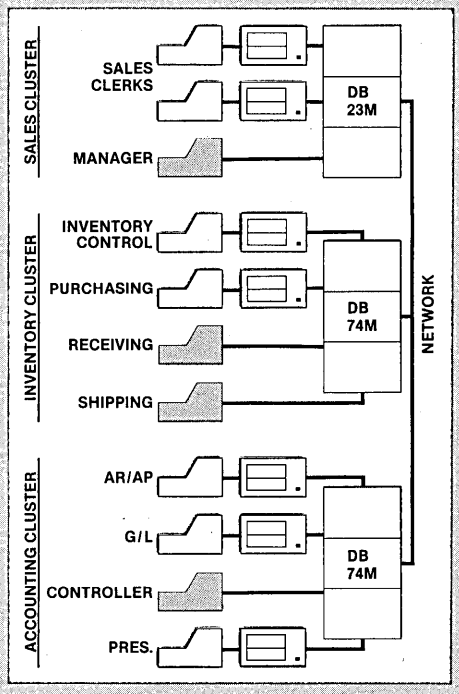
File syntax is as follows:

DEV A,B,C,D,	Local Floppies	} unchanged from single user and timeshare systems
DEV E	Local hard disks	
DEV K-Z	Specific network Data Bases	

Each of up to 8 open files per user can be from 8 separate origins. Specific file and shared peripheral contentions are handled by 256 network semaphores with the syntax Waite N

Waite N, close.

The network automatically prioritizes multiple resource requests and each user can specify a time out on resource requests. Semaphores are automatically reset on errors and program completion providing the system with a high degree of automatic recovery.



A Typical System

A typical system with two network data bases will have 148 megabytes of disk, four intelligent subsystems equipped with dual floppies, two dumb terminals, a word processing printer, a fast line printer, network data base manager software and 1000 ft. of interconnecting cable. Utlizing .7 MIPS processors throughout it will cost less than $50,000 plus installation. GT option computers (1.2 MIPS) can be utilized at a slightly higher cost.

One Step at a Time

Best of all, Ohio Scientific users can develop distributed processing systems economically one step at a time. A user can start with a single user floppy system, add a hard disk, then time-sharing, then a second Winchester data base for backup and finally cluster intelligent terminals to achieve a full network configuration.

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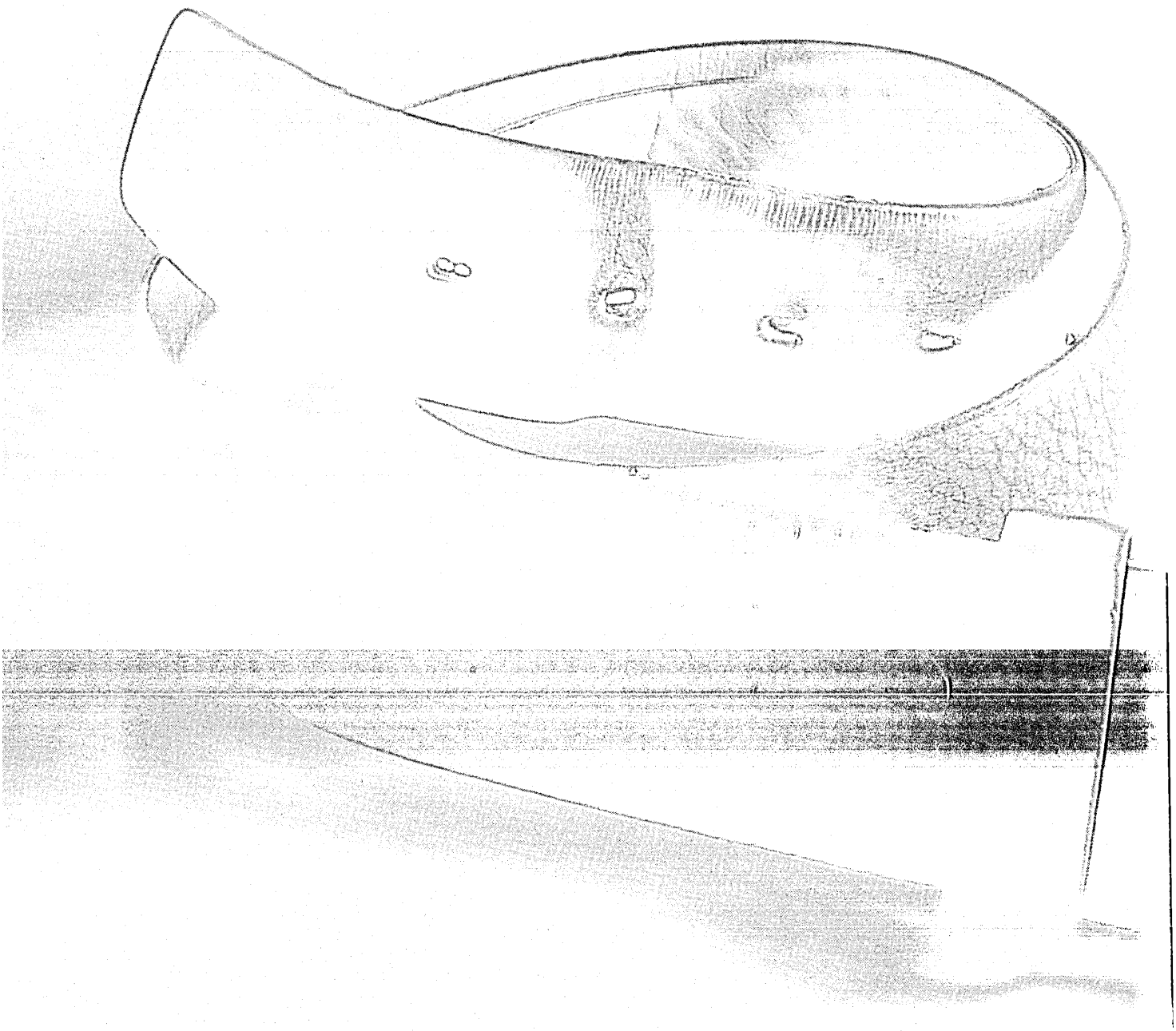
DDP from Northern Telecom: it's a perfect fit for all the different sizes you're going to be.



Most DDP systems can be expanded somehow. But keeping your system cost-effective as your company grows —that's another story. Northern Telecom Systems Corporation has a collection of ways to ease your growing pains that's hard to match. Take a look—and think about where you're growing.

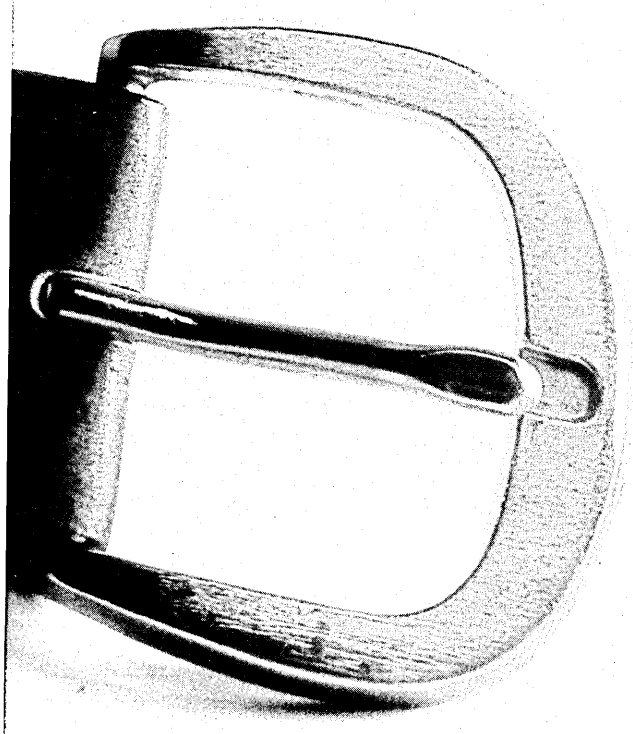
Starting small?

You can start a DDP system at any convenient size if you start with Northern Telecom. We have processors that work efficiently with just a single data station. Or with two. Or eight. Or sixteen. Upward compatibility makes it easy to use some of these processors in tandem.

Extra capability without excess capacity.

Our networking options let you link your processors for more processing power at the data station where it's needed. Easy access to all your processors means you won't have to buy excess capacity for peak loads in isolated places.

Our Multi-Task Operating Systems stretch the capacity of the data station still further. For example, each location can work on inventory, general ledger, receivables and order entry simultaneously. Even disk storage is unusually flexible—from .5 to 308 megabytes. So you never pay for more than you need.



We'll help you add big-time text-editing capabilities while a system is still small. So you can edit both files and programs in a speedy, simple way. Our text-editing ability saves programmer time. And it cuts the need for skilled people—because editing for any remote location can be done from any other location that has a programmer.

We speak your language.

You can start with any of four languages: COBOL, BASIC, RPG and TAL. And add any of the others whenever it becomes appropriate.

But it's not just our DDP systems that soothe your growing pains— it's our whole organization.

Right now, we can deliver state-of-the-art systems for Data Entry, On-Line and Remote Job Entry, as well as DDP. So when you work with Northern Telecom, one call can bring you factory-trained service for every part of your remote processing system.

The best reason to talk to us today is tomorrow.

Northern Telecom is combining data processing expertise with telecommunications expertise,—a mix no other company can match.

Today, it means better access to all the processing power you pay for. Tomorrow, it means a smoother transition to the single system that will meet all your processing and telecommunications needs.

Talk to Northern Telecom Systems Corporation. Where computers and communications meet.

For the office nearest you, call our Marketing Services Department at 1-800-328-6760. In Minnesota call (612) 932-8202. Or write Northern Telecom Systems Corporation, Box 1222, Minneapolis, MN, 55440.

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Northern Telecom Systems Corporation

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CALENDAR

gies. For further information contact Industrial and Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

CALLS

Papers are being solicited for the 1980 Summer Computer Simulation Conference, which will be held in Seattle in July. The theme will be the future of computer simulation. Three- to five-page summaries are due Dec. 1. Contact David R. S. McColl, 1980 SCSC General Chairman, Manager Military Spacecraft, Boeing Aerospace Co., P.O. Box 3999, MS 84-16, Seattle, WA 98124, (206) 773-1543.

Papers are being solicited for the 1980 Joint Automatic Control Conference, August 13-15, New York. Theme areas emphasized will be the frontiers in theory, application, and implementation of automation and control. The conference will cover all aspects of automation in the areas of: multivariable frequency domain control design, robust controls; the role of control in power networks; control for energy efficiency; large flexible aerospace structures; the automated factory including flexible manufacturing; distributed microcomputer systems; and digital control of automobile and turbofan engines. Two types of papers are being solicited: a) regular papers describing work in some detail; and b) short papers which present recent, perhaps preliminary, results. Authors should submit at least seven copies of regular papers and seven copies of a 700-word abstract for short papers marked "1980 JACC" by Dec. 1 to Dr. J. L. Shearer, 213 Mechanical Engineering Building, Penn State Univ., University Park, PA 16802, (814) 865-6377. Authors will be notified of selection by April 1.

Papers are being solicited for the 1980 Conference on Communications to be held in Seattle June 16-18. Original papers will be considered for the following disciplines: adaptive antennas, aerospace and electronic systems, antijam communications, communications command and control, communication electronics, communications software, communication switching, communication systems disciplines, communication and information theory, computer communication, data communication systems, electromagnetic compatibility, microwave theory and techniques, radio communication, social implications of technology, space communication, standards coordination and liason, transmission systems. Complete manuscript and abstract should be received by Nov 21. The author's name, complete address, and telephone number should appear on the abstract. Four double-spaced copies, in English, of the one-page abstract and manuscript (3,000 word limit) should be sent to one of the following: Asia—Dr. N. Kuroyanagi, Nippon Telegraph and Telephone, Musashino-Shi, Tokyo, 180 Japan (0422) 59-2882; Europe—Dr. M. Urien, CNET, Route de Tregastel BP 40 22301 Lannion Cedex, France (96) 38 29 15; South America—Dr. J.P.A. Alberquerque, Rau J. Carlos 90/AP. 402, 22461 Rio de Janiero RJ, Brazil; and North America and other regions—Dr. P.R. Metz, ICC '80, P.O. Box 88465, Seattle, WA 98188 (206) 773-2760.

Technical papers for the Fifth International Conference on Computer Communications, October 27-30, 1980, in Atlanta, are being solicited for presentation at the regular conference sessions and publication in the official proceedings. The conference will represent an interdisciplinary forum for discussing social, economic, political, and technological implications of computer communications networks. Six copies of all materials must be sent by March 1, 1980 to: Dr. J. Salz, Program Chairman, ICCC '80 Bell Laboratories 1G-509, Holmdel, NJ 07733. For further information contact Wayne W. Adams, Sperry Univac C2SE10, P.O. Box 500, Blue Bell, PA 19424, (215) 542-4673. ✲

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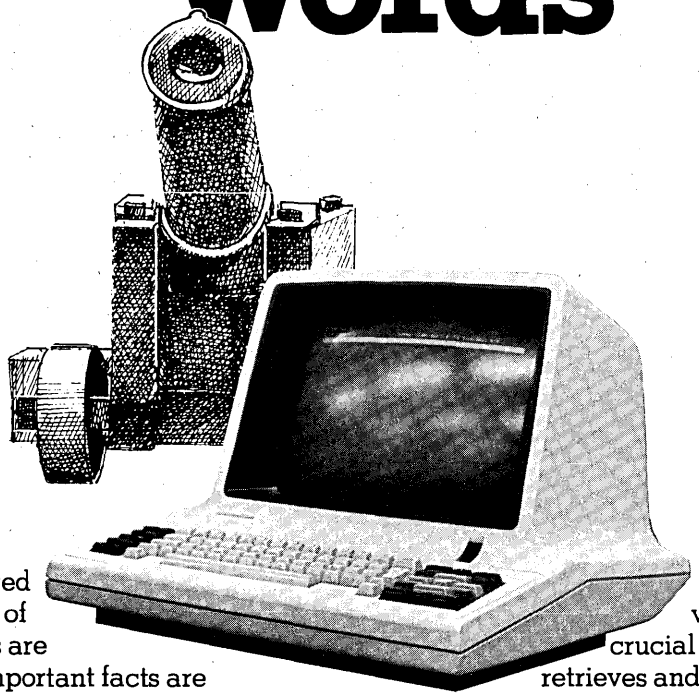
The war on words



Business is besieged by words. Hordes of wordy documents are overrunning it. Important facts are camouflaged by a smokescreen of irrelevent information. The casualties are mounting as office productivity advances at a painstaking pace. The costs in office support staff are reaching staggering proportions. Beleaguered managers are beginning to despair.

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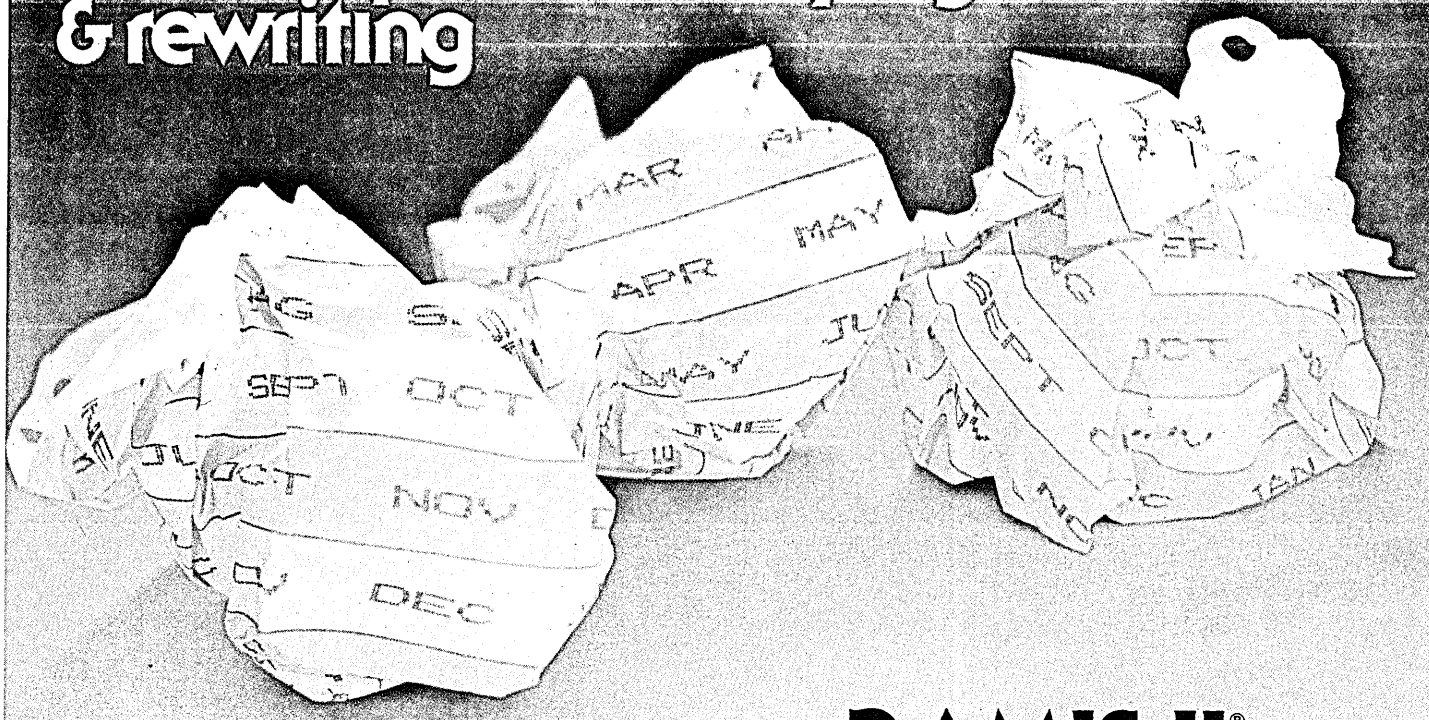

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Even though the average program has a life expectancy of only 14 months.

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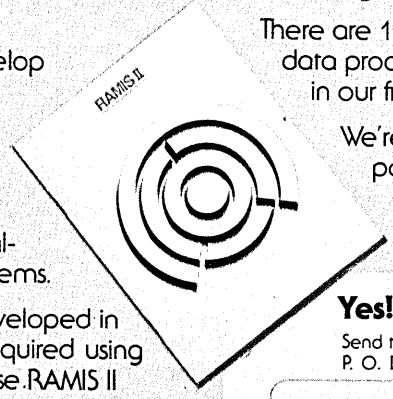

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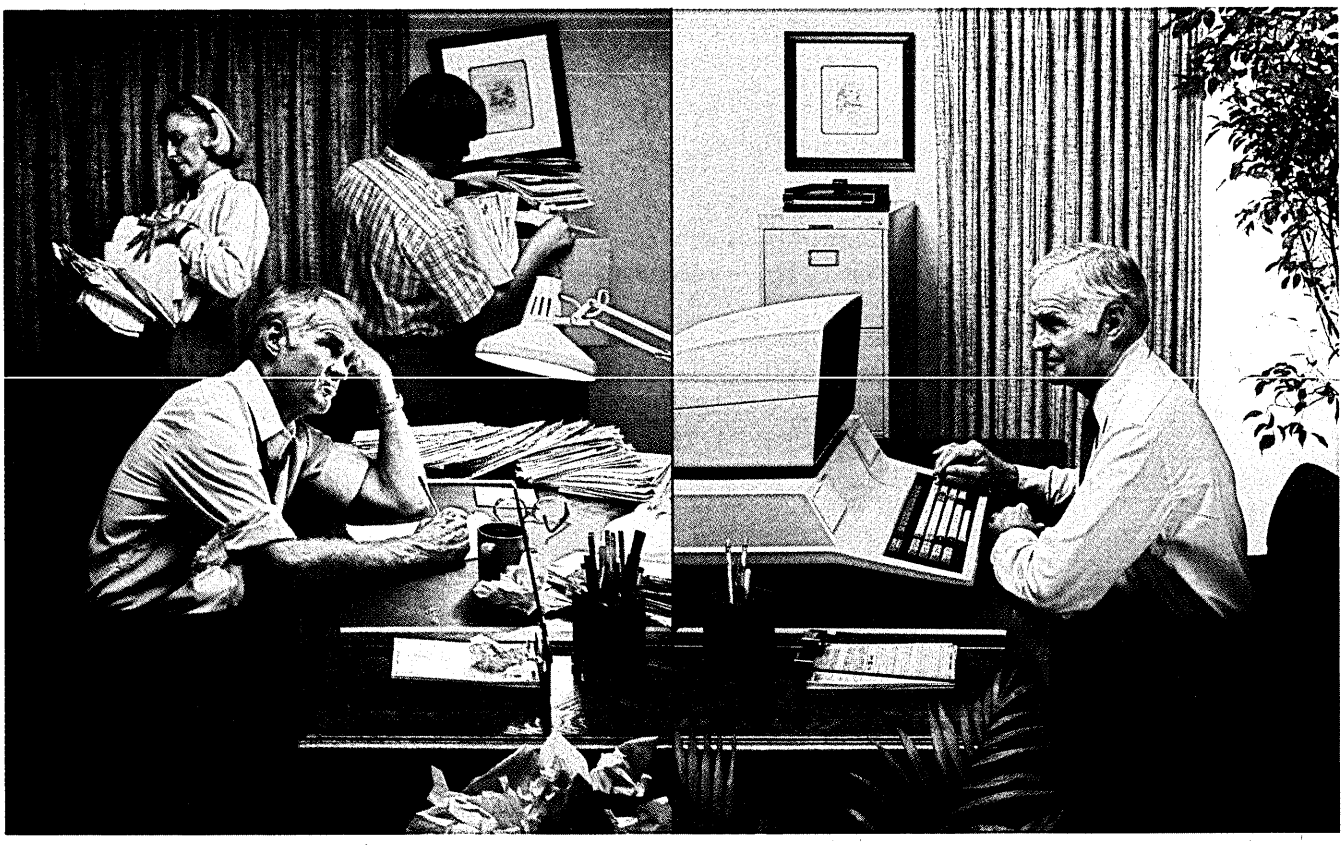

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The Model 771 desktop computer uses single-sided, single-density diskette storage for a total of up to 500,000 characters of instantly available on-line data storage. The DS990 Model 1 stores up to 4,600,000 characters using double-sided, double-density diskette storage, making it among the most powerful small business computers available anywhere.

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Solve your problems reliably and efficiently using small business computers from Texas Instruments, the company appointed the official computer and calculator company of the 1980 Olympic Winter Games. Contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7784, Houston, Texas 77001. In Europe write, Bôite Postale 5, 06270 Villaneuve Loubet, Nice, France.

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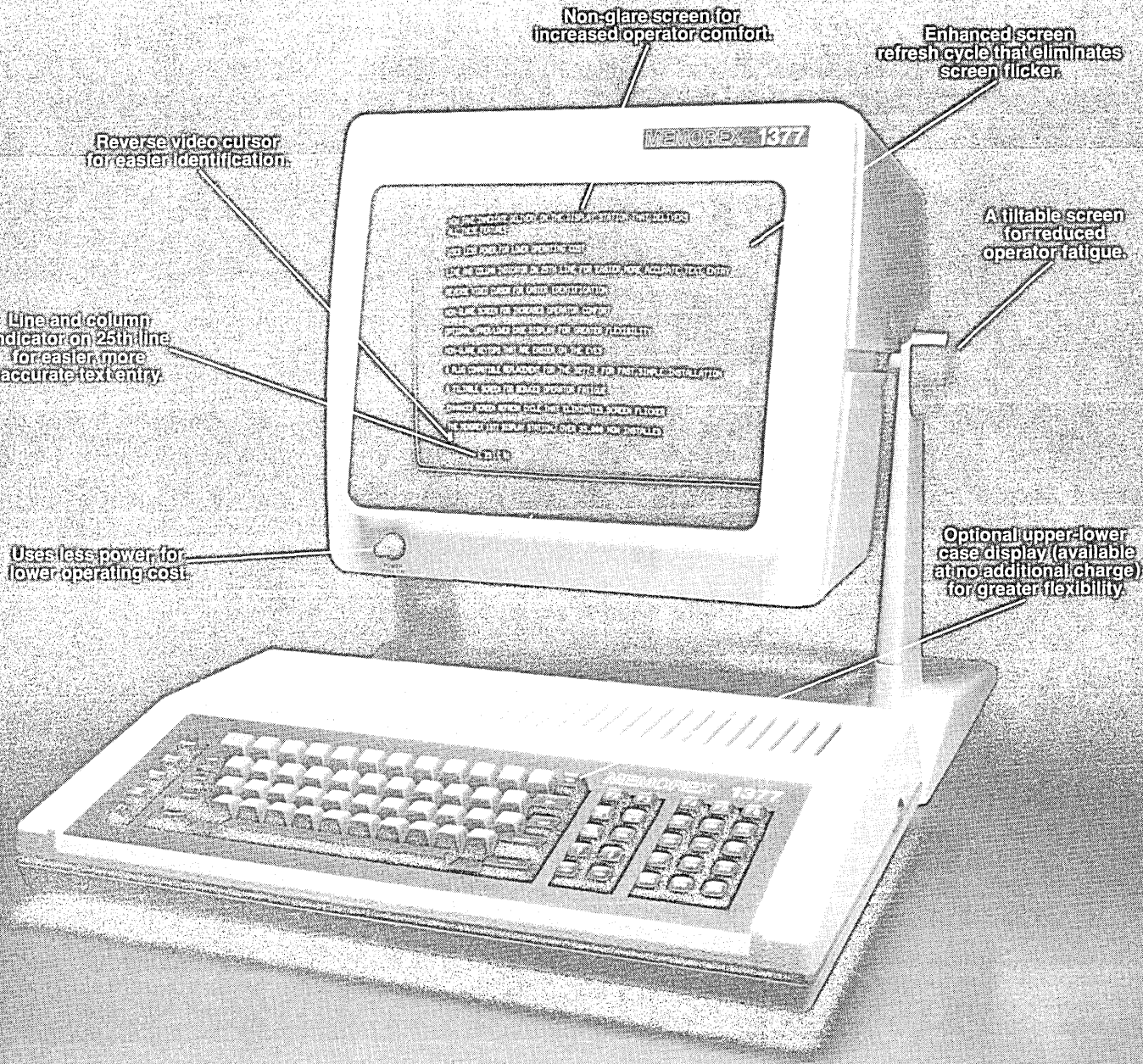

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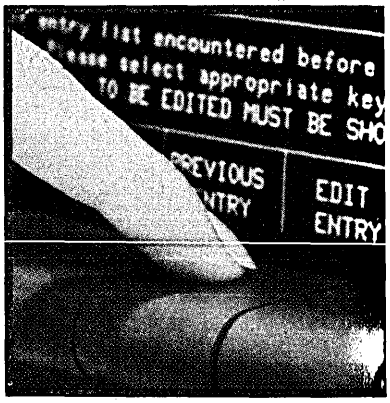
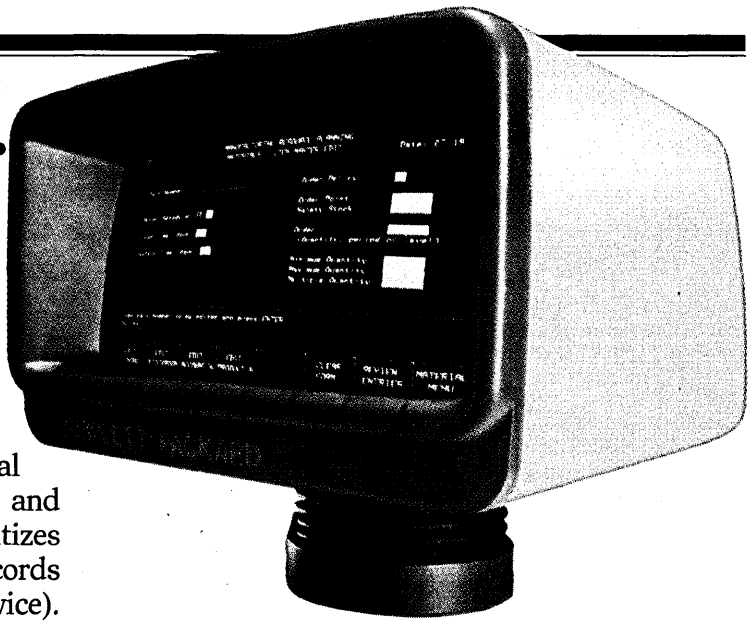


to be a business OEM.



Paying your way. Fast.

HP has designed two OEM software products with the manufacturer and distributor in mind. MFG/250 and OM/250 let you customize the system for improved inventory and fiscal management tasks—in a lot less time. So you can count a return on your investment sooner than you would have thought possible.

MFG/250 captures and maintains vital information about parts, inventory status, and cost. It automates bills of material, prioritizes stock and maintains accurate inventory records throughout the year (instead of only once or twice). So the manufacturer can get more complete control over his engineering, accounting, and materials information.

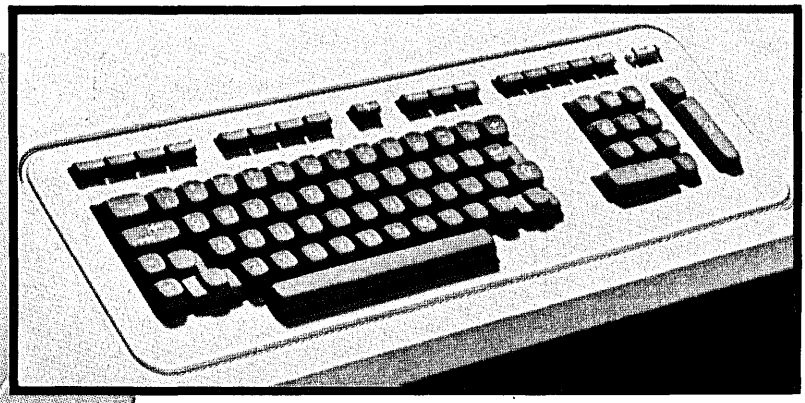
For better management of bottom line finances, HP has designed OM/250, an integrated, modular Order Management package. The Order Entry module, for instance, simplifies all types of order transactions, including multiple price breaks, exception posting, and even back orders. Other modules provide powerful capabilities for managing inventory and accounts receivable, as well as for sales analysis. There's also a special "configurator" program that helps you customize the machine even further.

Plenty of room for growth.

The HP 250 is designed to grow right along with your customer's needs. He can start small and build up, adding as many as five terminals. And with our new REMOTE/250, he can do everything at remote stations that he can do on the HP 250 itself, which may be in the next room, or across the plant. (You can use the remote terminals for programming.)

For more storage, the HP 250 can accommodate a 20 megabyte disc drive, and three printers give you a choice of hard copy options.

The HP 250 comes with full support, service, and documentation from Hewlett-Packard. With a complete system (including dual flexible disc and printer) for only $23,500, it really pays to be an HP 250 OEM. If you'd like a hands-on demonstration, give us a call at your nearest HP office listed in the White Pages. Or write for more information to Hewlett-Packard, Attn: Jerry Peterson, Dept. 461, 11000 Wolfe Road, Cupertino, CA 95014.



Price is U.S. list.

37901 HP FC6

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CIRCLE 30 ON READER CARD

ADVANTAGE: FLEXIBILITY

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Centronics' Model 730 miniprinter shatters the rules of the game. Greater flexibility than any printer is one of the reasons why.

APPLICATIONS FLEXIBILITY Now you can meet a wide range of applications requirements with just a single printer: the Model 730. Payroll checks on pre-printed continuous forms. Inventory listings on fanfold. Direct mail on company letterhead. General information on roll paper... and change from one to another quickly.

INVENTORY FLEXIBILITY Model 730's versatility means no more costly inventories of limited-use printers. Stock only one set of spares. One set of service tools. Train to service only one highly reliable machine.

INTERNATIONAL FLEXIBILITY To make your overseas marketing easier, international models of the 730 can print 96 character U.S., British, French, German, Italian, and Swedish/Finnish. Available in all standard international power requirements.

Here are more reasons why the Model 730 is the newest sensation on the circuit.

Its simple design ensures reliability. Combine that with an attractive purchase price and you have a very low cost of ownerlship.

Although it's surprisingly affordable, Model 730 sets new quality standards. Its 7x7 dot matrix produces crisp, clean characters, and its quiet, compact, and stylish design makes it welcome in any environment.

Best of all, because of Centronics' manufacturing capabilities, volume delivery is assured.

ADVANTAGE:MODEL 730 Model 730 leads the way to a whole new era. Naturally, it's from the leader: Centronics. No other company can match our strong serve in performance, selection, and value. And every Centronics printer is backed by one of the largest worldwide service organizations of any independent printer company.

On flexibility, features, price, and support, the Model 730 is a clear winner. For more information on products or employment opportunities, please write or call today: Centronics Data Computer Corporation, Hudson, New Hampshire 03051 (603) 883-0111.

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CIRCLE 31 ON READER CARD

LETTERS

RETIRING THE PHONE

Re: "Time to Retire the Telephone?" (August, p. 185): Mr. Marill provides economic justification for electronic mail (EM) on the basis of replacing a 4.8-minute phone call, requiring four tries to consummate, with a 1-1½ line (108 character) EM message requiring 1.3 minutes to compose, edit, review, and send. Many of his phone calls (before he had EM) should not have been attempted at all; he should have used standard three-part message forms, reserving telephoning for those occasions when time was of the essence, or when two-way communication was required. A reason that 38% of those Mr. Marill phoned refused to be interrupted might be due to their prior experience with his 1-1½ liners.

The telephone permits dialog, enabling questions to be answered immediately, and answers questioned. Such dialog is difficult to conduct by mail, electronic or otherwise. The "obligatory discussions" of health and meteorology, decried as telephone time wasters, serve as important social functions in developing the trust and understanding required for the effective functioning of organizations composed of human beings.

Since EM is so easy to distribute, it can be anticipated that copies of EM messages will be sent to many people having no need for or interest in them. Such "junk mail" will place a burden on its recipients. A portent of this phenomenon was seen when cheap copying technology increased the number of distributees of memos and other documents beyond the limits previously set by the legibility of the nth carbon copy of typewritten material.

EM can undoubtedly be useful, but Mr. Marill's economic justification of it is based on a comparison of the current system, inefficiently employed, with that of EM, used efficiently.

No fair.

EDWIN COHEN, PhD
Staff Scientist
Link Div.
Singer Co.
Binghamton, New York

Mr. Marill replies: Dr. Cohen puts forth some startling advice: according to him, people like myself who find the phone a frustrating and inefficient way to communicate should not be using the phone in the first place—they should be writing memos! I assume he is joking.

And yes, the phone allows questions to be answered immediately, but only if you can locate the other person, if you and he both have a phone near by, if his phone is not busy, and if he is willing to be interrupted.

Personally, I have never developed trust in anyone on the basis that he asked me how I was or what the weather was like.

I have been a heavy user of EM for several years. Despite Dr. Cohen's forebodings, junk mail is not a problem.

TAKING EXCEPTION

Re: Look Ahead (August, p. 17): The Independent Computer Consultants Assn. wishes to take exception to the comments of Tony Abbott. He implies that small, one- to five-man consulting firms provide a low level of service and are not dependable.

As a professional organization representing small consulting organizations across the country, we feel it is necessary to set the record straight. As in any industry, there are firms that do not adhere to strict professional standards. However, the vast majority do provide a valuable service at a reasonable cost.

Mr. Abbott claims they "are peddling their services at prices way below what they should be." May I suggest that in the very competitive marketplace of consulting services, prices are based on the free market pressures of supply and demand. Our members welcome the opportunity to freely compete with the giants of the industry.

In recognition of our responsibility to the business users of consultants, we have established a "Better Business Bureau" approach to regulation. Performance counts. Any person or company who has had a bad experience with consultants is invited to write the association. Where possible, we will mediate the situation and attempt to resolve any problems.

Members who violate our code of ethics will have their membership revoked. We want to provide the business community with the greatest assurance possible that a consulting engagement will be successful. It will take time to reach our goal. This is a positive first step. With cooperation and dedication we can do it.

STEVEN A. EPNER
President
Independent Computer Consultants Assn.
St. Louis, Missouri

ANOTHER ALGOL?

Re: "PASCAL Power," (July, p. 142): To judge the enormous success of PASCAL, it should be compared with the relative failure of ALGOL 68, which was designed at about the same time. Perhaps the two main reasons for the low acceptance of ALGOL 68 are the difficulties in implementation (as one implementor commented, "While PL/1 was our Fall, ALGOL 68 is our Purgatory") and the although very elegant and powerful but also very

"Gentlemen, our target date for this project will be . . ."

Meet the World Leader in Data Concentrators. Over 5,000 Units Installed.

Meet MICOM's Micro800 Data Concentrator, the statistical multiplexor which ended the TDM era. The Micro800 allows up to 16 terminals to share one telephone line more efficiently and more economically than ever before, and provides the added benefit of automatic error correction. And since it is virtually self-configuring, the Micro800 also offers *do-it-yourself* installation — no straps, jumpers, or 'kluge' headers to mess with.

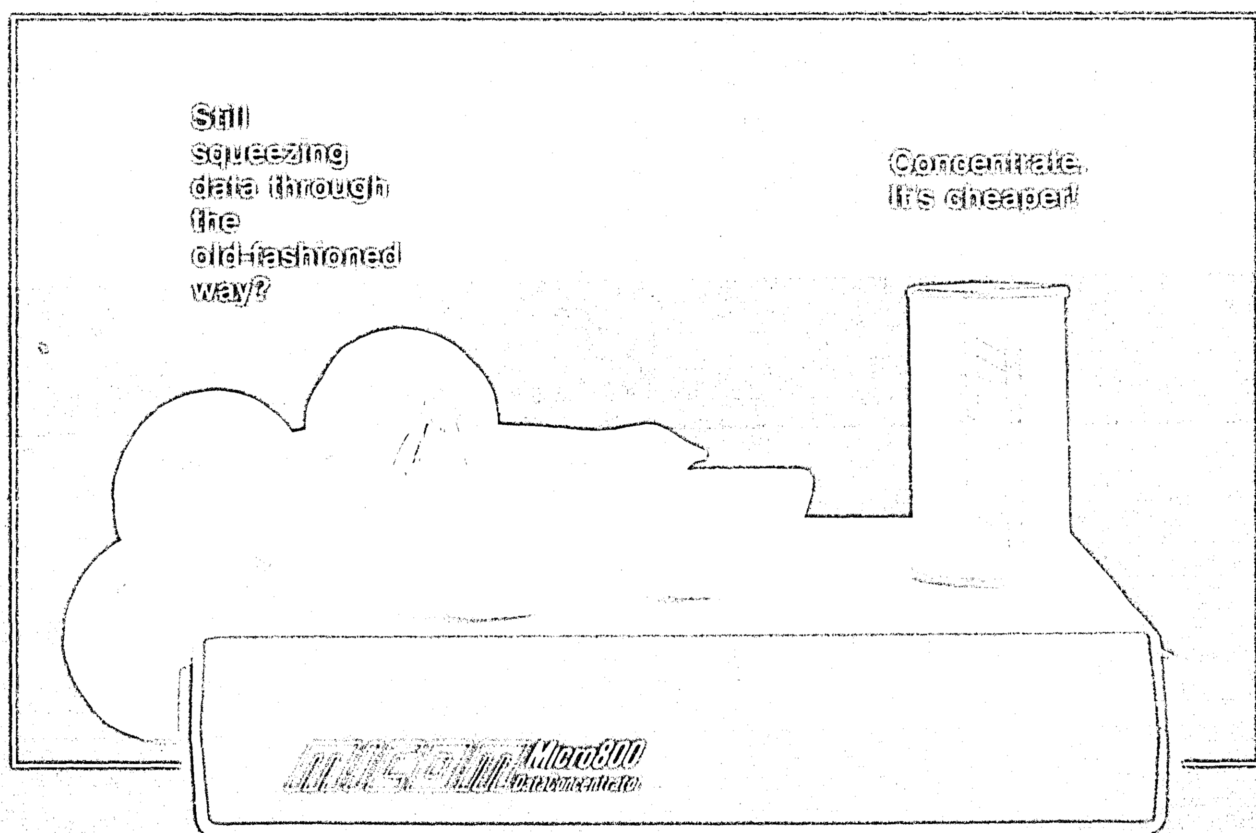
So if you have a time-share network and you think you can only afford error-controlled multiplexing to cities with more than 8 or 16 dial access ports, think again . . . and try our Autobaud feature, you'll like it.

Or if you have a large private data communications network, and you can't afford to provide direct network access in your smaller locations, the Micro800 can provide economical error-controlled multiplexing into your network concentrators for as few as two terminals . . . and software demultiplexing in your network nodes may be awfully attractive.

In particular, if you have a minicomputer system with several terminals in one remote site, you are probably paying a fortune in communications costs, operating the terminals slower than you would like, and learning to live with the occasional phone line 'glitch' which drives your CRT's crazy.

Why not talk with some of our Micro800 customers, supporting four 2400 bps CRT's on a single 2400 bps line, glitch-less! . . . and take advantage of our Hewlett-Packard, TermiNet* and DECwriter* options.

The Micro800 requires absolutely no changes to the hardware and software you have installed today, and prices start as low as $1160 for a 2-channel unit. So why not call and order a pair on a 30-day sale-or-return basis today. No strings attached! We *know* you'll love it.



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CIRCLE 34 ON READER CARD

LETTERS

hard to understand principles of the language. There are some signs the ALGOL 68 project was just too ambitious, but perhaps in 1988 things will look different.

It should also be noted that Niklaus Wirth, the father of PASCAL, did design several languages before: PL/360, a low-level language for the then-new 360; ALGOL W, and EULER, two evolutions of ALGOL 60, which all give evidence of Professor Wirth's sense for simplicity and clarity.

K. P. PIELNEIER
Konstanz, Federal Republic of Germany

CORRECTION INCORRECT

Re: Letters (May, p. 44 and August, p. 44): According to my experiences with ANSI COBOL on IBM hardware, Mr. Hutton's correction to Mr. Wagner's structured code is incorrect. I do not dispute Mr. Hutton's suggestion that MASTER-FILE should be read once before performing paragraph ONE-RECORD (see statement #500). But the previous statement MOVE LOW-VALUES... etc., becomes unnecessary and, in fact, would have unpredictable results. It is common knowledge —ANSI COBOL on IBM—that the record is not addressable until the first successful read has been accomplished. This was one of the nightmares of converting from COBOL-F to ANSI COBOL.

I would also add that Mr. Hutton's code would work, although the move statement, #400, would still be unnecessary if we were to assume that DATA-RECORD was in working storage and that statement #110, READ MASTER-FILE...etc., was coded as most efficient structured programming followers would code: READ MASTER-FILE INTO DATA-RECORD.

For reference, Mr. Hutton's recommended code was:

```
200  MAIN-LINE.
300  OPEN INPUT MASTER-FILE.
400  MOVE LOW-VALUES TO
     DATA-RECORD IN MASTER-
     FILE.
500  PERFORM READ-MASTER.
600  PERFORM ONE-RECORD
     UNTIL . . .
     . . .
     . . .
1000 READ-MASTER.
1100 READ MASTER-FILE.
     AT END MOVE HIGH-
     VALUES TO DATA-RECORD
     IN MASTER-FILE.
```

THOMAS E. OLECHNOWICZ
White Motor Corp.
Eastlake, Ohio

THE WILY HYPHEN

Re: A Survey of Remote Computing Services," (August, p. 100): We were pleased to be included. However, the listing of our company was technically incorrect. The vendor index identified us as "Com-Share," which was, in fact, our original name, but was discontinued in the early 1970s. Since then, the company has been identified by the registered trademark Comshare.

BRUCE ZEWE
Director of Corporate Communications
Comshare
Ann Arbor, Michigan

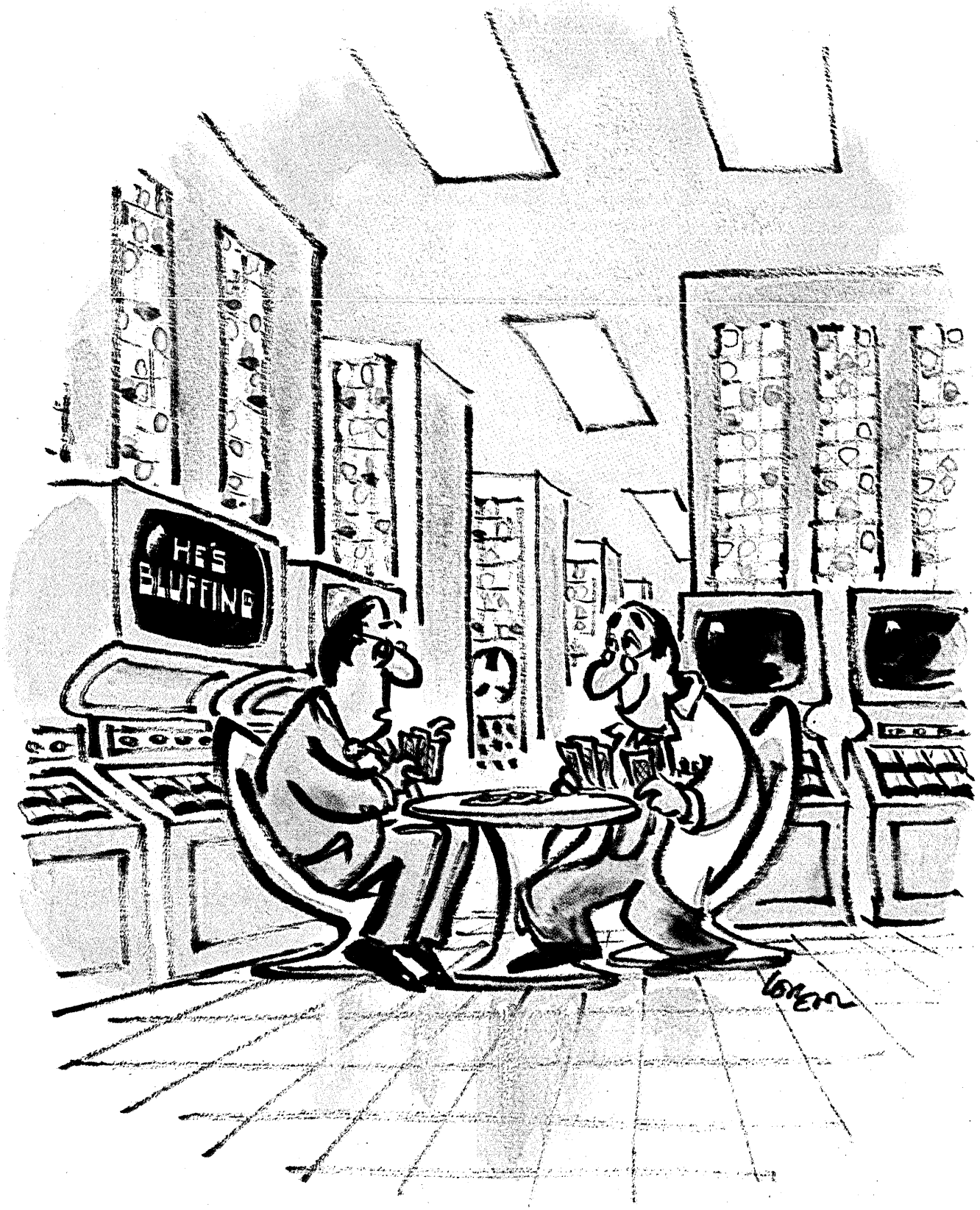
I would like to correct our company profile as it appeared in the survey.

As of October 1978, Datacrown Ltd. had acquired Systems Dimensions Ltd. The resulting firm, Datacrown Inc., rates 16th in size in North America.

Our shared processing environment, accessed by a transcontinental communications network, operates from two Systemcentres, with computing power equivalent to twelve 370/168s. Clients are serviced from 11 branch offices in the U.S. and Canada.

A. S. PUSTOWKA
Manager, Marketing Services
Datacrown Inc.
Willowdale, Ontario, Canada

Why our MARKLINK™ Terminal



"I don't know what you guys see in these computers..."

is how to use RCS best.

As a Data Processing manager, you've probably thought of Remote Computing Services (RCS) only in terms of functional applications such as financial analysis, problem solving and analytical forecasting.

But, now there's a computer services company that has expanded the scope and flexibility of RCS so that it can be of greater use to you.

The company is General Electric Information Services Company. And the reason we now can offer you this increased range of data processing capabilities is our new intelligent terminal, the MARKLINK Terminal. And MARK III® DDP. A fully integrated distributed data processing system from one supplier—General Electric Information Services Company.

Our intelligent terminal is a better means to more ends

What makes our MARKLINK Terminal so smart? Incredible versatility. In fact, it gives you local processing, distributed processing *and* timesharing capabilities, for either interactive or batch processing. Even more remarkably, you can use all of these capabilities *simultaneously.*

The more it does, the more you can do

By doing more, the MARKLINK Terminal opens up to you a whole world of computing possibilities.

Local Processing. As a minicomputer, the MARKLINK Terminal is ideally suited for local data entry, editing and storage. So, offices and factories can use it for everyday jobs such as local financial accounting, inventory control and order entry—without the expense of always being on-line to a large host computer.

Transaction Processing. The MARKLINK Terminal, accessing the host computers of General Electric Information Services Company, gives you the transaction power you need for large centralized data bases like master inventory files, consumer credit histories or international reservations information that must be continually accessed from multiple locations. And it does it more economically than simple timesharing.

Interactive Timesharing. The MARKLINK Terminal gives you direct access to our MARK III Service command system or our IBM compatible MARK 3000℠ Service. So, you can talk directly to the host computer for ad hoc reporting, program development and control of production runs.

Remote-Batch Processing. For scheduled daytime or overnight and weekend jobs like payroll and invoicing, large volumes of data can be captured and edited on the MARKLINK Terminal to be processed by our host computer on a delayed basis.

You even get more options

Another reason the MARKLINK Terminal is a better choice is the additional options it gives you. Like access to our extensive software library, including more than 1800 different programs covering key industry areas. You also get access to both Honeywell and IBM equipment, whichever best suits your needs. And the flexibility of both CRT and print capability.

Yet for more, you pay less

Your MARKLINK Terminal is linked to GEISCO's host computers by a single, synchronous 2400 baud communications line. This gives you high speed communications and flexibility at a low cost. Though you pay for only one line, its multi-stream capabilities can do transaction processing, timesharing, batch transfer—all at the same time.

The team behind the terminal

When you build your distributed processing around the MARKLINK Terminal, you get more than state-of-the-art hardware and software. You also get state-of-the-art services. Like a customer service desk that you can call 24 hours a day, 7 days a week. Like the attention of our technical support staff. And a training program that will give your people the documentation and expertise they need to get the most out of our services.

Who we are

We're General Electric Information Services Company. One of the world's leading companies in remote computing services.

We help make business more effective, more efficient and more profitable for our customers, over 5000 of them around the world.

If you'd like to know more about our MARKLINK Terminal, please send us the coupon below.

General Electric Information Service *is* how to use computers best.

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Information Services Company
401 N. Washington Street
Rockville, Maryland 20850
Dept. MC

Please send me more information on using the MARKLINK Terminal.

☐ Please send me your booklet.
☐ Please have your representative call.

Name_____
Title_____
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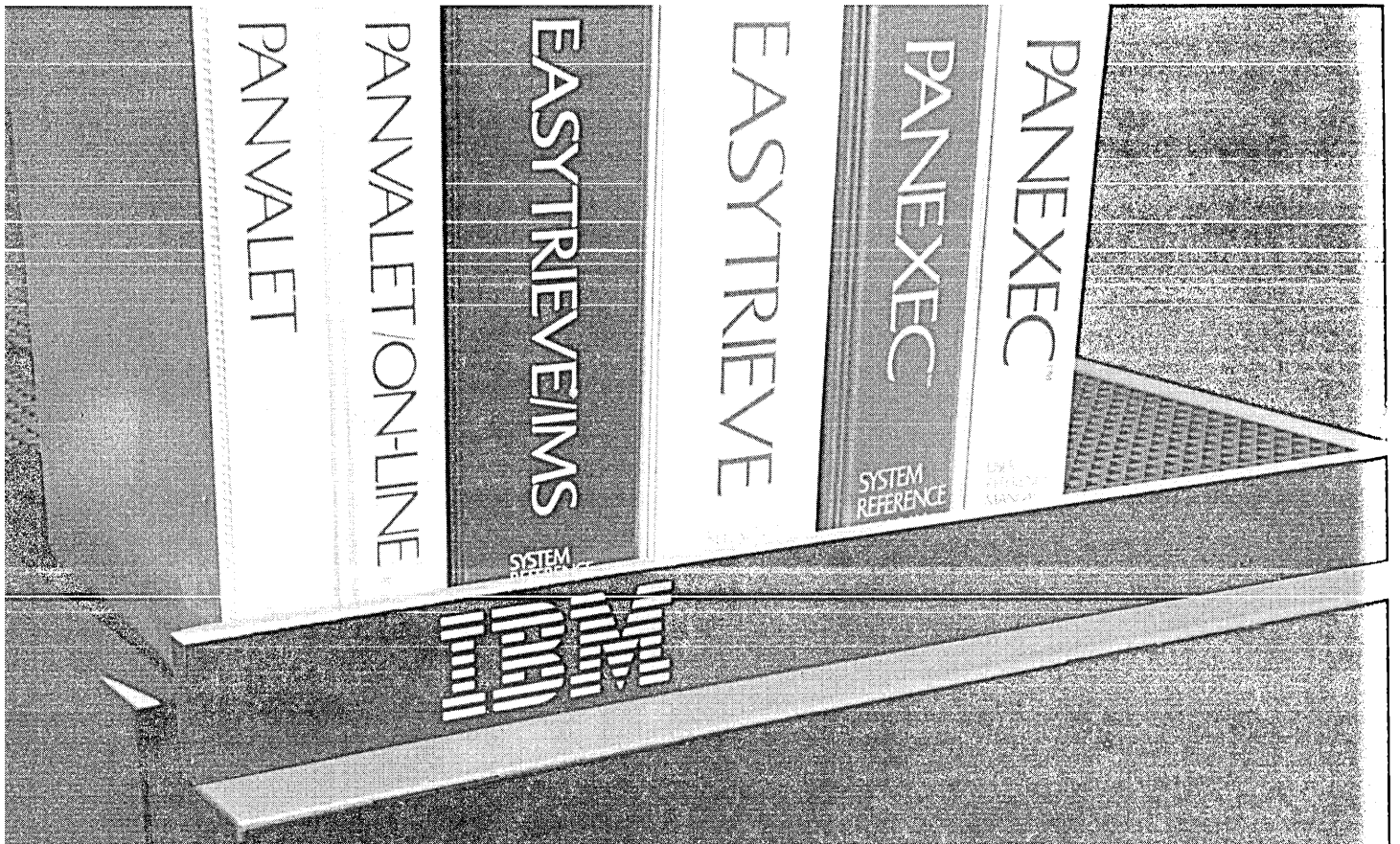
Company_____
Type of business_____
Do you have a specific application in mind? If so, please specify.

GENERAL ELECTRIC

CIRCLE 36 ON READER CARD



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Pansophic Systems, Incorporated has what you're looking for. Quality systems software and related products for users of IBM hardware.

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These products, and the many selectable units to each, represent quality and reliability in the software industry. And support of these products is second to none.

Across all industries, over 7,000 Pansophic products are in use daily, because they work and because they offer practical solutions to real problems.

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CIRCLE 37 ON READER CARD

"NCR's VRX is the best software product I've seen," says Stan Trawick of Bassett-Walker.

TRAWICK:
When we went to VRX (NCR's Virtual Resource Executive), our work-scheduling problems simply disappeared. Now, we run what we want to run when we want to run it. It is just a simple statement, but it makes a fantastic difference in the computer room. VRX is the best software product I've seen.

NCR's JOE KEPLEY:
VRX really takes the pressure off your operator. It will actually run up to 35 jobs at one time. It dynamically allocates memory and other resources. It oversees virtual memory swapping. It watches for memory thrashing and program loops. And adjusts the job mix to eliminate them, if they occur.

Stan Trawick (right) is computer systems manager of Bassett-Walker Knitting Co., Inc., Martinsville, Va. Joe Kepley is an NCR district manager.

TRAWICK:
And VRX gives us Online Program Development, a feature that has increased our programming efficiency tremendously. Recently, I received the printout produced by a modified program just two hours after I asked for the programming change. That's fast. Before VRX, we'd have needed at least a day.

NCR's KEPLEY:
TRAN-PRO (NCR's transaction processing software) has helped your programmers, too.

TRAWICK:
That's an understatement. When we decided we needed a sophisticated communications system, our programming staff had no communications background. So we were looking at a period of intensive programmer education. And that would have been followed by another lengthy period devoted to the development of basic communications software. With TRAN-PRO, our staff was able to move through these two stages rapidly and get directly into the application programming.

NCR's KEPLEY:
So you were able to sidestep the communications complications as you moved directly into application programming. Because TRAN-PRO handled the communications for you.

TRAWICK:
Yes. And it is all part of a larger picture. Our competitive edge in the sportswear industry is our ability to respond quickly to our customers. Because we are online, we can answer a customer's inquiry instantaneously. And we can ship an order within 24 hours of receipt. VRX and TRAN-PRO are real aids.

In the NCR office nearest you, there is an account manager like Joe Kepley who specializes in your industry and knows NCR systems, including VRX and TRAN-PRO. Learn how an NCR system can help you. Phone him at the local NCR office. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

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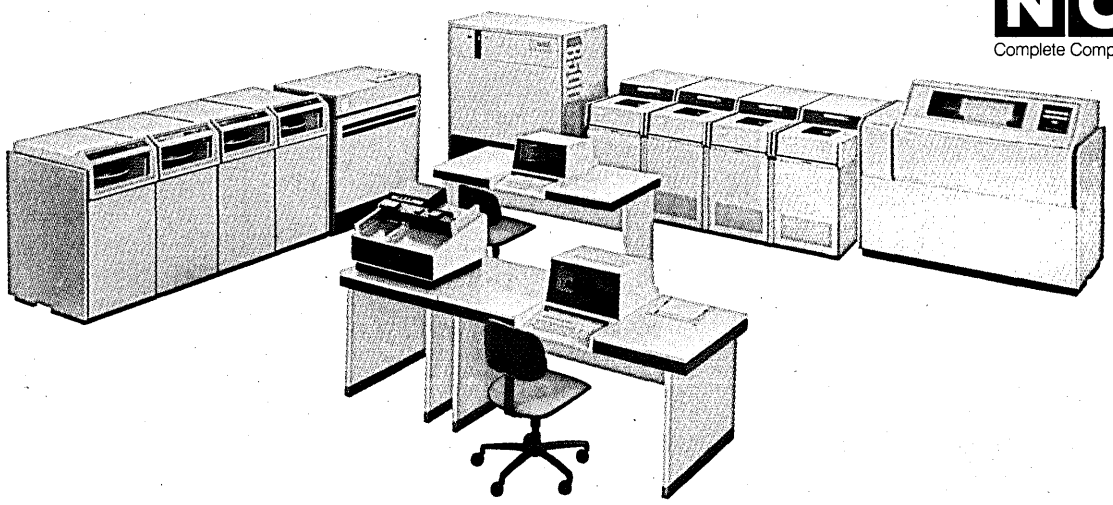
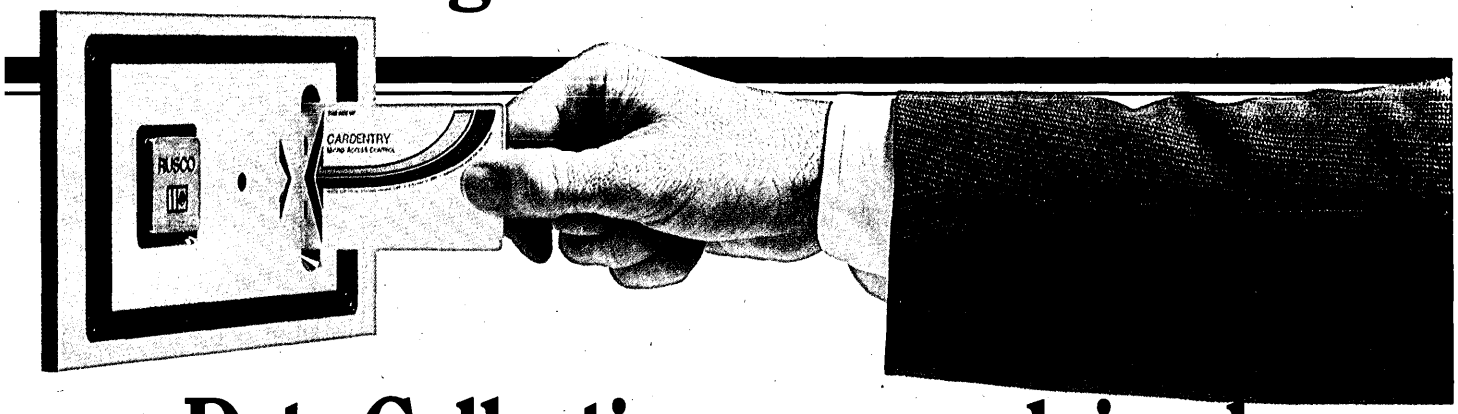
Complete Computer Systems



CIRCLE 38 ON READER CARD

Introducing the Identification Network.



Data Collection, pure and simple.

From the moment your employees entered the front gate until they left for home, they've always been on their own.

And no matter how dependable they were it's been almost impossible to hold them accountable for their actions and their whereabouts.

Accounting for the heretofore unaccountable.

The Identification Network from Rusco Electronics gives you accountability for people and facilities that you never thought possible. It monitors and reports employee whereabouts and actions. And gives you an accurate, immediate record of who, what, where, and when.

Now basic data entry is available anywhere. For instance, you can control the locking and unlocking of doors on a pre-programmed time schedule.

Parking lot entrances and exits can be tied into the Identification Network. So you can always find out if an employee is on the premises.

You can account for the use of the copying machine and know how many copies each employee makes.

You can create an electronic time and attendance log of your employees ins-and-outs for automatic payroll processing.

You can even restrict after hours elevator use. For certain key people and certain floors.

Those are just a few examples.

How the Identification Network works.

Each of your employees gets an Identification Network EntryCard™ with a personalized code. Each room or piece of equipment that requires accountability has a single, compact CARDENTRY™ reader.

You simply tell the Identification Network which employees are allowed into each room and which employees are authorized to use each piece of equipment.

If someone attempts to enter a room or use a piece of equipment that's off limits to them, the door will not open or the machinery will not work.

And a central printer immediately tells your security people that an attempted unauthorized entry has occurred, where it occurred, and when.

It's that easy to account for (and control) unauthorized access and activities. And that easy to save money.

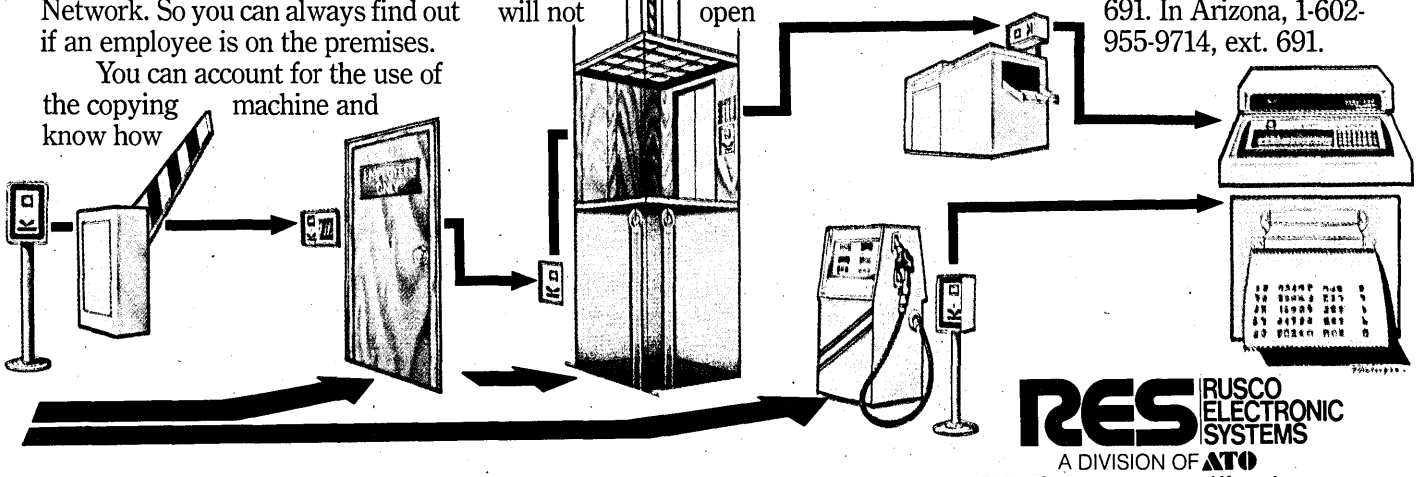
The most important control of all.

That, of course, is the ability to control losses.

The simple fact is, if you can account for detailed activities in areas where you lose money due to theft and misuse of materials, machinery and information, you can cut those losses dramatically.

That's exactly what the Identification Network does. It saves a lot of money. In a lot of places.

Call or Write: Rusco Electronics Systems, 1840 Victory Blvd., Glendale, CA 91201, 1-800-528-6050, ext. 691. In Arizona, 1-602-955-9714, ext. 691.



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A DIVISION OF ATO
We give you controlling interest.

CIRCLE 39 ON READER CARD

DPMA SHAKEN UP

Despite an earthquake, speakers at DPMA's international conference probed the future.

The Data Processing Management Assn. (DPMA), focusing on the future at its international conference and exposition in San Diego last month, was jolted into the present by a happening some eastern delegates will consider the most memorable of the meeting—a 6.4 (on the Richter scale) earthquake.

It sent many attendees scurrying from meeting rooms in the middle of sessions and it provided a promotional opportunity for The Mobiltape Co., which was taping the sessions and selling cassettes. The company edited tapes of sessions held during the quake and developed an earthquake tape made up of comments made by speakers immediately after the temblor. They offered copies of this tape free to persons buying five others.

Some of the comments:

"I don't know what to do so I guess I'll just keep on talking."

"I didn't think I'd said anything that earthshaking."

"I think that was an earthquake."

"Most impact I've ever had in any speech I've ever given."

But the conference settled down and returned to future concerns, first brought up by keynoter John Diebold, chairman and founder of The Diebold Group Inc., in the opening session.

Gradually, said Diebold, "questions of handling words, information and images are merging. We must begin today to think out policy. There is a need for an information policy in any organizational unit to deal with volume, complexity and speed."

He said few organizations have an information policy today and those that do exist are narrow. "There must be a change in management focus from control of operations to a planning mode. Converging technologies demand a shift in management guidelines to how to plan, not just what to plan. It's a question of supporting management goals."

How should the information policy for the '80s be developed? Diebold suggests:

"Gather information ... intelligence work ... create executive awareness.

"Next, develop a notebook of scenarios ... do an impact study ... take inventory.

"Draft an information policy and establish an information policy task group.

"Implement an information policy ... Reorganize. Form new cadre teams composed of information specialists. Maybe you need a chief information officer."

In a panel session titled "Visions of the 1980s," Dr. Harold Fleisher, IBM Corp., talked about technology. "In the '60s," he recalled, "we could get 10 components on a chip. We're rapidly approaching the capability of putting one million components on a chip.... The cost per gate in 1965 was 30 cents. In 1985 it will be less than 1/10th of a cent."

He said the memory trend in the '80s will continue to be semiconductor, "but there are on the horizon the kinds of technology associated with cryogenic devices." For the late '80s he looks for increased use of Josephson technology and read-only holographic storage materials, principally for archival purposes.

Dr. John Poduska of Prime Computer Inc. sees robotics "coming into its own" in the next decade. "It's going to be a major growing industry, a major investment opportunity." He hopes for a growth in financial modeling.

"Few organizations have an information policy today and those that do exist are narrow."

"Do not expect miracles overnight," he warned. He doesn't believe there will be great advances in the development of operating systems in the '80s. He feels that evolution of languages will be "substantial" but will not have great impact. "By the middle '80s, 75% of the programs written or ever written will still be in FORTRAN or COBOL."

Dr. Ulf Fagerquist, Digital Equipment Corp., sees the '80s as the time to move from problems of managing data to managing information flow. "It's a challenge. Make all those distributed computers provide information flow."

Dr. Efrem Mallach, Honeywell Information Systems, said, "distributed data processing will not necessarily solve your problems it will simply distribute them." He believes that "five years from now we're not going to be selling minicomputers for business data processing any more." What he sees being sold instead are customized general purpose systems built around minis.

In a session on "Data Base Management Systems and the Minicomputer," Gerry Cullen, Datapoint Corp., looked to the future. "Five years out we have no idea what's going to be on the drawing board ... It's a process of evolution. We're on a course hell bent to protect the applications dollar." He said the time will come "when processing power is essentially free."

Cullen talked about the small busi-

ness computer buyer. "He's pragmatic. He wants to be able to fix it with a hammer. He's the harbinger of the future. He treats machines like turret lathes."

John P. Imlay, Jr., Management Science America, Inc., Atlanta, sees the electronic home as "the major battlefield of the future." And he thinks IBM will be there. "We anticipate computer stores, retail, with IBM on the door."

Imlay's session was titled "Unlimited Potential in Business Leadership for the Data Processing Professional Through Information Technology." He predicted the '80s "will be the decade of information technology . . . And information technology touches every American every day."

Cullen worried that "our know-how is not keeping up with our gear." He talked about dispersed data processing systems which he said "have grown up. They need data base management systems. What we need is data independence, the ability to address by what you need rather than where it is."

"The time will come when processing power is essentially free."

In a session on "Distributed Processing—Planning by Objectives," William S. Finkelstein, Security Pacific Bank, said distributed processing really is "computer power to the people." He said most minicomputer vendors "don't sell you all the pieces you need to put the thing (distributed data processing) together. IBM doesn't really have a very good approach to distributed data processing. Maybe the 8100 would be okay if they ever delivered one."

Robert Derounian, Schlegel Corp., Rochester, N.Y., believes there are people problems associated with distributed data processing. "People problems are holding

DPMA WILL CHANGE AWARD TITLE: DAVIS IS LAST "MAN"

DPMA's last computer sciences "Man-of-the-Year" is a woman.

In presenting the 1979 award to Dr. Ruth M. Davis, newly appointed by President Carter as Assistant Secretary of Energy, George R. Eggert, DPMA international president, said she was the last to win the award with its present title. He said the organization's executive council would be changing the title "in the next couple of weeks." He didn't say what the new title would be but it's certain the word man won't be in it.

This change is reflective of some of the comments made by Dr. Davis in her acceptance of the award. She described the field of computer science as new enough to "have none of the old impediments. There is a greater percentage of women and minorities."

She recalled her first management job back in 1958 when she was in charge of installation of a command and control system for the Navy. "The admiral had a rule: 'no women on my staff.' " The job required her presence on site 24 hours each day. "He finally relented and allowed me to be there during the day but there were no ladies rooms. I had to walk two blocks. He was adamant about nights." She staked out a closet and surveillance crew. Warned whenever the admiral came around, she would hide in the closet until he left.

"It was with great pride in 1973 that I watched my husband's daughter board a carrier as a computer scientist to check out a system. Except for the fact that she was a pretty girl, little notice was paid."

Dr. Davis likes the newness of the computer science field for another reason. "It's possible to indulge in reminiscences of the early days without being called senile."

She recalled programming on the SEAC back in 1951 when she was a student at American Univ. "Now I have a terminal in my office and a typewriter terminal at home." She said morals and ethics as well as technology were different in the early days. "In writing our SEAC report we worried about use of the word sexidecimal. We decided we shouldn't use it and used hexidecimal instead."

DR. RUTH M. DAVIS—Last man of the year.

Dr. Davis thinks the dramatic increase in computer power over the past two decades is a good thing but she worries that "you don't get the feeling of raw power. The profundity of intellect is missing. What we build around the computer makes it possible for anybody to use it. I'm concerned that the transparent power should never be missing to those of us in the science called computer science."

She believes that "we are nowhere near to using the full power of a computer. There has never been a theoretical proof of a limit of intellectual or logical power of the computer. Not taking advantage of it would be a travesty of our own power."

The world, she said, "advances principally through changes brought about by technology. Technology advances principally through instruments and devices, mostly from the computer field."

Dr. Davis sees uses for computers in her new field of energy. "For the future of nuclear power, showing that things can be made safe comes down to real-time control systems."

Prior to her new appointment, Dr. Davis was Deputy Under Secretary of Defense for Research and Technology, Office of the Secretary of Defense. Before that she was Director of the Institute for Computer Sciences and Technology, National Bureau of Standards, Department of Commerce.

Earlier positions included: associate director for research and development for the National Library of Medicine, National Health Institute; director, Lister Hill National Center for Biomedical Communications; staff assistant for National Intelligence in the Office of the Director of Defense Research and Engineering, Department of Defense, and director, Operations Research Div. of the Applied Mathematics Laboratory, David Taylor Model Basin, Navy Dept.

While with the Navy Dept., she developed the "Davis Projection," a modified Mercator projection designed to meet specialized geographical needs for a ship tracing system. She also originated a large portion of the logic for the application of computers to solve nuclear, command-control, communications, intelligence and reconnaissance problems.

She holds three degrees, all summa cum laude: a bachelors in mathematics, physics and economics from American Univ.; a masters in mathematics and physics, and a doctorate in applied mathematics and physics, both from the Univ. of Maryland.

—E.M.

us back. There are conflicting attitudes. Data processing shouldn't be telling manufacturing that stock status is more important than cost monitoring. We're there to serve the user. The technology for distributed data processing has been around for a few years. People, not machines, will make it a reality."

Datapoint's Cullen would like to include word processing in a dispersed environment, but "word processing people are not exactly in love with data processing people."

Imlay of MSA believes "word processing very quickly will evolve into a data processing function."

And keynoter Diebold said word processing should be a part of his advocated information policy for the '80s. He feels too that the policy should consider consumer interfaces, "direct electronic dialogue."

Fleisher of IBM said the '80s will see "data processing capability expanding in a wide range of applications in the consumer environment."

In the midst of the future gazing, Dr. Norman Sondak, San Diego State Univ., who moderated the "Visions of the 1980s" panel, chose to look back. The '70s, he said, have been the decade of the microcomputer, distributed data processing, word processing, structured design and programming, and the development of information systems as an educational major and profession.

Diebold said the creation of chief information officers and/or information management organizations could do much "for individual careers, for this profession. It's an opportunity."

Paul Armer of the Charles Babbage Institute worried about professional obsolescence and what to do about it. He believes "the real solution is the sum of a large number of things." One of the things he favors is self-assessment procedures and he would like to see the Institute for the Certification of Computer Professionals (ICCP) turn all of its tests into self-assessment tests. He said feedback could be provided which show a person who has taken a test what his weaknesses are.

Armer, who several years ago added to the Peter principle (that all men tend to rise in an organization until they reach their level of incompetence), the Paul principle (men tend to reach levels of incompetence in jobs in which they once were competent), had a new one. "When people ask me why the world isn't coming apart if the Peter and Paul principles are true, I give them the Mary principle. Behind all men, precluded by society from subjectability to Peter and Paul, are women. They're keeping the world from falling apart."

But not from shaking a bit.

—Edith Myers

LITIGATION

IBM WINS AGAIN

Federal judge rules Transamerica failed to prove IBM violated antitrust laws.

"This is an innovative and highly competitive industry," said IBM chairman Frank T. Cary, when he learned last month that IBM had won its sixth major antitrust case in a federal court in San Francisco. "Those who allege otherwise are refusing to face reality."

The case was the one brought against IBM by Transamerica Computer Co., a division of giant Transamerica Corp. Federal Judge Robert Schnacke ruled that Transamerica "has failed to carry its burden" of proving that IBM violated the Sherman Antitrust Act.

The judge added, "It is unwise policy for the law to coddle competitors, especially if the protection comes at the expense of destroying a larger firm's incentive to compete. Even companies that choose to enter dominated markets must be prepared to face competition on the merits."

Transamerica said it would appeal the judge's ruling. In the five other cases, only one has finally been resolved. Telex Corp. settled out of court after a decision in its favor was reversed. Greyhound Computer's case is being retried in February. Suits lost by Forro Precision, Inc., California Computer Products, Inc. and Memorex Corp. are still in the appeals stage.

The decision in the Transamerica-IBM case followed by several months an earlier ruling by the Ninth Circuit Court of Appeals in California, upholding a directed verdict against CalComp in its unsuccessful antitrust suit against IBM. CalComp, on losing that appeal, has filed for a rehearing.

Transamerica Computer had filed its suit in December of 1973. The trial began five years later, in December 1978, in U.S. district court in San Francisco, with the selection of a jury. The San Francisco-based firm claimed that IBM's actions in the marketplace had caused the leasing company to lose $36 million in revenues and future profits, plus $51 million in additional profits, for a total of $87 million. It asked for trebled damages of $261 million.

Transamerica charged IBM with engaging in monopolistic practices from 1968 through 1973, alleging the company had the power to control prices or exclude competition in three markets—for general purpose computer systems, plug-compatible disk drives and controllers, and compatible tape drives and controllers. Many of the issues in this case thus were the same as those thrashed out earlier in the Memorex, CalComp, Greyhound, and Telex cases against IBM, as well as the Justice Dept.'s case in New York City. Both the CalComp and Memorex cases ended in directed verdicts by the judges.

Said to have been anticompetitive were IBM's pricing on its 2319 disk drives, Aspen (the 3420) and Mandan (2401-8) tape drives; the designs of those products, as well as the 370/115 and 125; and the long-term lease plans FTP and ETP.

The plaintiff, which dropped out of the IBM 360 mainframe leasing business before getting into plug-compatible peripherals, charged IBM with prematurely announcing the 360s back in April 1964 in order to deter users from ordering from other mainframers. It was further alleged that the 360/44, 67, and 90 were dropped from the IBM product line once competitive models were withdrawn from the market by the other mainframers. These machines were thus said to have been announced to protect an alleged monopoly share of the market and showed a "willful acquisition or willful maintenance of monopoly power" by IBM, one of the things the plaintiff had to prove.

IBM attorney William W. Vaughn of O'Melveny & Myers in Los Angeles, in his summation, denied any monopolistic behavior by the defendant, citing the existence of technological progress as an indication that competition existed in the

Transamerica alleged that IBM had the power to control prices or exclude competition in three markets.

industry. He spoke of improvements in disk access times and mainframe speeds, of dramatic reductions in hardware prices, and said, "... I suggest to you, ladies and gentlemen, that IBM may be the defendant in this case but it's competition that's on trial. Transamerica really complains about competition."

Vaughn also brushed aside the contention of Transamerica lead attorney Richard J. Lucas, of the San Francisco firm of Orrick, Herrington, Rowley & Sutcliffe, that the IBM 2319 disk drive was not a technological advance but only an interim product developed to impact adversely on the PCM's. Transamerica contended that IBM, having a large installed base of 2314 drives, came out with the 2319, which was described as a repackaged 2314. It then dropped the price of the new 2319s, creating a financial barrier for the PCM's, who had to price below IBM, while maintaining the same higher

price for the already-installed 2314s. "You have to really be a monopolist to be able to have that much control (over a market) and be able to juggle things around that way," charged Transamerica's Lucas.

The pricing issue was important to the Transamerica case, and Lucas worked it over in depth. He charged IBM with failing to include the cost of capital in its pricing strategies. He said IBM reused parts of older machines, but did its cost accounting in such ways as to stay flexible in its pricing. He was also critical of its revenue apportionment schemes, which he also said provide IBM with "undue flexibility" in the pricing of its products. Lucas spoke of IBM's arguments before the Federal Communications Commission about Ma Bell's revenue apportionment, in which IBM charged AT&T with assigning a cost to a regulated part of its business but not to an unregulated portion and thereby being in a better position to compete effectively with unregulated companies. And yet, said Lucas, the same IBM that complained of AT&T's revenue apportionment schemes resorts to similar schemes in its own pricing strategies.

But while the Transamerica attorney was critical of the 2319s, referring to them as the crudest IBM action against the PCM's, he said FTP, the fixed term leasing plan, was perhaps the most subtle, perhaps the most devastating action against PCM's. He said IBM adopted FTP on the basis of an incomplete analysis at a time when it had no good disk or tape drives to counter the competition. It chose to use FTP instead, although the company had no history of offering long-term leases in its marketing. And it applied FTP only to the peripheral products facing competition, nothing else.

Part of the Transamerica evidence on this was a memo informing top management that FTP had cut IBM profits by $102 million and recommending that prices of other products be increased to offset this. This, Lucas contended, was the very thing that IBM criticized the phone company for doing, subsidizing one activity so that prices could be cut elsewhere. And that, he added, is what IBM shortly did. It increased mainframe prices from 4% to 8% and maintenance charged by an average 20%.

"It's clear that IBM knew before FTP that the plan would bring PCM prices to the death level of the PCM's," Lucas charged. "Because they knew how much the PCM's had to discount and they knew they couldn't maintain that discount after FTP."

IBM's Vaughn discussed pricing strategies, showed how prices were determined, and referred to documents in evidence that revealed profits on specific products. One of these showed the 2319 was expected to produce revenues of $227 million and a profit of $72 million, a hefty 31%. The 2319s were expected to have some impact on older 2314s, but the document also showed the introduction of the 2319B would still increase IBM's overall revenues by $157 million and profits by $62 million, or 39%.

Vaughn also refreshed the jurors' minds on what IBM calls its postannouncement phase reviews, a review of product performance in the marketplace. He said the 2319A, introduced in September 1970, was reviewed two years later and found to have had a profitability of 40.2%. The 2319B two years after introduction had a 34.1% profitability, and the 2319 family as a whole at the end of 1978 netted out at 28.4%.

The fixed term plan (FTP) was perhaps the most subtle, perhaps the most devastating action against PCMs.

As for FTP, the IBM attorney said, that was a reasonable response to competition. Long-term leases were being offered by the PCM's and IBM felt it, too, had to offer the same. After all, the PCM's were acquiring an increasingly larger share of the market. Besides, FTP was profitable for IBM and certainly not the loss leader characterized by Transamerica.

—Edward K. Yasaki

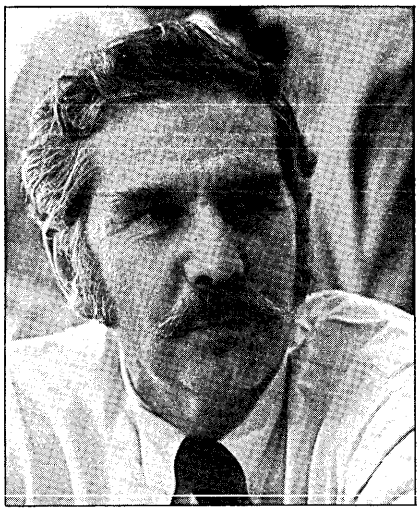
MAINFRAMERS

THE NEW COMPUTER COMPANY

Acquisition of Itel business puts National Semiconductor in the computer systems business in a big way.

In the waning months of 1978, IBM users began holding off on new computer orders in anticipation of the so-called E Series. Affected by this withdrawal of buyers from the market were not only IBM, itself, but also such vendors of IBM-compatible mainframes as Amdahl Corp. and Itel Corp. Orders were just difficult to come by.

The long-awaited announcement came at the end of January in the form of the 4331 and 4341 mainframes. Still, the pent-up demand that hardware vendors had been anticipating did not show up in the form of new orders. Users saw the attractive price-performance levels of the new 4300s, reasoned that IBM's next announcements of mainframes, the H Series, would be similarly low-priced, and changed their buying ways. Outright purchases were replaced by leases. Used mainframes were substituted for new hardware. All this in anticipation of a new and larger family of computers, announcement of which is not expected until early next year.



CHARLES E. SPORCK—Uninterrupted support to Itel customers.

Hardest hit by all this has been Itel Corp., the San Francisco-based financial services/leasing company. The firm, which earlier this year announced it had stopped construction on a 100,000-square-foot plant in San Diego, Calif., to manufacture its own computers, began last month transferring its computer marketing force to National Semiconductor Corp., which has been a supplier of IBM-compatible mainframes that Itel marketed as the Advanced System family.

Acquired by National were Itel's computer marketing and field engineering operations in the U.S., Canada, Europe, and Singapore, which leaves out Japan, Australia, and Latin America. Also not taken over is Itel's service bureau operation.

Between 1,500 and 2,000 people in Itel's Data Products Group were to be transferred to a new, wholly owned subsidiary of National, which also will buy Itel's warehoused inventory of computers, add-on memories, and peripherals, which at the end of June was valued at some $120 million. These are both National- and Hitachi-made mainframes. No value has been placed publicly by either party on these transactions. Under the agreement, Itel retains all assets and liabilities associated with its computer activities in the areas specified in the agreement. Negotiations relating to Hitachi's agreement with Itel were said to be underway between Hitachi and National.

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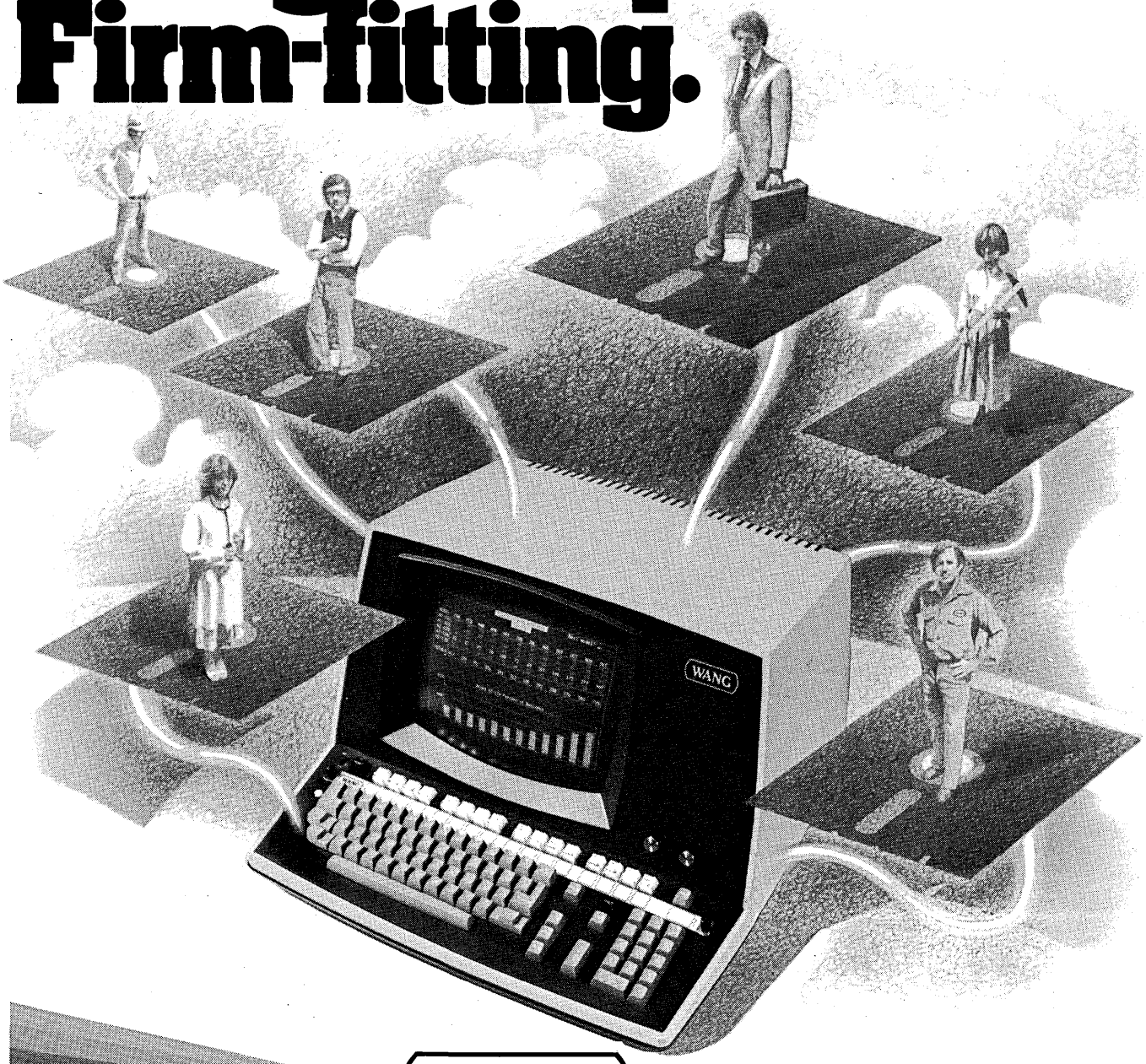

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ITEL: THREE YEARS WITH THE AS SYSTEM

October 1976	Announces Advanced System family of mainframes, the AS/4 and AS/5
November 1976	Receives first production unit from National Semiconductor, verifies AS/5 compatibility with the 370/158
March 1977	Ships first unit to a customer, an AS/5 to Pacific Mutual Life Insurance, Newport Beach, Calif.
June 1977	Announces Itel-Hitachi joint effort in large-scale systems
August 1977	Announces joint agreement with Siemens to develop laser printer
October 1977	Announces first Hitachi machine, the AS/6
November 1977	Announces the AS/7031
June 1978	Ships 100th AS processor to a customer, an AS/4 to Security Life of Denver
September 1978	Announces the AS/3 models 3 and 4
October 1978	Announces the AS/6-2
November 1978	Forms AS users group, CHOICE
December 1978	At the end of 1978 the company had 230 AS computers installed worldwide, of which 190 were installed during the year
February 1979	Announces the AS/3-5. With some models dropped from the line, current production includes the AS/3-5, AS/7031, AS/7031 AP, AS/6, and AS/6-2
March 1979	Installs first AS/7031, at City of Fort Worth, Texas
April 1979	Announces joint agreement with Hitachi to develop and produce a series of large-scale mainframes
April 1979	Announces installation of more than 300 AS processors worldwide
July 1979	Announces the AS/7 model 7033 and AS/8 model 7034 from Hitachi

the new operation, the results of the operations transferred will be for Itel's account, losses to be repayable to Itel from any future profits. In addition, Itel will advance up to $7.5 million of net working capital required by the subsidiary through 1980. Additionally, National releases Itel from future commitments to purchase computer equipment, and procedures are

Close to 2,000 Itel people were to be transferred to a new National subsidiary.

established to pay off an Itel account payable to National. Of course, National assumes Itel's maintenance and service obligations on its existing installed base.

"This step by National will provide immediate full-scale marketing and service for our IBM-compatible products," said National president Charles E. Sporck, "while providing uninterrupted support to existing Itel customers for their computers and peripherals."

Each year for the past seven, Itel had recorded new records in revenues and earnings. Last year sales came to $688 million, profits to $47 million. Revenues from the computer operations, which includes the financing of systems, field engineering, and data services, came to $486 million, far more than the $191 million from its transportation activities, which includes the leasing of containers, railcars, ships, airplanes, and trucks. But in terms of earnings before taxes, the transportation group contributed $58 million, while computing brought in only $33 million.

Indeed, the company in its institutional advertising has been touting its amazing growth, which it credits to its "success in capital equipment leasing with innovative marketing ideas." Using a thorough knowledge of the tax laws, peppered with more than a passing acquaintance of accounting, the company installed IBM System/360s at customer sites like mad, took a bath on them when the 370s came out, but survived it to do the same with large-scale 370s. Its portfolio of installed machines are mostly 155s, 158s, 165s, and 168s. And most of its installed AS machines are of the 158-and-above range in performance.

Last May, after the public became aware of deep troubles in Itel, vice president Ken Hunt of the Data Products Group spoke optimistically of the PCM business in his office 30 floors above San Francisco Bay. He readily acknowledged that the fall-off of business began in the fourth quarter of 1978 and that orders were slow also in February, March, and April of this year. When asked whether Itel would have to reduce its prices because of the price-performance of the newly announced 4300s, he replied, "We've had to become a little more creative."

It was a typical Itel answer to a reporter's straightforward question. It's like asking whether the new computers would be painted red or blue and being told it wouldn't be red. Somehow one inevitably came away from a visit to Itel feeling the need to clear cobwebs out of the old skull and asking, "What did they say?"

But in June the company indicated that for the three months ending June 30 it looked like there would be a $10-million loss from operations. A few days later Richard Lussier, who headed the Data Products Group, resigned. The extent of the second-quarter loss subsequently was tabbed at $60 million; the financial problems on the computer side of the house, it turned out, also affected the transportation side. New business entered into in the last two years, things like manufacturing its own computers and railcars, were

Most of Itel's installed AS machines are of the 370/158 and above range in performance.

scrapped or the ventures sold off. Two cofounders of the company, chief executive officer Peter Redfield and vice chairman Gary Friedman, resigned in August. And now, apparently in settlement for all the computers made by National Semiconductor but never shipped or paid for by Itel, the two companies have reached some kind of settlement.

It puts National into the computer systems business in a big way.

—Edward K. Yasaki

BIG NEW LINE FROM HONEYWELL

Company follows IBM into the separately priced operating system software market with DPS offerings.

Honeywell Information Systems reshaped its large scale product line and followed IBM into the operating system software market last month when it announced four new processors and a new, modular, separately priced operating system, GCOS 8—the face of HIS for the '80s, according to corporate spokesmen.

Honeywell is conceding to the advocates of centralization with a bigger big machine, DPS 8/70, described by the company as twice as powerful as Honeywell's largest previous system, the model 66/80—even as it underscores its own philosophical commitment to decentralization with a communications-oriented GCOS 8 designed to ease remote host implementation. All four new machines—the DPS 8 series—were introduced as part of HIS's Distributed Systems Environment.

The company also unveiled two new single channel mass storage processors, two new dual channel mass storage processors, and a new 1.1 billion byte disk storage device, which transfers data at 983,000 bytes per second. Use of mass storage processors with the new DPS 8 machines or the existing Level 66 or 66/DPS systems is said to optimize data transfer

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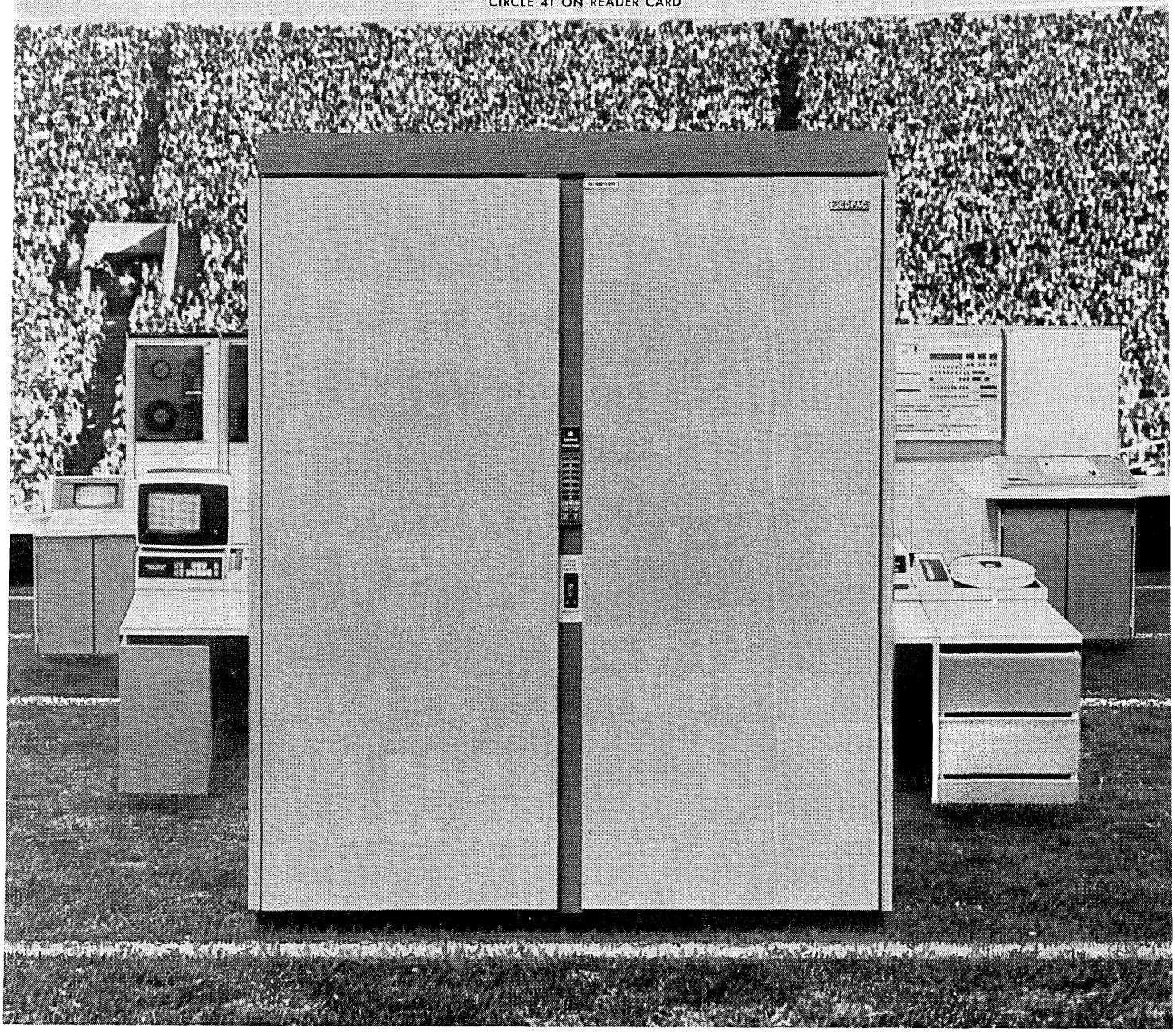


between the mass storage and the I/O multiplexor of a central system, with microcoded controller programs providing "significantly greater throughput."

The four fully-compatable DPS 8 systems expand the range of large systems previously available at both the high and low ends of the HIS Level 66 and Level 66/DPS line with improved price/performance benefits, although the vendor claims

Whole DPS 8 line makes extensive use of microprocessors, LSI circuit elements, and enhanced logic packaging techniques.

no significant technological advances in the announcement.

The smallest of the four new processors, the DPS 8/20, is designed as a free-standing or remote host system and is described as offering roughly twice the "performance value" of IBM's 4331 or one-third greater power than a similarly configured model 66/10. With memory expandable from one to four megabytes, the DPS 2/20 can be configured with up to two front-end processors with either the Datanet 6641 or the 6651 front-end network processor, and is field-upgradable to the higher performance DPS 8/44.

Honeywell's new mid-range system is the DPS 8/44, described as equal to the 4341 in performance value and offering 50% more power than the DPS 8/20, with similar memory options. Both the DPS 8/20 and the DPS 8/44 take advantage of bit-slice microprocessor technology in certain execution units. The whole DPS 8 line makes extensive use of microprocessors, LSI circuit elements, and enhanced logic packaging techniques at the board level to provide cost, performance, space and energy benefits for the user, according to HIS. (The 8/20, for instance, offers a 50% reduction in power consumption and BTU output, and takes up about half the floorspace of a 66/10.)

One level up from the 8/44, the vendor now offers the DPS 8/52, which it describes as roughly equal in performance value to IBM's 3031—or, more than two and a half times as powerful as the DPS 8/20. It consists of a free-standing central system composed of one cpu, one system control unit, one megabyte of main memory and one I/O multiplexor with 35 channel function slots, expandable to 54 slots. Memory can be expanded up to eight megabytes and the 8/52 will support two front-end network processors and two system consoles, each perhaps with a printer and two crt's.

Like the two smaller DPS 8 systems, the 8/52 and the top-of-the-line DPS 8/70 are paired: the 8/52 is field upgradable to the 8/70.

The DPS 8/70 is described by Honeywell as offering slightly less performance than the IBM 3032 in its single processor configuration, with power "roughly equal" to the 3033 in its multiprocessor configuration.

The free-standing 8/70 consists of one cpu, one SCU, one megabyte of main memory and a 35 slot I/O multiplexor. The I/O multiplexor can be expanded to a maximum of 54 channel slots, and a maximum of eight Datanet 6641 or 6651 front-end network processors can be supported. Honeywell will provide multiprocessor configurations with up to four DPS 8/70 systems.

All four DPS 8 systems will operate under separately-priced versions of the existing GCOS III or the newly announced GCOS 8 operating systems, although the DPS 8/20 will be offered to new customers with the GCOS 8 OS only. Initial shipments of the new systems, scheduled for second quarter, 1980, will have GCOS III OS, with GCOS 8 available in the third quarter. Programs created to run under GCOS III, including file systems, can be run unchanged under GCOS 8.

Pricing for basic central systems—including cpu, I/O multiplexor and one megabyte of main memory—is $149,048 (five-year rental, $3,693/mo.) on the 8/20; and $225,500 (five-year rental, $5,249/mo.) on the DPS 8/44. On the DPS 8/52, the five-year rental charge is $13,020 monthly and purchase price is $556,791. On the DPS 8/70, the rental is $26,617 per month over five years, and purchase price is $1,156,791. In the multiprocessor configuration of the 8/70, additional processors can be rented at $20,431/mo. over five years or purchased at $892,232.

—Vin McLellan

DOES IT FLY?

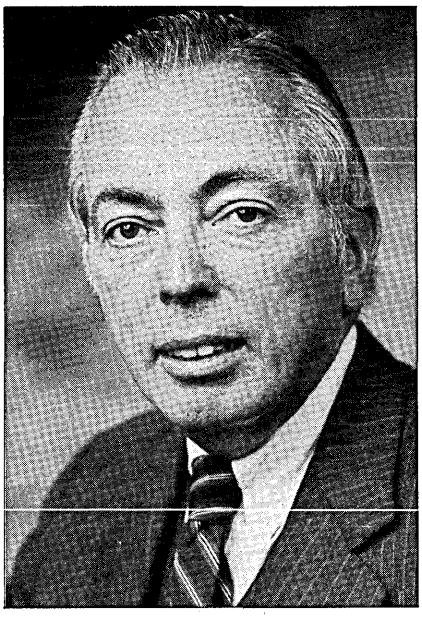
Users of Xerox' CP-V operating system want to know how Honeywell's CP-6 is doing.

Control Program 6, Honeywell's successor to Xerox' CP-V operating system, drew the lions' share of attention last month at the 31st annual meeting of Exchange, the user group representing the former Xerox Data Systems customer base.

Users of CP-V were there to see if CP-6, which has been installed at three beta test sites, lives up to promises made for it when it was announced in July 1976.

"More than half of our CP-V sites worldwide are represented here," said a Honeywell spokesman.

Prior to the meeting, the Exchange technical committee had sent 43 questions and recommendations to Michael J. Keliher, Honeywell's vice president and general manager, Marketing Services and Information Systems Div. Many concerned CP-6 and Keliher commented on some at the meeting.



RICHARD R. DOUGLAS—His seventh Exchange meeting.

"With CP-6, we still have a good deal to do. We are proceeding to implement it on the full range of newly announced Honeywell products (see p. 56) and have stepped up the pace."

One of the technical committee's comments was: "We believe that CP-6 should be able to act as a terminal to IBM networks."

"An interface to IBM networks is a candidate for Release 3," said Keliher.

Keliher noted that this was his first Exchange meeting. Dick Douglas, vice president and general manager of Honeywell's Large Information Systems Div., proudly pointed out that it was his seventh. "I've been coming every year since that harmonious meeting in San Diego." That was the one immediately following Xerox' pull-out from the general purpose computer business.

He too talked about CP-6. He said average installation time at the beta sites has been three days. He paid tribute to Shel Klee, who resigned as director of Honeywell's Los Angeles Data Center Sept. 1 (September, p. 105), saying Klee had played a key role in CP-6's reaching established goals on time. "There was regret on both parts," he said of Klee's leaving.

Klee's successor at LADC, Dick Litschgi, talked about CP-6 at the Exchange meeting. He said work is "well underway" on Release 2 which will include transaction processing, delegation of authorization, auto sharing of run units and terminal coupling. He admitted that "the

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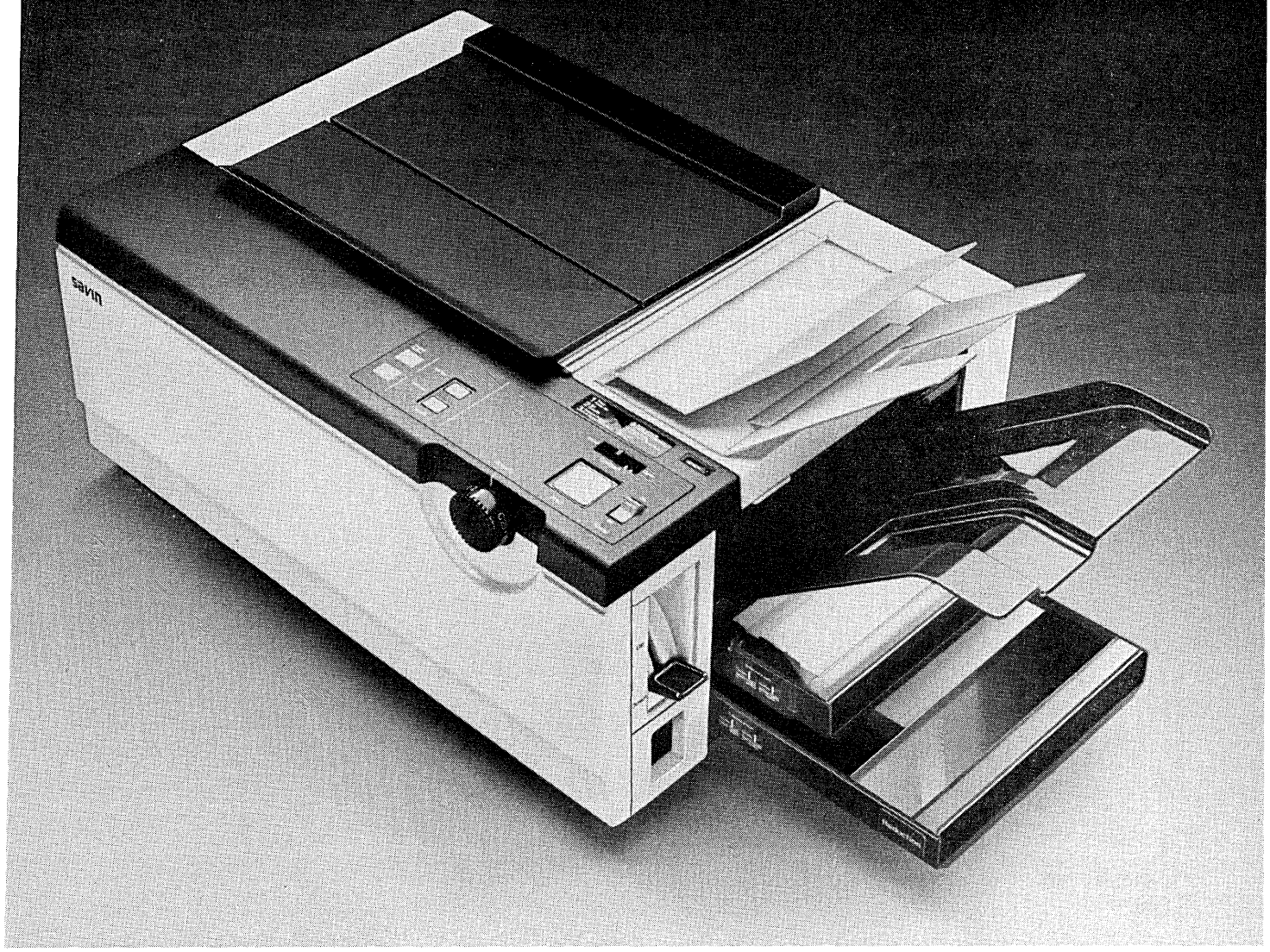

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CIRCLE 42 ON READER CARD

FORTRAN 77 compiler is late."

Later at a panel of beta site users, Dave Sutherland of Carleton Univ., Ottowa, Ontario, Canada, in response to a question as to other alternatives considered, included the HP 3000 and drew laughter. "They can deliver FORTRAN," he quipped.

Dave Peters of Honeywell ex-

"An interface to IBM networks is a candidate for Release 3."

plained CP-6 conversion (from CP-V) to a standing room only crowd in a not-too-well ventilated room. "Our goal," he said, "was to make it 50% as difficult as conversion to anything else. It's much like CP-V in terms of terminal personality."

He advised users doing conversion to "analyze, organize, educate, plan, implement and involve some of us. There is a group of people in Phoenix who will act as conversion consultants. They came to us from Xerox. Get us involved early. Develop a CP-6 connection. We will hold on-site conversion seminars."

Beta site panelists seemed to be tentatively pleased. Sandy Panzarella, president of Science Dynamics of Torrance, Calif., asked why he had elected to use CP-6, said: "Our second Sigma had just been installed when Xerox got out of the business. Now we're out of capacity. We needed something for the future. On paper the system (CP-6) looked like the answer to our problem. And we're 20 minutes away from LADC."

George Gorsline of the Univ. of Toronto Library Automation System, answering the same question, explained, "we have a library data base network across Canada. We simply ran out of Sigma capacity. We looked at which would be the easiest conversion. At least we didn't have to rephilosophize."

Sutherland of Carleton said it was "growth and growth pressure," that led him to CP-6. "If you're a CP-V user you can use CP-6 without a manual."

Panelists were asked how long they expected to run their CP-6 systems, which are based on Honeywell level 66 machines, in parallel with Sigma CP-V systems. Panzarella said Science Dynamics hopes to stop parallel operation by the second quarter of 1980. Gorsline gave parallel operation about 15 months and Sutherland estimated ending by next summer.

In a word processing panel discussion at the Exchange meeting, Rob Langsten of LADC talked about CP-6 Text as a word processing system. "It has most of the features of CP-V Text," he said, "and is terminal independent."

Asked why CP-6 Text hasn't addressed human engineering problems and isn't interactive, Langsten said such a request should be made by the Exchange Technical Committee. Dave Thomas of Exchange said some users have made such a request. "What we need now is more input."

—Edith Myers

COMMUNICATIONS

WARC OFF TO SLOW START

Political squabbles hold up start of two-month world radio conference.

The United States looked as though it had lost the first round in the World Administrative Radio Conference (WARC), which started behind schedule in Geneva, Switzerland, in late September. Political squabbles over the election of a meeting chairman held up the start of what the United States has maintained is a purely technical conference for a full three days.

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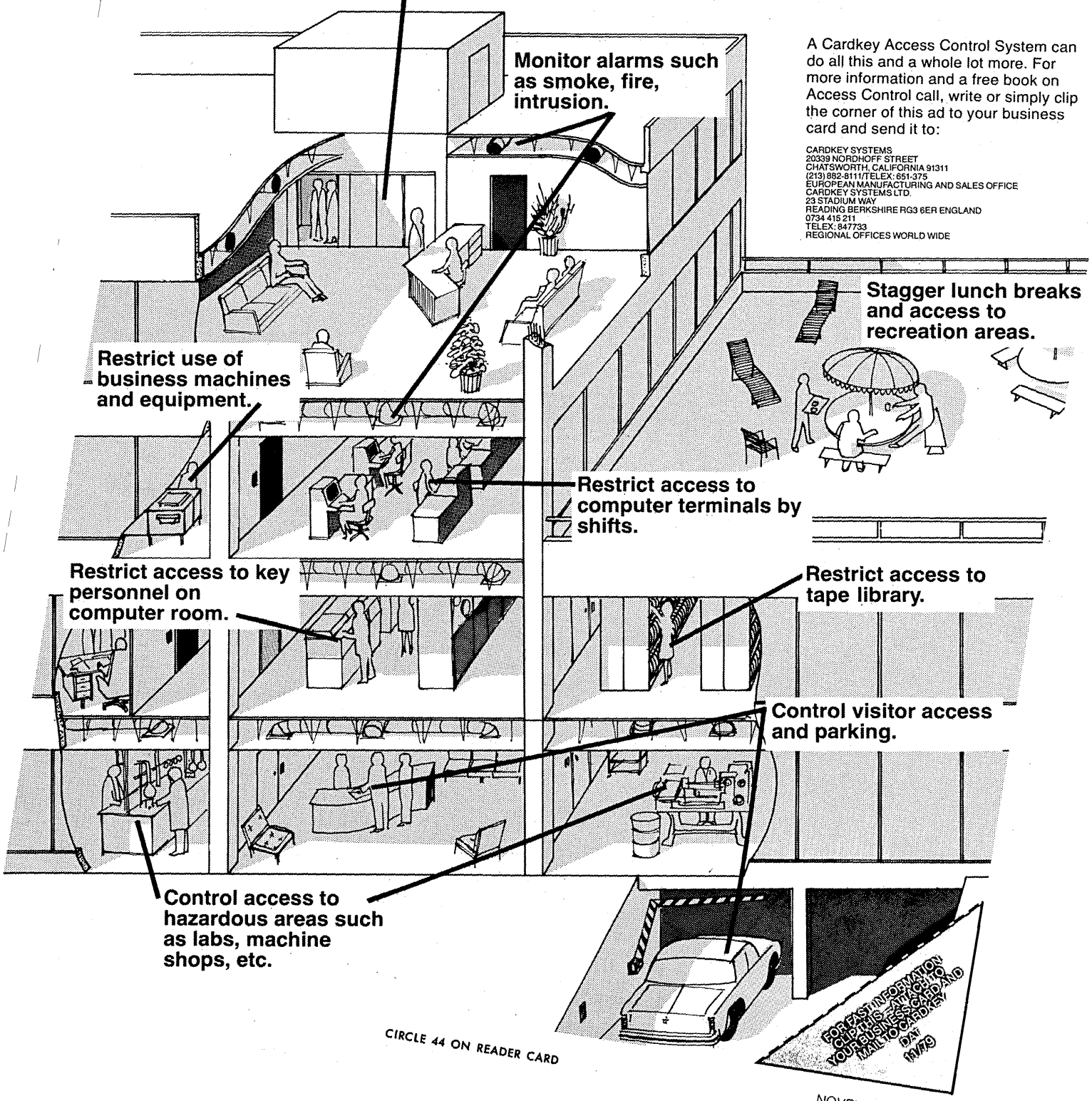

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NEWS IN PERSPECTIVE

tries finally agreed, it was an Argentinean who won the key position. An Algerian and a Czechoslovakian were elected as chairmen of the two committees due to settle the conference's most controversial questions—Committee 5 on frequency allocation and Committee 6 on regulatory procedures. Veterans of similar international gatherings say that the chairman has an important privilege in controlling the discussions, and sometimes in pushing through or impeding controversial proposals.

Decisions taken at WARC are likely to have widespread effects on many aspects of everyday life. In the business sector, the conference outcome could alter the rules for microwave and satellite voice

U.S. called for 36 hour adjournment to allow time for cooling off and for more wheeling and dealing.

and data transmission and, as well as users, vendors could find themselves having to write off millions of dollars' worth of development costs on technology they will no longer be allowed to sell.

The conference was due to start Sept. 24 and take 10 weeks to settle frequency allocations affecting broadcasting, and civil and military communications for the next 20 years. The frequency spectrum until now has been allocated on a first come first served basis. But more developing nations, wanting access to communications infrastructures, are making strong bids to treat the spectrum as a natural resource like oil. And, as with oil, there is a good deal of tension between the haves and the have-nots. This time it is the developed world which has most of the resources, because it got in there first. The developing nations are the have-nots.

Feelings among the 148 nations ran high even during the first few days. The atmosphere at the conference center was more tense than at many other political meetings under United Nations auspices. Unlike these, WARC has to come up with a share-out of a finite resource, instead of grudging agreement to the usual vague statements of principle. Right from the start, heads of delegations went into a series of closed meetings to try to achieve consensus on a conference chairman—while those outside speculated on exactly what was happening. In view of the obvious difficulty in choosing a chairman, they also wondered just how easy it was going to be to settle some of the thornier issues due to come up over the succeeding 10 weeks.

The original candidate, a Western proposal, was a New Zealander, Derek Rose, considered a solid technical choice. But by the scheduled start time of the conference, an Indian, T. V. Srirangan, had

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NEWS IN PERSPECTIVE

come to the fore backed by most of the Third World countries. The Indian, who had presided over a similar but lower level conference a few years before, was unacceptable to the developed nations. "He's just incompetent," said one European delegate.

A compromise Swiss candidate came briefly into the running. This was Henry Kieffer, who also proved unacceptable for a reason which did not leak out of the closed meetings. Thereupon, the United States called for a 36 hour adjournment to allow time for cooling off and for more wheeling and dealing in the corridors. The request, according to a source who attended the closed meetings, was accompanied by a forthright, if undiplomatic, statement from the U.S. to the effect that the U.S. did not want the conference to be dictated to by "any group of countries however large." To this the Cubans apparently replied in kind, saying the conference was not going to be dictated to by "any group of countries however small." Predictably by now, the conference was again unsuccessful after its adjournment. But the following day an Argentinean telecommunications expert, 56-year-old Robert Severini, achieved the support required for election, apparently satisfying enough of the delegates present that he would be an equitable and competent chairman.

Unusually, the Russians stand to lose as much as the United States in the WARC debate. They were obviously in something of a quandary as to how to protect their own interests while not seeming to attack militant Third Worlders such as Cuba. The Soviets won one of the six vice-chairman positions, as did Glen Robinson, head of the U.S. delegation. These two share the rank with representatives from China, Italy, Switzerland and the Cameroons, the last of which was active in organizing Third World strategy for the conference.

Nine committees were set up in the ensuing days. The two which have to handle the most controversial issues are numbers 5 and 6. Committee 5 will handle frequency allocation. The chairman of this is an Algerian, Mohammed Harbi. Algeria is the country which has put through some of the most radical proposals for the reallocation of the high-frequency (short wave) band. Harbi's vice chairman is a Mexican, José Hernandez. In Committee 6, the chairman is Miroslav Joachim, a Czech, supported (or not) by an Australian, Edward Wilkinson.

Spokesmen for the International Telecommunications Union, the United Nations agency handling the conference, say that work in the committees proceeded smoothly over the first few weeks. But insiders were predicting that things would start to heat up well before the end of November when the meeting was scheduled to end. Prospects were so gloomy that after the first few days of abortive attempts to elect a president, some delegates were already extending their hotel bookings for a further two weeks in anticipation of a delayed finish date—and in view of the fact that accommodation within 50 miles of Geneva officially had been fully booked since well before the conference.

One complicating factor is that the conference is not just a straight fight between the U.S., the U.S.S.R. and the other developed nations on one side, and the Third World on the other. At the beginning of the conference, there seemed to be as many different interests as there were delegates at the meeting. More than 1,900 registered in the first week, including observers from nearly 40 other international organizations. The conference has to consider around 14,000 proposals—of which 9,000 came from the U.S.

Insiders predicted that things would start to heat up before conference ends late this month.

While the developed nations and the Russians have established interests to safeguard, all is not quiet on the Western front. There were, for example, complaints from the French that U.S. proposals for European military communications standards would favor U.S. industry if accepted. "If the American proposals are accepted, then General Electric will clean up," said one. There is possibly more commonality of interest between the U.S. and the U.S.S.R. than between the U.S. and its traditional allies, more than one official has claimed.

The big question is whether the nonaligned countries of the developing world will stick together as a bloc, or whether the developed countries can lead them into a split with maybe some concessions to the more advanced Third Worlders such as Brazil, Argentina or Algeria. The Algerians themselves admit that there are significant differences of interests between the nonaligned nations. The Algerians admit privately that they are less interested in satellite parking positions, for example, than the equatorial countries.

The U.S. public stance was still one of saying that the conference is nonpolitical. The argument behind this finds some support from other developed nations. It is that technical solutions can be found to meet all the developing nations' demands without going as far as many are requesting—that is the reservation of spectrum space for future requirements. Technological advances, it is argued, can make the finite spectrum into an almost infinite resource. Samuel E. Probst, a se-

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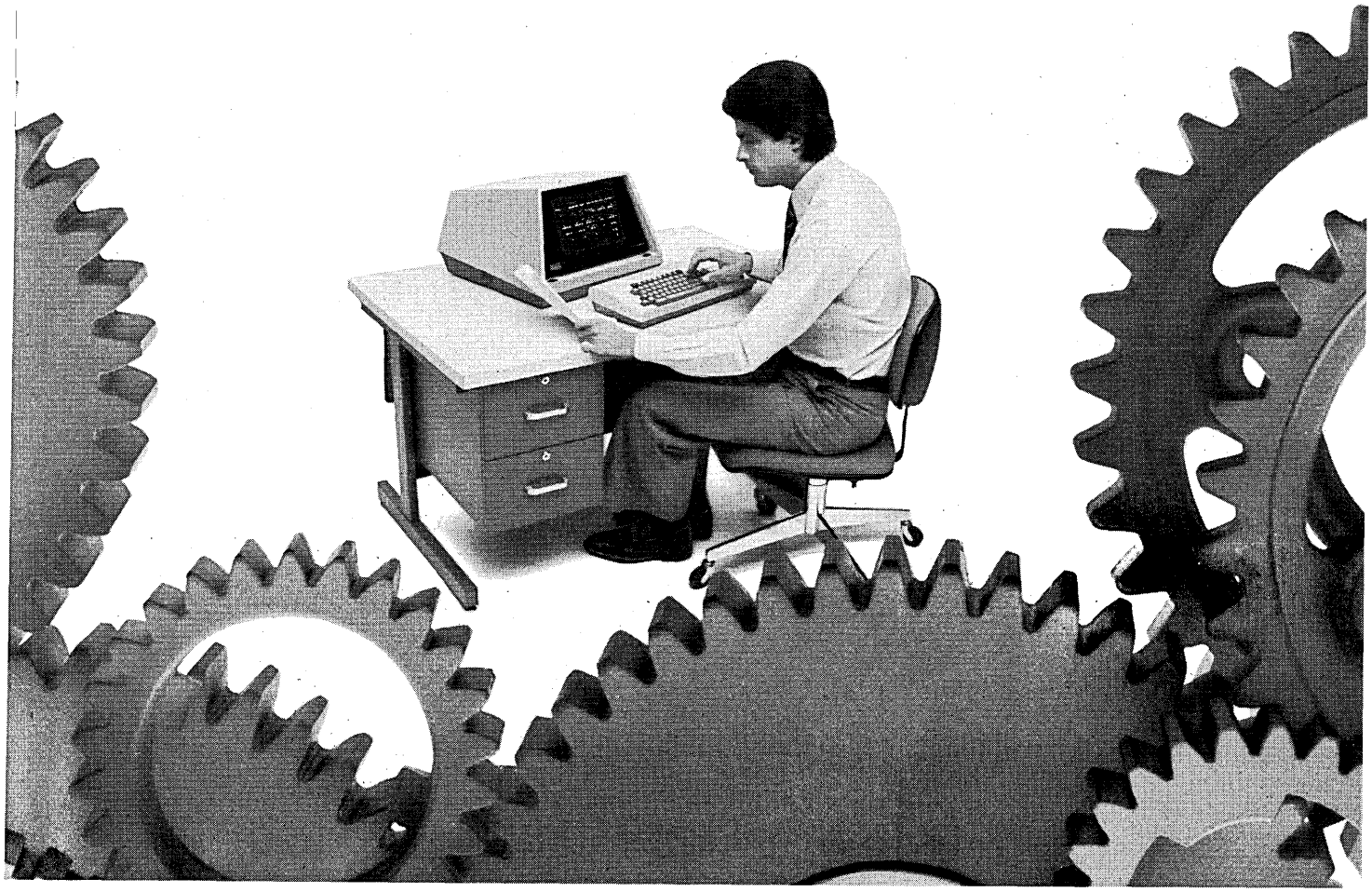

nior member of the U.S. delegation, noted, "Even taking the most pessimistic view of technical progress, and the most optimistic view of the growth in requirements, there will still be plenty of room for everybody in the year 2000." Forecasts in the early days of the conference from the U.S. delegation were that there may be some trimming down of developed world allocations at the edges of existing wave bands, but nothing too serious.

A representative of Canadian industry, Alexander Sophianopoulos, in Geneva for the Telecom '79 show, conceded ground that most Western nations seem prepared to admit. "The spectrum has become too much used and too little paid for, like oil," he said. "Henceforth we will have to see it is more efficiently used. We also have to understand that latecomers also have needs." Commenting on industry worries that WARC decisions might obsolete technology, he added, "We've spent a lot of money on developments, and we don't want to see it going down the drain. We don't want to sell ourselves down the river, but we have an open mind."

One consolation for vendors is that whatever technology gets the go-ahead at WARC or follow-up meetings (if anything is left over for later decision), they will still have a big, big market for some time to come. But the developed nations—at least those with products to sell—are going to have a hard time convincing Third World politicians that they have a technical solution to their demands. Convinced of the justification for their claims to a larger finite share of the spectrum, many of the negotiators at the conference are not going to let themselves be put off by mere technical arguments. "Trying to explain some of the latest technology to them is like trying to explain sex to someone who's never had it," said one Western industry representative.

—Andrew Lloyd

MEETINGS

DDP: HOT TOPIC AT INFO 79

Trade show portion a disappointment after huge NCC turnout four months earlier.

It wasn't a replay of June's National Computer Conference. It wasn't even a repeat of last year's Info 78 in Chicago. What the Sixth International Information Management Exposition and Conference, Info 79, was was a disappointment to exhibitors as well as show planners who had banked on bettering last year's turnout of nearly 17,000. Staged in mid-October at the Coliseum in New York, the permanent site for the show, this year's Info simply didn't get the draw, attracting around 15,000.

"We asked our booth workers how the first day went," reported one frank exhibitor, "and they responded with yawns." Such vendor reaction was typical on the show's opening day. Even the snack bar reported business was slow. Some exhibitors, however, were pleased with the show. Microdata, for example, said it inked orders for its Reality Series 8000 computer system, shown for the first time at Info.

There could be no doubt that Info's biggest boogeyman was the overwhelmingly successful NCC, which four months earlier filled the Coliseum and overflowed into two hotels, drawing a phenomenal turnout of roughly 80,000. The double-whammy effect of having two major dp shows in the same city in so short a span of time was reflected in Info's significantly lower attendence and the absence of some potential exhibitors. One conjecture, heard on the floor, holds that many companies were reluctant to finance two

DISTRIBUTED data processing again was a hot topic at Info 79 last month in New York.

show stints in New York.

Session goers also had mixed feelings on the Info presentations. "I learned a lot of new things," commented Everett Joline, head of Aviation Simulation International, "and found out what was available." Other attendees were less enthusiastic. "I was a little disappointed in the conference," admitted Edward Elanjian of INA Corp. in Philadelphia. "The conference had dp people who knew very little about business, making it too introductory on business and with very little on systems subjects." One veteran attendee was even more blunt. "This will probably be my last Info," he confided.

Info's provocatively-titled sessions covered a variety of information management topics grouped around the conference theme of "Managing Information for Improved Productivity." As usual, one of the hotter topics was distributed data processing. At one ddp session, industry experts continued to debate the exact role of these systems which, all agreed, are here to stay.

Trends in the dp industry are forcing the emergence of ddp and, therefore, MIS departments must be prepared to cope with its ramifications, said Larry D. Woods, manager of distributed computing at Deere & Co., Moline, Ill.

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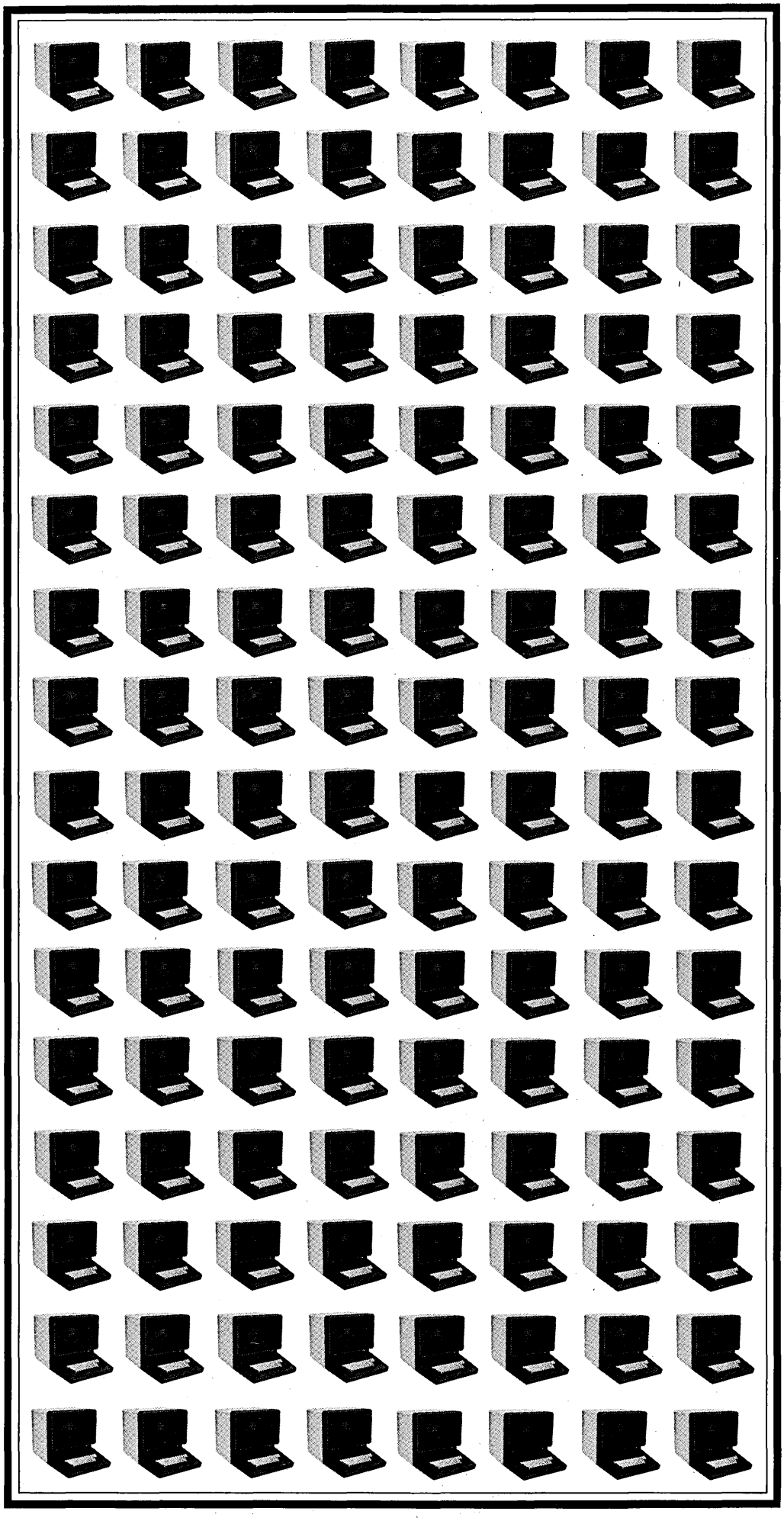

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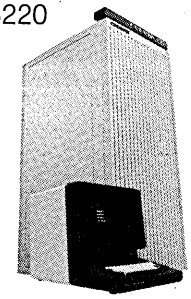

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of the user. Clearly designed to counter the diagnostic control systems pioneered by independent suppliers, Dataphone II provides three levels of capabilities that are upward compatible so that control features can be upgraded as a user's network expands.

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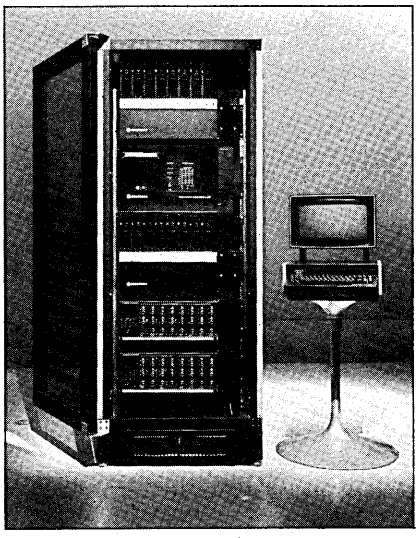
Level I consists of a basic system which includes a control data set operating with one or more "tributary" data sets. Level II adds a diagnostic console which allows users to display system faults after the key entry of preprogrammed test/command sequences. Level III adds a network controller that operates with a Dataspeed 40/2 crt terminal and optional printer to provide real-time readout of system fault conditions.



NETWORK CONTROLLER operates through a crt/keyboard terminal such as the Dataspeed 40/2 providing user of a large data communications system full diagnostic management of all Dataphone II service data in the network.

The network controller is a multiport device that can monitor network operation, perform diagnostic tests, and communicate with phone company test centers to correct error conditions, AT&T said.

System is compatible with both terrestrial and satellite transmission facilities used by the Bell System.

The Dataphone II diagnostic system uses a secondary test channel with a derived speed of 110bps and basic tests can be performed in many cases without interrupting data transmission.

The lease-only system is available in both standalone and rack-mounted configurations at monthly rates ranging from $85 to $210, depending on transmission speed of the data set. The network controller costs $235 a month while the diagnostic console is priced at $125/mo. Installation fees can add as much as $325 depending on configuration.

In conjunction with the Dataphone II introduction, AT&T operating companies filed simultaneous tariffs in their respective regulatory jurisdictions for intrastate service. An interstate tariff filing was scheduled with the FCC shortly after announcement of the diagnostic system, AT&T sources said.

—R.A.F.

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CIRCLE 57 ON READER CARD

INNOVATION

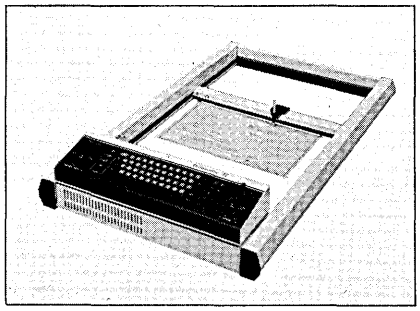
NO MORE HANDS

"Unhappy with his own handwriting, he developed a device that will do it for him . . . and hopefully for others.

An adverse reaction to your own handwriting is rarely an incentive to start a company but it was for John Hart.

As a mechanical engineer with Dataproducts, he had draftsmen working under him to do the tedious work of lettering on engineering drawings. One day the draftsman working on one of his drawings was sick and he had to finish the lettering himself. "It looked terrible. I knew there had to be a better way. I knew it could be done with microprocessors."

This was in the winter of 1977. Hart set about to develop a device to handle the lettering that would be both inexpensive and portable. He enlisted the help of a friend who is an electronics engineer and by May of '78 he had the first breadboard model of what now is called the



DATASCRIBE II—Takes the tedium out of lettering on engineering drawings.

DataScribe II, a microprocessor-based drafting tool which produces quality hand lettering for all types of engineering and architectural drawings.

"The lettering is the most tedious and time consuming task a draftsman has to do," said Hart. "And draftsmen earn around $18,000 a year." One DataScribe II costs $7,950.

The unit weighs 27 lbs. and measures 25 in. x 42 in. It provides a printing area of 18 x 30 in. and can be moved around on a drawing.

In October of '78, Hart was joined by a software specialist, Jim Hayes from RCA, who wrote software for the DataScribe II. At the user's option, the device can remember up to 255 keystrokes. If the same information is required more than once on a drawing, it can be keyed in a single time.

Armed with a complete product, Hart formed his company, Alpha Merics Corp., in November 1978. He received funding—private—last March and that was when he really got going. He has been joined by Ken Evans, with whom he worked at Burroughs Corp., as manufacturing manager, and Mark McGrew, from Computer Power Systems, as director of marketing.

They are operating out of 1200 sq. ft. of space in a converted motel in Van Nuys, Calif., where, Hart said, they can produce up to 15 units per month. By next spring they hope to go beyond that production rate and anticipate seeking a 4,000 sq. ft. facility.

In late September they had sold four, delivered two and had orders for two more in the works. They were in the process of setting up a network of representatives and had signed one, Business Equipment Sales, Inc., Laguna Hills, Calif.

The DataScribe II is based on two Motorola 6800 microprocessors but Hart said they are not limiting themselves to the 6800 in future development plans. The next step, he said, probably will be external storage.

—E.M.

Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

Microdata Corp.'s Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems users survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 companies that use 689 small business CPU's.

Each respondent was asked to subjectively rate the vendors and their products on performance (whether stated equipment specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

In Case You Missed It,

OUR COMPETITORS JUST CAME FACE TO FACE WITH REALITY.®

A recent MIC survey published in Computerworld asked small business computer system users to evaluate their equipment.

The result: our competitors lost. They lost in performance. They lost in ease of use. They lost in overall user satisfaction.

If you don't want to make the same mistake our competitors' users made, face Reality. Call your nearest authorized Microdata representative.

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Fayettsville 501/756-0970
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Indianapolis 317/257-1426
Kansas City 816/483-6900
Los Angeles 213/685-8910
Memphis 901/346-0088
Monroe 318/325-9618
Montreal 416/862-0125
Nashville 615/373-3636
Oakland 415/547-6565
Philadelphia 609/779-1901
Portland 503/245-7714
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Raleigh 919/782-6020
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Seattle 206/641-4990
Spokane 509/624-1308
Toronto 416/862-0125
Washington, DC 703/549-4300

Reality® by Microdata

SURPRISE: Researchers for International Data Corp. were surprised to learn in a recent study of minicomputer software spending practices that independent software packages don't figure in the plans of many customers. The trend will continue through 1980 as the money spent for outside software goes to custom consultants, rather than to hardware vendors and independent packaged software vendors. The IDC study says software spending at minicomputer sites will increase to $69,000 by 1980, compared with $48,000 spent for software last year. Most of these dollars, the survey shows, are being spent in-house (80%). Outside spending is primarily for application software, says the report, "Software Spending Patterns of Minicomputer Users," available for $395 from IDC, 214 Third Ave., Waltham, MA 02254.

MERGER BLOCKER: Lester L. Kilpatrick, a director and founder of California Computer Products, Inc., filed a Form 14B with the Securities and Exchange Commission indicating he will solicit proxy votes from shareholders to block a proposed merger of CalComp into Sanders Associates Inc. Sanders revised an original merger offer of $13.50 per share when CalComp said it will post a loss for the fiscal year that ended June 30 of about $9 million. Under Sanders' revised offer, CalComp shareholders would receive 0.34 share of Sanders common for each CalComp common share. Kilpatrick said this would yield each shareholder only about $8.58 a share or $21.7 million less in total value to CalComp shareholders. He said he plans to solicit proxies to defeat the merger and elect a majority of the CalComp board at the next shareholders meeting, still unscheduled in late October. Kilpatrick owns 66,693 of CalComp's 3.5 million shares outstanding.

MOSTEK MERGER: Mostek Corp., Carrollton, Texas, and United Technologies Corp., Hartford, Conn., said UTC will make a tender offer for Mostek stock at $62 a share. The agreement provides for a merger of the two companies if UTC acquires a majority of Mostek's six million shares outstanding. Then any shares not acquired in the tender would be acquired by UTC at $62. In a related transaction in late September, Mostek repurchased some 1.2 million of its shares owned by Sprague Electric Co. at $42 a share and resold them to UTC at $42.

INFOREX COURTED: Inforex chairman and chief executive officer Timothy Cronin said his company is holding "preliminary discussions" with several major potential merger partners. He predicted the company will report a loss of more than $3 million for the third quarter, bringing the nine month loss to about $6 million. "We made a lot of miscalculations," said Cronin. Part of the firm's problem stemmed from the fact that salesmen were concentrating on leasing upgraded equipment to old customers rather than seeking out new ones. Existing customers were returning their old systems to Inforex, which proved costly.

MICRODATA ACQUIRED: Microdata Corp., Irvine, Calif., minicomputer manufacturer, was merged into McDonnell Douglas Corp. last month following purchase of 92.68% of outstanding Microdata stock by MICD Holding Co., a wholly-owned McDonnell Douglas subsidiary. Price paid per share was $32. McDonnell Douglas, when it announced its offer to acquire Microdata last July, said it would operate Microdata as a separate subsidiary from McDonnell Douglas Automation Co., a provider of remote computer services.

ACM HONORS: Stephen Wozniac, vice president of research and development for the Apple Computer Co., Cupertino, Calif., received the Association for Computing Machinery (ACM) Grace Murray Hopper award, and Dr. M. Stuart Lynn, director of computing affairs and professor of electrical engineering and computer science at the Univ. of California, Berkeley, the ACM Outstanding Contribution award at the ACM annual conference last month in Detroit. The Hopper award cites Wozniac for "his many contributions to the rapidly growing field of personal computing and, in particular, to the hardware and software for the Apple Computer." Dr. Lynn, who is chairman of the ACM Publications Board, was cited for "his chairing and directing of the ACM Publications Planning Committee which produced a long-term policy framework and the current implementation plan for ACM publications."

HERMAN LUKOFF: Sperry Univac Director of Technical Operations, Herman Lukoff, died Sept. 24 at the age of 56. A computer industry pioneer, Lukoff joined Eckert-Mauchly Computer Co. following Navy service in World War II. He was chief engineer of Univac's LARC computer, the first big mainframe to use solid state devices. He also has been credited with a number of pivotal developments in input/output technology. His book *From Dits to Bits: A Personal History of the Electronic Computer,* published last month by Robotics Press, is a personal commentary on his involvement and the involvement of other key personalities in the development of computer technology and his lifelong interest in amateur radio.

DISK AND TAPE DRIVES: A study by Creative Strategies International, San Jose, Calif., shows that the disk and tape drive business is booming—rising from $4 billion in 1978 to $10.8 billion in 1983, a compound annual growth rate of nearly 22%. Surprisingly, the greatest growth will occur in the tape drive market, primarily in the 6250bpi range, as demand grows for half-inch tape drives as backup for nonremovable Winchester disk drives. The tape drive market, CSI predicts, will grow at a 35% compound annual rate. The 6250bpi tape drives will enjoy a phenomenal growth rate of 89%, compounded annually.

ZILOG IN IDAHO: Zilog, Inc., the Cupertino, Calif., affiliate of Exxon Enterprises, opened a 76,000 sq. ft. semiconductor manufacturing plant at Nampa, Idaho, because the area has ample sources of clean water and electrical power. The company, which will do about $40 million this year, operates a 135,000 sq. ft. plant in Cupertino. The Idaho plant will employ 80 by year end and between 600 and 700 within several years. ✲

THE EXPERIENCE OF THE FEDERAL RESERVE WITH DATA TRANSMISSION

Today, computers at the Federal Reserve transmit data, over a Bell System network, at 240,000 characters per minute.

Bell was chosen for this high-speed data transmission system because of the magnitude of the Fed's requirements—and because of Bell's technical capabilities. Bob Dunlap, Bell System National Account Manager, worked closely with the Fed to meet their special needs.

Mr. Dunlap explains: "This system eliminates flying computer tapes from one Federal Reserve bank to another. No more delays, no more getting fogged in. Banking transactions speed up.

"The Fed does a lot of payroll data transmission over the system," Mr. Dunlap explains. "This gets payrolls distributed on time, eliminates theft of checks from mail boxes, provides better service to banks and the larger commercial community. And," he concludes, "it helps arrest the staggering growth of checks."

If your agency is interested in data transmission, talk to your Bell System Account Executive. He/she can bring Bell expertise to your problem, and is the point of contact that opens the resources of the Bell System to your needs.

Bell System

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Instantly, our nationwide on-line computerized inventory system will check our dozens of regional inventory centers to pinpoint the unit closest to you. Within minutes, your order will be processed and moving on its way. In most cases, your terminal will be in your hands in less than 24 hours.

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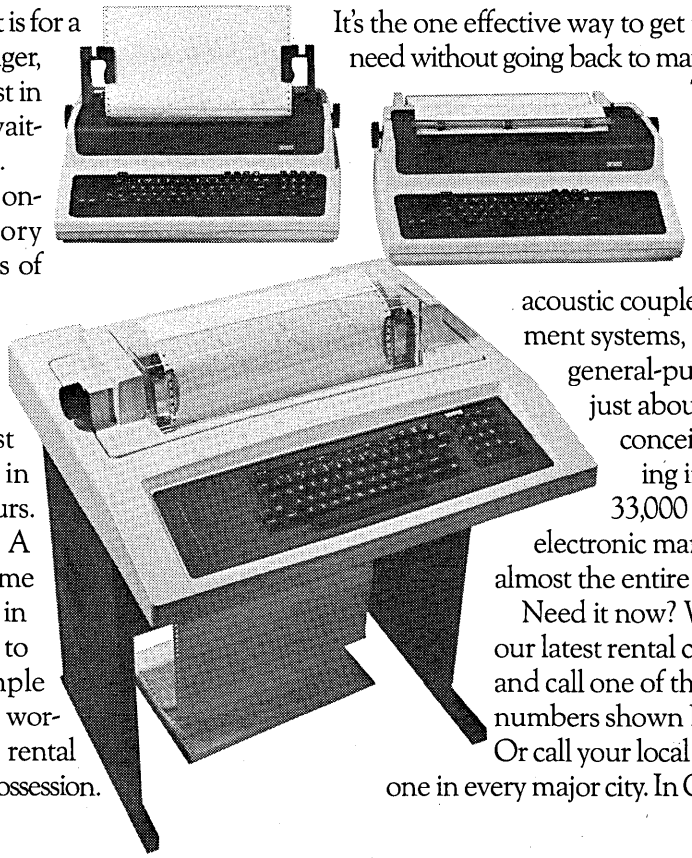

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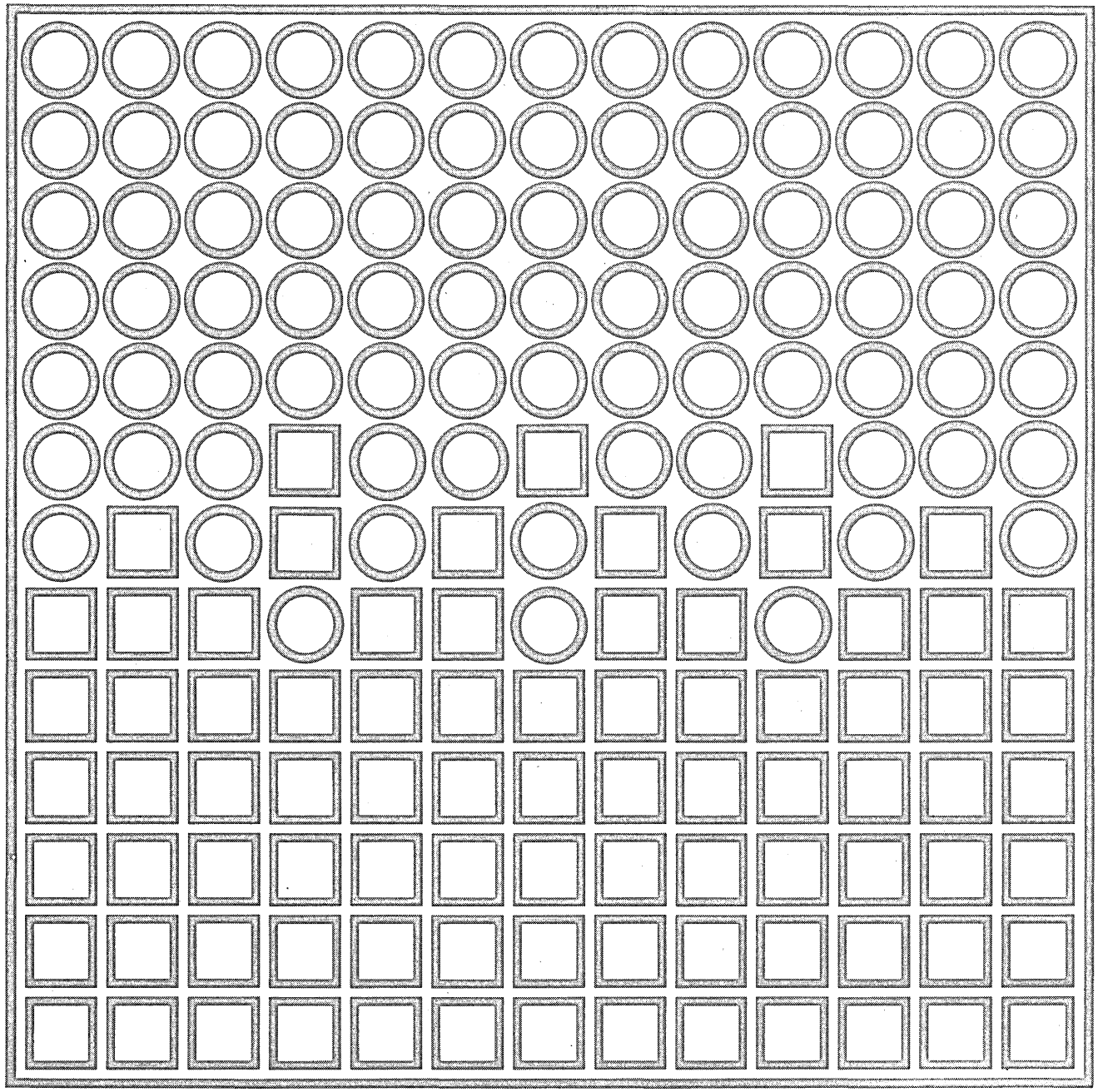

BECAUSE MANAGING DATA MEANS MANAGING CHANGE

Computer Corporation of America

For the first time fax is fax.

Starting December 3, your facsimile machine can talk to almost any other fax machine -via ITT's new FAXPAK®.

Until now, if you wanted to fax something to somebody with a different kind of fax machine, you couldn't.

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But with ITT's new FAXPAK, we're going to make everybody's facsimile machine compatible with everybody else's.

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DM-1

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Our new display terminal has a great supporting cast.

The AJ 510 display terminal with AJ 460 Micro Diskette System, AJ 832/RO receive-only printer, and AJ 1234 acoustic data coupler/modem.

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For convenient, low-cost data storage and retrieval, the AJ 460 Micro Diskette System offers you local data manipulation and high-speed on-line communications. Combined with the AJ 510, the AJ 460 helps you reduce telephone charges and computer connect time, while further increasing application flexibility.

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Connect an AJ 832/RO receive-only printer and you get letter-quality hard copy output. Features include selectable data rates up to 45 cps, dual pitch selection, vertical forms control, and more—even interchangeable "daisy" wheel printing elements so you can customize the type face to the application. Now you have a system that's ideal for form letters, contracts, and camera-ready art of all kinds.

And communications

Finally, from the wide range of AJ couplers and modems, select the one that best fits your application. The AJ 1234 coupler/modem, for example, lets you take advantage of full duplex 1200 bps communications over dial-up or two-wire leased lines.

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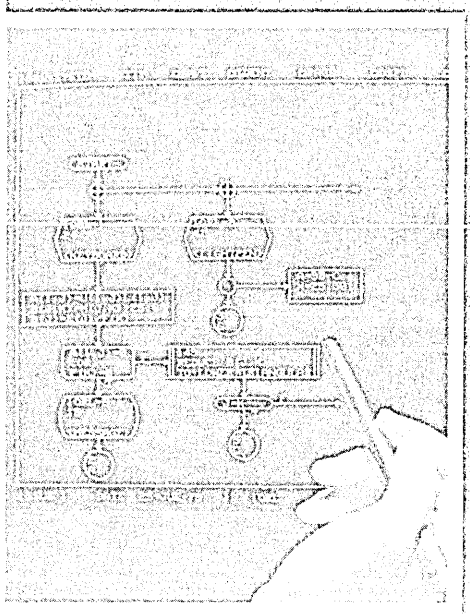

The source of most errors in the entire field of software engineering is the primitive way in which specifications are still being written. With a combination of pen and paper, broken English, a few graphs and a little math, many times the engineer who writes the spec is the only one who knows what he's talking about. Hours are lost. Days are lost. The cost of a system soars. That's why Teledyne Brown developed IORL, the Input Output Requirements Language.

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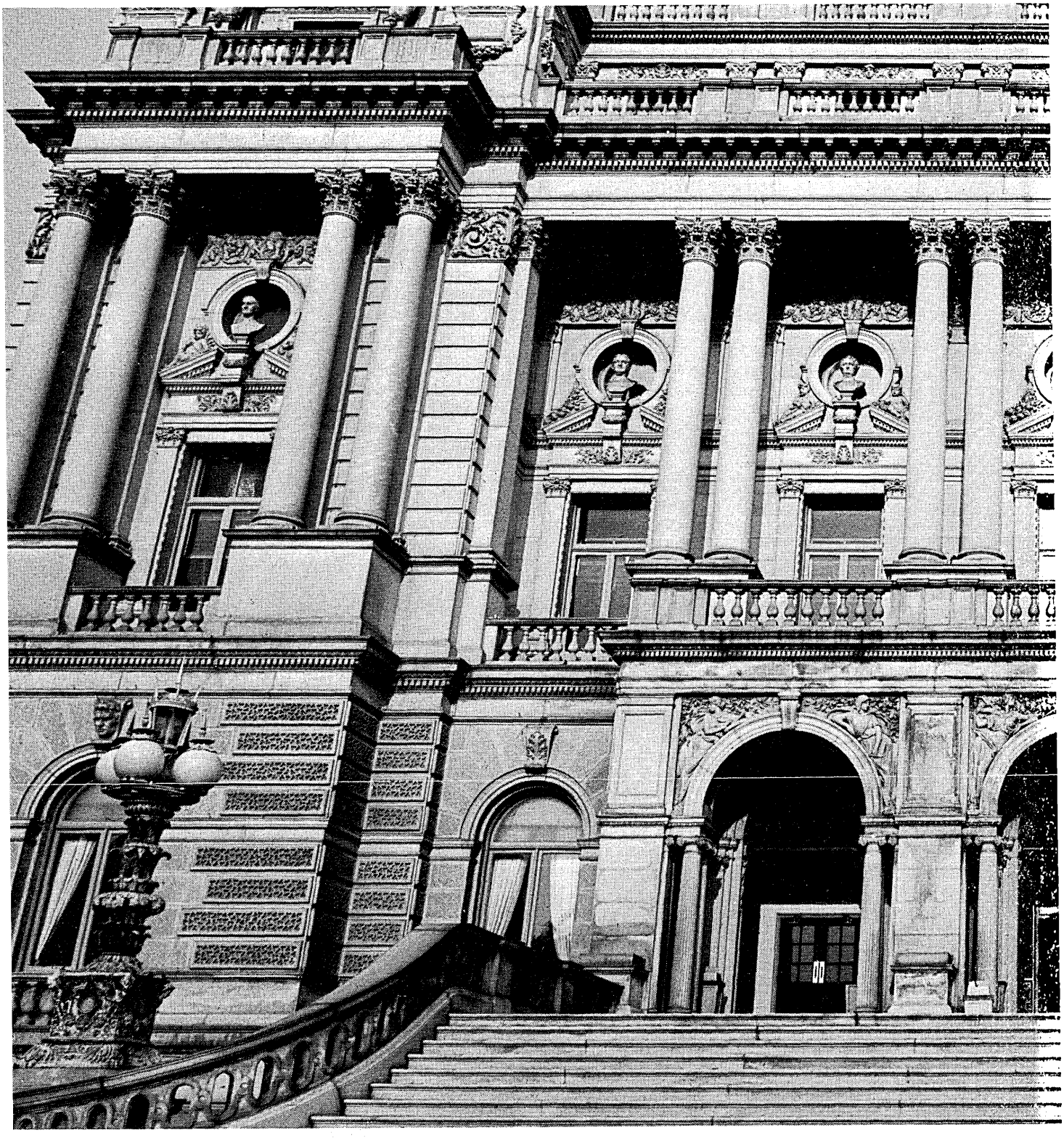

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It's called the Library of Congress.

Every year almost a million new books, records, films and other pieces of information arrive here.

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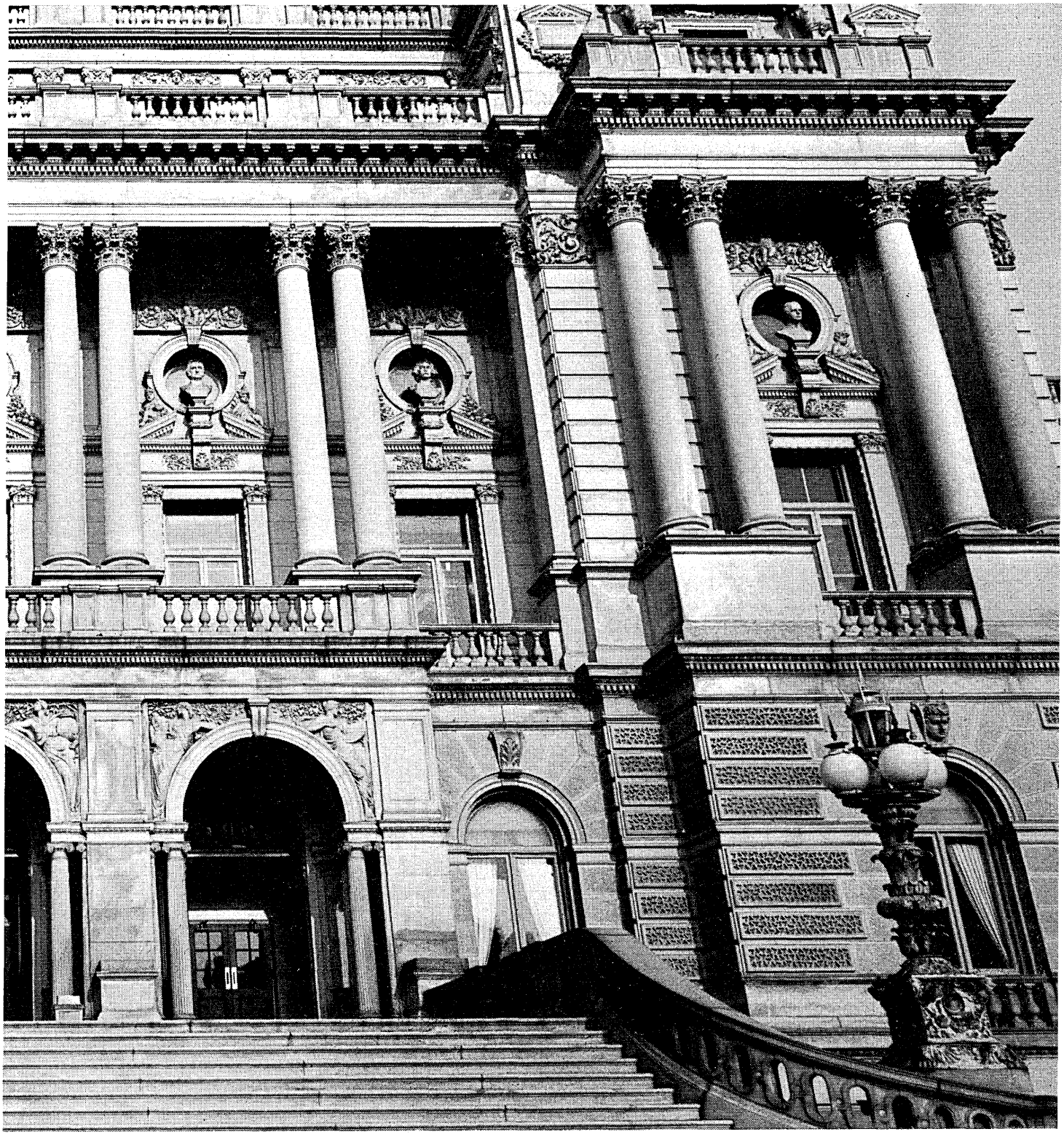


WORLD'S LARGEST "IN" BOX.

or whatever is needed.

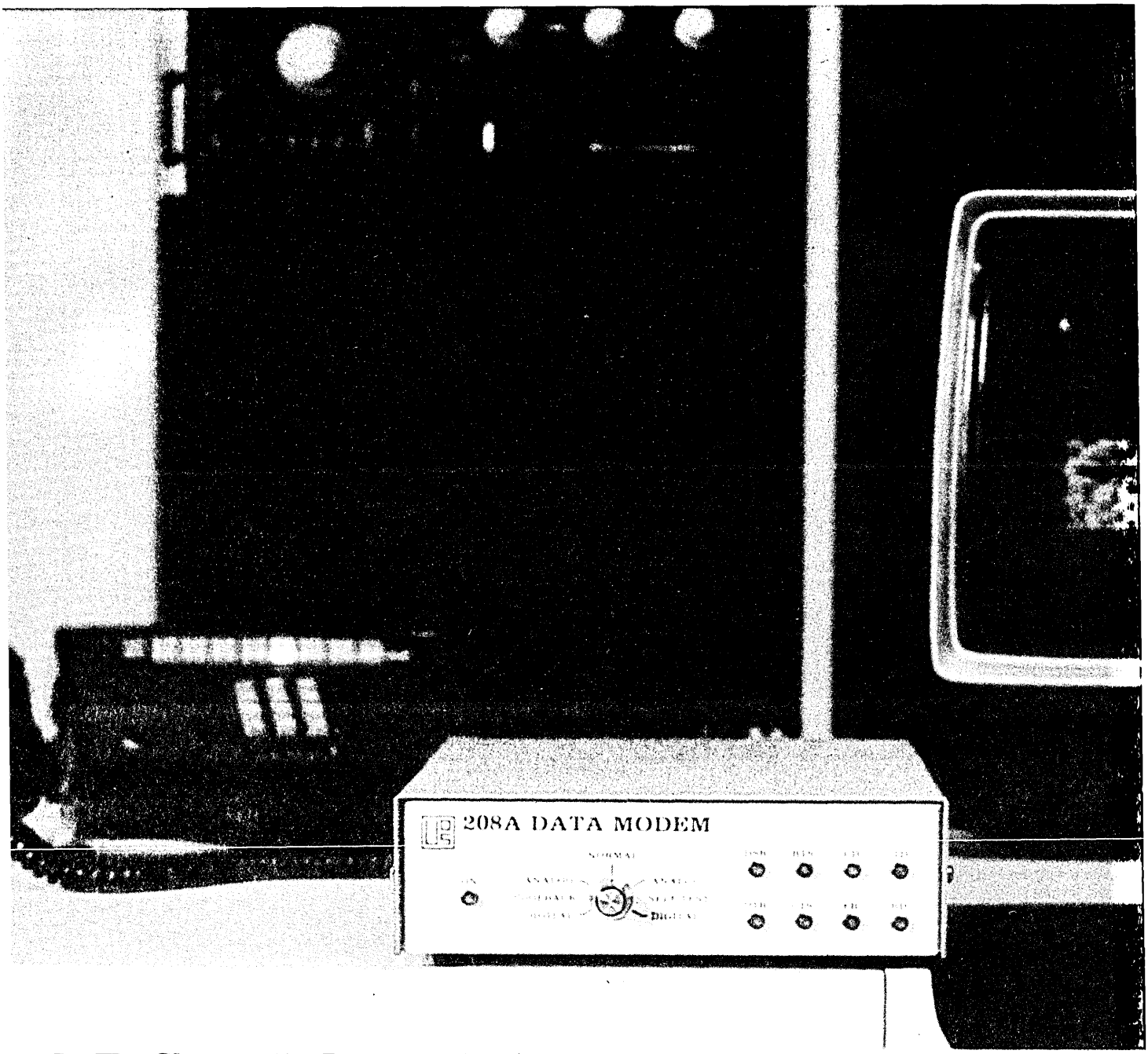
All of which is important, since the Library doesn't just print these cards for its own use. It sends them out to as many as 100,000 other libraries, all over the country.

Which is another reason the Library of Congress uses this Xerox information management system.

Because the world's largest "In" box also happens to be one of the world's largest "Out" boxes.

XEROX

CIRCLE 67 ON READER CARD



UDS adds microprocessor power to Bell-compatible 4800 bps modems

UDS has leapfrogged current LSI technology with nanosecond microprocessor performance! All components are industry standards — no custom or single-source parts are used.

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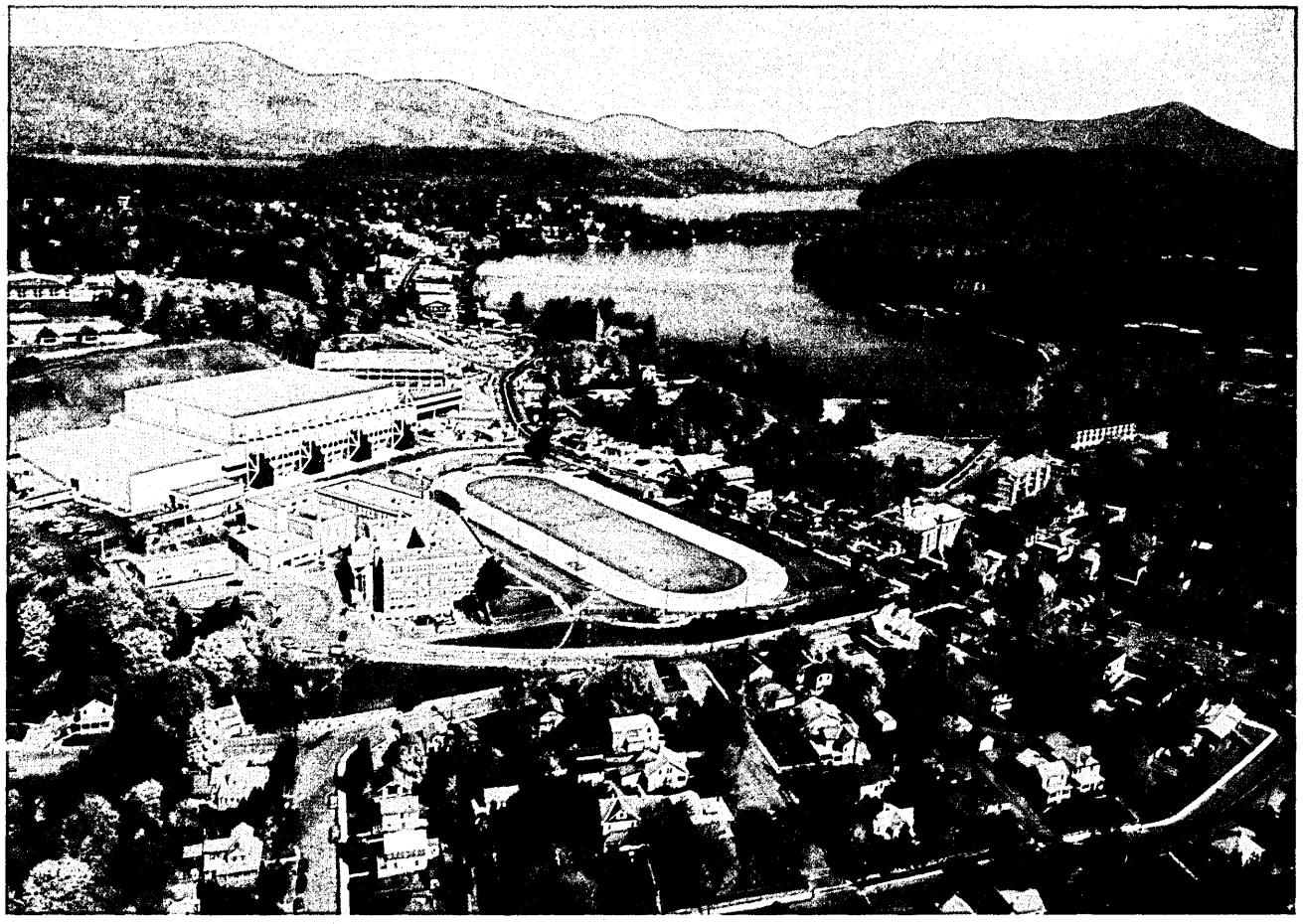
CIRCLE 68 ON READER CARD

FOCUS

COMPUTING THE OLYMPICS

What hardware, software, interfaces, services, and people are necessary to computerize a variety of athletic competitions in full view of world tv?



Lake Placid, N.Y., late September. Tuesday's 70-degree sunshine snapped overnight to 40 degrees. Wednesday the leaves blushed into autumn, obligingly on schedule for the weekend's figure skating competition, an event formerly known as Flaming Leaves and renamed Norton Skate in deference to its sponsors.

Pre-Olympic competitions such as Flaming Leaves are required by the international associations of all sports for the purposes of testing the athletic facilities before the Feb. 13-24 Winter Olympics. At Lake Placid, there is a new skating arena filled with red seats, surrounded by blue walls, and supported by white beams. The arena contains four ice rinks—including one built for the 1932 Olympics—for ice-dancing, figure skating, ice hockey, and other popular competitions. Nearby, at the high school, is a circular outdoor track for speed skating.

Rising above the landscape at Intervale, a single, abrupt slope less than two miles from town, are the ski jump towers; five miles further is Mt. Van Hoevenberg, site of the cross-country, biathlon, luge, and bobsled competitions. Looming nine miles north of town, Whiteface Mountain will be the location of the downhill, slalom, and giant slalom.

Lake Placid, a town of 2,700 people in upstate New York, is enveloped in the six-million acre, "forever wild" Adirondack National Forest. The town has spent the last four years preparing to host the 1980 Winter Olympics, and not surprisingly is now roiling in its own adrenalin. In the 48 years since the games were last held here, the times have been economically rugged; winter unemployment often soars to 28%. The 1980 Winter Olympic games will not only provide a brief moment of international glory, but presumably will also revive the town as a center of recreational winter sports (Olympic athletes, particularly figure skaters—Dorothy Hamill among them—have continued to train here over the years).

The townspeople who began the Olympic planning under the Lake Placid Olympic Organizing Committee (LPOOC), have, in some cases, been replaced by outside experts. Managers, marketing directors, PR people, fund-raisers, and data processing managers have been joined by officials from the various sports associations, television crews, and sundry entrepreneurs wishing to be licensed for the Winter Olympics coloring books, T-shirts, coffee mugs, and the like. Finally, there are the vendors, who supply capital goods and services in exchange for promotional consideration. Included among the many are Coca-Cola, the official soft drink of the Winter Olympics; Canon, the official 35-millimeter camera; J. I. Case, the official snow removal equipment; Kirin, the official imported beer; and Texas Instruments, the official computer and calculator supplier.

The latter vendor, and the two associated electronics suppliers, Swiss Timing, and Daktronics, was the reason DATAMATION was visiting Lake Placid. There were several questions we wanted to ask. How—and why—does a dp manager accept a posi-

MARY LOU BROWN: Not often a chance to design, develop, manage, operate, and terminate a project.

tion that consists of building a staff and services for a venture that has such a brief tenure? How does a vendor—particularly one from Texas, none of whose staff has ever skied or skated or installed hardware on the tops of snowy mountains, staff, design, and service a temporary winter installation? What hardware, software, interfaces, services, and people are necessary to successfully computerize a variety of athletic competitions in full view of the world's televisions?

•

Mary Lou Brown is the director of information services for the LPOOC umbrella organization. A vibrant, attractive, 37-year-old woman, she began her career at IBM in Poughkeepsie when the 360s were being announced. She has degrees in both math and English ("It doesn't matter what you know up here," she says, tapping her temple. "If you can't put it down on paper, it's worthless.") Now working on a PhD in management information systems at Clarkson, she was teaching computer science at the State University of New York at Potsdam when she decided to leave and accept the job at LPOOC—then defined as a data processing manager and thought to be a one-staff-member responsibility. Her husband Doug left his college development job, became LPOOC's deputy director of marketing in charge of fund-raising, and they moved their family to a new home in Lake Placid. The children, Robin, 11, and Tyler, 13, were not difficult to persuade ("They are skiers, and the Whiteface training center has the best coaches in the country").

From May 1978, when there were no computer systems, no staff, and no clear-cut ideas of what programs or procedures were needed, Mary Lou has built a department staffed with 14 people, including two managers, Bill Michelfelder for technical facilities and Cindy Dye for programming. The information services department has developed a management information system for John Musgrave, LPOOC's director of marketing; coordinated the electronics vendors in efforts to produce scoring, timing, and results systems; managed the accreditation and registration programs, and the off-site systems (a GE time-shared accounting package and Globe Tickets' reservation system); and handled special requirements from the nine sports associations representing the competitions, from ABC television, and from LPOOC and its parent, the International Olympic Committee.

At the first joint conference of electronics vendors, in September 1978, the fuzziness of the lines separating responsibilities became obvious. Where does timing stop and reporting begin? What about interfaces? How can the lines of communication —between people and between equipment —be established and maintained? At this point, Mary Lou suggested that she be promoted to information systems director and the LPOOC agreed.

•

The three electronics vendors are an interesting international mix: Swiss Timing, a Swiss corporation founded to promote the timing service organized by watchmakers Longines, Omega, and Heuer; Daktronics (technically, a "supplier" rather than a vendor, because the small South Dakota company is operating on a contract basis); and Texas Instruments.

Although not among the computer manufacturers originally contacted by LPOOC, TI's Digital Systems Group (DSG) slipped into the Winter Olympics under the wing of its calculator division, which had received an offer to bid. In the spring of 1978, when LPOOC officials, headed by Arch Swinyer, a deputy marketing director, met with TI's calculator division in Dallas, the computer people were invited to attend.

During the meeting, Swinyer commented that one of the major worries of LPOOC was that there would be no snow. Ironically, for a region that had a snowfall every month of 1979—including five inches on July 5—this is a well-founded fear. In 1932, a traditional "January thaw" set in days before the competition was to begin, and a trainload of snow was hurriedly shipped down from Canada. The day before the opening ceremonies, there was a fortuitous snowfall. Hearing the story, DSG's director of marketing communications, Jerry Johns, proposed a toast and said, "Here's to snow." The next day, in Dallas, it snowed six inches. Whether or not the story is apocryphal, TI got the contract to provide the official results system.

The first task for the project manager, Glynn Marlow, was to meet with the LPOOC and the representatives of the sporting competitions to determine the requirements for the system.

Each sport has an international federation that is its governing body; the federations have technical delegates, most often former athletes who volunteer for the assignment and who represent the interests of the sport at the Olympics. The technical delegate determines the operational details of the competition: acceptability of the facilities (a decision based on the trial competitions held prior to the Olympics), methods and precision of scoring, qualifications of judges, etc.

Following the discussions with the delegates, Marlow assembled a five-man team and began writing the programs and selecting the hardware. With the assistance of Larry Crochet, a hardware engineer from the customer service division, Marlow chose dual DS990 minicomputers as the host systems for 31 model 771 intelligent terminals, 13 Omni 800 model 820 send-receive printer terminals, and 10 Silent 700 models 745/765 portable data terminals. The terminals, it was decided, would be located in 22 sites, and would link, via 54 dedicated lines, all event sites with the broadcast, press, and officials' locations. The system, called TI-SCORE (for Texas Instruments System for Computerized Olympic Results and Events), is also providing information on the athletes and the starting lists, and is supporting all reservations and accreditations for the "Olympic family"—the 25,000 to 28,000 nonspectators of whom 1,500 are the athletes; the rest are coaches, vendors, press, sponsors, suppliers, administrative staff, security, medics, etc.

The first two remote terminals TI installed for the Winter Olympics were placed in the New York State Police headquarters at nearby Ray Brook and will be used for the verification of Olympic family credentials. Accreditation is limited to certain events and venues (competition sites); to maintain a high level of security, terminals running checks on credentials will be at all sites and linked to the State Police.

The system will provide information on athletes and starting lists, and support registration and accreditions for 25,000 to 28,000 people.

All members of the Olympic family have to be registered; the registration includes a security clearance from the State Police and the FBI. In Mary Lou Brown's installation, by late September, data entry operators were entering registration information into the DS990s. Access to the information will be selective and limited; personal information, for example on foreign athletes, will be completely available only to the police agencies. The press will be able to access only selected data in the form of biographical profiles. As an extra security measure, information can only be changed at the host site, in the Town Hall, and not at the remote locations.

Additional terminals for checking credentials (and also for accessing weather

Until now, computer graphics suffered from terminal high cost.

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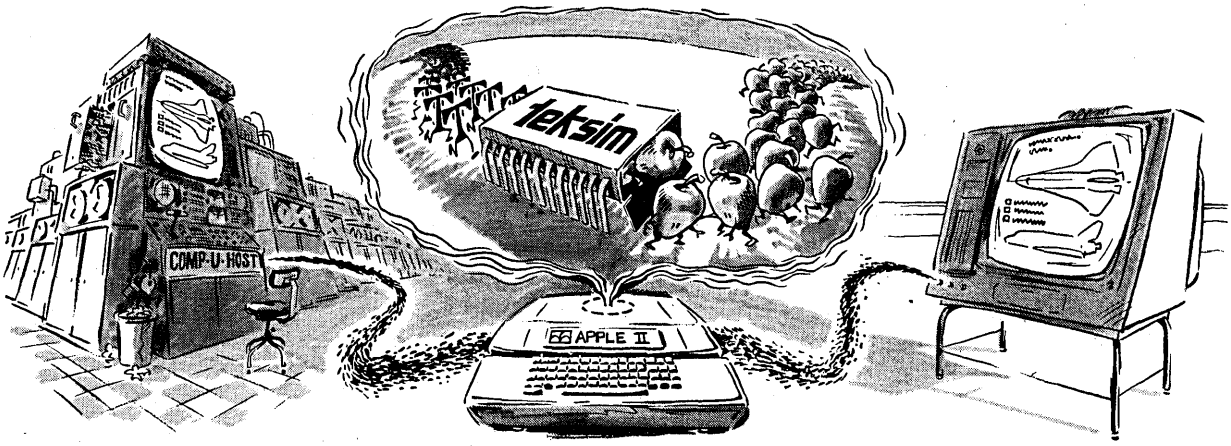

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Then TEKSIM transforms it into Apple data...

...so it can be displayed on the Apple's TV screen.

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ABW CORPORATION
Ann Arbor, Michigan

conditions and other constantly updated general information) will be placed in the Olympic Village in Ray Brook, a rather forbidding structure with 10-foot barbed-wire-topped fences, built by the U.S. Department of Justice's Bureau of Prisons. This less than opulent environmental design is a result of plans for the village to become a correctional facility following the Olympics. (Also in Ray Brook is Camp Adirondack, a New York State prison; its current population will be transferred elsewhere during the events, and the camp will house the force of specially assigned New York State Police.)

•

In LPOOC's administrative offices, Arch Swinyer is on the phone, convincing a producer from Hanna-Barbera to animate Roni (from a Mohawk Indian word meaning "racoon"), the mascot of the Winter Olympics. Down the hall, John Musgrave, director of marketing, is stating the management philosophy of running the event.

"We're in the business of killing an organization. Usually, you manage an organization to stay alive. Here, it is critical we never lose sight of the fact that it all has to end. It's very tempting to put together deals that will have a delayed income, but in reality everything must come to a close simultaneously. The goal is to keep up the momentum, build quickly and efficiently to a successful peak, and shut it down, terminating effectively as many functions as possible."

"It's like being a senior in college," says Mary Lou Brown. "Everyone goes around asking everyone else, 'What are you doing in March?' "

At $150 million ($100 million for capital expenses, $50 million for administration), the budget for the 1980 Winter Olympics is smaller than its predecessors. By September, LPOOC was tracking against a cash budget of $47 million.

Revenue-producing programs include the licensing fees, fund-raising (there have been two direct-mail campaigns; the successful second one has raised $800,000 since February), official publications, broadcast rights, and tickets.

Domestic broadcast rights were sold to ABC for $15 million; LPOOC, unlike previous Olympic host cities, did not sell ABC the international rights—LPOOC's marketing department separately sold rights to Europe, Japan, the Philippines, Australia, and —for the first time in Olympic broadcasting —to third-world countries such as Zimbabwe-Rhodesia.

About $13 million is expected from ticket sales. A maximum of 51,700 tickets can be sold for any one day; the limits apply to the number of people who can realistically be present at a venue, and to the size of crowds allowed by the policies of the State Environmental Agency for Adirondack Park.

The accounting and payroll for LPOOC administration is handled by an offsite GE time-shared system, and the ticket sales are controlled by Globe Tickets. John Musgrave needed a financial and marketing system to track and update the contracts between LPOOC and its licensees, suppliers, and corporate sponsors, so Mary Lou Brown and Cindy Dye designed a system on the TI DS990 that keeps the information on the 290 contracts updated and produces weekly reports for the staff on the status of the contracts, the current payment schedules, the lists of products to be supplied (if applicable), and the number of rooms and tickets that have been promised to the contracted support personnel.

•

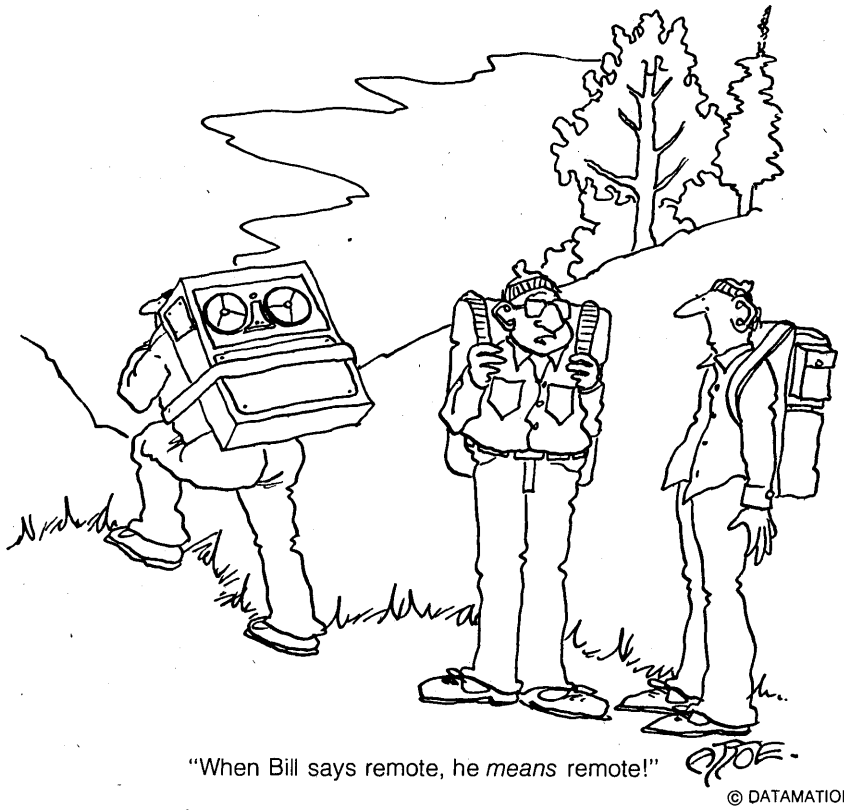
After more than a year of navigating the flight connections from Austin to Saranac Lake, Glynn Marlow's "Olympic team" has learned to offer Molson's Gold instead of Lone Star, but it still seeks out the Mexican restaurants. Mike Morrison, a tall young man from Tampa who speaks nearly inaudibly while munching jalapenos, wrote the master control program for the system that allows the host to accept the remotely entered information, determine allocation of the information to the other remote sites, and distribute the data through the communications channels. Morrison, who also designed the device service routine interface between the hardware and the operating system, wrote the TPL programs for the downhill, slalom, and giant slalom competitions—the Alpine events.

In ski jump trials at New Year's, it was too cold for the terminals to read the floppies. The project manager blew hot air into the vents with his wife's hair dryer.

The test for the Alpine events was last March, when Lake Placid hosted the Alpine World Cup, sponsored by Texas Instruments. This was the first opportunity the vendors had to test the on-line interface between Swiss Timing, represented at this venue by Omega, and TI. The Omega system sent a datastream directly into a TI terminal; as backup TI ran parallel systems: one accepted the input directly, at another, an operator entered the data. (During the Winter Olympics, data entry at all remote locations will be done by volunteers, most of whom have been recruited and trained from Mary Lou Brown's former students at SUNY Potsdam and from the sports committees.)

Installation of the system at the World Cup—which ran the results system in a local mode only and did not distribute the results—found the Texans hauling terminals on snow caterpillars up the side of 2,000-foot Whiteface Mountain, the greatest vertical drop in the Eastern U.S. At temperatures up to 40 degrees F., there was a heat problem. The terminals at the downhill finish line building basked in direct sunlight, causing some diskettes to warp.

There had also been a minor prob-



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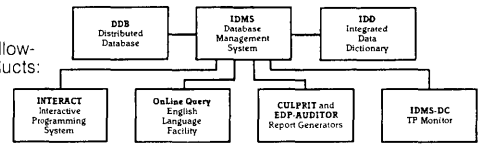

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CIRCLE 70 ON READER CARD

lem at the Master Class Ski Jump held over New Year's. There, in the judges' tower, it was too cold for the terminals to read the floppies. Glynn Marlow went back to his hotel room, returned with his wife's hair dryer, and blew hot air into the terminal vents until the system warmed up.

The early programs for the ski jump were written by a since-transferred team member, and John Romano was assigned to complete the job. John, a native of New York, graduated from SUNY at Albany in June 1978; he joined TI in August, and within two weeks he was back in New York. ("I ski now," he says, "I couldn't afford to when I lived here.")

The ski jump had both operational and technical considerations in the design of a program: there is no timing; points are recorded by the judges on factors of distance and style. The speed at takeoff is recorded at the end of the ramp (measured by a light bar). To score the distance, judges are stationed along the route at two-meter intervals; they record the point where the middle of the ski lands.

At the Master's Jump the judges' scoring was manual, and reached the electronic systems of TI and Daktronics too slowly for quick results to be calculated. To solve this problem, a 10-key console with four function keys and an RCA 1802 microprocessor that transmits the data over communications lines was developed by Daktronics. The keys on the console are widely spaced, in a fine example of human engineering, so it may be efficiently operated by people wearing heavy gloves.

The jumpers take off every 30 seconds; in that time, the program must rank the top 10 jumpers, list the last three jumpers, and directly convey name, national affiliation, points and ranking to ABC. (In the timed events, the television data is relayed by Swiss Timing, via an Olivetti computer.)

The biathlon is the competition with the most scores: it is a 20-kilometer cross-country ski with four internal times and a finish time; there are also four shooting scores. The participants carry a rifle, and periodically stop racing and take various positions to shoot at targets. Below each of the 32 targets is an underground cavern called the "butts," where the scoring takes place. After a target has been shot, it is pulled down to the butts, the judge removes the paper shield and hands it to a messenger who carries it to the officials' scoring room. At the Winter Olympics, the immediate, unofficial scores will be transmitted from the butts over Daktronics consoles to TI771 terminals and distributed from there to all remote locations.

Cross-country skiing, also tested last winter, had the TI system accepting results and ranking all intermediate and final times. "We've had to develop a system," says Mary Lou, "to please the press, which is difficult in an event such as this one that doesn't end officially until the last racers come in—and the stragglers aren't in any hurry. The program will give the press unofficial intermediate scores and standings."

(Although, in these cases, TI-SCORE will be distributing immediate, unofficial scoring to the media, the final validation of all scores is also an essential part of the system; Texas Instruments has been given the responsibility for tabulating all official scores and standings and producing the final Olympics results.)

The luge event, introduced at the Winter Olympics in Innsbruck in 1964 and therefore a relatively new sport, was one of the more difficult to test, primarily because its federation lacked the tradition and the experience of the older sports. In the luge, in which one man, supine on a sled the size of a tea tray (with his head slightly lifted in order to see his feet, which are guiding the craft) comes down a hill at speeds up to 60 m.p.h., the TI system is again logging and distributing the intermediate and finish times.

The programs for the figure skating events had been written several years ago in FORTRAN to run on Honeywell machines; the U.S. Figure Skating Association is considered to be far ahead of other sports in computerized scoring of results. A comparison of each judge's scoring and a correlation with nationality, included to check on nationalistic biases, will also be part of the system. The programs were adapted to run on TI machines by "Olympic team" member Lewis Smalley, who also wrote the accreditation and registration programs. "The problems we have are never in the programs," says Mary Lou. "We run the programs all week long, constantly, to test them. The problems are in the procedures: Are the schedules realistic? Have we assigned the right people to the right functions? And, of course, pulling together the diverse groups, such as the LPOOC, the Figure Skating Association, the vendors, to see that there is no duplication."

The pre-Olympic competition for bobsled will be held next month to test the interface between the TI system and Heuer (for Swiss Timing). Also scheduled for December is a simulation of the speed skating event using local skaters to run the course, and a six-nation hockey competition.

The sport with the least use of the computerized results system is hockey, where intermediate scores and standings are less important than the final scores. The TI-SCORE program will be mainly reporting the standard National Hockey League statistics: number of shots on goal, saves, and period scores, as well as overall tournament statistics on the players and goalies.

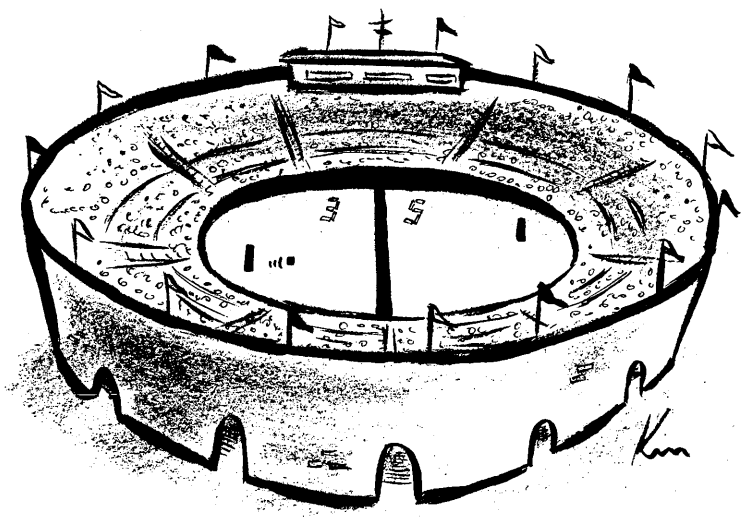
•

Maintaining the hardware is the responsibility of Larry Crochet, his helper, Dave Turner, and five technicians who will be added to the team in February. Larry says, "The biggest job will be keeping the communications up. During the Olympics, Dave will be at the host location, monitoring data going across the line, and another technician will be roamin' around outside with a datascope."

The New York Telephone installation crews in Lake Placid were unfamiliar with some aspects of data communications, but the TI team has helped them along, troubleshooting most of the problems before calling in the phone company. Diagnostics have been built into the system for an end-to-end check on the communications. Still, with 22 remote locations subject to heavy snowfalls or a repeat of last winter's record -52 degrees F., the odds on communications failure are uncomfortably high; the potential for public failure, after an investment of 120 man-months and an undisclosed amount of money, is the greatest risk confronting Texas Instruments.

The last event of the Winter Olympics is the bobsled; as soon as the competition ends, Larry Crochet and his technicians will close shop. "It shouldn't take more than two days. We'll just strip everything, and haul it back to Texas."

—Wendy Reid Crisp



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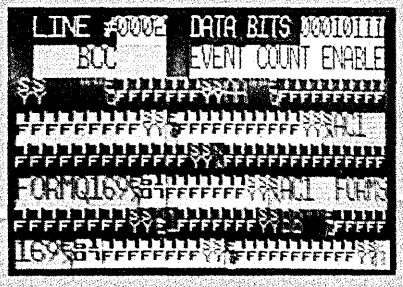

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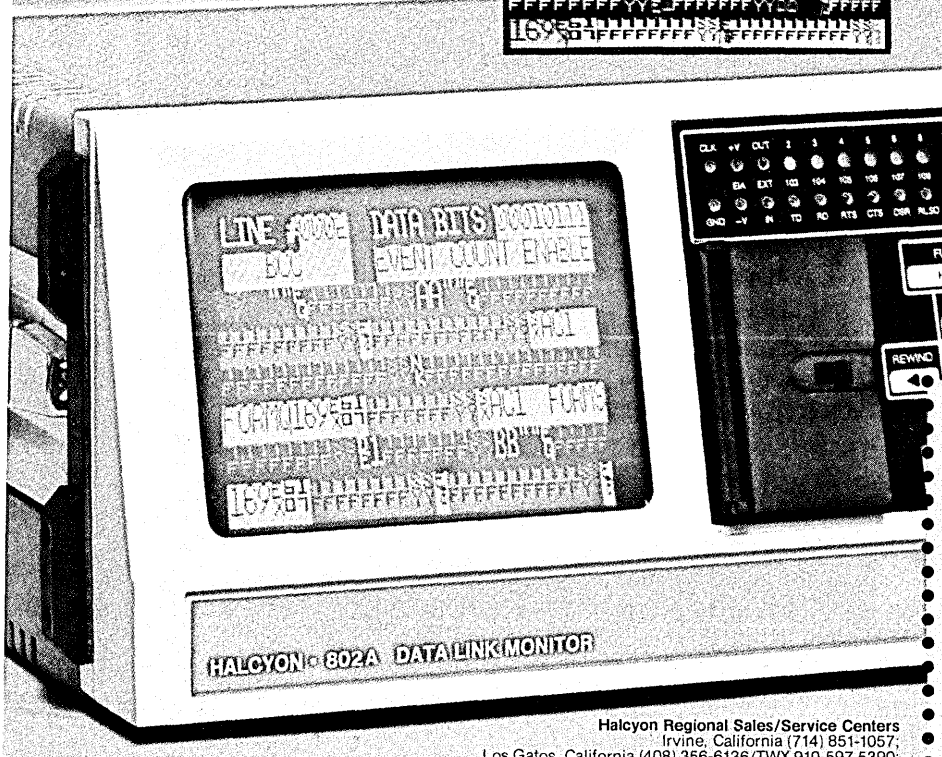

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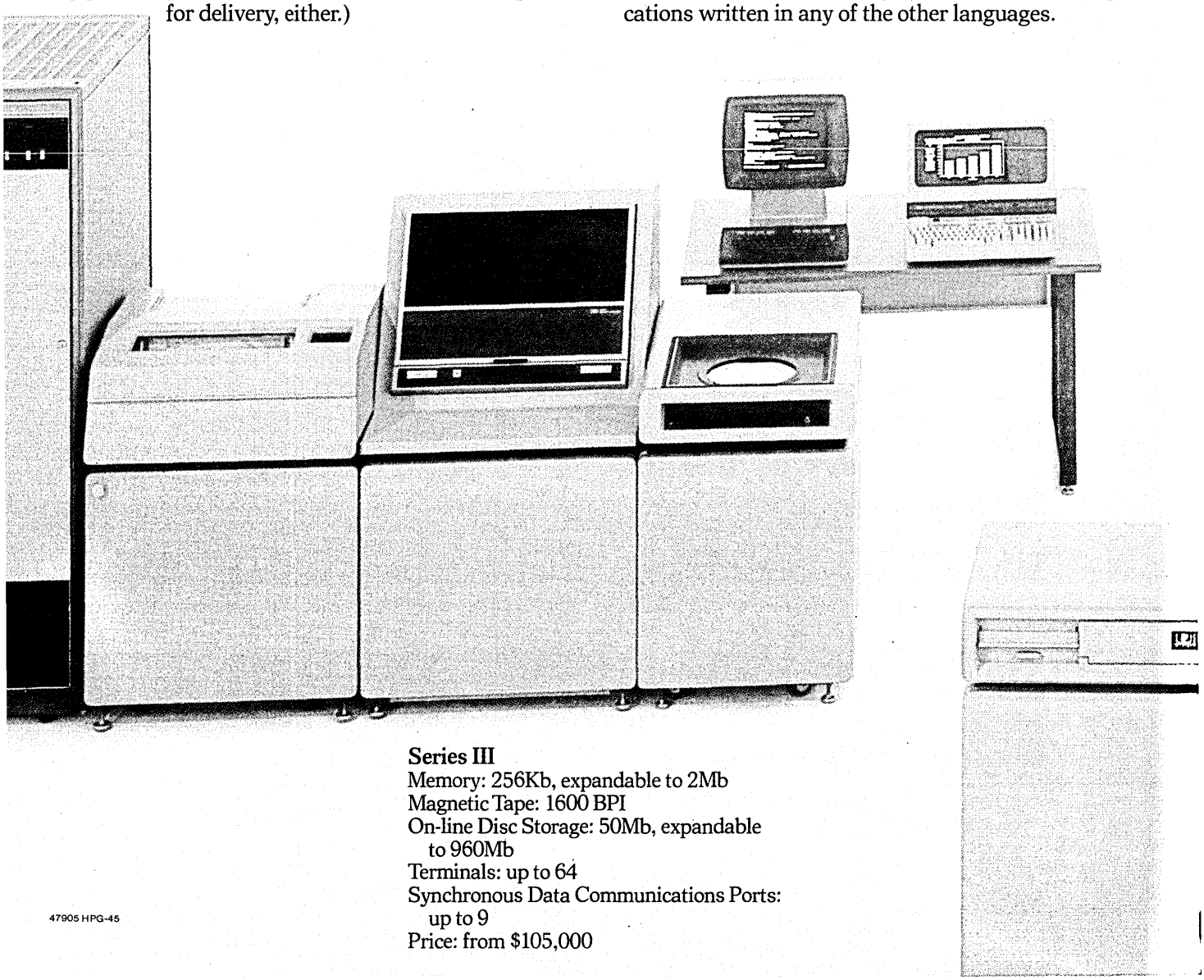

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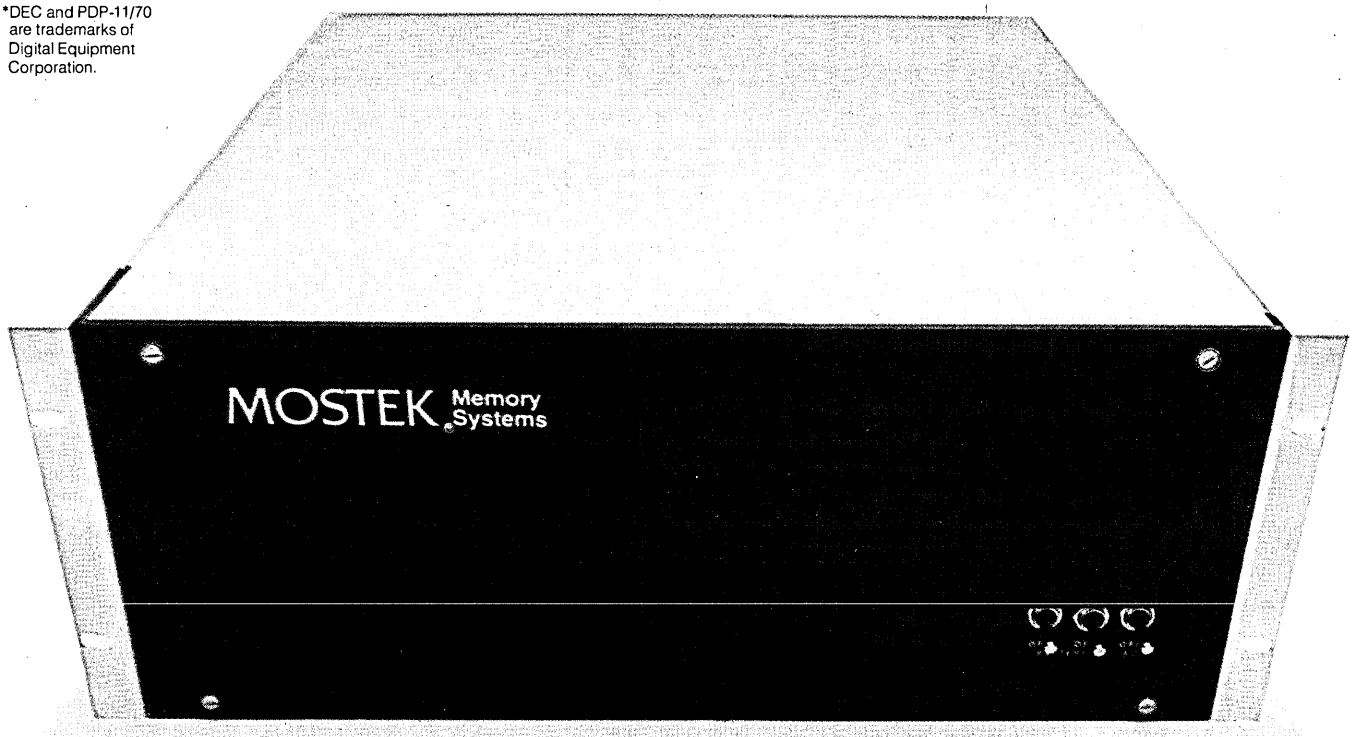

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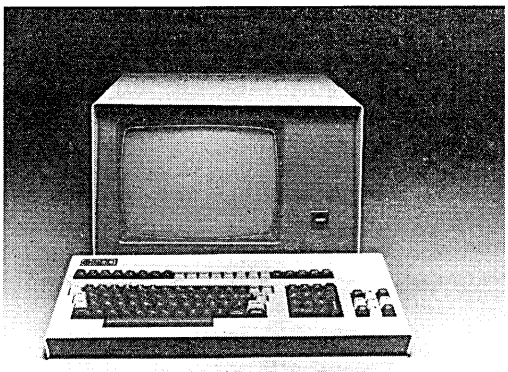

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PEOPLE AND THE AUTOMATED OFFICE

by James W. Driscoll

As industrialized societies become service- and knowledge-based economies, increasing the productivity of the office becomes a major challenge. Citing the relatively low capital investment per office employee, vendors of office equipment propose mechanization as the road to productivity. Lurking just behind equipment vendors, software specialists propose complete automation of office tasks. However, present hardware and software strategies for office automation neglect critical facts about human behavior in organizations. Based on the empirical literature on the behavioral impact of new office technology as well as the long-standing tradition of behavioral science research, office redesign is necessary to take maximum advantage of the automation of the office.

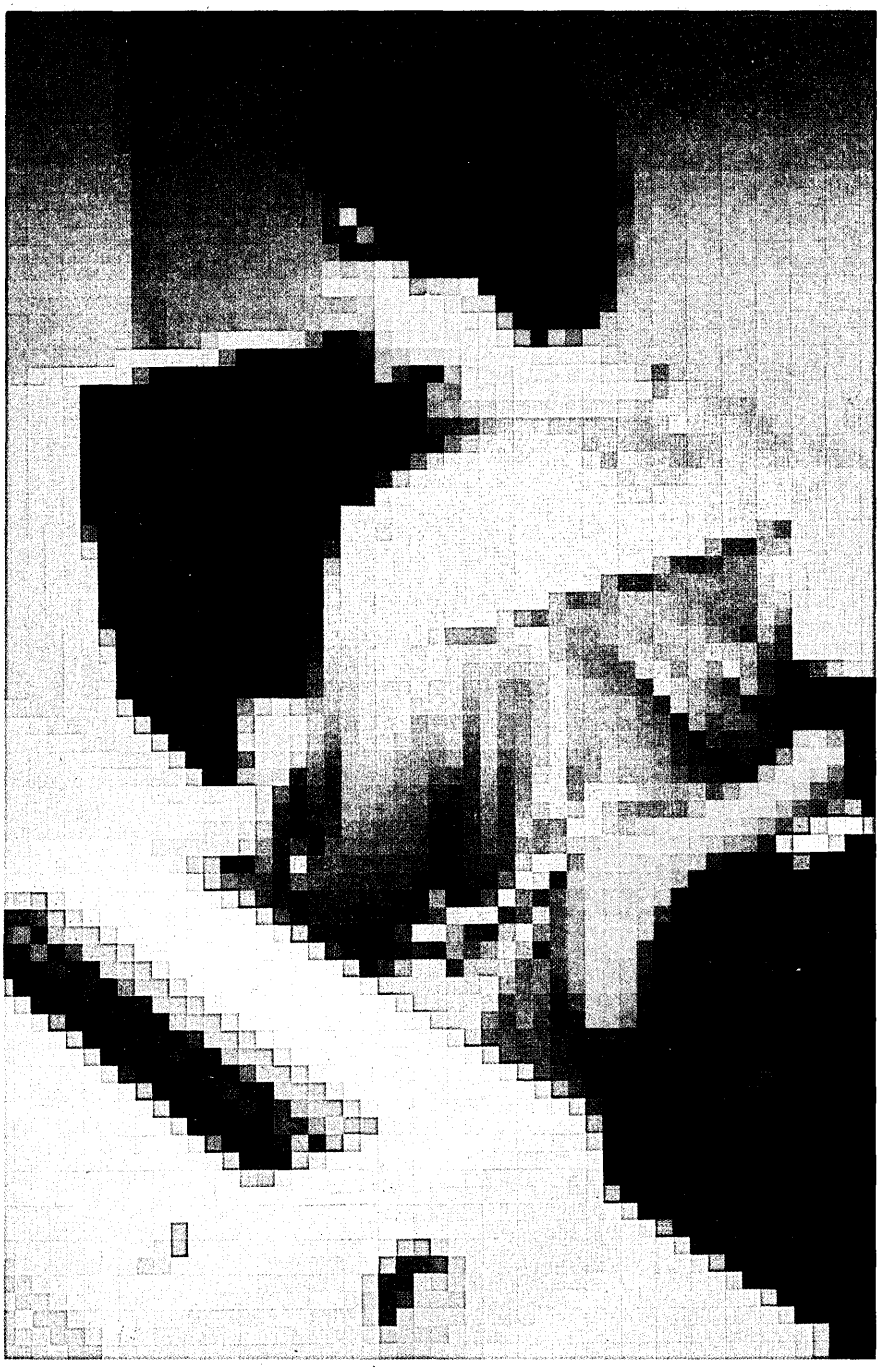
In its early installations, word processing disappointed many users. IBM's marketing strategy, to mechanize typing with capital investment in new equipment, specialized the typing task and centralized typists. However, many early installations generated little cost savings, output of disappointing quality, widespread resistance from users, and turnover in the newly formed word processing center—turnover at all levels from typists to supervisors and in many cases even office managers. As leases were canceled, IBM and its many competitors began to modify the initial marketing strategy to accommodate the demands of a human work organization.

The model of the office as factory misjudged both the variety of tasks and the critical functions in the office. The central center was doomed by such situations as different language groups in many offices—typists had trouble deciphering the secret language of lawyers at 9 a.m. and chemical engineers at 10. More importantly, savings were being sought solely through more efficient typing, but only 20% of secretarial time is spent typing. The much greater potential for savings from the higher salaries of managers and professionals was being neglected. Another mistake was that implementation of word processing equipment usually followed analysis by the *vendor* of needed equipment with little benefit derived from the input of ultimate *users* of the equipment.

Electronic mail threatens to repeat the early disappointments of word processing. Estimates that electronic mail can save two hours a day for every nonclerical worker in an office, with optimistic predictions of $62 billion savings* reflect a questionable diagnosis of managerial and professional work. Firsthand observation shows the critical functions of managers to be building relationships, persuading others, and resolving conflicts. The impact of electronic mail hinges on the ability of managers to complete such sensitive functions by intermittent written communication.

Similar difficulties await the electronic workstation. According to Paul Strassman of Xerox Corp., the electronic workstation can improve the ability of white collar workers at the boundary of organizations (those whose jobs entail working with people outside their organization or department) to respond flexibly and directly to the needs of clients and customers. Strassman cites the possibility of coordination among the workstations by organizational procedures imbedded in the system software. However, behavioral research on such boundary spanning jobs has highlighted the need for flexibility *within* the organization, the opposite of programmed coordination. Effective boundary spanners influence internal procedures and modify standing operating procedures in order to serve clients and customers. Indeed, if any work organization follows all of its routines all of the time, chaos ensues.

As a further complication, managerial and professional work is increasingly accomplished in groups rather than by individuals. A more promising mechanization might be group rather than indi-



motivating the productivity of the employee than entirely specialized jobs are.

Combining a systematic job redesign with the introduction of new office equipment can greatly enhance the effectiveness of managers and professionals in the office. A routine managerial function such as preparing a report might better be delegated to an office staff member, to whom the task could provide relatively more responsibility. The mix of discretionary and routine tasks can thus help avoid the problems of alienation and turnover among clerical workers, while managers and professionals are freed to concentrate on the most discretionary aspects of their jobs.

Communication among members of an organization has been studied from many angles. Perhaps the simplest insight of the behavioral sciences distinguishes between informal and formal communication.

Formal communication is required and tends to be written and hierarchical. It reflects the organization's need to accomplish its missions. Informal communication, on the other hand, is ad hoc, and tends to be verbal and lateral. It satisfies the individual's need for social satisfaction in the work setting.

Informal communications should be encouraged as a systematic supplement to formal channels. In complex and changing organizational environments, communications must be rapid, spontaneous, and capable of cutting across formal organizational boundaries. Innovative organizations have thus nurtured informal communications and deemphasized the formal.

Informal communications provide an important incentive to some experimental new electronic systems. In every successful installation of electronic mail I have visited so far, the users have developed informal distribution lists to notify each other of social events and gossip (concerts, parties, etc.). While these informal channels have developed among groups experimenting with electronic mail, the formal introduction of the mail system has often encountered massive reluctance to make use of the equipment. Organizations seeking to encourage the use of electronic mail might take the behavioral perspective and cultivate the *informal* use of the system, similar to the white collar worker's use of the telephone for social contacts. Users could develop familiarity with the equipment in the course of enjoyable, informal communications rather than face the electronics as a barrier to the accomplishment of formal organizational tasks.

Employees stay with an organization and perform effectively when there is a good fit between their needs and the opportunities provided.

FOUR LEADERSHIP FUNCTIONS

Another important function of the jobs of managers and professionals is to provide leadership, that is, to help further the mission of the organization. After a long and frustrating history of research, behavioral scientists no longer attempt to identify natural-born leaders nor the traits of successful leaders. Rather leadership is most frequently described as any action by any member of a group or organization to help the organization progress towards its goals.

At least four types of leadership functions can be specified: technical, administrative, social, and institutional. Unfortunately, most practicing managers conceive of leadership as a technical and administrative function and neglect the social and institutional aspects of the role. Therefore, it is not surprising that attempts to support managers in their office settings emphasize the two former roles and inadvertently jeopardize social and institutional contributions. Yet behavioral-science research, beginning with the famous Hawthorne experiments, has shown that human organizations must provide social support to maintain the commitment of members. At the same time, there is the need for institutional direction in establishing organizational goals.

In office work, for example, social leadership involves meeting the needs of individual workers for a close personal involvement in the work group. In several successful word processing installations I have studied, face-to-face personal contact between users of the system and operators of the equipment has helped overcome the frustration resulting from the physical and social distance between the initiator of word processing input and the system operator.

Electronic mail opens up whole new social possibilities. For instance, many organizations currently administer attitude surveys on a regular basis to monitor the feelings and satisfactions of employees. Electronic mail systems provide another medium for conducting such surveys. A survey could be conducted in a very short time, for example, in response to an organizational crisis. In like manner, a confidential complaint service might easily be incorporated into an electronic mail system.

The introduction of electronic technology into the office increases the need for social leadership. The electronic office makes it much easier to get input from all levels of employees into the planning process and easier to communicate institutional decisions throughout the work force. Electronic technology can thus fulfill the social and institutional requirements of a productive organization rather than being addressed simply to technical and administrative components.

THREE STAGES OF OFFICE AUTOMATION.

Stage	Mechanization	Automation	Socio-diagnostic design
Focus	Tasks	Whole procedures	Missions
Criterion	Individual efficiency	Organizational efficiency	Organizational effectiveness
Form	Hardware	Software	Management
Discipline	Electrical engineering	Artificial intelligence	Applied behaviorial science
Origin	Vendor	Vendor	User
Obstacle	User resistance	Programming	Management
Feasibility	Present	5 years	Present
Application	5 years	10 years	15 years

Table 1

Particular attention should be paid to the development of effective working groups as part of the social functions of leadership. Sophisticated managers realize that new groups don't work together well; the comparative advantage of groups over individual contributions only emerges as groups mature. Therefore groups must be allowed a period of time early in their history when little is expected from them in the way of performance. Managers who are most dissatisfied with groups (task forces, committees, and the like) typically call a group of people together, assign them a task to work on immediately, and are then surprised when the group fails to accomplish its objectives on time.

Indeed, predictable crises emerge in the history of a group. Phrased in terms of questions a group member might ask, they are: "Who's in charge here?" "What's in it for me?" and "What do people expect of me in this group?" Sorting through these issues takes time, but once the problems are resolved, groups can make rapid progress on tasks.

These patterns in group development have obvious implications for electronic teleconferencing. Ideally a geographically dispersed project group can function without the need for extensive travel to coordinate their efforts. Teleconferencing—either video or electronic mail—could substitute for face-to-face meetings. However, installation of the electronic system without attention to the social problems in group development would doom such a system.

On the other hand, a manager could convene a long (multiple-day), face-to-face session early in the project group's history and devote the session to an exploration of the difficult social issues. Then, a teleconferencing facility could save the hothouse grown project group substantial travel time during the life of the project. In concrete terms, an organization hoping to reduce meeting time by purchasing the electronic equipment for teleconferencing should at the same time build a conference center for extended startup meetings.

HUMAN RESOURCE DEVELOPMENT

Although performance appraisal, recruitment, management development, etc., have been analyzed in detail by sociologists, two global concepts highlight the problems in most offices. In the first place, there is the distinction between jobs in what labor economists have termed primary and secondary labor markets. In the vernacular, the primary labor market provides "good" jobs. They combine high pay, opportunities for training and advancement, considerate supervision, job security, and protection from arbitrary discipline. By contrast, a substantial portion of office jobs currently falls in the secondary labor market. These jobs combine low pay, little training or advancement, little job security, authoritarian supervision, and arbitrary discipline.

Employers must attempt to move more office jobs into the primary labor market. The commitment of the employee to the organization engendered by this step would allow the use of participative

decision and communications practices as well as ease the implementation of new equipment.

A second important concept in human resource development is the psychological contract. Office employees are motivated to stay with the organization and to perform effectively when they feel there is a good fit between their individual needs and the opportunities provided by the organization. Although office workers have been studied by psychologists much less frequently than managers and professionals have, we do know that individual secretaries and clerks differ substantially in personal preferences. Some seek advancement to higher organizational levels, others want an opportunity to cultivate and use particular technical skills, and still others need only a secure job and source of income among congenial coworkers. Formal systems to identify the needs of individual employees and match them with organizational opportunities should be developed. Counseling sessions, posting job opportunities and allowing open job bidding reflect this orientation. Clear career paths should be made obvious, some for progression upward through office jobs, but also a variety of other career paths to satisfy the different individuals who work in the office.

The question is not whether a new, more effective organizational design will evolve but who will control the evolution. Managers can act now to implement these changes or be forced to accept them by legislation or unionization.

For example, equal employment opportunity litigation is increasingly directed at the office. A number of suits will almost certainly challenge the job evaluation schemes which currently relegate female secretaries and clerks to low salary grades. The Equal Employment Opportunity Commission has already commissioned a major study to investigate job evaluation practices. Initial indications suggest a major threat to current patterns of sex segregation in the office.

Also, unionization of the white collar work force in the U.S. is a likely development in the 1980s as women become increasingly career oriented. A recent report for the Department of Labor described female white collar workers as "ripe for unionization in the 1980s." A central question for labor relations specialists forecasting the level of unionization in the next decade is whether increased office automation will be a force contributing to the increase in unionization or whether its careful introduction becomes a means for managers to maintain their current nonunion status.

Will increased office automation be a force contributing to the increase in unionization?

TWO-PRONGED STRATEGY OF CHANGE Given the inertia of the traditional organization of office work, a two-pronged strategy of organizational change may be required. The first step in any transition is creating the felt need for change; the process of transition is actually the second stage. The need for change must be directly felt by managers and professionals. Top management must visibly support the new organizational design, through new human resource practices, as a means of eliminating any second-class citizenship in the office.

For the second, process-oriented stage, a nondirective approach is required. Innovations should be allowed to move in the marketplace of ideas within the organization. For example, employers can use new technology in local demonstration projects to diagnose particular office situations and subsequently experiment with related new social designs. Evaluation of these local initiatives encourages the slow diffusion of ideas through the organization.

Such a slow-paced strategic effort is required in the second stage of change because of the nature of the change ultimately desired. The object of the exercise is to increase productivity through a basic change in the nature of office work.

In most organizations, it will be impossible to impose from the top of an organization a single design flexible enough to accomodate all local idiosyncrasies. Moreover, employers ultimately want their office staff to internalize the values underlying the new organizational design as well as becoming familiar with the electronic technology. Superficial commitment will not suffice; if the traditional human resource systems remain in place, managers are taking the risk that equipment may be purchased and then not used. Commitment and local innovation require a slow-paced transition, not specific directions from the top.

The transition to a new organizational design for the office requires careful management. The logical management vehicle for such a transition is a high-level, interdepartmental task force combining the various disciplines within the organization affected by new office technology. Most innovative users in the United States have already formed such a task force to encompass data processing, telecommunications, and administrative services. The mix combines expertise in hardware, software, telecommunications, and methods analysis. However, such task forces seem systematically designed to overlook the third stage in the evolution of automation as described here.

Professionals from the department of human resources or personnel rarely sit on such task forces even though they can bring a number of skills relevant to the change process described here. Implementing the new organizational design involves the modification of job descriptions, job evaluations, supervisory style, management training and development, selection and placement, to list only a few issues relevant to the human resource support staff groups. The task force also requires an applied behavioral scientist familiar with the process and problems of planned change in organizations. A major challenge confronting user organizations is to establish the link between the office automation/office of the future task force and the human resource disciplines within their own organizations. ✲

"Furthermore, I do not question the existence of pure relational data base machines, the covert commercial use of a 512K chip, or the melodic supremacy of Vic Damone."

JAMES W. DRISCOLL

Prof. Driscoll teaches human resource management, labor relations, and psychology at the Sloan School of Management at MIT. He has consulted with a number of vendors and users in the development and assessment of new office technology.

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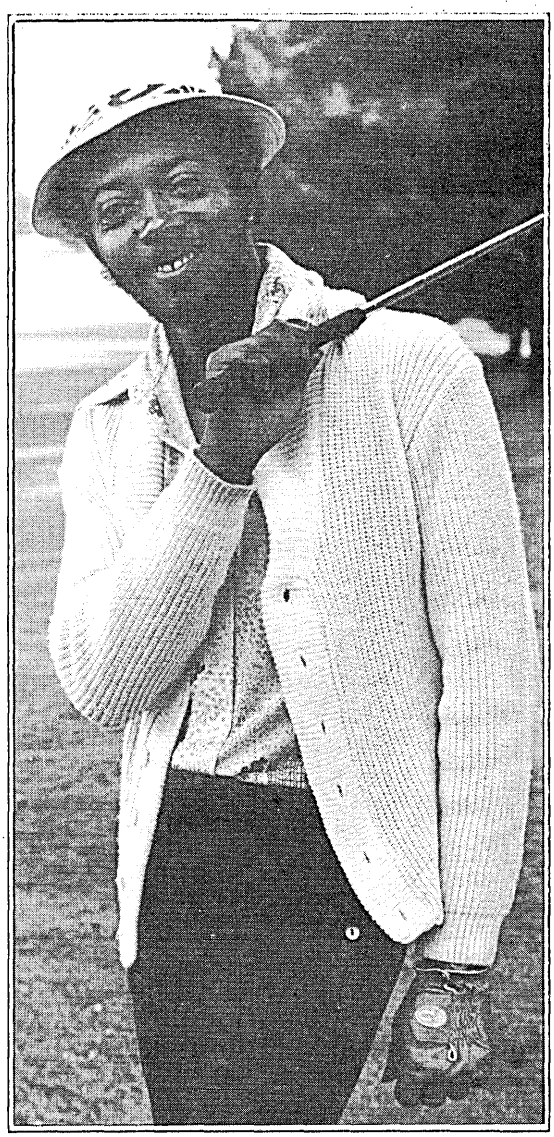

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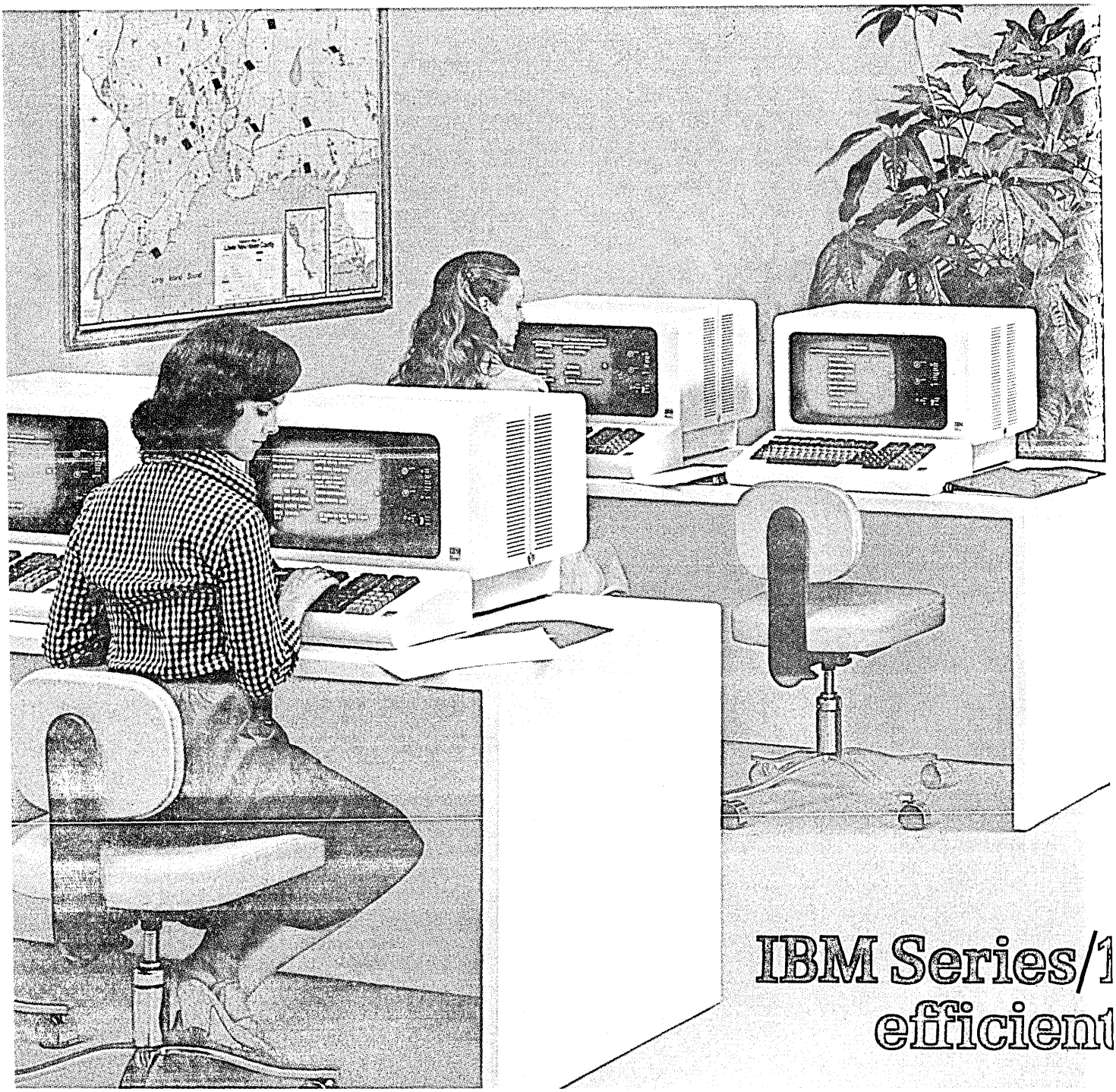

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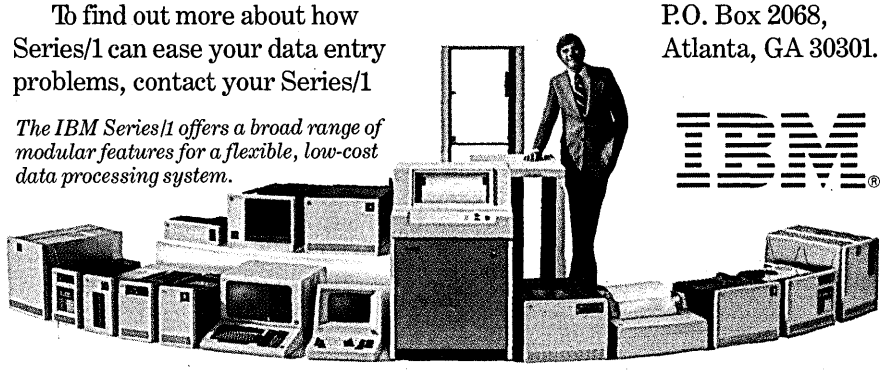

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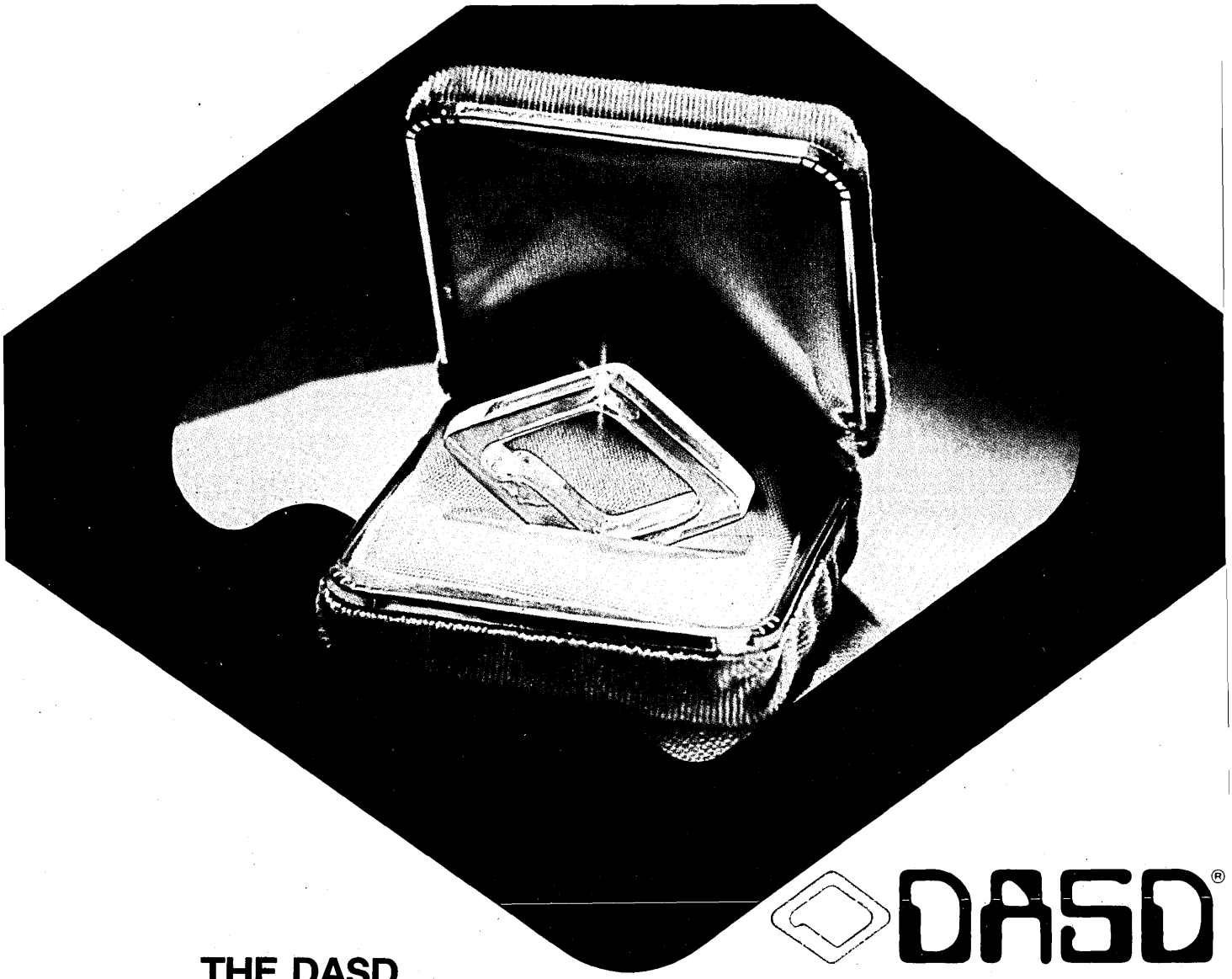

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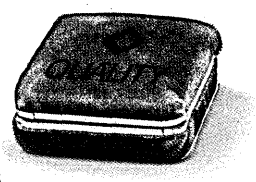

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Decision support exploits existing computer technology to meet decision-makers' needs.

DSS: AN EXECUTIVE MIND-SUPPORT SYSTEM

by P.G. Keen and G.R. Wagner

When one asks a senior manager, "What do you use computers for?" the dialog is often predictable:

"Oh, we use them for everything. Why, we have systems on-line, interactive thus-and-so's. We're putting in a distributed such-and-such."

"Yes, but what do *you* use computers for?"

"Well, I get a lot of reports. Some of them are very helpful. . . ."

"Yes, but what do you *use* computers for?"

"Well, actually—very little."

The importance of data processing to the organization and the feverish growth in demand for hardware and software hide an inescapable reality: even now, many managers feel that the computer is only of peripheral value.

But a new concept in computer use is afoot that promises to improve this situation. New approaches are being taken that represent an entirely different philosophy. As a result, in many organizations, computers are being used by managers as *personal tools*—as extensions of the executive mind. Wrapped up in this change are some monumental implications for dp professionals.

The new managerial uses of computers are being brought about by inexorable trends in hardware, software, and business needs. This is not a single, clean-cut innovation that occurred overnight, but is more like a tide moving in many currents and eddies over a period of time. What is happening is manifested in a variety of new software packages for interactive use by managerial personnel. This software is centered around two broad classes of applications: data base management (information systems) and financial planning (modeling, analysis, etc.).

Several years ago, one of us (Keen, in association with others at the Sloan School of Management) began describing the emerging new philosophy and gave it a name: decision support. A decision-support system (DSS) is a computer-based system (say, a data base management system or a set of financial models) which is used personally on an ongoing basis by managers and their immediate staffs in direct *support* of managerial activities—that is, *decisions*. Another term for DSS might be "executive mind-support system."

The other one of us (Wagner, working independently) created a planning or modeling language which is an expression of the decision-support concept. Called interactive financial planning system (IFPS), this software package is a method of creating a DSS in the form of one or more models, and then using the system on a continuing basis by manipulating the models and improving them in a learning process. The models may be linked to a data base management system to form an even broader expression of the DSS philosophy.

Here, we will elaborate on the movement toward personal use of a computer by managerial personnel in terms of decision support. We will draw on IFPS as an example of DSS philosophy.

First, it is well to explore the discouraging situation reflected in the opening dialog. What does it mean when a senior manager admits computers are of little use to him? And why is this so?

For one thing, many technical specialists have little understanding of managers. They assume the products they offer are useful to executives. Data Processing views its role as improving the operations and data flows of the organization, MIS as providing the information needed by managers, and OR/MS (operations research/management science) as developing analytic methods for decision-making. Each group works forward from technology (the means) to applications (the end). For some, the end *is* the means.

No one can deny these traditional approaches have been fruitful. Even though we have often jumped ahead only to scuttle back, computer systems and models are indeed a central component of most functions of business.

But regardless of how indispensible such computer-based systems have become, they are incomplete from the viewpoint of the manager. Benefits of the systems are often limited to matters peripheral to the center of the manager's activities, such as reporting and control systems, delegated activities that mainly involve procedures and rules, and delegated decisions that—although they involve judgment—are of minor importance.

The central managerial activities not touched by traditional computer systems are those involving personal choices—matters that cannot be performed routinely or delegated: planning for the future, "fire fighting," and providing fast responses to unanticipated situations. Even though much of the analysis is provided by staff, the final choice must be made by the manager.

Henry Mintzberg[1] aptly characterized the senior manager's job as one of brevity, fragmentation, and variety. Managers rarely spend more than an hour at a time on any one activity; they deal with a typical problem in fragments of time scattered over a period of weeks or months; and they cover many different tasks in a given day. Furthermore, they prefer obtaining concrete information and rely on face-to-face discussions; yet they often depend on intuition.

In light of a senior manager's real job and how he does it, one may discern several reasons why computer-based systems useful to the manager's organization may provide no help at all to him personally:

1. Since his decision-making is often ad hoc and addressed to unexpected problems, standardized reporting systems lack scope, flexibility, and relevance.
2. Many classical OR/MS models that are *conceptually* useful often do not adequately fit a specific situation. Decision-making involves exceptions and qualitative issues.
3. While plenty of computer pow-

Computers and models must be natural extensions of managers' normal methods for exploring problems.

er is available, the lead time is too long for writing programs and getting answers.

4. Managers cannot specify in advance what they want from programmers and model builders. Decision-making and planning are often exploratory. Information needs and methods of analysis evolve as the decision-maker and his or her staff learn more about the problem.

SUPPORT FOR MANAGERIAL DECISIONS

However, systems are appearing that do provide direct, personal support for managerial decision: decision-support systems. What capabilities must such a system have to be useful to a manager? A DSS should be able to reflect the way managers think, be flexible and adaptive through ease of modification, support managers in a complex process of exploration and learning, and evolve to meet changing needs, knowledge, and situations.

In many ways, such a system is defined by its uses, and not by any specific technology. The goal is to provide managers with tools they will choose to adopt and that mesh with their own decision-making and judgment processes. The means are whatever software and hardware tools are suitable and available.

This is the essence of DSS philosophy. As far as computer systems are concerned, the foregoing capabilities translate into some specific design criteria:

- A flexible development language that allows rapid creation and modification of systems for specific applications.
- A system design architecture that allows quick and easy extensions and alterations.
- An interface that buffers the users from the "computer" and allows a dialog based on the manager's concepts, vocabulary, and definition of the decision problem.
- Communicative display devices and output generators.

The key words to this system are flexibility, ease of use, and adaptivity. A manager will not use a system lacking these attributes. It is hard to see any reason why he should.

Decision-support systems are used for many purposes, but there are certain common features. Direct, personal support of managerial decisions requires either the elements of an information system (a DBMS) for storing and retrieving data, or modeling and analysis capabilities, or both. Of course, the systems are interactive—usually on a time-shared basis.

Systems with these characteristics are becoming more prevalent as interactive processing spreads and as the software tools become available. Some decision-support systems are created by means of canned models that provide many functions. Others are developed from scratch by close staff members of the managers whose decisions are to be supported—or, in some cases, by the managers themselves.

Although it is possible to use a general purpose language, such as APL, DSS can be more easily implemented by using any of several simple special-purpose languages. For example, EXPRESS is a development language used for marketing analysis applications. A language called RAMIS is suitable for data base-oriented decision support. In addition, there are several financial planning languages.

Of course, it's not in any particular software package that the DSS philosophy is realized—it's in the way the software is used.

Of all managerial tasks, strategic planning is the least amenable to the traditional computer system approach, because it is least subject to predictability, delegation, and automation. The more continuous, ongoing aspects of planning (budgeting, capital investment analyses, and forecasting) are obvious candidates for decision-support applications. But perhaps the most spectacular use of a DSS is in a quick-turnaround, ad hoc situation. Here is a case in point.[2]

Houston Oil and Minerals Corp. was interested in a proposed joint venture with a petrochemicals company, with respect to developing a chemical plant. The executive vice president responsible for the decision wanted a Monte Carlo analysis of the risks involved in the variables of supply, demand, and price. David Simpson, manager of planning and administration, and his staff built a DSS model in a few days by means of a planning language. The results strongly suggested the project should be accepted.

Up to this point, any traditional simulation model might well have been adequate for providing answers to the expressed problem. The genuine decision-support capabilities of the model were mainly latent. They were reflected principally in the speed with which the problem statement was translated into a model the executive vp could readily understand and trust.

Then came the real test. Although the executive vp accepted the validity and value of the results, he was worried about the potential downside risk of the project—the chance of a catastrophic outcome. As Simpson tells it, his words were something like this: "I would like to see this in a different light. But I realize the amount of work you have already done, and I am 99% confident with it. I know we are short on time and we have to get back to our partners with our yes or no decision."

In short, Simpson replied that the executive vp could have the risk analysis he needed in less than an hour's time. Simpson concludes, "Within 20 minutes, there in the executive boardroom, we were reviewing the results of his 'what-if?' questions. Those results led to the eventual *dismissal* of the project which we otherwise would probably have accepted."

This was decision support in action. The particular situation is one that occurs again and again in top-level decision-making. The process began with what was really a first cut, based on the decision-maker's best initial definition of what was needed. The executive vp then responded to the results—his judgment alerted him to the need for additional analysis, so that the model needed to be modified, and *quickly*. In a sense, the first model—the one he asked for—was either incomplete or incorrect. It performed well, but the executive vp's broader sense of the situation told him something was wrong—even though he did not realize that the computer tools at hand were flexible and responsive enough to allow this result of his own learning to be followed up. In the end, he was using the system as an extension of his own mind.

In this and countless other specific applications for which decision-support systems are being created, one sees the necessary capabilities we listed earlier—reflection of the way managers think, flexibility, and ease of use, exploration, and evolution. The importance of these features is apparent in studies of DSS development and use.[3] Without them, true DSS is impossible.

LANGUAGES FOR DECISION SUPPORT

The foregoing example may leave some people incredulous. In such a short time, how can a thorough risk analysis be performed for a proposed major chemical plant? How can all the judgment factors be elicited, quantified, and worked into a model? How can the results be presented meaningfully and convincingly to the manager? And how could a worthwhile model for such an undertaking be created and validated as quickly as it was in the first place?

To provide an idea of how these things—and more—are being done, we should study the planning language used for such applications.

Although a planning language is

A STUDY OF DECISION-MAKERS

From 1970 to 1974, a research group at IBM in San Jose developed one of the first decision-support systems. The project centered around a system for geographic allocation of resources and people, and was used both by IBM, to determine, for example, how many reps to put where, when, and how, and by customers, on a test basis. IBM provided the software free—and temporarily—while the customer paid operational costs and provided the data.

One of the most impressive aspects of the General Analysis and Display System—GADS, as it was known—was its proven flexibility. Over 200 people at 17 different organizations used the same version of GADS. And none of them were computer experts.

IBM learned a great deal about end-user problem solving from the GADS project. For one thing, the way organizations do business is very likely to change once automation begins to be applied to decision-making. Behavioral studies of the manager and the organization thus become newly important.

For another thing, the nature of decision-making itself presented a serious design problem for which traditional systems analysis isn't really very well suited. The user interface is one of the least mature aspects of system design.

Also, in order to attack the business user market, the nature of the business would have to be examined. The most obvious finding IBM made along these lines was that decision-making is almost entirely unstructured. Managers don't really know how they make decisions, and, on top of that, they don't want to reveal the details of decision-making of which they *are* aware, as these tend to be important specifics.

IBM's DSS research group decided it was necessary to start with the assumption that they didn't know what was needed, and then piece together the answer from the clues. They got the clues by asking simple questions of decision-makers. "What do you look at when you are making a decision?" "What do you need to have on hand?" "How do you manipulate these tools?" "What are the standard operating procedures and control procedures you have that you know you want to keep?"

With the answers to these questions, the research group came up with a set of variables that made sense for use in a decision-support system. The success of GADS was probably due to the wisdom of this simple analysis.

The significance of the user interface lent weight to two more research directions for IBM. Having discovered that the nonprogrammer user wants a completely interactive system, the importance of a menu-driven system with good display capabilities became obvious. Neither the hardware nor the software available were geared to these characteristics. IBM realized that it was going to have to design a system to really involve the people. Improving the user interface would need a better terminal.

It was also going to require a better language. In an interactive program, screen management—putting up the option or the information, manipulating it, taking it down, and quite possibly keeping it handy for later use—takes up much of the code, about 60%. Because IBM believes the major new applications will be interactive, research is being done on a language discipline tailored to the heavy use of the display. What is needed is a language that goes beyond the subroutine—coroutines make more sense when a lot of information needs remembering (and only ALGOL and one version of PASCAL use coroutines).

Another important aspect of decision-making surfaced in IBM's examination of its successful research effort. The final ingredient of decision-making is communication. The social acceptance involved in presenting a decision or solution and the feedback generated from those people the decision involves must be considered part of the process.

—**Sarah Rolph**

often used in systems supporting a wide range of managerial activities, its basic design reflects its original purpose—corporate planning by the use of models for simulation purposes. It allows a user—often without prior programming expertise—to set up a model that operates on a rectangular array of numbers. The numbers represent characteristics of a business entity over a series of time periods. The model consists of mathematical formulas or relationships for calculating the numbers of the array. These formulas are specified so as to simulate the behavior of the entity as time passes. In operating the model, certain numbers in the array are provided and the remaining numbers are automatically calculated.

The commands that comprise some of these languages are easy to learn and use, and each command is powerful in terms of the results. To this end, the commands often resemble familiar business terminology and may be phrased with a great deal of latitude. Moreover, these languages allow highly nonprocedural descriptions of the problems, in that the user may key in a model's characteristics in whatever order he thinks of them. The system, in turn, comes up with a specific procedure (invisible to the user) for getting the desired results.

Because of these features—and because the language use is interactive—models may be built, modified, and applied quickly. Simple models can be created in a few minutes; complex ones rarely take more than a few days. A modification can be made in a few seconds, and the new results obtained a few seconds later.

Other features of planning languages vary widely, but a few of the more important ones may be named. A "what-if?" command allows the results of changed conditions to be revealed quickly, without losing the original base case. A "goal-seeking" or "reverse what-if" command similarly calculates the change that would be required in one variable to produce specified results in another variable.

Besides the expected sort of algebraic and trigonometric functions, a number of sophisticated mathematical techniques are usually provided. For example, there is often a choice of several types of curve-fitting for smoothing and extrapolation of data. There are logic-condition expressions of the "if...then...else" type. Routines are often provided for standard business purposes such as net present value, depreciation, and so forth. Functions may sometimes be specified in terms of interpolation along straight segments between given points. Sometimes the user is able to define his own subroutines and functions in various programming languages such as FORTRAN and incorporate them into the model.

Some planning languages allow variables to be specified probabilistically, using a choice of several intuitive formats including normal, triangular, and uniform random distributions. Deterministic values may often be called from a probabilistically specified variable in terms of high, low, mean, or most probable. At least one language allows a Monte Carlo solution for specified variables, based on probabilistic inputs. That is, the probabilities of various outcomes of a particular scenario can be calculated.

Arrays of data may usually be stored apart from the actual models (the numerical framework and formulas).

A manager will not use a system that lacks flexibility, ease of use, and adaptivity.

Such arrays are created as outputs of models or called from storage as inputs. Arrays (data files) resulting from several different models may in some cases be consolidated—as for various divisions of a company—either by simple addition of corresponding entries or with the inclusion of weighting or post-consolidation processing.

Finally, the contents of many of the array files (say, the results from a model being investigated) may be reported in any desired arrangement of rows, columns, and headings. Report formats may be called from storage or specified as needed. As for all other capabilities of certain languages, report generation is accomplished by simple, easily remembered, English-like commands.

From this brief generic description it can be seen that the potential exists for the more sophisticated planning languages to create a system suitable for genuine decision support. Referring to our earlier list of necessary DSS capabilities, some particular instances immediately come to mind.

Familiar and flexible syntax allows models to be specified in terms of the way a particular user or manager thinks. The same may be said of intuitive expressions for probabilities and risks, and of output formats variable to suit the manager's style. Simple, powerful commands and rapid interactive processing allow the model or given data to be changed quickly and easily to adapt flexibly to new situations or assumptions.

If desired, the senior manager may put hands to the keyboard for instant feedback on various scenarios. In any event, the manager need be only one step removed from the machine—which may be a dedicated installation right in the executive suite, with no need for traditional forms of dp support. (More on dp's new role later.) Obviously, a system application built and used through a planning language can support exploration and learning by the manager with respect to the problem at hand. Furthermore, an ongoing system will readily evolve to meet inevitable changes.

USES CORRESPOND TO PHILOSOPHY

More than a potential, DSS is a recognized reality, although not necessarily by that particular name. For evidence, we turn to IFPS, one of several planning languages. The question is, "Do the actual uses of a planning language correspond to the philosophy of DSS?" The results of a recent survey of IFPS users shed a great deal of light on this question.[4]

The survey was conducted among 24 medium-to-large companies. The reported model applications covered a broad range of purposes, as diverse as predictions of long and short term financial positions, product line studies, pricing analysis, facilities planning, and contract negotiations. Table 1 is a summary of the responses to four questions with regard to the persons connected with each application.

From these responses, it is apparent computer power has been placed in the hands of upper and middle management. Although staff analysts are understandably heavily involved in the actual keyboard work, a significant percentage of upper-management people are actually sitting down at the terminal.

On the other hand, it would appear that so-called "data processing" personnel are almost never involved. In this category were placed systems analysts and programmers. As we will see later, this finding need not imply that the dp function and organization drops out of the picture when DSS comes in.

Table 2 shows the responses with regard to the number of days required to build each model.

Bearing in mind that the models reported were real-life and moderately complex, it may seem startling that the majority were created in five days or less. Five days would correspond to a cost (principally the employee's time) of perhaps $2,300. That is the sort of performance to be expected of a true DSS.

The respondents were asked to describe the most important "people-oriented" benefits and the most important "feature-oriented" benefits of the language. Table 3 is a partial rank-ordered summary according to the number of times various classes of benefits were mentioned.

These responses could be analyzed and categorized, but it takes only a cursory inspection to recognize echoes of DSS philosophy as we described it earlier. Leaping from the page are capabilities such as those we have been reiterating: flexibility, turnaround and responsiveness, meshing with managers' decision processes, and communicability. It is apparent managers not only want these attributes in a computer-based system, but that they are also getting them in the form of what we are calling decision-support systems.

A CLASSICAL DSS CASE STUDY

These findings are borne out in greater detail by a case study of the development and use of a set of models based on IFPS. The object was to develop a detailed proposal for a major new production plant for L.D. Shreiber Cheese Company of Green Bay, Wis. The proposal had to be accompanied by all the appropriate supporting information and by a list of feasible, if less desirable, alternatives. Variables included not only an uncertain sales volume forecast but also the configuration and flow pattern of the various equipment and peripheral facilities. The proposal was assigned to a team consisting of the prospective plant manager and various subordinate managers experienced in several fields.

The problems faced by the plant manager and his team before they began to apply IFPS to the problem were:

1. Estimates of sales volume might be revised at any time and in any category of product, depending on marketing plans.

2. Evaluation of any one alternative involved complex and largely manual calculations by each team member on the subject relevant to his own line responsibility. The calculations were called, appropriately enough, "homework." Meetings were needed to interpret the results and send them to top management.

3. The ground rules for the homework kept changing, so that previous analyses and data might become valueless.

4. Top management, who evaluated the succession of proposals that flowed from the team, were evolving their own criteria for acceptance, primarily in response to the stream of proposals.

In the published account, this situation was described as a classical problem. All growing companies involved in manufacturing have it, "...and some companies have it chronically because they are so successful." This is natural territory for DSS.

After a considerable amount of proposal development work had been done, IFPS was used to develop a family of models which became known as GYMJAC. Even though it was not characterized as such, it was a picture-book DSS. This fact is reflected in the explicit design criteria for the system, which emphasized that using computers and models must be a natural extension of a manager's normal methods for framing and exploring decision problems, and the system must be able to cope with a manager's need to change levels of sophistication in framing decisions.

The costs involved in completing the proposal to the point of acceptance are so unbelievable that we quote directly from the published account:

The original family of models,

CLEARING AWAY ACADEMIC DEBRIS

When a decision-support system is applied to the planning efforts of a school system—where limited public monies must be spent selectively—the support clears away academic debris to outline a solid program of definite answers and guidelines. Often these answers indicate necessary spending or educational needs, eliminating expensive dead ends or waste.

Such a program is Project Simu-School, developed by the Dallas Independent School District under a grant from the U.S. Office of Education. Simu-School is a computerized simulation of the school planning process: its three models predict enrollment (how many schools and what types of instructional programs will be needed); faculty requirements; and financial requirements.

Simu-School was one of the original projects to be funded through the National Diffusion Network (NDN), an end-product of a government program begun in the '50s to disseminate research information and materials to educators in the local districts.

The idea for Simu-School originated with an architect, Donald F. Burr, in 1974. He and a few other architects, attending a national convention, had the idea that if they had some scientific support for the requirements of the educational facilities they were planning, much time could be saved and unnecessary waste avoided. Over $10,000 in seed money was granted to see if such a project was feasible. It was—and in 1971, the first Simu-School Project began in Chicago, followed by others in Santa Clara County, Calif.; Ohio State Univ.; Washington State Univ.; and the Dallas Independent School District. Only the Dallas project survived. As part of NDN, it has been validated by the U.S. Office of Education as a sound, effective approach to educational decision-making, and has been made available to the 16,000 school districts throughout the country.

The basic packages—enrollment and facilities projection (an interactive program written in COBOL), and faculty projection and financial projection (both batch programs written in FORTRAN)—can be combined in a comprehensive planning program or used individually. A fourth program, a forecast of energy requirements, will be added to the system shortly.

The models for Simu-School were originally developed on a Burroughs 5500; the programs require at least an 80K memory. Currently, the models in Dallas are running on a Burroughs 6700, but are being adapted to a variety of systems. Supporting programs for data entry and file updates are unique to each individual district.

As examples of how Simu-School has worked in real situations: in the Terrell Independent School District, near Dallas, an enrollment of 3,300 students was an unexpected, rapid growth. When a school bond issue passed, no one was certain precisely how to spend the money: How many schools did they need? Where should they build them? The enrollment and facilities model was fed historical data, current information, and some assumptions on the trends in the district. The model, forecasting needs over a 10-year period, provided statistics directing the construction of one new junior high school and the addition of several portable classrooms at other locations.

In Palo Alto, Calif., the district faced declining enrollment and a corresponding decrease in revenue. Using the faculty projection model, the educational planners were able to determine how many teachers were needed as a result of fewer students, and what specializations were needed as indicated by trends in student course selection.

In Dallas, the financial model's reports won a triple-A rating for a school construction bond issue.

School districts without computer systems for the Simu-School terminal to tie into can participate with other schools in an ad hoc consortium, or tie in with a regional service center. Texas, for example, has 20 regional school districts sharing five computer systems. Minnesota has a single system for the entire state—the Minnesota Educational Computing Consortium—which any school district in the state may join. A third alternative would be for a district to purchase a microcomputer in the $10K to $20K range to ensure the minimum system requirements for a single package are present.

Participation in Simu-School is described by its assistant project director, Jane Richardson, as "a snap." After several initial discussions and explanations, a user guide and a technical demonstration are provided for the interested district's staff. Once an adoption agreement is signed, the new district sends a scratch tape to Dallas, and the model is duplicated and returned to the district for implementation.

Richardson envisions a busy future for Simu-School, including the formation of users' groups, program sharing, computer planning conventions specifically for the educational field, and maybe, she adds, "We might even see every school superintendent with his or her own computer—either a time-sharing terminal or a microcomputer—on the desk."

—William Pohl

MODs 1 to 9, was developed and put on-stream for about $4,000. Three-fourths of this amount derives from the time spent by the plant manager and one technician collaborating to develop the initial sets of variables and functions. The work required to build and test the modular hierarchy and scheme out MODs 10 and 11 was done for another $800. The operating costs over the nine months of GYMJAC activity totalled $5,800. About $3,000 of this amount went to time-sharing costs; the rest was the cost of labor at the computer keyboard terminal. Based upon pre-GYMJAC experience with manual homeworking, the same basic information would have cost over $300,000 to generate. However, we must point out that Monte Carlo style simulation and risk analysis are virtually impossible by hand.

The real user of GYMJAC was, of course, top management—through the intermediation of the proposal team. A major benefit expressed by the participants was improved communication between these two parties. Analysis was easier to understand and explain. Management had confidence in the results.

We may conclude that DSS is not only possible but has often been made a practical reality, recognized as valuable by top management. But what are the implications of this for the people who may be involved in such a process? This question may well be more significant than any other.

For the manager, the implication is not that he has an automatic machine that sits on his desk and cranks out decisions. A DSS is not the raven on Odin's

shoulder whispering oracles in his ear. After all is said and done, the manager is still the source of the decisions. The DSS *supports* him in this process as a figurative extension of his own mind—as a tool that, like any other, must be properly used to be effective. It is not a fully automatic tool.

Here we begin to shade into the implications of DSS for the manager's close subordinates—the staff planners or analysts. It is really these people and not the DSS that constitute the top manager's mind support system. Far from competing with them, a capability for creating and operating decision-support systems augments their power in supporting the manager's decisions. In the words of a company president, "The human expertise that already existed within the company was amplified." As exemplified by the case of David Simpson's 20-minute risk analysis, a DSS tends to make the staff heroes.

What about the remaining people who have been traditionally involved with computers and their applications—the ones we earlier labeled as dp, MIS, and OR/MS? One might think—especially after noting the IFPS users' survey—that the new, easy-to-use development languages will leave them out entirely. But the fact is that DSS and the languages used can help these people make their products and services more complete. The technical specialists can work—almost for the first time—from the user's view of the world. They can become indispensible instead of peripheral to managers' activities and can move off the defensive. Like the staff analysts, they can become heroes.

This is written not in reassurance but in challenge. For dp, MIS, OR/MS, and related analytic disciplines, the urgent need is to bridge the gap between their specialized world and the manager's. Decision support exploits existing computer technology to meet the needs of decision-makers. As such, it is the basis for a refreshingly positive answer to the question, "What do managers *use* computers for?" ✲

REFERENCES

1. Mintzberg, H., *The Nature of Managerial Work*. New York: Harper & Row, 1973.

2. Simpson, David J., "Making Business Models Easy To Use," Transcript of Panel Presentation of 1979 National Computer Conference, New York City, June 1979.

3. Keen, P. G. W. and Morton, M. S. Scott, *Decision Support Systems: An Organizational Perspective*. Reading, Mass.: Addison-Wesley, 1978.

4. Wagner, G. R., "Enhancing Creativity in Strategic Planning Through Computer Systems," *Managerial Planning*, July-August 1979.

PLANNING LANGUAGE USE SUMMARY

Question	Percent of Total: Dp	Staff Analyst	Middle Management	Upper Management
Who initiates requests to build models?	0	4	30	66
Who built the model?	3	53	22	22
Who uses the output?	0	6	42	52
Who uses the terminal to ask "what-if?" questions?	0	70	21	9

Table 1.

NUMBER OF DAYS TO BUILD MODEL

1 to 5	6 to 10	11 to 15	16 to 20	Beyond 20
62%	13%	4%	6%	15%

Table 2.

BENEFITS OF IFPS

People-Oriented	Feature-Oriented
1. Easy to learn and easy to use	1. Quantify risk in a sensible manner
2. "What-if?" capability	2. Goal-seeking (reverse what-if)
3. Low hurdle entry—speed of being effective	3. Consolidation of levels of data
4. Flexibility of use	4. Sensitivity analysis
5. Complete, accurate output in a few minutes	5. Power, simplicity, and flexibility of report writing
6. Communication with management	6. Variety of functions and applications
7. Model itself readable in English	7. Simultaneous equations
8. Ability to respond quickly to user requests	8. Quick updates
9. Decision-makers can easily build own models	9. FORTRAN user interfaces

Table 3.

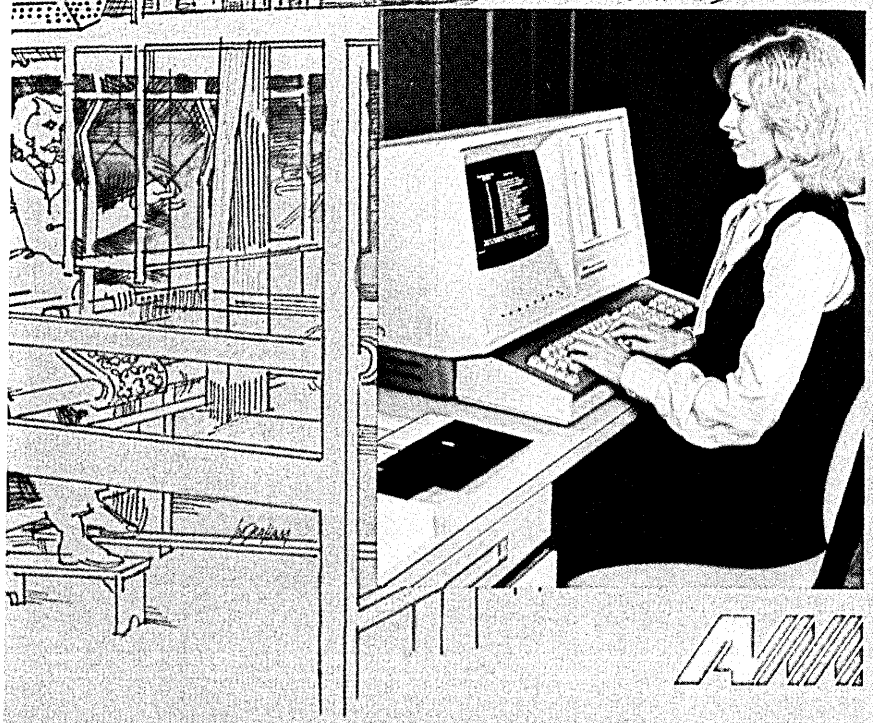
JERRY WAGNER

Jerry Wagner is president of EXECUCOM Systems Corp. in Austin, Texas. He has been professor of operations research at the University of Texas, vice president of MRI Systems Corp., and corporate director of operations research for Swift & Co. He received a PhD in statistics from Iowa State Univ.

PETER G. KEEN

Peter G. Keen is an associate professor at the MIT Sloan School of Management, and has served on the faculties of Stanford and Harvard. He is a coauthor of the book *Decision Support Systems: An Organizational Perspective* and a founding partner of CGK Associates, Washington, D.C. He holds a PhD in business administration from Harvard.

Joseph Marie Jacquard would have been proud...



Considered the "father" of the computer industry, Joseph Marie Jacquard, a Frenchman, was honored in 1801 by the Industrial Exposition in Paris for his innovative weaving loom design.

The Jacquard loom used a series of punched cards that contained the "program" for weaving complex patterns from colored threads. Within a decade, over 11,000 looms using Jacquard's "program" were at work in French textile plants.

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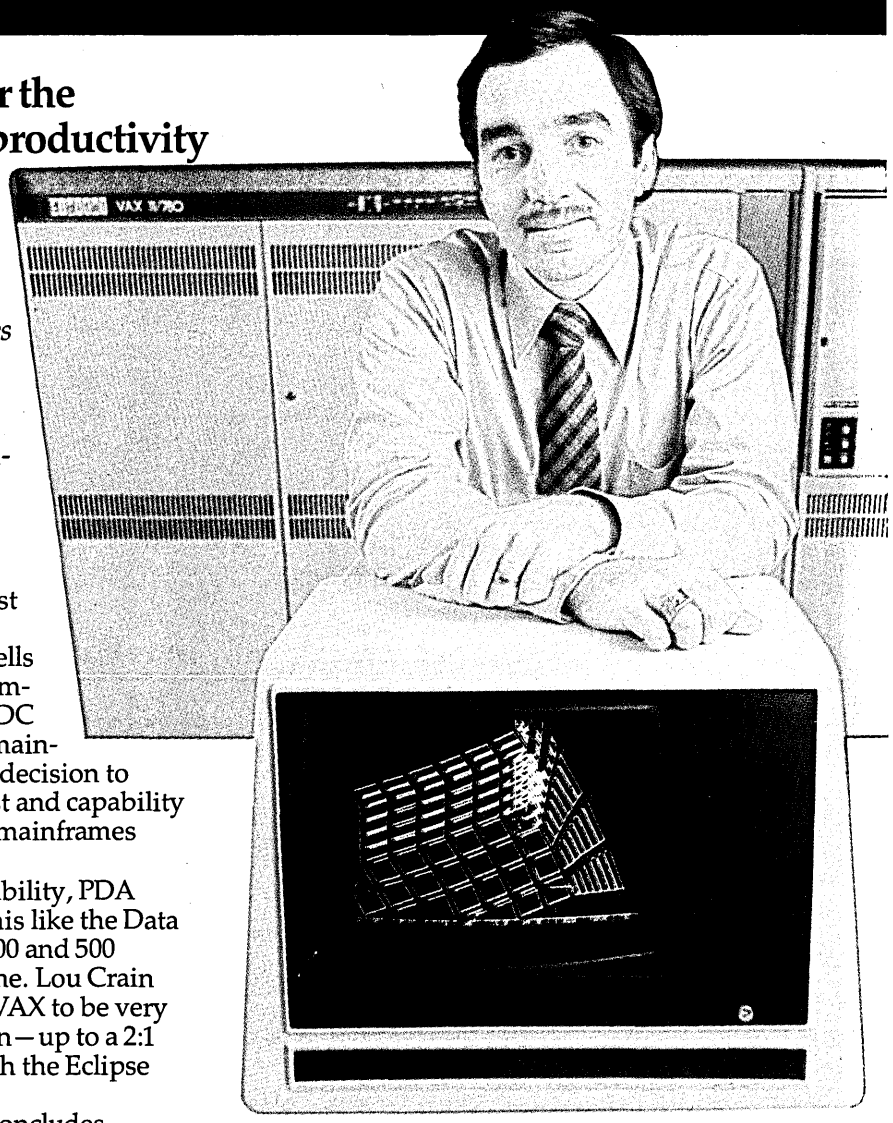
Prototype Development Associates
Santa Ana, California



PDA is an employee-owned engineering concern whose business ranges from fundamental research in structural analysis to the manufacture of critical aerospace components.

The VAX-11/780 is PDA's first in-house computer. Lou Crain, Manager of Software Products, tells us, "We've been doing all our computing through utilities using CDC 6600, Cyber 74 and Univac 1108 mainframes. The key elements in our decision to acquire the VAX-11/780 were cost and capability — compared to service bureaus, mainframes and competitive minis."

From the standpoint of capability, PDA considered traditional superminis like the Data General Eclipse and the Prime 400 and 500 series, plus a used 1108 mainframe. Lou Crain says, "Our benchmark showed VAX to be very powerful against the competition — up to a 2:1 performance advantage over both the Eclipse and the 1108."

"After installation," Crain concludes, "VAX has lived up to our expectations and has performed impressively. It's resulted in better products for our customers, as well as improved cost-effectiveness. Having our own interactive capability in-house has meant an increase in engineering productivity of up to 300%."

"VAX turns out to be twice the machine for the same amount of money."

Roger Vossler,
Section Manager and Systems Engineer
TRW Defense and Space Systems Group
Redondo Beach, California

Sensor data processing and distributed processing systems in support of real-time embedded applications are among the specialties of TRW's Defense and Space Systems Group.

To find the right computer, TRW continues to evaluate numerous machines—including Digital's VAX-11/780. They've also conducted numerous FORTRAN and PASCAL benchmarks.

In every test, VAX stands out as a clear winner.

Roger Vossler, Section Manager and Systems Engineer, says, "VAX is one of the best implementations we've seen of a successful integrated hardware and software system."

Since TRW's sensor data processing applications require enormous memories—over a million bytes to store a single image, for example—VAX's true 32-bit address space is vitally important. In addition, says Vossler, "VAX's I/O bandwidth capabilities are extremely important for effectively moving large quantities of real-time data at very high data rates."

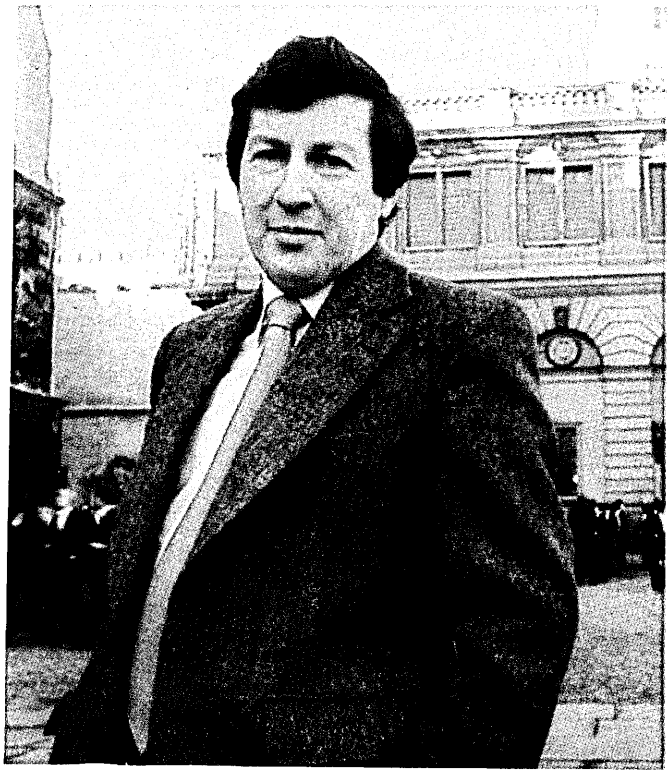
Because TRW already had an investment in Digital technology, Vossler is particularly impressed with the relative ease of moving PDP-11 series programs onto VAX.

"But," says Vossler, "Even if I were starting all over again—without our Digital experience—I would still pick VAX, on the basis of its architecture, both hardware and software, and its impressive performance."

"Implementation was faster on VAX than on 25 other machines."

Brian Ford, Director
Numerical Algorithms Group
Oxford, England/
Downers Grove, Illinois

The Numerical Algorithms Group develops and maintains mathematical and statistical software libraries for customers in industry, science and academia.



Before VAX, NAG had implemented their complex Mark 6 Library on 25 major machines, including the Burroughs 6700, CDC 7600, Univac 1100, and the IBM 370. The average implementation time was 13 man-weeks.

VAX took five.

In Dr. Ford's words, "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 implementation performance was just the start. Dr. Ford comments on VAX's impressive record of reliability after the program was up and running: "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.

"VAX," Dr. Ford concludes, "is an implementor's dream."

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CIRCLE 81 ON READER CARD

Specialized systems are capable of far greater performance and throughput than generally recognized.

EXPANDING THE SMALL BUSINESS SYSTEM

by Joe Mitchell

Many people view small business computers as specialized systems capable of processing only a limited number of tasks. A typical argument is that the smaller internal memory and processing speed reduces throughput power and thereby limits its use.

At Spalding Sporting Goods, we are using three small business computers —HP 3000s—accessed by 146 local and remote terminals, to support all the information system requirements of a business that is approaching $160 million in sales, with 3,500 products and 12,000 stockkeeping units (see Fig. 1).

In addition to handling all the financial, sales, manufacturing control and order processing formerly done by a Honeywell 2040A and a Univac 1050, the new systems also provide statistical analyses and graphs. Most importantly, there is also improved inventory management and customer satisfaction.

The change at Spalding began about two years ago, when management decided it was time to get into an on-line environment. Careful planning preceded the changeover.

Crucial to any firm's use of a small business computer is the power and flexibility of its operating system. Ideally, an operating system should support the capabilities normally associated with larger systems. It should also be as well documented and certainly as bug free.

Some of the capabilities that we decided Spalding needed from a small business operating system were data base management (DBMS) with a query capability, reentrant COBOL, interactive COBOL debug capability, output spooling, multiprogramming, and various forms of data communication, such as network control software for distributed processing.

Our intention was to couple such capabilities with the accessibility of the small business system to achieve the highest possible "bang for the buck." Our experience after two years shows that this has been achieved. The computers are successfully connected and communicating, DBMS is being used across all application areas, and on-line program development has nearly doubled programmer productivity.

Of course, even if a system has all these operating system features, there are many traditional considerations which can have a powerful affect on throughput. If disk files are not properly dispersed, for example, disk contention will greatly reduce throughput. Processing applications on-line that have no businss being there—applications that do not truly supply information that is needed on a minute-by-minute basis—will bring the same result.

Resource-heavy tasks such as on-line program development can require special consideration. Our own experience and research with small business computers at Spalding has shown us that many systems cannot efficiently handle more than about five development programmers concurrently with major batch and on-line applications in a production mode. As a result, we have dedicated one computer to program development, although it is still retained as part of the total configuration. The advantage of such an approach is not only increased application throughput and programmer productivity, but also the availability of backup should a production computer go down.

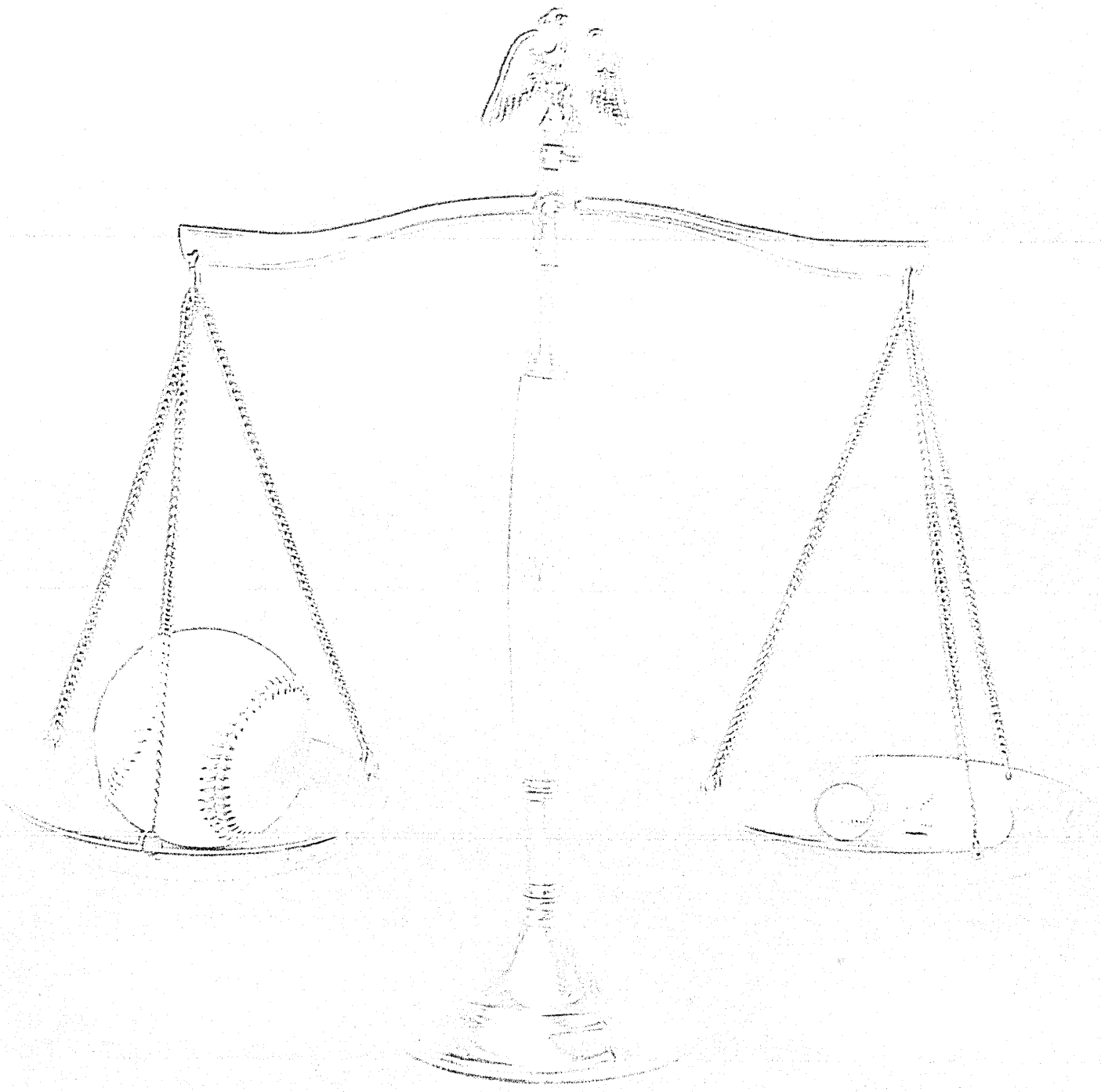
At Spalding we have two HP 3000 computers for production with 512K bytes of memory each. The development 3000 is configured with 256K bytes. All three computers are tied together by Hewlett-Packard's distributed system software, DS 3000. A T-bar terminal switching system makes it possible to switch individual or groups of terminals from one computer to another (see Table 1).

Other traditional considerations in maximizing computer throughput are the efficiency and correctness of the program code. Inefficient system design and program code can quickly destroy the performance of a small business system. To insulate ourselves from such problems while at the same time satisfying the need to utilize small business systems for large applications in a multiprogramming environment, we decided to employ a form of structured design and programming.

USING THE NOLL APPROACH

As a guide for structured system development, we used most of the structured programming techniques proposed by Paul Noll in his book *Structured Programming for the COBOL Programmer*, though we modified his approach to testing and staff requirements. The programming techniques are based on the use of the COBOL PERFORM UNTIL and IF THEN, ELSE statements instead of the traditional GO TO. Because each program or module has one one entry and one exit point, the program statements are executed in a structured manner from the first to the last, with no internal branches.

Structured programming brings with it many benefits in program development, documentation, testing and implementation. These benefits derive mainly



Structured programming brings benefits in program development, documentation, testing and implementation.

from the small program size normally associated with this technique and the ease of generating and maintaining code that has no internal branches. Our payroll system, for example, is broken up into approximately 40 programs with 125 independent modules, none of which exceed 8K bytes in size. Structured design also fits in well with a virtual operating system, is easy to learn and, just as importantly, lends itself well to a DBMS interface.

The DBMS file orientation, which naturally facilitates the separation of data and programs, also relates well to the development of small, efficient programs that can access the data base and extract —in the most expeditious manner—only the data that is needed at the moment. An additional benefit is that as data bases become more and more refined with the passage of time, the impact of complicated data structures on maintenance programming tasks is greatly reduced over the non-DBMS environment. If new data fields have to be added for new programs, there is no need to go back to old programs to restructure the data definitions. If, on the other hand, it is necessary to restructure a data base for processing efficiency or structure maintenance, a data base management system such as Hewlett-Packard's IMAGE makes this easy to accomplish.

We found learning structured programming to be a relatively easy task using Noll's step-by-step approach. When these techniques were implemented two years ago, none of our 15 programmers had ever used them, nor had they programmed in an on-line, data base environment. Yet it was only two or three months before they were doing productive work.

An interesting sidelight of working in a structured design environment is that program size limits are determined and enforced. Since most small business computers have an optimum program size that maximizes throughput, we looked to Hewlett-Packard for a recommendation. They suggested an 8K to 10K code segment size limit, and we selected 8K as the maximum. We use the operating system to enforce the standard, since it allows the insertion of a parameter limiting the size of the program that the computer will compile.

Although Noll's book is extremely pragmatic and easy to use, his suggestions about staff have a built-in overhead—at least for a shop of our size. Noll requires a larger staff than was practical for Spalding. Noll's suggested staff includes a chief programmer, a backup programmer, an administrator, a librarian, two development programmers, a junior programmer and a technical writer.

Under this structure, personnel have relatively narrow responsibilities, doing only what they are best at doing. While this is theoretically an efficient approach, from our own experience we felt it might dampen the programmer's feeling of creativity by reducing the diversity of tasks he was involved in.

What we did at Spalding, instead, was to combine the various functions that Noll outlines under the people and structure we already had, thus giving programmers wider responsibilities and making their jobs more interesting. In addition, our teams are not organized around projects but around functions such as finance, manufacturing, sales/marketing and distribution—thus giving every member a feel for the entire application area.

Although Spalding now employs more programmers, they were not hired because of data base or operating system complexities but because of expanded company requirements.

The only extra person hired to implement structured design and programming was for administration and control. This person handles all administrative tasks and is in charge of monitoring adherence to programming, testing and documentation standards.

No formal data base managers have been designated, and the traditional programmer-analyst-manager relationship continues.

TESTING AND WALK-THROUGHS

In a traditional systems approach, testing can be a haphazard affair, with little or no control until the final system nears completion. With Noll's approach, testing is a structured and thorough process that is done in phases, starting from the top down. In other words, first the top level module is tested, then one or more level 1 modules, and so on.

At Spalding, we modified this method somewhat. The modified method is as thorough and controlled as Noll's, but it is much more efficient for our operation.

We also use this method for what Noll refers to as "walkthroughs," or checks prior to testing of program code by someone other than the programmer. Instead of testing or "walking through" individual modules, we combine individual

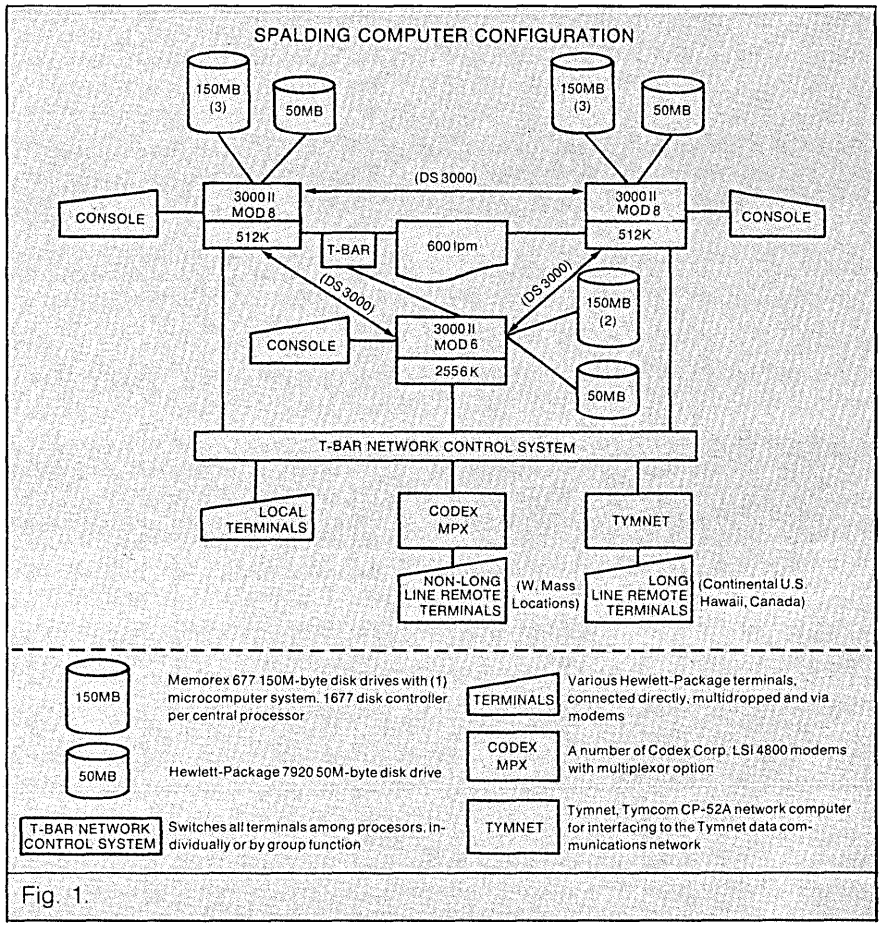


Fig. 1.

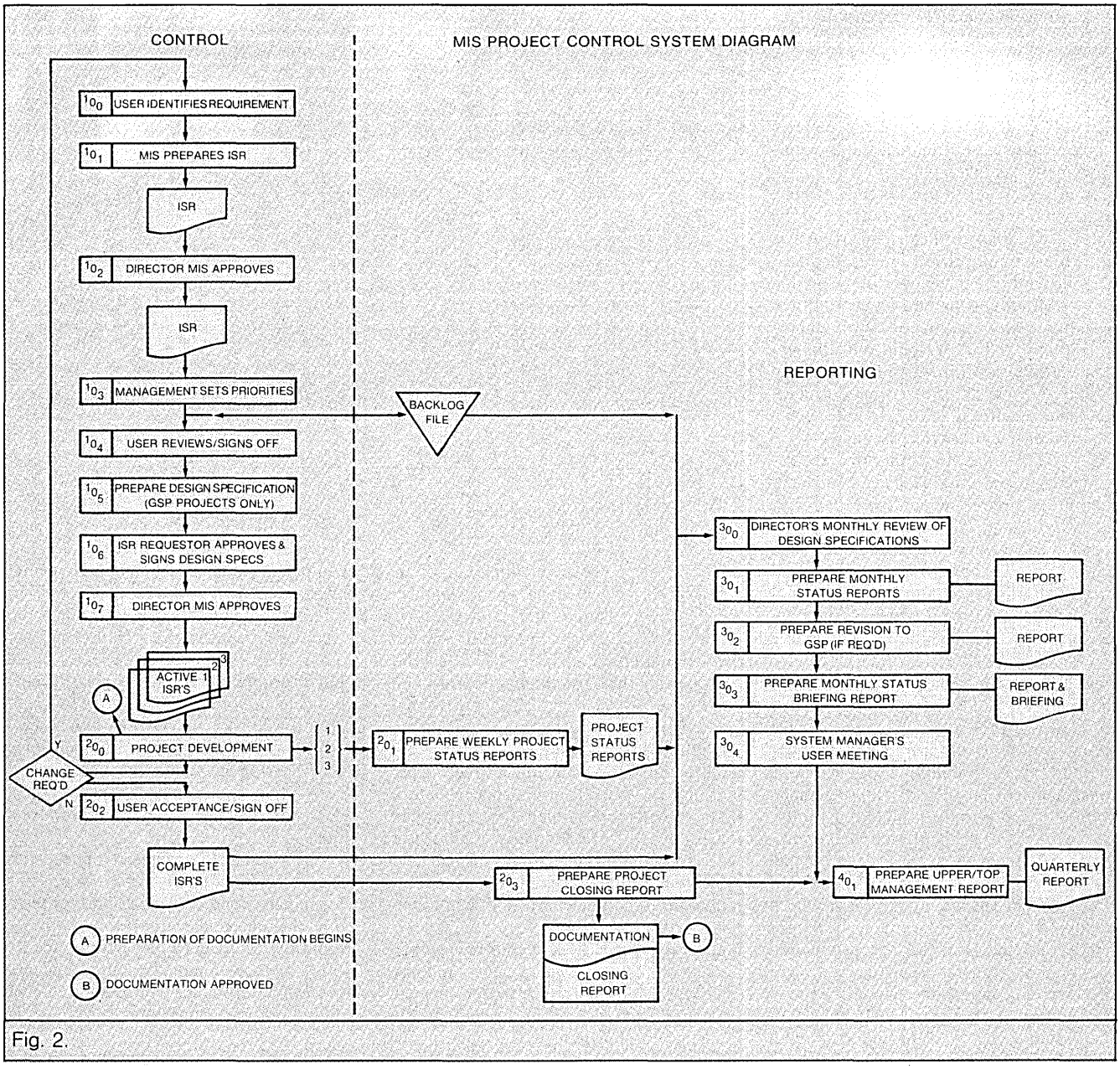


Fig. 2.

modules into logical groups and test and walk through each group as a whole. This saves time and enhances the time spent in the review since the persons who do them (in our case the manager of System Services & Control and the system technologist) can gear their thoughts to the function being performed and discover logic-flow errors more quickly.

If traditional programming techniques are used, one of the most time-consuming tasks is program flowcharting. In addition, because flowcharts are so often unwieldly, they are frequently difficult to read and are not consistently updated when programs are modified. They can thus become useless as documentation.

Because structured programming results in smaller modules without complex logic branches, we have not found it necessary to use flowcharts in the traditional sense. We have replaced them with VTOCs (volume table of contents) and an applications data base. The VTOC is a structure chart that identifies by system the various programs and their frequency of use. The applications data base follows the VTOC format to show program/system and file interactions. Together these pieces of documentation provide a clear, concise picture, and both are easily modified.

The application data base is in one way a change from Noll's approach, but in another an extension to it. It is a change because it replaces the HIPO diagrams (hierarchy plus input/process/output). It is an extension because the information in the HIPO is included along with other information in a more readily accessible form.

The application data base is maintained by the Services & Control Group from the documentation, and our programmers feel that it is one of the most significant tools they have to control the complexities of program maintenance in an integrated system environment. In day-to-day use, a programmer queries the applications data base before data base maintenance, system maintenance or new

A system must have the right degree of control: too little has no effect, too much creates resistance.

system development. He essentially employs its where-used capability to see the file system implications of what he is planning to do, and he then plans his work accordingly.

Now that Spalding's file maintenance is data base oriented, a major improvement has taken place in the time required to respond to users' requests. The separation of data from programs and the data base method of file organization permit programming to be done in hours or days instead of days or weeks.

Although this approach would be of value to any organization, it is important to realize that we built our applications data base while we were developing a totally new systems inventory. It might not have been feasible to assemble such a comprehensive tool after the fact.

As systems and programs are developed, all the physical pieces of documentation become a complete package. At walkthrough time, the programmer turns the package over to System Services & Control. This group in turn issues the project closing report and prepares entries for the application data base, system encyclopedia and report dictionary.

An important feature relating to the enforcement of documentation standards is the use of HP's file security system to password-protect the production program libraries. In order for a programmer to maintain a production program, he must request that the program be copied from the appropriate production library to a work area on the development computer. The transfer is controlled and executed by System Services & Control.

When the maintenance has been completed and the program has been prepared to replace its former production version, the transfer is again password-protected and controlled. Updating, however, requires changes to existing documentation and a walkthrough. Since all these functions are the responsibility of System Services & Control, a high degree of discipline can be achieved.

A criticism of this technique is that it slows maintenance turnaround. This is true, but we are willing to pay that price to successfully protect Spalding from the degenerating documentation syndrome.

Standards at Spalding were developed by a group of key people in the organization—system managers, project leaders, technical support—using Noll's book as a guide. Although the MIS director establihsed most of the general policies, the group as a whole established the specifics. This ensured the participation and support of the entire group and made it possible to achieve our design objectives without overburdening the organization with work perceived as unnecessary by those who would have to carry it out.

MAJOR & INTERMEDIATE COMPLETED PROJECTS

	Variance From Schedule % Time	% Man-Hours
Average For All Projects YTD:		
7 Projects Completed	-6.9	-3.1
Projects Completed This Report Period:		
Distribution, N.A.		
Quantity pricing using a discount percent	0	0
Golf-Ball quality tracking system	0	+3.0
Finance, N.A.		
Revise payables open invoice maintenance report	-46.0	-10.0
Group Finance		
Field length change for Spalding account number	0	0
MIS		
Process management/control system:		
Golf Ball—Phase I	-2.0	-2.0
Sales, N.A.		
Support Puerto Rico trip	0	-4.0
Sales year-end conversions	0	-9.0

Table 1.

PROJECT CONTROL

The overriding aim of any MIS department should be adequate service to its users. Frequently, however, computer system users do not feel they are getting the most out of MIS. In a small- to medium-sized organization, this can be especially true—everything can become magnified. For example, a key programmer's resignation can appear to bring program development in his area to a stop.

Another problem, which perhaps exists in any size company, is that users are frequently puzzled and disheartened by the fact that seemingly minor requests take forever to be completed, while some larger requests get fast response. Users generally have little comprehension of why MIS responds well or badly, and have varying degrees of appreciation for management complexities in the computer industry. In short, there is a communications gap.

As a result, it is very important that the MIS group either acquire or design a project control system to ensure that schedules are met and resources are used effectively. The system chosen, however, must have the right degree of control: too little will have no effect and too much will create resistance to using the system in-house.

At Spalding, we designed and developed our own project control system, which incorporates the concept of the work order. The system includes specifications, review points, user sign-offs, status reporting and programmer activity reporting. It facilitates a high degree of planning control, good user communication, and consistent, thorough documentation (see Fig. 2).

Tailored to fit into the participative management operating style of our company, the system was implemented over a one-year period so that people inside and outside MIS could gradually become accustomed to it. We also feel that our system is very much user oriented. For example, our users do not fill out a project work order—this is done by an analyst through an interview with the user—but they do sign off on the original project specification as well as on the end product. While this may be a minor point, it has important psychological ramifications.

In addition, regular reports show the user what the MIS department's performance is on the project, both in terms of schedule and actual man-hours—a monthly report card of performance. By this means, computer resource and programming problems can be spotted early and appropriate action taken.

JOE MITCHELL

A specialist in data processing and personnel administration, Mr. Mitchell has been director of MIS for Spalding Sporting Goods, Chicopee, Mass., for the past three years. Before joining Spalding he chalked up 10 years of data processing experience in the Army and three more years with AVCO's Lycoming Div. in Stratford, Conn.

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CIRCLE 131 ON READER CARD

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Lanier's new No Problem Shared System does just that. It can be configured as an extremely powerful stand-alone, a cluster system, a shared system, or a combination of both the shared and cluster systems in one.

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It eliminates typing rough drafts on paper. Pages are prepared on a TV-like screen instead. Up to 40 pages can be stored on a single magnetic disc.

Changes and corrections are made right on the screen. So no whiteouts. No retyping. No false starts.

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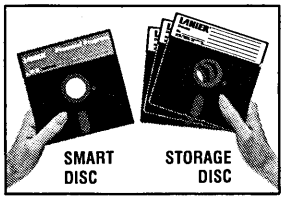
A No Problem standalone typewriter can perform *additional* tasks beyond conventional electronic typing—simply by inserting different Lanier Smart Discs.™



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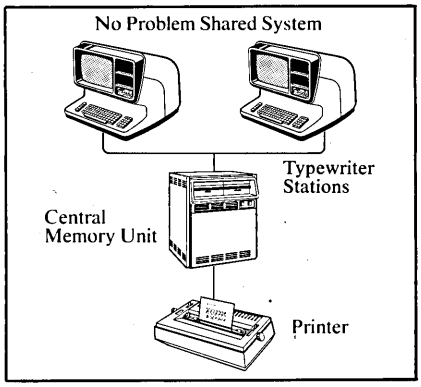

The No Problem Shared System adds new capabilities to the already versatile No Problem concept.

The No Problem Shared System's screen will display 256 different characters, including Greek and math symbols.

You can start with one or two typewriter stations connected to the Central Memory Unit, and add typewriter stations or printers as your needs increase.

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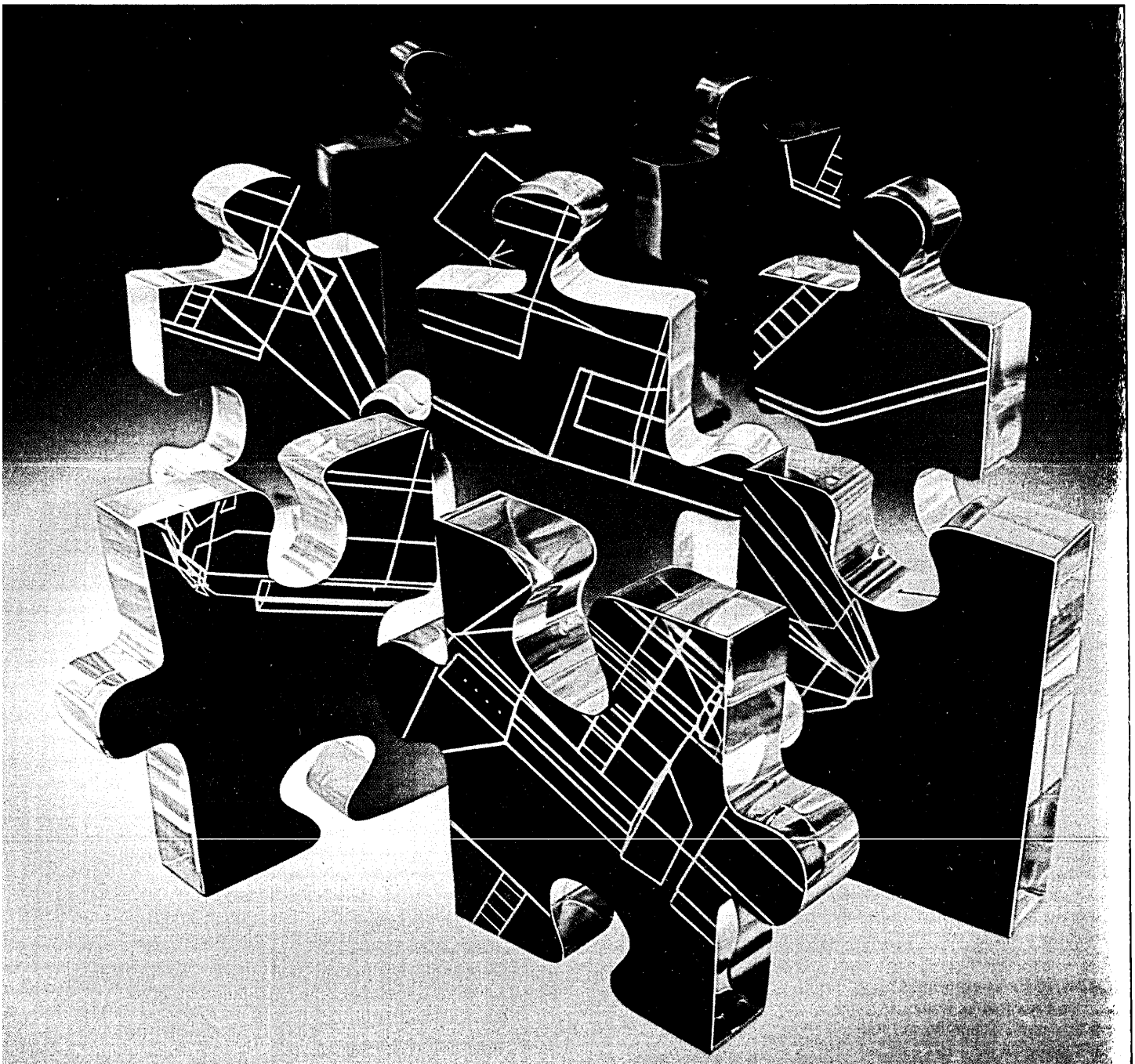
CIRCLE 83 ON READER CARD



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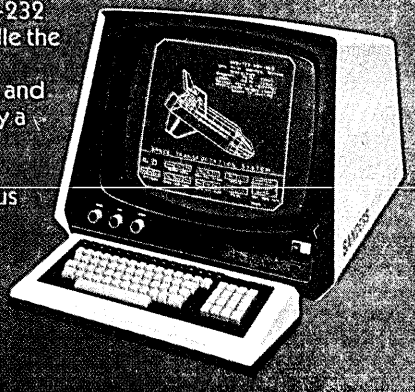
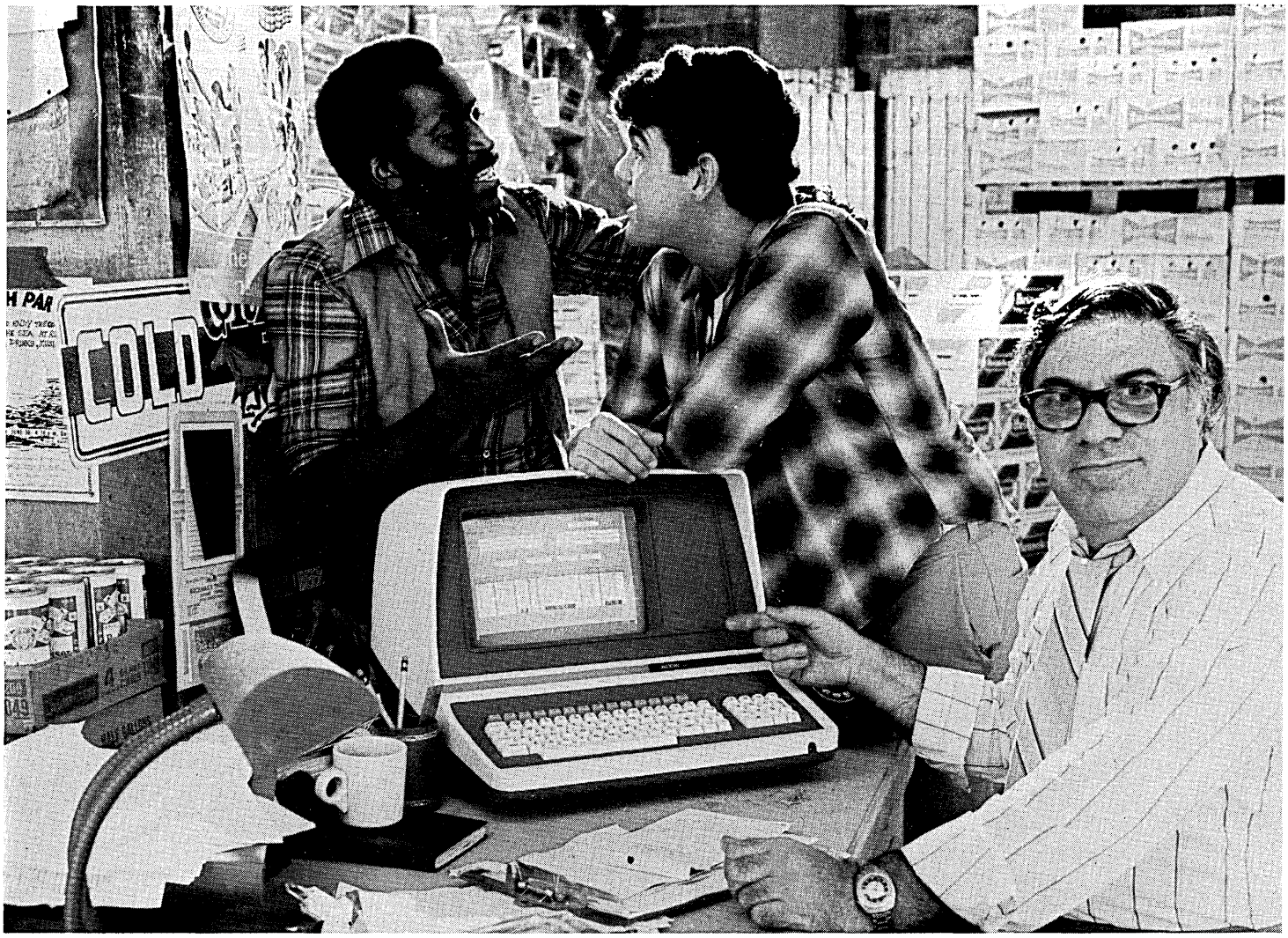


CIRCLE 84 ON READER CARD



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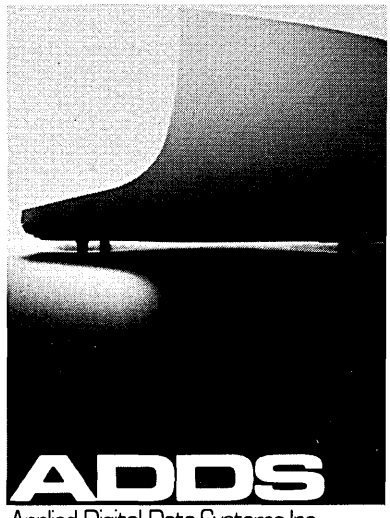

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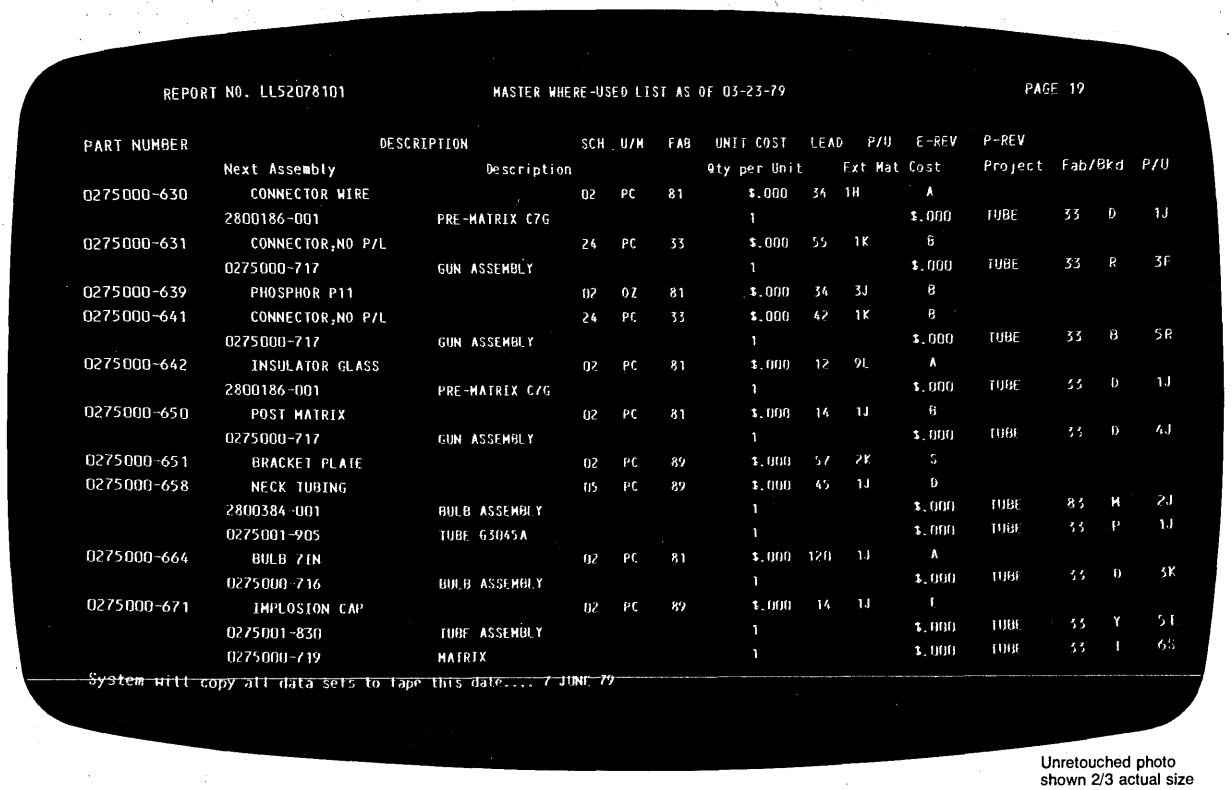

REPORT NO. LL52078101 MASTER WHERE-USED LIST AS OF 03-23-79 PAGE 19

PART NUMBER	DESCRIPTION	SCH	U/M	FAB	UNIT COST	LEAD	P/U	E-REV	P-REV		
Next Assembly	Description				Qty per Unit		Ext Mat Cost		Project	Fab/Bkd	P/U
0275000-630	CONNECTOR WIRE	02	PC	81	$.000	34	1H	A			
2800186-001	PRE-MATRIX C/G				1			$.000	TUBE	33 D	1J
0275000-631	CONNECTOR,NO P/L	24	PC	33	$.000	55	1K	B			
0275000-717	GUN ASSEMBLY				1			$.000	TUBE	33 R	3F
0275000-639	PHOSPHOR P11	02	OZ	81	$.000	34	3J	B			
0275000-641	CONNECTOR,NO P/L	24	PC	33	$.000	42	1K	B			
0275000-717	GUN ASSEMBLY				1			$.000	TUBE	33 B	5R
0275000-642	INSULATOR GLASS	02	PC	81	$.000	12	9L	A			
2800186-001	PRE-MATRIX C/G				1			$.000	TUBE	33 D	1J
0275000-650	POST MATRIX	02	PC	81	$.000	14	1J	B			
0275000-717	GUN ASSEMBLY				1			$.000	TUBE	33 D	4J
0275000-651	BRACKET PLATE	02	PC	89	$.000	57	2K	C			
0275000-658	NECK TUBING	05	PC	89	$.000	45	1J	D			
2800384-001	BULB ASSEMBLY				1			$.000	TUBE	83 M	2J
0275001-905	TUBE G3045A				1			$.000	TUBE	33 P	1J
0275000-664	BULB ZIN	02	PC	81	$.000	120	1J	A			
0275000-716	BULB ASSEMBLY				1			$.000	TUBE	33 D	3K
0275000-671	IMPLOSION CAP	02	PC	89	$.000	14	1J	F			
0275001-830	TUBE ASSEMBLY				1			$.000	TUBE	33 Y	5E
0275000-719	MATRIX				1			$.000	TUBE	33 I	6S

System will copy all data sets to tape this date.... 7 JUNE 79

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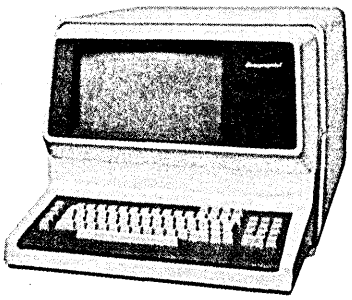

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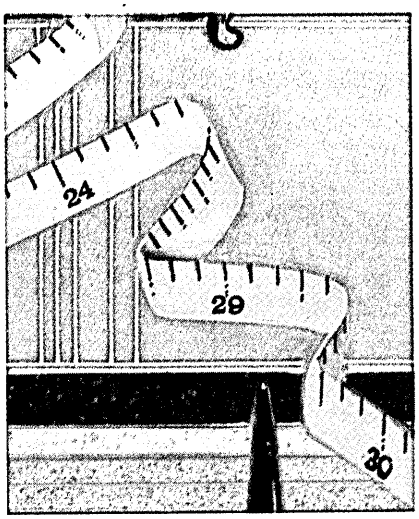

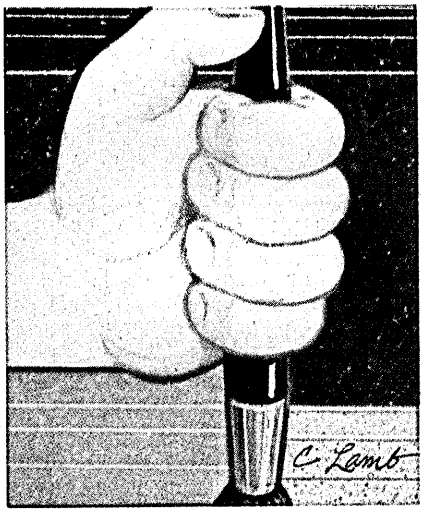

Understanding the software life cycle helps managers avoid inefficient use of manpower.

ESTIMATING SOFTWARE COSTS

by Lawrence H. Putnam and Ann Fitzsimmons

This is the final section of a three-part article that began in September and continued in October.

Most large-scale software takes one to three years to develop and has an operational life of six to 10 years. This is a life cycle. We have studied the behavior of this life cycle, just as other businesses study the life cycle of a new product. We have developed a model of the software life cycle that can be used by management to forecast and manage the schedules and manloading requirements of software projects. Understanding the life cycle can help prevent managers from misapplication or inefficient management of the available manpower.

Large-scale software development can be thought of as a series of interrelated tasks. At the beginning of the project there may be only one or two major tasks, for example, defining the major system modules and the interactions among them. Each of these major tasks is broken into more and more subtasks. There must eventually come a time when the number of subtasks remaining reaches a peak, levels off, and finally begins to decline.

At the beginning of development, when only a few major tasks have been defined, only a few key people can actually do productive work on the project. These key people must become intimately familiar with the overall function and design of the system. They are responsible for breaking the problem down into manageable pieces—a task that becomes virtually impossible as more and more people are applied to it. However, as the problem becomes better defined, additional people can be applied successfully.

If people are applied as useful work becomes available for them we begin to see a manloading pattern like the one shown in Fig. 1.

We have looked at data from hundreds of past software systems and noticed that almost all large software development efforts show a pattern of manloading very similar to Fig. 1. Moreover, for all large systems, the peak of the curve occurs at approximately the same time the system reaches full operational capability. (We will call this the development time for the system, and denote it as t_d.)

There is a logical reason for this. Just before the system reaches full operational capability, the total development task has been subdivided into many subtasks—testing and final integration, installation, writing documentation, fixing remaining bugs, etc. It is possible to have many types of personnel—programmers, analysts, quality assurance personnel, clerical, administrative and training support—all usefully employed. This was not true earlier in the development phase.

At the time the system is accepted and becomes fully operational we move into the operations and maintenance phase of the software life cycle. This corresponds to the falling part of the curve. The principal work during this phase is modification, minor enhancements, and remedial repair (fixing bugs).

The form of the curve and the accompanying equation allow us to project what the manpower requirements and cashflow for system development will be at any given time. The equation representing this curve is:

$$\dot{Y} = K/t_d^2 \; t \; e^{-t^2/2t_d^2}, \text{ where}$$

K is the life cycle effort in manyears,

t_d is the development time for the system, and

t is the independent variable representing any point in the life cycle—current elapsed time.

Obviously, K and t_d can take on a range of values. A change in K or a change in t_d (or both) will result in a change in the shape and magnitude of the curve. Let's look at what this means to a manager faced with the real problem of applying manpower in the most effective way.

We will assume that K=100 manyears for a given system. Fig. 2 shows what happens to the distribution of this effort simply by varying the time to reach peak manpower. If the development of the system is set at two years, then the system would require a relatively gradual application of manpower, peaking at 30 people 24 months into the project. However, notice what happens when we reduce the development time to one year (assuming this were feasible)—this would require hiring

and assimilating 61 people in 12 months. While this may be possible in some larger corporations, many organizations would find the practical problems associated with hiring—and productively applying—this many people in this short time nearly impossible.

This is a good example of what project management must contend with when the development time for a system is arbitrarily set by senior management.

There is another factor in software development that makes it unreasonable to try to compress development time. The tasks in a software project must interact with each other; for example, the initiation of one task may depend on the successful completion of a preceding task. Thus the software schedule can be compressed only so much; attempts to reduce it more will result in wasted effort, at best, and may even result in negative effort—work that will have to be redone.

DETERMINING THE BEST MANLOADING

Part II of this article described a software estimating problem for a system called SAVE. We showed that there exists a fundamental relationship between the size of the system, the effort (K), the development time (t_d) and the state of technology an organization applies to the project. Using this fundamental relationship, we determined that the minimum feasible schedule for development of SAVE was 1.81 years with a corresponding development effort of 35.1 man-years and a life cycle effort (K) of 89.2 man-years. Because there was a time constraint on the system, management elected to develop the system in the minimum time (1.81 years).

Using our manpower equation, we can determine the best manloading for this system over the 1.81 years, and even project ahead throughout the life cycle. We substitute our management parameters into the Rayleigh equation,

$$\dot{Y} = 89 / (1.81)^2 \cdot t \cdot e^{-t^2/2(1.81)^2}$$

Fig. 3 shows a plot of the expected manloading for SAVE.

The range of values to either side of the curve in Fig. 3 represents the uncertainty in our estimate of how many people can be expected to be working on the project at any time. For example, our best estimate is that there will be 22 people working on the project one year into development, but there is a 16% chance that the number will 19 or lower, and 25 or higher—simply as a result of the uncertainties in our estimates of K and t_d.

Every experienced software manager knows that behind most precise calcu-

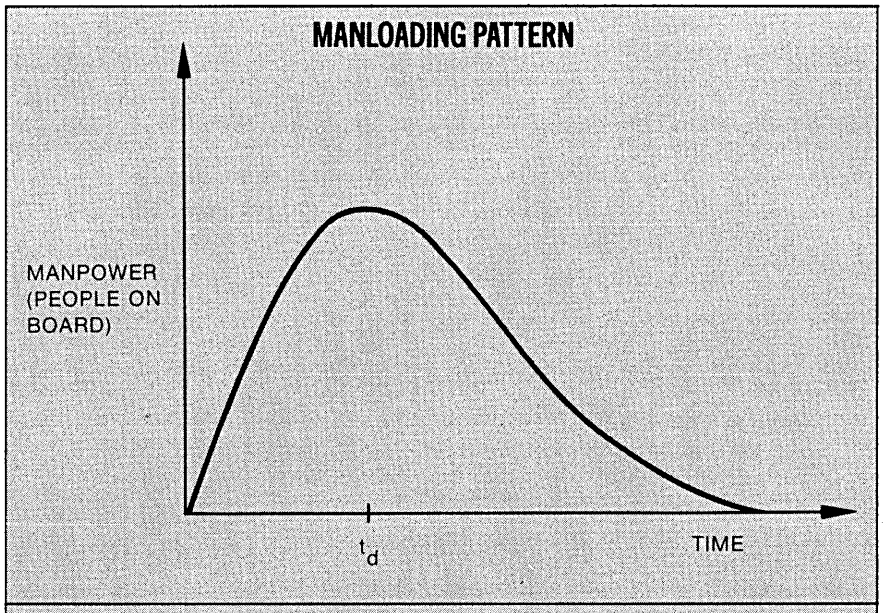

Fig. 1.

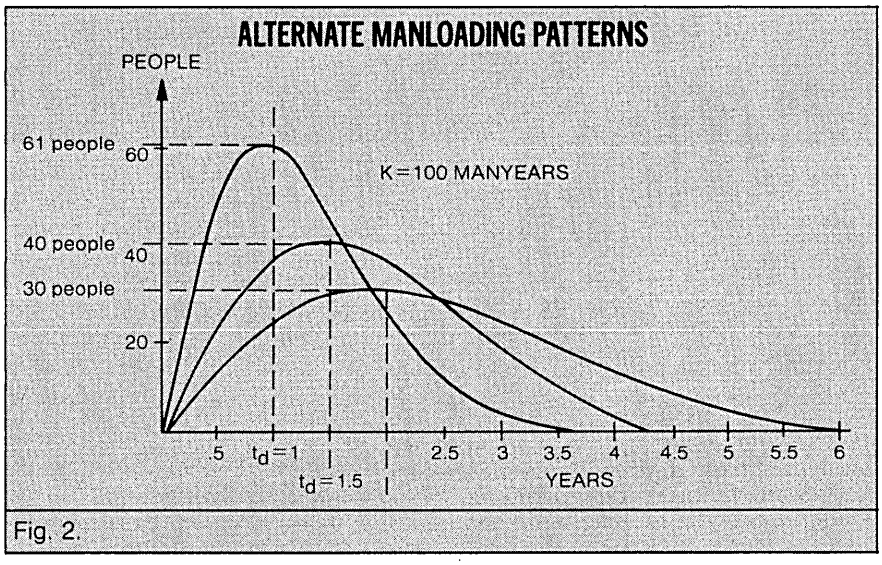

Fig. 2.

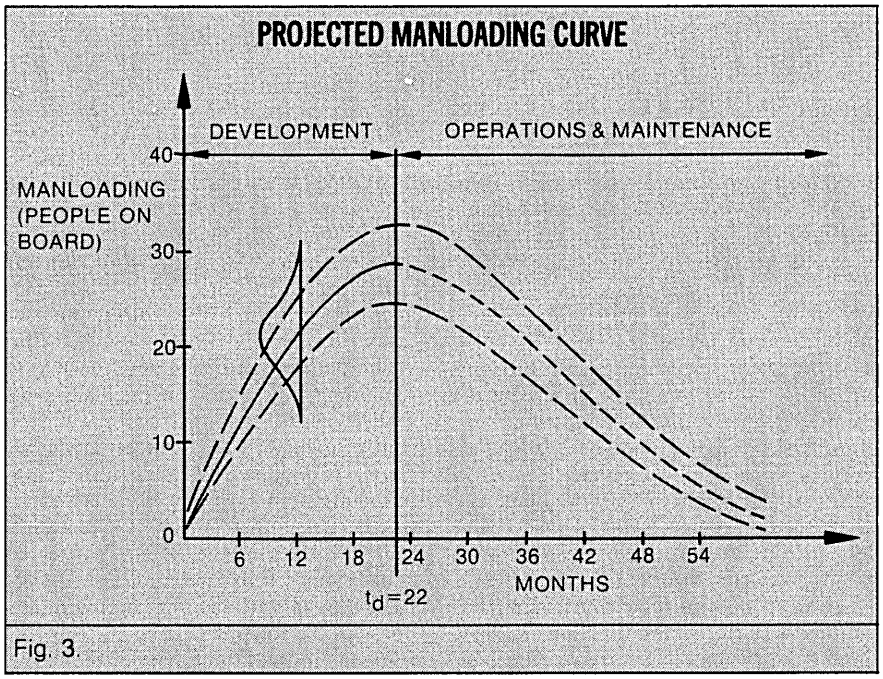

Fig. 3.

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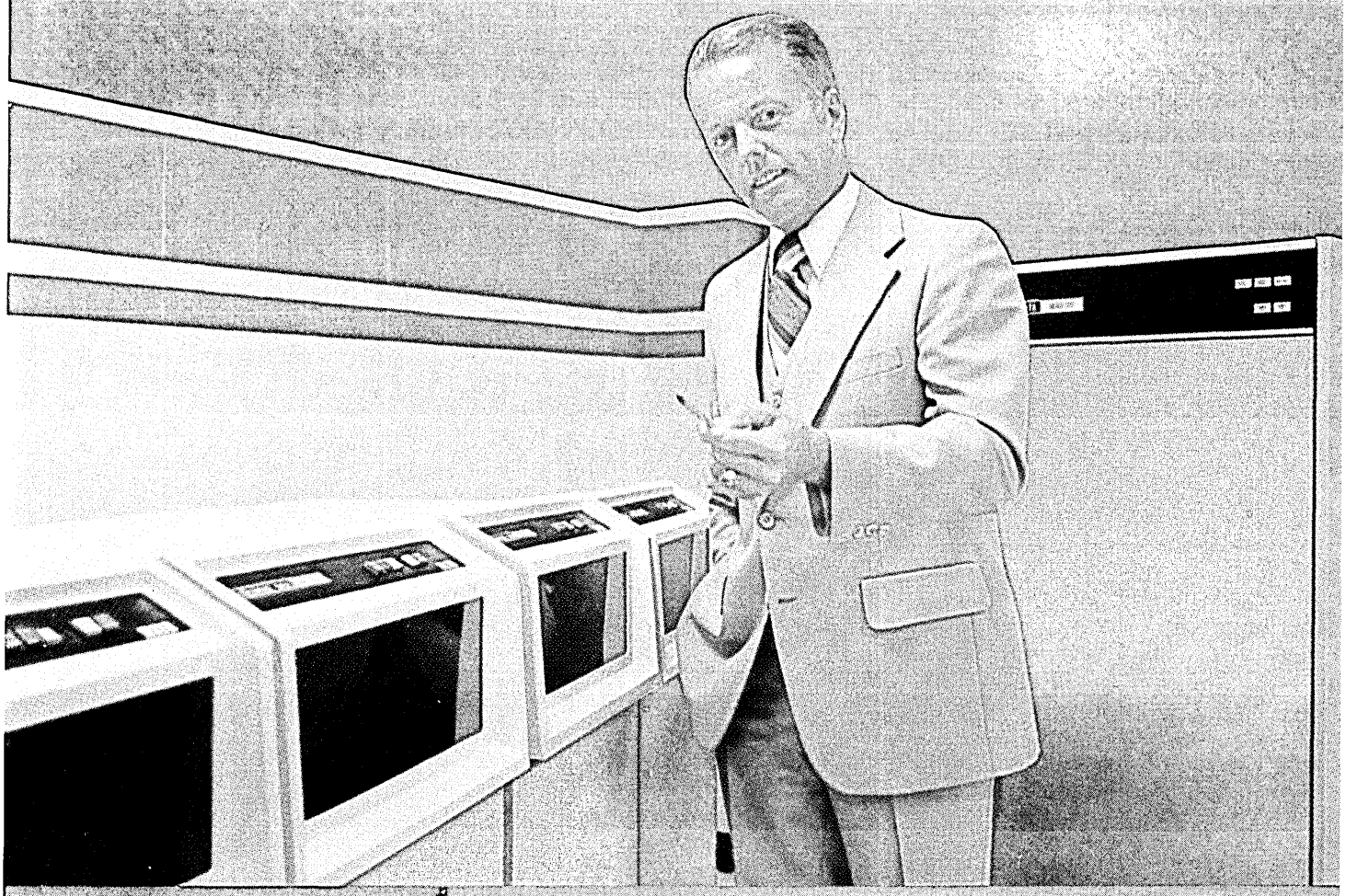

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JAN 79	1.	0.	5.	1.	5.	1.
FEB 79	3.	0.	14.	2.	18.	3.
MAR 79	5.	1.	23.	4.	41.	7.
APR 79	8.	1.	33.	6.	73.	12.
MAY 79	10.	2.	41.	8.	115.	19.
JUN 79	12.	2.	50.	8.	165.	27.
JUL 79	14.	2.	59.	11.	223.	37.
AUG 79	16.	2.	69.	13.	292.	49.
SEP 79	18.	3.	78.	15.	369.	62.
OCT 79	19.	3.	84.	15.	454.	76.
NOV 79	21.	3.	94.	18.	547	91.
DEC 79	22.	3.	101.	19.	648.	108.
JAN 80	23.	3.	104.	19.	753.	126.
FEB 80	25.	3.	109.	19.	863.	144.
MAR 80	26.	4.	120.	21.	980.	164.
APR 80	27.	4.	123.	22.	1104.	184.
MAY 80	27.	4.	126.	22.	1231.	206.
JUN 80	28.	4.	128.	23.	1359.	227.
JUL 80	29.	4.	136.	24.	1493.	249.
AUG 80	29.	4.	136.	24.	1630.	272.
SEP 80	29.	4.	136.	23.	1767.	295.
OCT 80	29.	4.	139.	22.	1905.	318.

Table 1.

lations in business are data that are not so precise. The software development field is certainly not excluded from this situation; in fact, the data in software development are notoriously imprecise. In this example, we had estimated that the life cycle effort was 89 manyears with a statistical uncertainty of + or − nine manyears. Similarly, the minimum development was 1.81 years + or − .063 years.

By solving the manloading equation several thousand times at each time interval, and varying our inputs (K and t_d) according to this statistical uncertainty, we can get a more realistic picture of the odds of having more or less people on board than the expected number at any time.

Now that we have a good estimate of the manpower requirements each month we can determine what our cashflow requirements will be throughout the project. All we need is the average burdened labor rate (including overhead) for software development. For this organization, we knew from past experience that this figure was $50,000/MY. Multiplying this figure by the manpower each month, we obtain the instantaneous and cumulative costs requirements shown in Table 1.

An interesting pattern in the occurrence of major milestones during development can be seen. Data from several hundred systems representing all types of development environments have shown that the relative occurence of these milestones to the total development time is extremely stable in most organizations and environments. This pattern has been noted even in organizations where the milestones have been arbitrarily (and often unrealistically) set by management; e.g., "Critical Design Review will occur three months after project start." In almost all these situations, the actual milestone accomplishment has slipped to the demands of the system itself.

TIMES OF MAJOR MILESTONES

EVENT	t/t_d	TIME FROM START (MONTHS) FOR 'SAVE'
CRITICAL DESIGN REVIEW	.43	9
SYSTEMS INTEGRATION TEST	.67	15
PROTOTYPE TEST	.80	17
START INSTALLATION	.93	20
FULL OPERATIONAL CAPABILITY	1.0	22

Table 2.

Table 2 shows the time from project start that these major milestones should occur.

This analysis should be used not only as a planning tool, but can be very helpful in measuring actual accomplishment once the project has begun. Past data have shown that if a single milestone slips, there is little hope of catching up later on.

For instance, in the Table 2 plan, if we successfully accomplish the Critical Design Review at 11 months, rather than at nine months, we should rework our proposed schedule rather than trying to speed up development. One of the best methods of preventing severe slippages and minimizing the impact of any slippage is to recognize them early, bite the bullet right then, and immediately revise project plans.

In the past, application software development has been unnecessarily characterized by cost overruns, manpower shortages, and schedule slippages. How much will it cost? How long will it take? What are the chances of the system not being operational on time? How many people will be required? Without reliable answers to these questions, a manager cannot expect to effectively manage the software development process.

A proven model of the software development process has been developed and used in this series of articles to provide numerical answers to the manager's questions. Some of the most powerful problem-solving techniques known today —the PERT algorithm, linear programming and simulation—have been simply applied to provide accurate size, cost, time, people, and milestone estimates for computer software systems development. Limiting constraints and viable alternatives are identified, permitting real design-to-cost and design-to-schedule options. Probability risk profiles can be calculated to provide the decision-maker with the hard numbers required to make sound decisions about software projects. Like ships upon the sea, software people need some numbers to guide them in the right direction at the right time to arrive on schedule at cost. ✲

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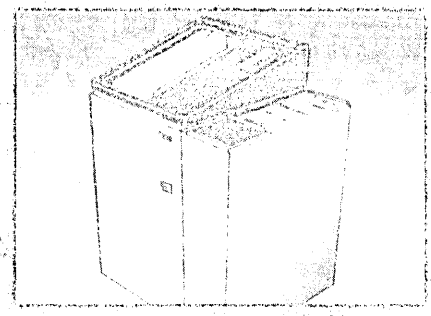

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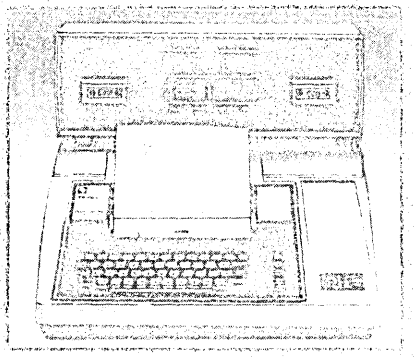

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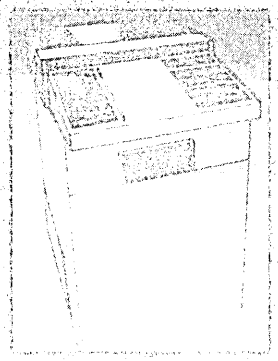

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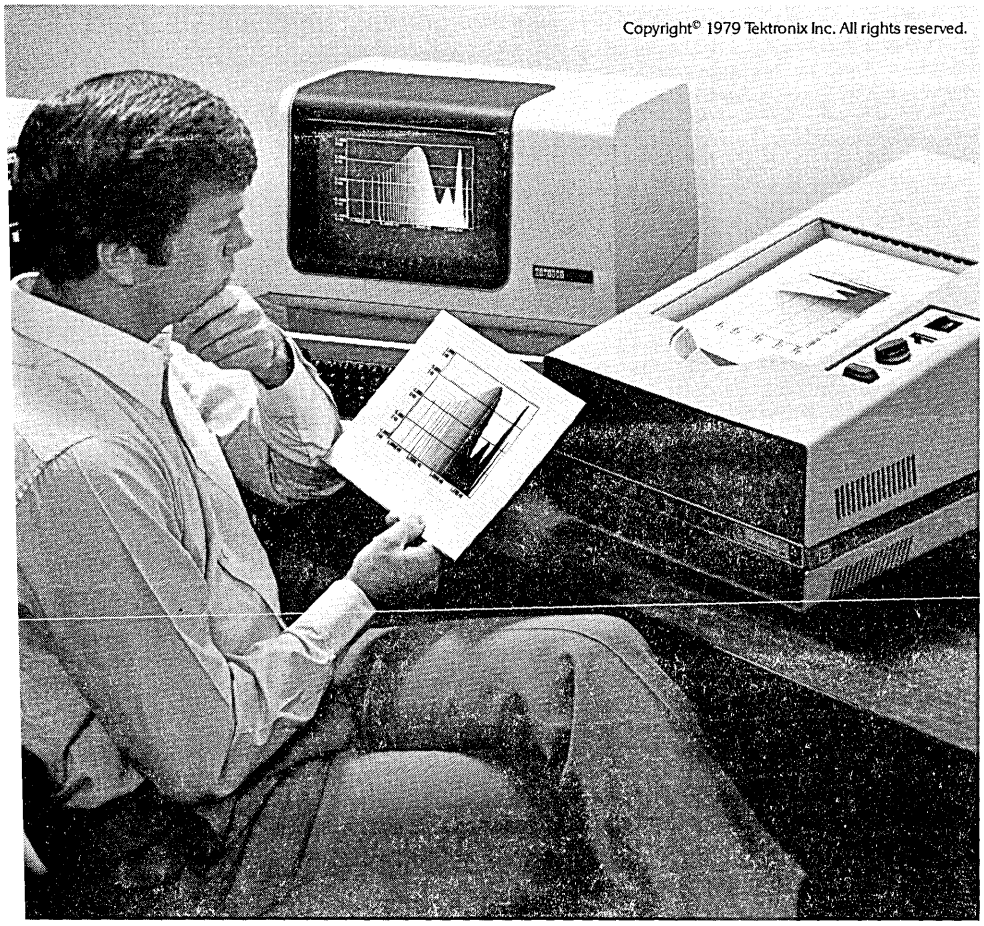

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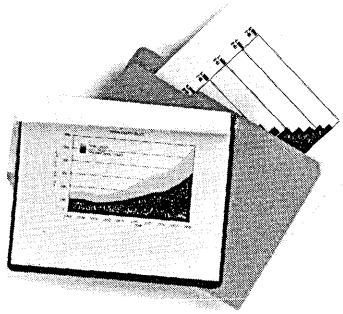

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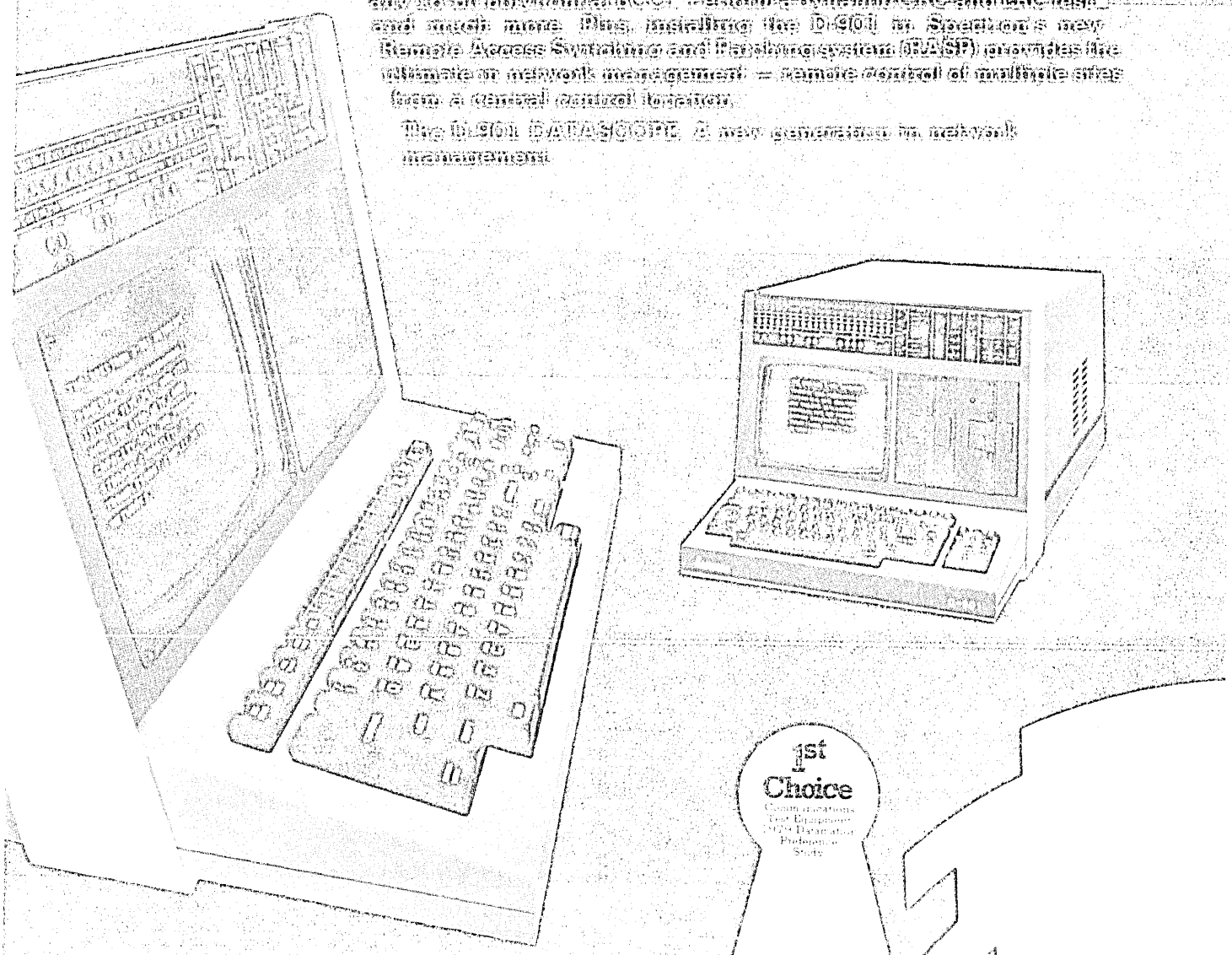

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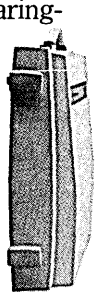
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If you would like more information on the Model 765 Portable Bubble Memory Terminal, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7784, Houston, Texas 77001, or phone (713) 937-2016.

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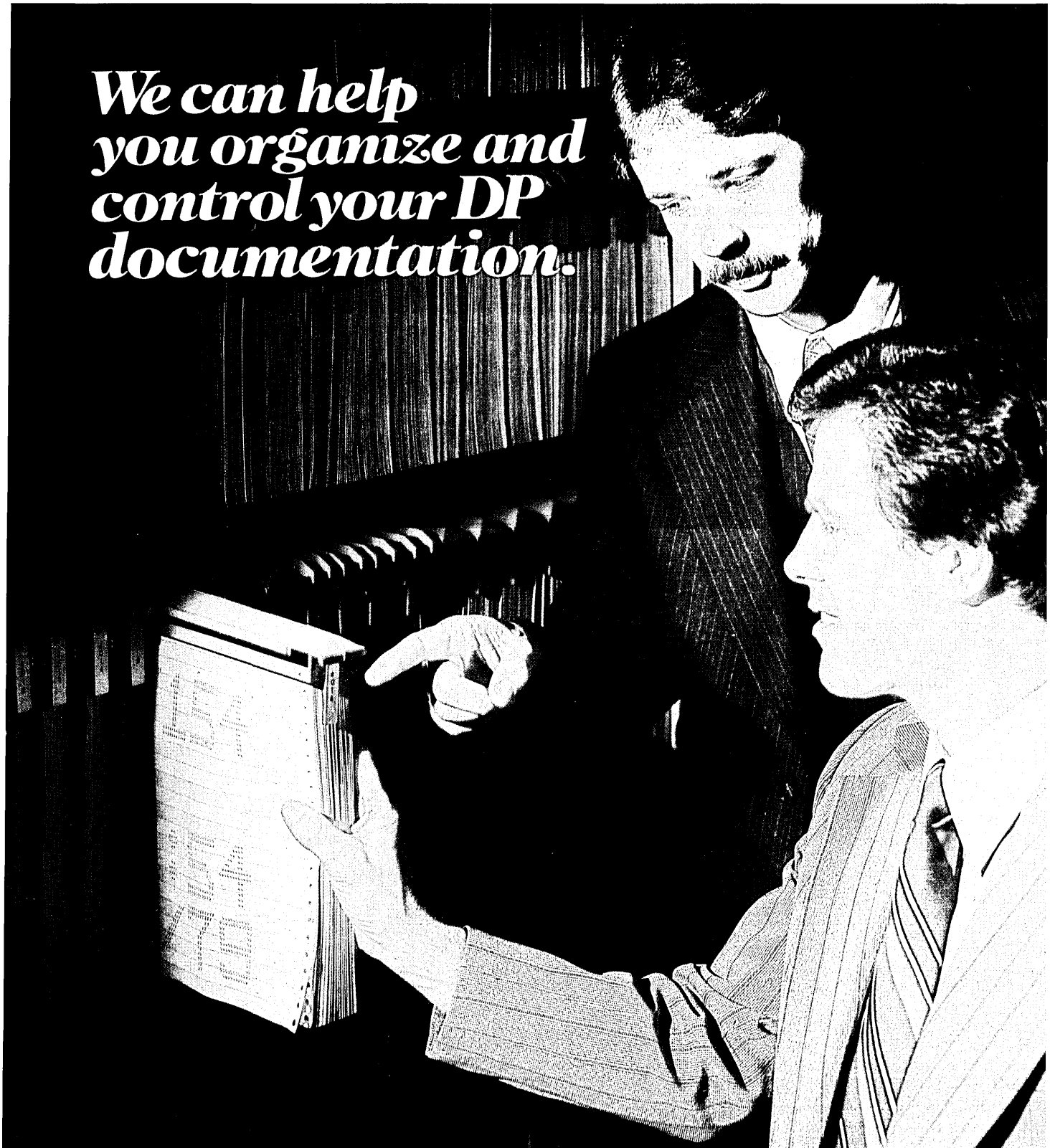
We can help you organize and control your DP documentation.



Wright Line men and women understand the problems of data processing documentation. Documentation is expensive to create, is regarded as a corporate asset by auditors but is useless if misplaced, lost or destroyed. As experts in DP filing equipment, Wright Line people can help you establish a Structured Filing™ network for better control and organization of completed and emerging documentation. The key to Structured Filing™ is the proprietary Documate™ System which provides a universal filing method for all sizes and shapes of documentation from cards to print-out.

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If you would like to know more about how the Structured Filing concept and the unique Documate System can help you accomplish better management control and organization of your D.P. documentation, circle the readers' service number or send today for a copy of our booklet "Guidelines for Establishing Structured Filing," Wright Line Inc., 160 Gold Star Boulevard, Worcester, Mass. 01606.

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CIRCLE 132 ON READER CARD

PEOPLE

THAT EXTRA DAZZLE

There's something beguiling about a kid from the Bronx who was born in Shanghai, China—especially if he grows up to be president of one of the largest independent systems software houses in the country.

Meet 34-year-old Charles Wang, who just over three years ago was brought in to head the Computer Associates' U.S. operations (CA is headquartered in Geneva). Since that time, CA has grown from a single product company to one offering 13 different software packages with revenues approaching the $20 million mark. Wang's mainland China heritage seems to add that extra edge of dazzle to a dazzling success story.

Computer Associates and Wang are an example of compatibility and good interfacing. With the dedication to work typical of people with Manchurian ancestry, coupled with an aggressiveness he labels "strictly New York," Wang has taken the business and computer worlds by storm.

"But it's not all me," Wang is quick to point out. "We've got good people. That's been our key to success."

Computer Associates develops and markets software packages for IBM mainframe users. The first package marketed by the Long Island, N.Y.-based company was called Sort, and this continues to be a popular seller with close to 5,000 installations worldwide. Sort existed when Wang joined CA. Since then he has been instrumental in developing many of the company's current offerings including Jasper for job accounting, Solve for testing and debugging, and Earl for information retrieval.

As the man at the top, Wang sees himself as a "direction setter, a motivator," setting a tone that makes people want to work for the company. "If you treat people right, if they enjoy coming to work, they will produce."

It's the same thing with clients. "We really treat the client like gold. That's not just something we say. We are not a one product company so we want our clients to return to us for whatever they need."

Prior to joining Computer Associates, Wang ran the software division at New York-based Standard Data, where he learned the ins and outs of research and development and discovered firsthand "how things were done and how I would do them differently." He started his computer career as a systems programmer after completing a master's degree at Baruch College in New York City.

CHARLES WANG—He chose not to go into law.

Age being "only a number to me," Wang feels comfortable when talking business with his company colleagues in Europe or in one of CA's 10 regional offices in the U.S. "I work as a partner with the others in the company. We are run by committees and not by one person."

Success is a commonly thrown around word at CA, and Wang is not about to let it go to anybody's head. "I still consider us as in the building stage of our foundations and client base. I want to build our success horizontally and I want it to be solid.

"We can't do this in a year. We're going like "Gang Busters" but we are using conservative methods; we are keeping our fingers on the pulse of the market; we are taking nothing for granted."

Innovation and caution are Wang traits, even in his interaction with his family. His two older brothers chose to follow their father into the legal profession while he "was the only one to take my father's advice." He chuckles when he recalls his father's suggestion to his three sons, "Don't go into law."

"He strongly advised us all to go into physics or math, something where the demand of language couldn't become a stumbling block."

Wang thinks part of the company's success in such a short period of time is the strong emphasis on listening to what people have to say. He places a lot of importance on feedback from IBM users within and without CA's client base. With IBM as one of the company's largest competitors, Wang knows his people have got to deliver not only the software but also the services that his clients can't get from the giant. "We have the incentive to work for efficient machines, to give people the products that will allow them to get the most out of the money they have invested in computers."

Intertwined with the marketing and research concerns and the worrying about funding and his competitors, Wang is enjoying himself. "It's fun to build something where nothing was before, to create products and to watch the interaction of your people as you grow."

AT NEW DESKS

ALFRED J. STEIN, vice president of Motorola Inc. and general manager of the firm's Integrated Circuits Div., was promoted to the post of corporate vice president and assistant general manager of the Semiconductor Group... HERBERT B. SHANNON was appointed director of data services marketing for RCA Services Co.... Intel Corp. directors elected LESLIE L. VADASZ and LAURENCE R. HOOTNICK as senior vice presidents and HENRY M. O'HARA as vice president... LAWRENCE H. DAY was appointed director of the Diebold Automated Office Program for The Diebold Group, Inc.... Tran Telecommunications Corp., Marina Del Rey, Calif., formed an International Div. and named UGO DE FUSCO to direct it... ROLANDO C. ESTEVERENA was named general manager of the microcomputer systems division of Zilog, Inc., Cupertino, Calif.... JOHN WOOLLEY, director of information systems for Newsweek, Inc., since August 1978, was named a vice president of the company... Zale Corp., Dallas, appointed HANK JOHNSTON director of development for its Management Information Systems Dept.

*

Datapoint just opened a local service office in Lafayette, Louisiana. It's one of 42 new ones we opened this year.

That brings the total to 138 and places our customer support personnel as close as possible to the people who need them...whether they're in Lafayette or Los Angeles.

To support all the new offices, we've increased our force of Customer Service Representatives by nearly 50%, to 665. They are trained to service Datapoint systems.

In addition to the supply of spare parts a CSR carries, we've expanded our parts supply system to 275 drop points. Of those, 25 are major parts centers.

Call one number, 24 hours of any day.

There are 42 people in our Customer Support Center in San Antonio awaiting calls and available seven days a week, 24 hours a day. When customers need service, they call one toll-free number. We find the CSR nearest the customer and usually have them on the telephone with each other within an hour.

The entire system is controlled by our own DATASHARE®, a sophisticated data processing and information retrieval system. Our own Infoswitch™ Automatic Call Distributor takes care of all incoming calls so that customers receive the quickest possible response.

All the equipment is our own, naturally.

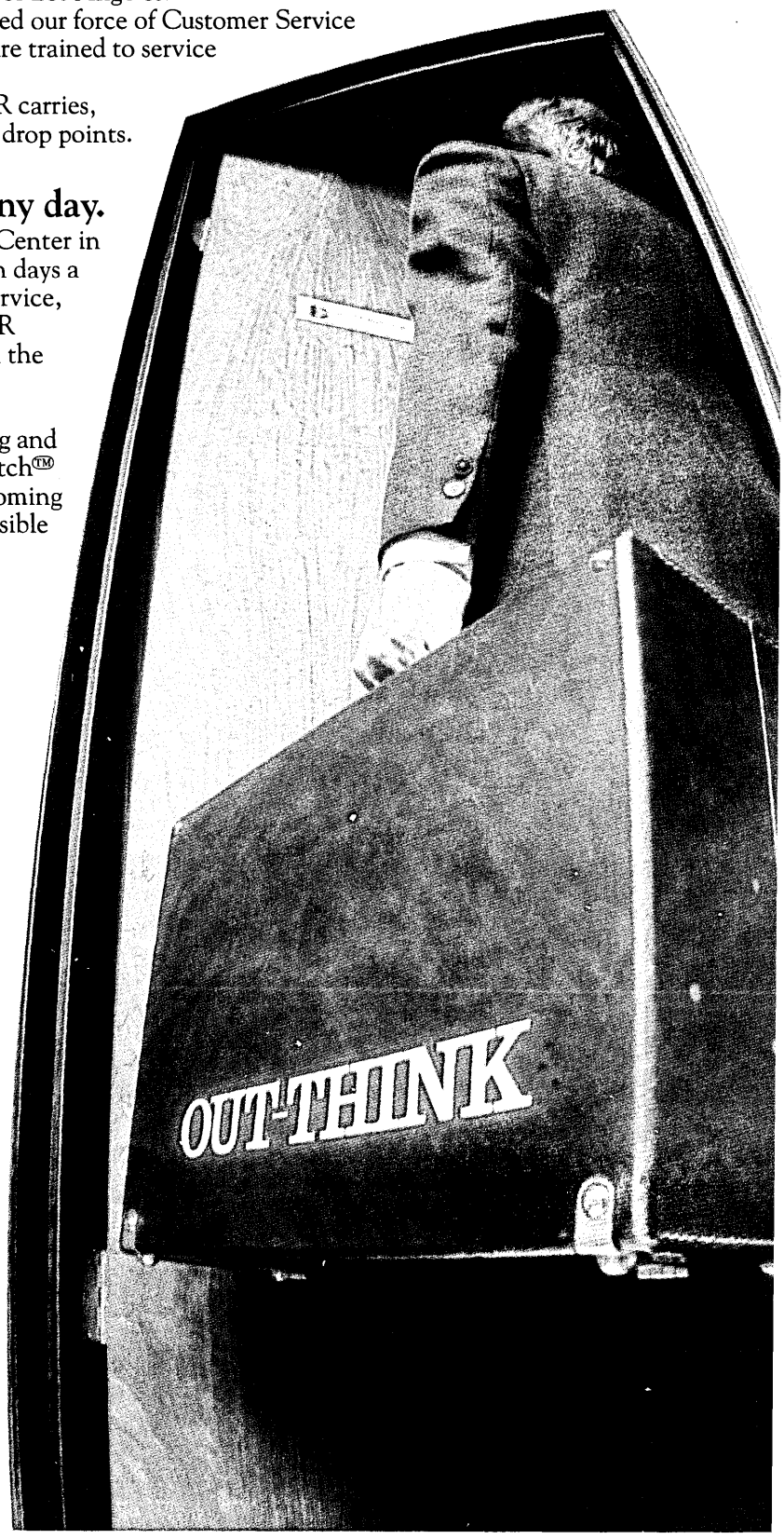
We don't forget our customers. They don't forget us.

Customers may choose Datapoint computers for any number of reasons—cost, ease of use, flexibility—but they soon learn our customer support is as good a reason as any. Our growth has come largely from the growth of our customers. They keep coming back for more. They don't forget us because we haven't forgotten them.

Providing the kind of customer support Datapoint believes its customers deserve requires a huge commitment in manpower, facilities and money. The commitment has been made—it's a matter of Datapoint's corporate policy. And it's just one of the ways we're out-thinking our competition to help our customers out-think theirs.

If you'd like to know more about Datapoint, its hardware, software, or service, please write Marketing Communications Dept. (M-62), Datapoint Corporation, 9725 Datapoint Drive, San Antonio, Texas 78284.

DATAPOINT CORPORATION



CIRCLE 133 ON READER CARD

HARDWARE

OFF-LINE

Ampex has entered the microdisk market with an oem line of media. Evolving from the company's experience with electroplated magnetic memory media used in video systems, such as the HS-100 series of "slow motion" video disk recorders, the medium bears the trademarked name "Alar." Alar disks are said to allow recording densities in the 10,000 to 12,000 bpi range.

IBM researchers have developed a technique for tailoring the properties of magnetic bubble materials. A precision laser can scan a thin film of magnetic material, heating small regions to high temperatures while surrounding areas remain cool. Rapidly cooling the laser-annealed areas results in their high-temperature crystal structures being frozen in. In gallium-substituted yttrium-iron-garnet magnetic bubble films, heating redistributes gallium and iron atoms; the redistributed atoms allow the film to support magnetic bubble domains of smaller diameters.

Fiber optics will figure heavily in the architecture and increased performance of future computer systems, according to a report prepared by Gnostic Concepts of Menlo Park, Calif. The report says fiber optics will find a place in both mainframes and minicomputers. Applications identified include use within the mainframe, across channel interfaces, between peripheral control devices and peripherals, and in networking.

GRAPHICS TABLET

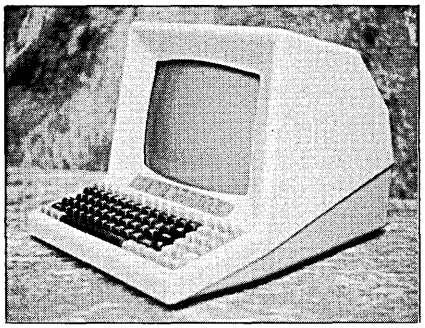
The Apple II personal computer generates some nice color graphic output, and now, with the addition of a graphics tablet, entering graphics becomes a lot easier. The graphics tablet package consists of the tablet, with an 11-inch square drawing surface, menu overlay, stylus, a printed circuit interface card that plugs into the Apple, and disk-based software; the user's Apple should have 48Kb of memory, Applesoft BASIC, and a floppy disk drive. Using the menu to select desired functions, users can enter original art, digitize detailed drawings, trace maps, blueprints, schematics, and other line drawings, and produce color separations. Standard menu functions include PEN COLOR, DRAW, FRAME, BOX, LINE, DOT, WINDOW, CALIBRATE, REDUCE, VIEWPORT, DISTANCE, AREA, and CLEAR.

Users also can define their own menu functions. Any of six colors—black, white, magenta, green, orange and blue—can be selected for the screen's background color or the pen's drawing color. Images can be saved on diskette for subsequent recall. Images can be moved about on the screen, and they may be scaled up or down as the application dictates. The provided software will even calculate the area of a closed figure in user supplied units. The Graphics Tablet retails for $795. APPLE COMPUTER, INC., Cupertino, Calif.

FOR DATA CIRCLE 406 ON READER CARD

CRT TERMINAL

The Z8-based miniMAS crt terminal is designed for large-volume applications. The terminal has a 12-inch crt screen, which is used to display 24 lines of 40 or 80 characters. A variety of attributes—inverse, half-intensity, blink, double-wide, underscore—can be applied to the upper and lower case ASCII data displayed. The terminal can operate in page or scroll mode. Cursor addressing and protected fields are standard. Function-code compatibility with DEC's VT52, Lear-Siegler's ADM3A, Hazeltine 1400-1500, and ADDS Regent 100-200 is standard. The miniMAS communicates via an RS232 interface at speeds of up to 19.2Kbps; a 20mA current loop interface is optional. An auxilliary printer port is standard equipment. In lots of 100, the miniMAS sells for $499. MICRO APPLICATIONS SYSTEMS, INC., Minneapolis, Minn.



FOR DATA CIRCLE 407 ON READER CARD

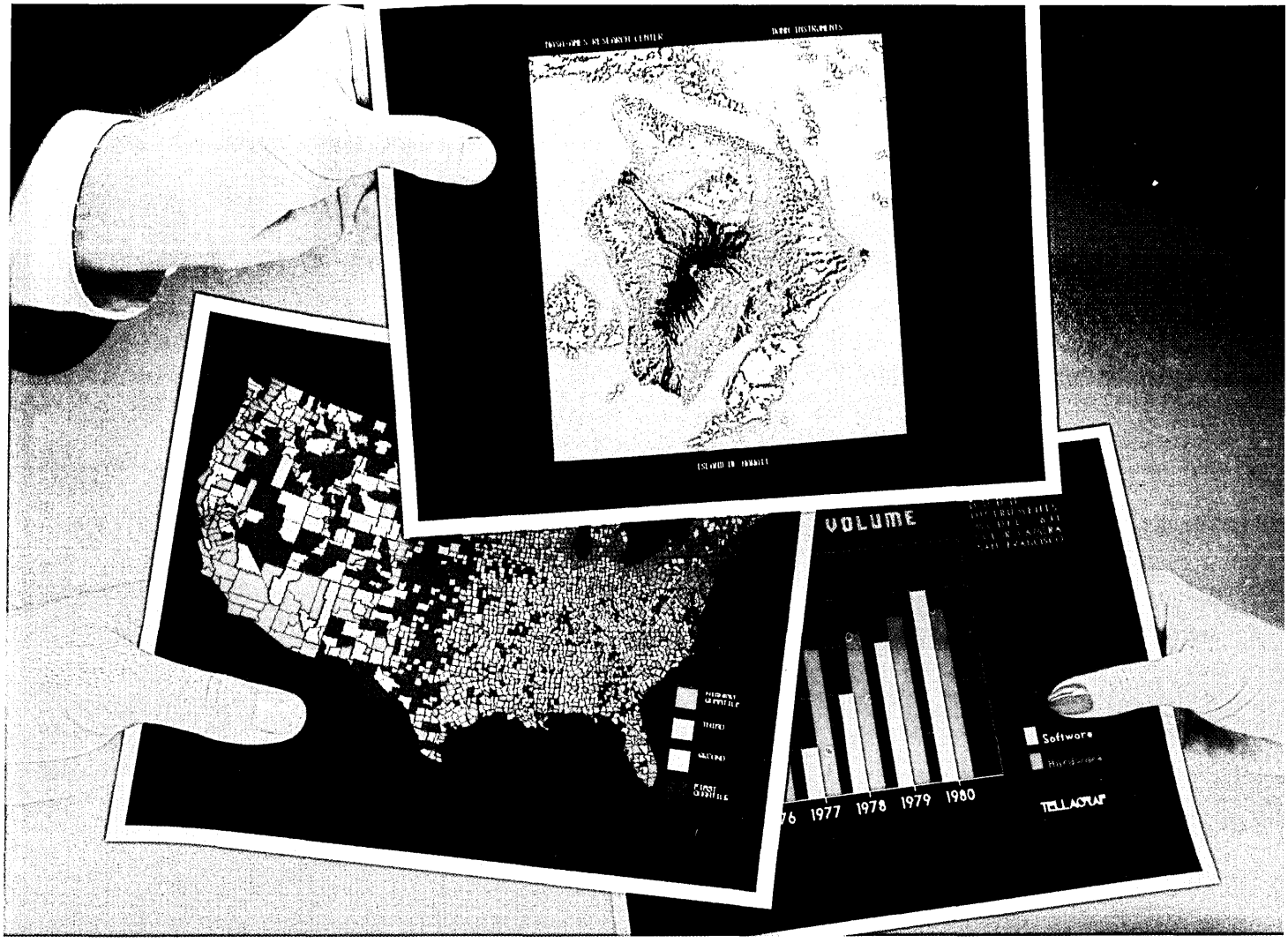
GRAPHICS INTERFACE

The Super Dazzler Interface (SDI) is a high-resolution (756 by 484 pixels) graphics interface intended for use in this vendor's line of S-100 bus microcomputers. The SDI can drive monochrome or color displays. The two-card interface uses DMA to display the contents of a display memory; each display pixel can be mapped from one bit or on nybble (four bits). Bit and nybble mapping are software selectable, and can be mixed in the same display. Display memory can be 12Kb (bit-mapped) or 48Kb (nybble-mapped). For color displays, 4,096 colors are available, of which any 16 may be used in a given display.

Black-and-white displays can use 16 shades of gray.

SDI generates three separate analog output signals to drive the red, green, and blue guns in a color monitor. With monochrome displays, the three signals can each drive a monitor, allowing one SDI to present three distinct images at the same time. The SDI sells for $595. A 16Kb, two-port memory card, developed for use with the SDI, is offered for $795. CROMEMCO, INC., Mountain View, Calif.

FOR DATA CIRCLE 408 ON READER CARD

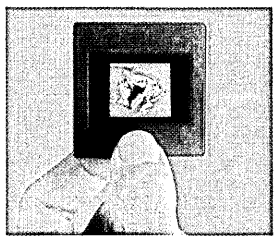


Actual 631 images on Polaroid instant 8x10 film.

Color hard copy is finally at hand!

Color hard copy: the luminescent electronic image, captured in the permanence of photographic prints and transparencies. Dunn Instruments makes it brilliant, accurate and effortless to obtain from an affordable system. At last you can hold the new computer graphics and digital images in your hands.

The source is the 631 Color Camera System. It packs a high resolution, high linearity CRT, sophisticated optics and microprocessor exposure control into a compact, fast and friendly unit. For instant hard copy for immediate analysis, use it with Polaroid Type 808 film to make stunning 8x10 color prints. Add the optional motor-driven 35mm system for beautiful color slides. Or load 8x10 transparency film and produce images you can project overhead.



The 631 economically records the data from any raster scan CRT, for presentation, reproduction, access and display. Applications range from management information graphics to satellite remote sensing. Call or write for more information. We'll arrange for you to get your hands on actual results from the 631 Color Camera System.

Dunn Instruments, Inc.,
544 Second Street, P.O. Box 77172,
San Francisco, CA 94107.
415/957-1600.

The 631 COLOR CAMERA SYSTEM

"Polaroid" is a registered trademark of the Polaroid Corporation.

LANDSAT image courtesy NASA-Ames Research. Cartographic study courtesy Harvard Laboratory for Computer Graphics. Management information graphics courtesy ISSCO.

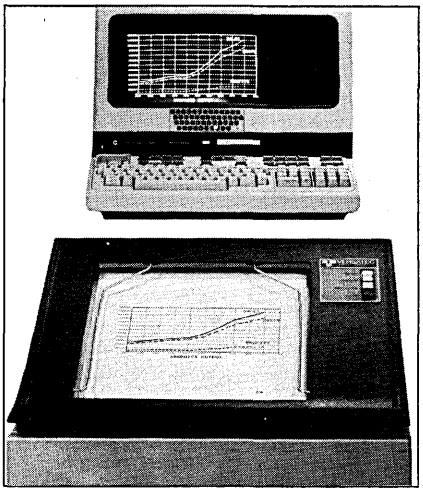
DUNN INSTRUMENTS

CIRCLE 134 ON READER CARD

PRINTER/PLOTTER

The 1641A Video Hard Copy System addresses three major applications. It can produce hard copies of screen images from raster scan display terminals and other video sources; it can function as a 132 column wide, 1,000 lpm computer printer; and it can print computer graphics. The hard-copy system comprises two modules: a floor-standing electrostatic printer/plotter with 160 dot-per-linear-inch resolution, and a desktop or rack-mountable video interface. The system can service up to eight terminals or video sources, producing up to 15 copies per terminal request.

A variety of video input signals, including RS-170, are supported; an entire screen can be copied in 20 seconds. In print/plot mode, the system accepts ASCII data at burst rates of up to 1MHz; its RS-232 interface operates in receive-only mode at asynchronous user-selectable data rates to 9600bps. Printing is on electrographic paper 11 inches wide. Paper is available either on 500 foot rolls, or in 1,000 page fanfold packages (pages are 11 inches by 8½ inches). The 1641A Video Hard Copy System sells for $10,500 (domestic) and $13,725 (international).



VERSATEC, A Xerox Co., Santa Clara, Calif.

FOR DATA CIRCLE 409 ON READER CARD

VIDEO INTERFACE

The VRQ-11, for use with DEC LSI-11 computers, provides a direct interface between any Q-Bus machine and a crt monitor. The dual-height board contains up to 8Kb of semiconductor memory, operating at main memory speeds; characters written into this memory are displayed on the monitor. Line and column formats may be altered under program control; graphics, with up to 64K pixels also are supported. The standard character generator handles 96 upper and lower case ASCII characters and 32 special symbols.

Using an EPROM, users can implement special character sets. Control signals are provided for use with a light pen operating in either polled or interrupt-driven mode. A unit select function allows several VRQ-11s to occupy the same address space while driving separate monitors. A number of display attributes, including blink and reverse-video, are provided. Basic VRQ-11 sells for $615. COMPUTER TECHNOLOGY, Oakland, Calif.

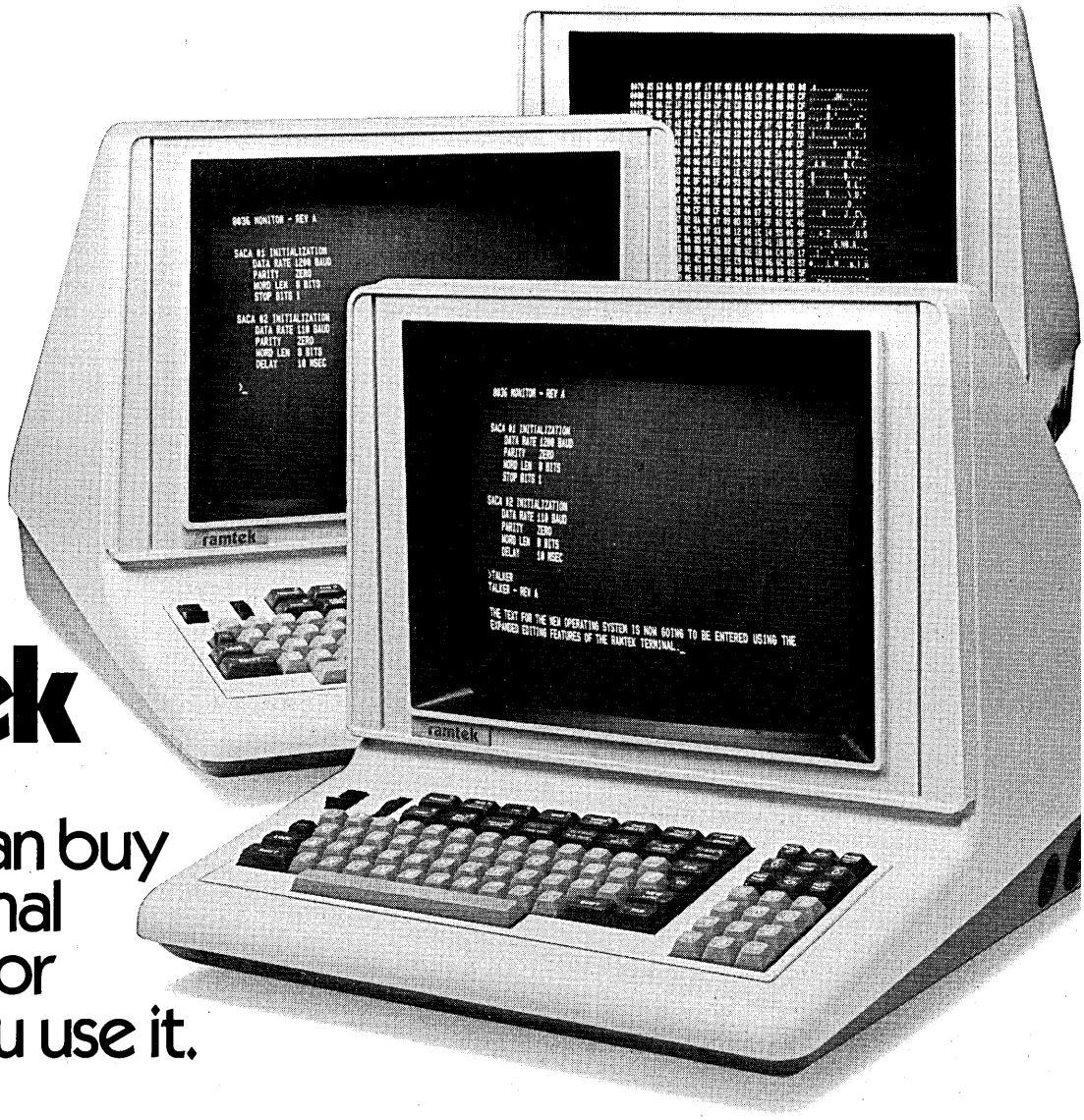
FOR DATA CIRCLE 410 ON READER CARD

LINE PRINTER

The model 3476 is a 760 lpm line printer for use with all models of IBM's System/34 and System/38. The printer's chain train design is said to produce sharp print quality on up to six-part forms. A variety of character sets are offered. Standard paper sizes to 19.5 inches can be used with the 3476. The printer attaches to the computer through the S/34 or S/38 Work Station Controller; the vendor's print controller is housed within the 3476's cabinet. The 3476 sells for $14,500. Monthly prices, including maintenance, are $497 on a two-year lease, and $470 on a three-year lease. MEMOREX CORP., Business Systems Div., Santa Clara, Calif.

FOR DATA CIRCLE 411 ON READER CARD

Three smart buys from Ramtek



Now you can buy a CRT terminal that's built for the way you use it.

Ramtek brings you three terminals, each designed—even customized—for specific applications. Each with the quality and performance you'd expect from Ramtek, the leader in color-graphics terminals.

The Ramtek 8400 Series Programmable Terminal.

Choose this model for straight data entry or as a remote terminal. If you have a teletype compatible system now, the 8400 will let you upgrade easily and affordably. It's got the communications protocols that make it instantly adaptable to telecommunications lines. Stand alone intelligence gives you low-cost local computing capability and it's user-programmable. The 8400 is hardware and software supported and serviced. This is a proven product that's performing in hundreds of applications throughout the world. And, if you've got a custom application for 25 terminals or more, the 8400 may be exactly the terminal you're looking for.

The Ramtek 8210 Uniscope® Emulation Terminal.

For Sperry Univac computer users. It's a superior plug-in replacement for the Uniscope 200 terminals. You gain because the 8210 costs less, does more, is totally compatible and is available now. In fact, you can save as much as $1400 per terminal when you choose the 8210. And, the 8210 offers the kind of features you've been looking for: eight video fields instead of two; self-test memory diagnostics; RID, SID, DID keyboard programmability; protected format; local intelligence and much more.

The Ramtek 8100 Smart Editing Terminal.

This powerful Ramtek data entry terminal has extensive features for data validation. A big 15" screen. Brighter, larger, more readable characters. And, you can have it any way you want it. Ramtek can give you custom modifications to precisely tailor the 8100 to the way you use it.

The Ramtek 8400, 8210, or 8100. They're the best in their class. With larger screens. Crisper, clearer characters. A uniquely comfortable keyboard "feel." Full software and service support. At prices you can afford. It all adds up to three smart buys from Ramtek. Call your local Ramtek office, or write: Ramtek, 2211 Lawson Lane, Santa Clara, CA 95050.

CIRCLE 136 ON READER CARD

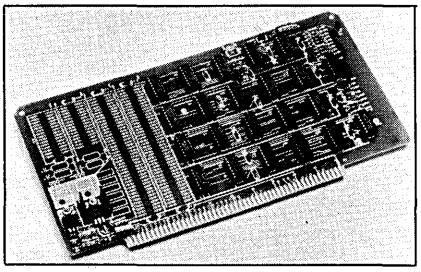
Ramtek

Our experience shows.

REGIONAL OFFICES: Santa Clara, CA (408) 988-2211; Newport Beach, CA (714) 979-5351; Dallas, TX (214) 422-2200; Maitland, FL (305) 645-0780; Huntsville, AL (205) 837-7000; Chicago, IL (312) 956-8265; Cleveland, OH (216) 464-4053; Washington, DC (301) 656-0350; Metropolitan N.Y. (201) 238-2090; Boston, MA (617) 862-7720

VIDEO INPUT

For use in S-100 bus personal computers, this vendor's fast-scan video digitizer accepts a composite video input signal and outputs 8-bit gray scale digital data. Software can send the board's digital output to main memory or to a memory-mapped high resolution video board. The board's maximum horizontal resolution is approximately 700 points per line; vertical resolution is 480 lines per image. A software driver is included for controlling the board; it supports 16 shades of gray, storing images on disk, printing images on a



matrix printer, and displaying images via a high-resolution video board. An assembled and tested fast-scan video digitizer board sells for $175. VECTOR GRAPHIC INC., Westlake Village, Calif.

FOR DATA CIRCLE 412 ON READER CARD

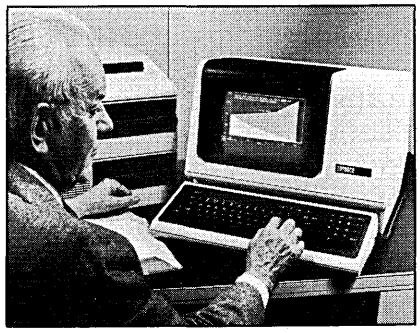
NOVA ADD-IN MEMORY

In addition to providing up to 256Kb (128K words) of add-in memory for Data General Nova 3 minicomputers, this vendor's model 5160 board offers a raft of options. Parity generation and checking are standard, while error checking and correcting (ECC) circuitry is optional. ECC corrects all single-bit errors, and detects multiple-bit errors. ECC also logs errors as they occur, at the same time displaying error indications on the board's control panel. A Memory Manager/Protect Unit (MMPU) also is offered as an option. A full-blown 5160 board containing 256Kb of memory, MMPU, ECC, and error logger, carries a quantity one price of $8,950. INTEL CORP., Santa Clara, Calif.

FOR DATA CIRCLE 413 ON READER CARD

DESKTOP SYSTEM

Intended for use as a desktop tool in scientific, engineering, and management problem solving, the MiniMINC also can handle data reduction of laboratory information. The smallest member of the vendor's MINC product line, MiniMINC has provisions for up to three serial ASCII input lines for accepting data from instruments; two additional ports are provided, one for a serial printer, the other for synchronous or asynchronous communications at speeds of up to 9600bps. Based on an LSI version of the popular PDP-11 minicomputer, MiniMINC includes 65Kb of memory, a dual floppy disk system with a 512Kb capacity, and a VT105 alphanumeric/graphics crt terminal. Users can write their own programs in MINC BASIC, and they can make use of 60 applications programs (included) for mathematical, statistical, and financial analysis. File transfers under the vendor's networking



architecture are possible; by bringing up the RT-11 operating system, users can have their MiniMINC function as a network node, or communicate with other machines using 2780 or 3780 protocols. MiniMINC sells for $9,900. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 414 ON READER CARD

INTERPROCESSOR LINKS

DEC PDP-11, VAX 11/780, and LSI-11/2 or 11/23 can be configured into multiprocessor networks using Interprocessor Subsystem Links from this vendor. Of the four links offered, those with BJ part number suffixes use differential driver/receiver modules good for high-speed parallel data transfers at distances of up to 3,000 feet. Links with BOI part number suffixes have differential drivers and optically isolated receivers for communications at distances of up to 1,000 feet. All four links are compatible with DEC DA11B operating and diagnostic software. A selectable feature supports data transfers across 32K word boundaries for blocks of up to 32K words.

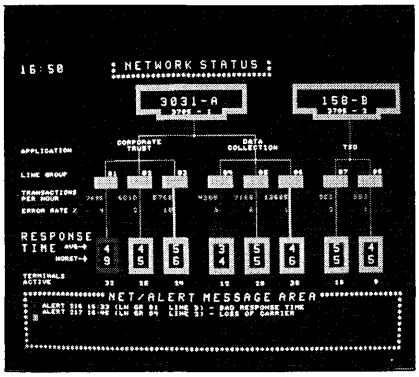
Data rates are adjustable for controlling the DMA load on each processor. Each link subsystem is supplied with a 50-foot ribbon cable for interconnecting processors. The interprocessor link requires one hex SPC slot in a PDP-11, or one quad slot in an LSI-11. The MDB-DA11BJ, for linking two PDP-11s, sells for $4,875. The MDB-DA11BOI, also for inter-PDP links, sells for $5,275. For PDP to LSI interconnections, the MLSI-DA11BOI sells for $4,050. And a fourth link with optically isolated receivers sells for $3,295; it links two LSI series processors. MDB SYSTEMS, INC., Orange, Calif.

FOR DATA CIRCLE 415 ON READER CARD

INPUT DEVICE

It may be true that there is nothing new under the sun, but this is the first time we recall seeing this unorthodox approach to data entry. The DEP-80 (Data Entry Peripheral) provides 48 bits of input per

HARDWARE SPOTLIGHT



COMMUNICATIONS MONITOR

Often, the first an operations manager hears of degradation in his teleprocessing network is when he gets an irate telephone call from a user. This vendor aims to put the operations manager a step ahead: its NET/ALERT system monitors an entire communications network from the central site, displaying network status, degradations, and failures on a large-screen color crt display. Central to the NET/ALERT concept, these color displays are tailored to the user's requirements. Multiple display screens can be used to show the total system simultaneously, or a single display can be used, with the operator stepping through various levels of detail as he troubleshoots the network.

The NET/ALERT system consists of a minicomputer system and one or more Microprocessor Line Sets (MLS). The MLSs are the interface between the user's communications lines and NET/ALERT. Each MLS handles from one 56 Kbps line to eight 4,800 bps (or slower) lines of the same protocol (bisynchronous, asynchronous, and HDLC are currently supported). Each line is tapped with a T-connector on the digital side of the central site modem. The MLS preprocesses each message—incoming or outbound—providing prereduced data to the NET/ALERT mini for analysis, logging, and display. Audible and visual alarms are raised when parameters pass user-specified limits.

At writing, the first installation of NET/ALERT was scheduled for a major bank wishing to watch its remote users on an application by application basis over several of its most important systems. A basic NET/ALERT system, including one MLS, color display, and associated minicomputer system, carries a $175,000 price tag. The vendor says one system can be configured with enough MLSs to watch several hundred lines. AVANT-GARDE COMPUTING, INC., Cherry Hill, N.J.

FOR DATA CIRCLE 439 ON READER CARD

Put a TI terminal to work for you. For as little as $85 a month.

Texas Instruments Supply Company offers a new leasing program.

Now there's a fast, easy and economical way to put a new TI terminal to work in your office.

Just call the Texas Instruments Supply Company location nearest you and we'll tell you all about it.

You'll like what you hear.

Especially the part about how we can speed the equipment to you in a matter of days. Not weeks.

One terminal. Or more. For as short a term as ninety days. Or as long as four years.

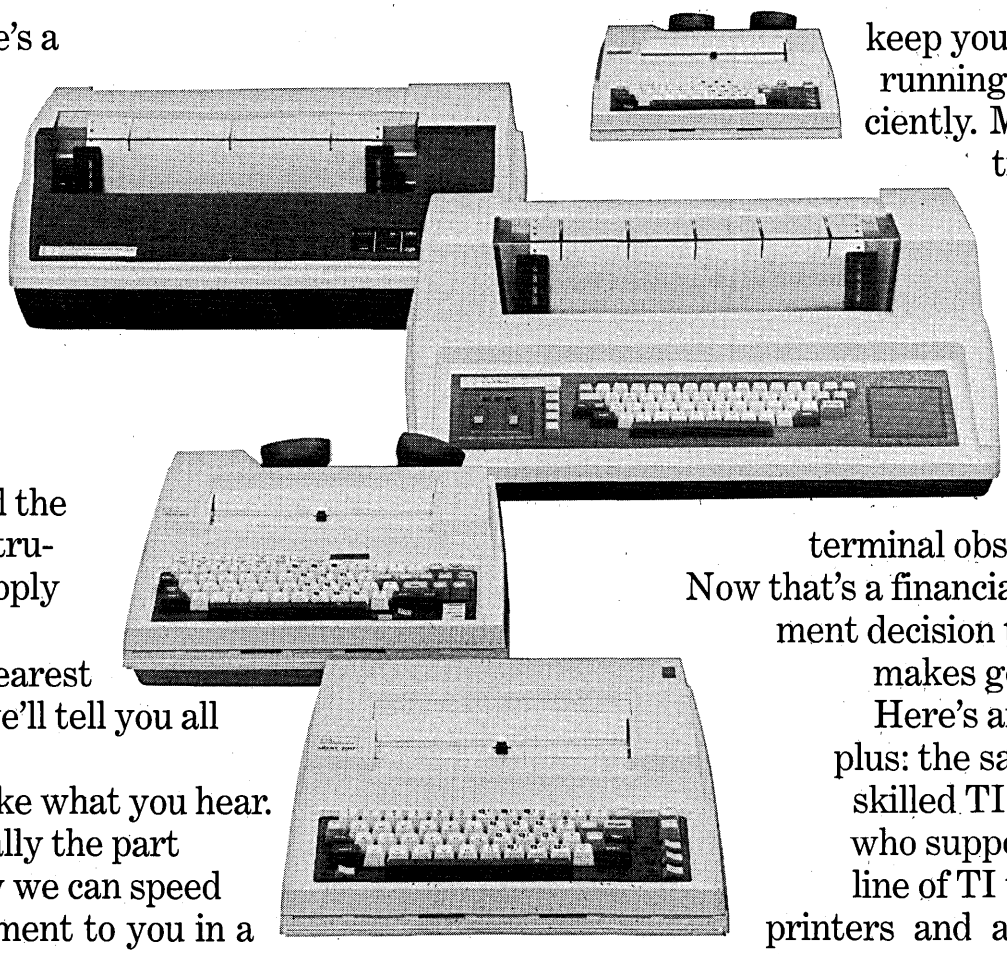
Imagine immediate off-the-shelf delivery of state-of-the-art products to keep your business running more efficiently. More effectively. And more productively.

With no capital investment. And without the risk of terminal obsolescence.

Now that's a financial management decision that really makes good sense.

Here's another big plus: the same highly skilled TI personnel who support the full line of TI terminals, printers and accessories also service the lease machines.

So, if you're looking for a leasing program, take a closer look at Texas Instruments Supply Company. You'll like what you see.



12-Month Lease Rates*

TI Model No.	Monthly Rate
733 KSR Data Terminal	$ 85.00
733 ASR Data Terminal	$145.00
743 KSR Data Terminal	$ 85.00
745 KSR Data Terminal	$100.00
763 Data Terminal with Bubble Memory	$125.00
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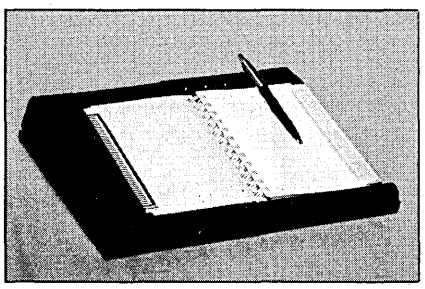
CIRCLE 101 ON READER CARD



page. Along the left-hand margin of each page are 48 conductive pads and a ground line. Descriptions can be printed adjacent to the conductive pads; to select an item, the user connects the respective conductive pad to the ground line by drawing a connecting line with a graphite pencil (completing the circuit). The vendor sees applications in inventory control, programmable industrial control, electronic games, and test scoring, although users are almost certain to come up with numerous unexpected applications. A basic DEP-80 sells for $195 in lots of 100. TURNEX INTERNATIONAL, Newport Beach, Calif.

FOR DATA CIRCLE 416 ON READER CARD

TERMINAL

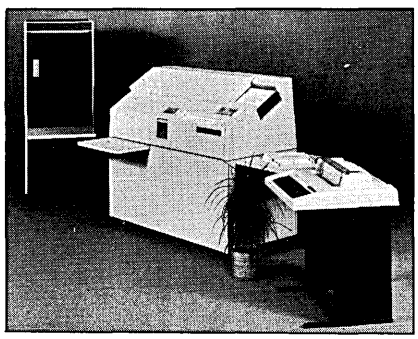
Based on Hewlett-Packard's 2645A crt terminal, this vendor's Workstation I has dual personalities: it can function as an IBM 3270 type terminal or as an HP 2645A. Operating modes can be switched wth a single keystroke. When communicating with an IBM host, the Workstation I can function as an IBM 3275, or it can be daisy-chained, simulating an IBM 3277 on a remote 3271 controller. In 3270 mode the terminal provides four PA keys and 12 PF keys, in addition to all 3275 keyboard functions.

Additionally, the Workstation I provides eight user-programmable soft keys, two alternate 128 character display sets, and display attributes including underline and blinking fields. EBCDIC characters are used when the terminal is in 3270 mode. In 2645A mode, the terminal talks ASCII, and can communicate synchronously or asynchronously. The Workstation I can support dual cartridge tape units and a printer; it is capable of local processing, self-testing, and loopback testing of lines and modems. Prices begin at $5,200, with quantity discounts offered. COMMUNICATIONS & SPECIAL SOFTWARE, INC., Spring Lake Park, Minn.

FOR DATA CIRCLE 418 ON READER CARD

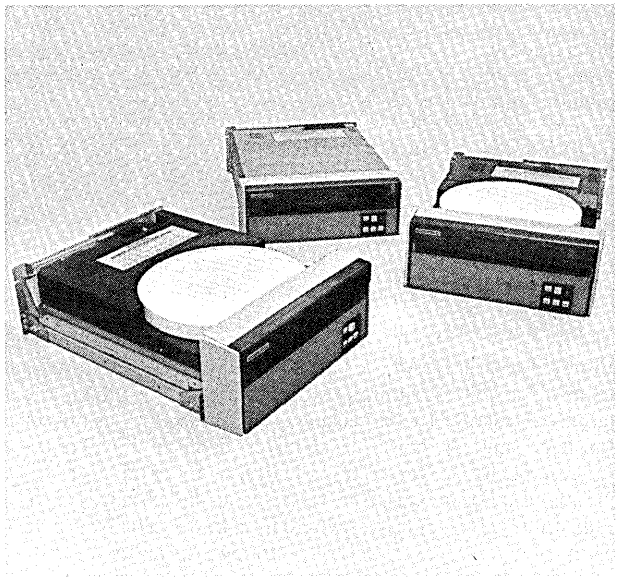
OPTICAL MARK READER

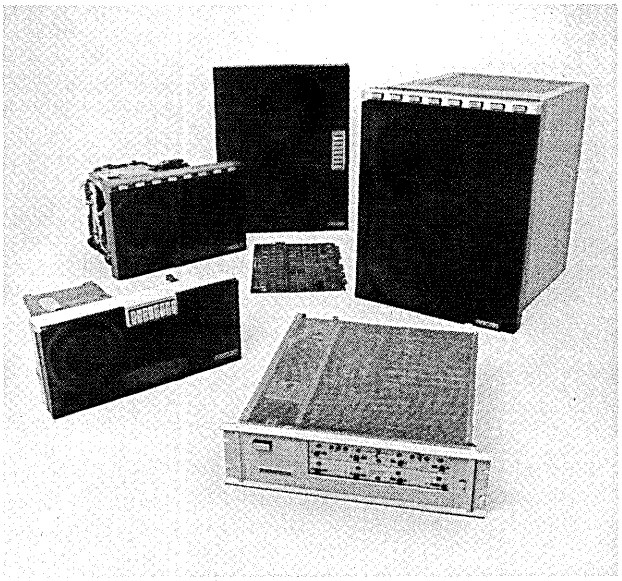
The Sentry 7018 Optical Mark Reading System can read pencil marks from both sides of a document at rates of up to 6,000



documents per hour. Documents can contain nearly 3,000 scanning positions (2,961 to be exact). The minicomputer based scanner is capable of editing, validating, and processing incoming data; output can be sent to the 7018's mag tape drive for subsequent processing on a mainframe. Users can program the 7018 in the vendor's DOSSIER language. A select stacker is standard for separating out documents not meeting user defined standards. Options inlude up to four mag tape units, additional processor memory, a high-speed terminal for systems communications, and line printers. Basic system pricing starts at $91,850 (for educational customers) or $98,500 (for commercial users). Leasing plans are offered. NATIONAL COMPUTER SYSTEMS, INC., Edina, Minn. ✲

FOR DATA CIRCLE 417 ON READER CARD





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CIRCLE 102 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Mitrol, of Waltham, Mass., has brought up MVS under VM on a 2Mb Magnuson M80/4 system. According to Arthur C. Goff, Mitrol Data Center manager, the firm is getting 20% to 25% more throughput than would be expected from a 370/148. Magnuson vp of software development Kevin Anderson says the M80's VM assist microcode feature makes running the large operating system possible.

MSP, the software house, has taken delivery of the third IBM 4331 installed in the U.K. (55th worldwide). The 1Mb system is currently running DOS/VSE with CIVS and ICCF. Intended for use by the development staff and by the company's worldwide offices as an electronic mail and RJE facility, the system should be running VM/CMS by the end of this year.

Cambridge Computer Associates recently took an ad in the Wall Street Journal to pose an interesting challenge: "...to any company or government agency in the United States... send us your four best chess players, and we'll win the match!" Six weeks later, no match had been scheduled. A company spokeswoman said that at a regional computer conference the firm managed to stage 230 fast matches, winning all but two. The firm hopes it can arrange a match with Digital Equipment. One thing that may be scaring off challengers is the CCA team: all are chess masters, and one is the highest ranked player in New England and a former U.S. Open winner. Your move.

And speaking of DEC, the firm has installed a toll-free telephone support line for customers needing assistance with software usage and performance.

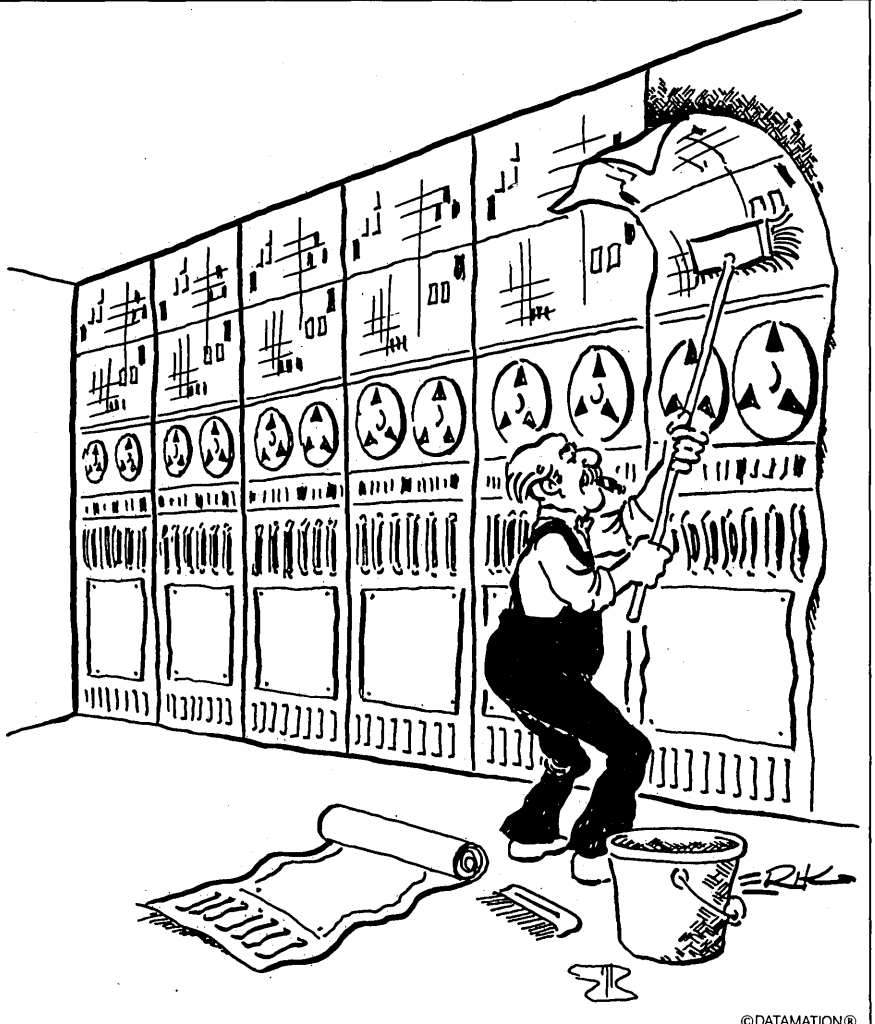
BASIC EXTENSIONS

The BASIC Toolkit implements a number of extensions to the command repertoire of the Commodore PET personal computer. AUOT simplifies program entry by automatically prompting with line numbers. An entire range of lines can be removed from a program by using the DELETE command. A variant of the LIST command, FIND displays only those program statements containing a user-specified string of characters. After encountering an error message, the user can use the HELP command, which lists the offending line, with the erroneous portion of the line displayed in reverse video. For debugging, users can avail themselves of the TRACE or single STEP commands. Programs can be RENUMBERed. The APPEND command takes a program from tape and adds it immediately after the program in memory. Finally, a DUMP command displays the names and values of the BASIC variables in an executing program. The Toolkit is packaged in ROM. The chip sells for $49.95, and plugs into a spare socket in new 16Kb or 32Kb PETS; for older 8Kb PETS, the chip is mounted on a pc board that plugs into the PET's expansion chassis. The pc board mounted Toolkit sells for $79.95. PALO ALTO ICS, Div. of Nestar Systems, Inc., Palo Alto, Calif.

FOR DATA CIRCLE 430 ON READER CARD

DUMP/RESTORE UTILITY

FAVER (Fast-Virtual-Export-Restore) is a dump/restore utility designed to handle the intricacies and interrelationships of VSAM files. Clusters can be dumped or restored individually, or by catalog or volume. The vendor says benchmarks have shown a two- to four-fold speed advantage over IDCAMS. Catalog information is written on the backup tape during dump operations, allowing automatic restoration



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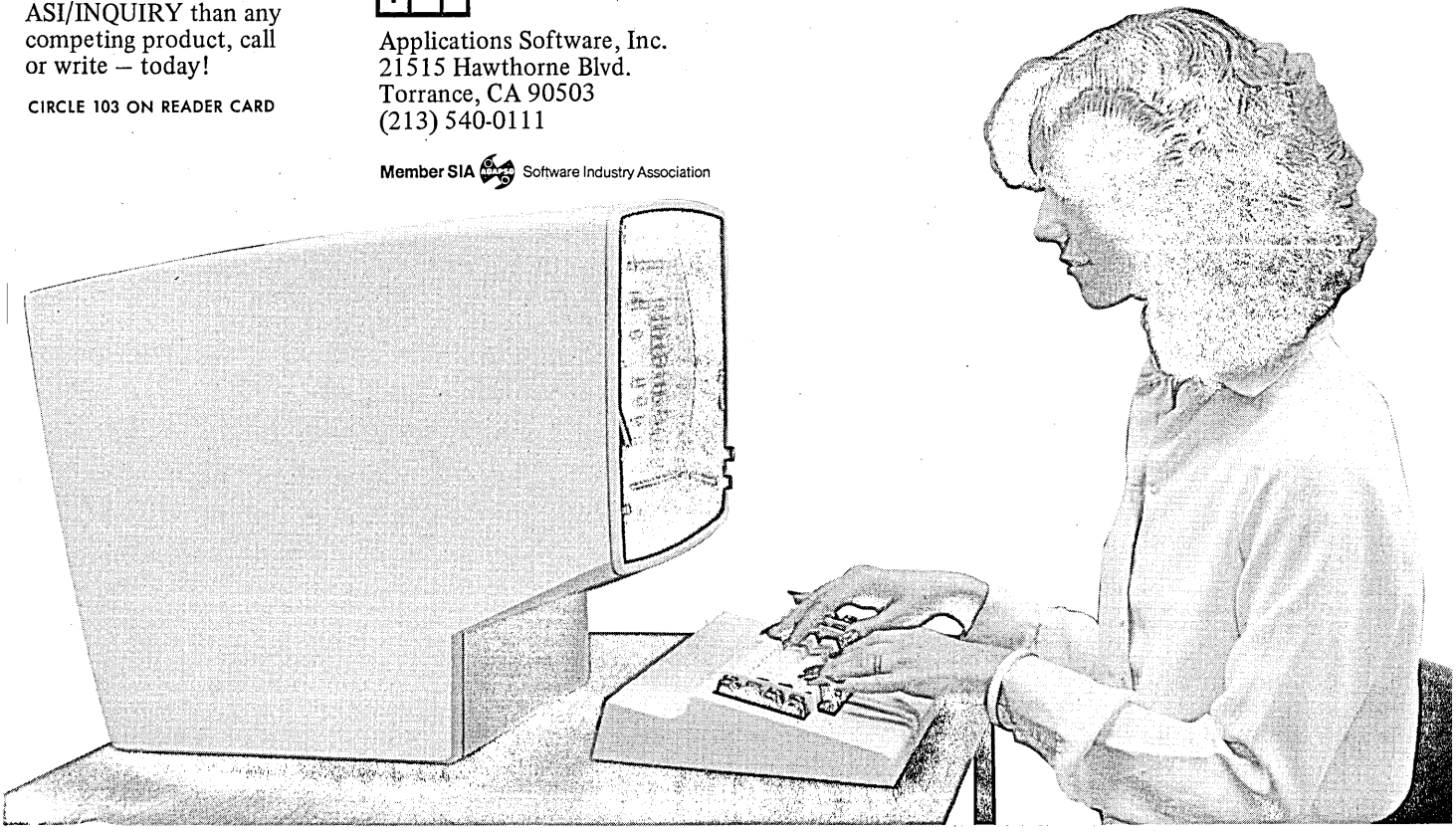

with FAVER handling all delete and define operations. Clusters allocated and opened by on-line systems can be dumped while open, providing update activity is stopped. During restore operations, a user exit may be included to delete, modify, or insert records. FAVER runs under OS/VS and is offered for $2,500. GOAL SYSTEMS CORP., Columbus, Ohio.

FOR DATA CIRCLE 431 ON READER CARD

FINANCIAL SYSTEM

Intended to help government contractors comply with auditing requirements, the Automated Financial Information System (AFIS) also is said to provide tools for better company management. Written for Wang 2200 series small business systems, AFIS consists of four applications packages, and a graphics output module for driving a Tektronix 4051. The first applications module—the labor schedule routine—includes time card entry and detail hours and costs by charge item. The module maintains a list of valid contracts, with validity checking for chargeouts as time cards enter the system. Up to 599 employees and 269 contracts can be maintained. Reports include personnel-by-account-charged and account-charged-by-personnel. This module goes for $2,900.

A job cost ledger is maintained by the second module. Reports include a "cum-to-date" contract summary giving detailed breakdowns of all costing elements, including target contract dollars, labor, other direct charges, etc.; contract funds and remaining funds also are included in this report. Users can make adjustments to the commulative contract summary. The program provides a printed audit trail. This module is for use with module one; the combined price is $4,500. A third module handles planning and projections. Projections can extend for four time periods after current closing. Budgets can be compared to projections. The price for modules one through three is $6,000 ($7,250 with graphics support). The fourth module, payroll, can run in a standalone environment. It includes paycheck printing, tax breakdown by profit center, and generation of a payroll ledger. Module four goes for $2,800. Leasing plans also are offered. DOTY ASSOCIATES, INC., Rockville, Md.

FOR DATA CIRCLE 432 ON READER CARD

CROSS-COMPILER

Written in PL/1 for large IBM mainframes, PLM/S86 is a cross-compiler for a superset of PL/M86 (Intel's langugage for its 16-bit 8086 microprocessor). Extensions to PL/M86 include DO UNTIL, DO UNTIL—WHILE, and PL/1-like IF statements. DO CASE has been extended with an OTHERWISE label (executed if the CASE index doesn't select any other statement). LEAVE and LEAVE label exit the innermost DO structure or the labeled DO structure, respectively. SHIFT and ROTATE operators also have been added. PLM/S86 has error detection and diagnostic features; downloading is under development. The package is planned for January availability on National CSS timesharing; a standalone license is tentatively priced at $30,000 including first year's maintenance. SLR COMPILERS, INC., Santa Monica, Calif.

FOR DATA CIRCLE 433 ON READER CARD

JOB ACCOUNTING

Written by a Univac 90/30 user, the Basic Job Accounting System allows allocating costs to users. The system also provides utilization information. The COBOL program uses Univac job accounting files, expanded with additional data. Reports are said to help management determine how effectively the 90/30 is being used, as well as remaining capacity, and how the user may be able to reduce processing bottlenecks. Reports include computer usage analysis, abnormal termination analysis,

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and computer time analysis (reported in both summary and graphic formats). The package carries a one-time license fee of $4,000, with multiple installation discounts available. WESTERN PUBLISHING CO., INC., Racine, Wisc.

FOR DATA CIRCLE 434 ON READER CARD

6670 LASER PRINTER SUPPORT

A utility program for the System/34, $SPOOL-6670, allows transmission of any report in a S/34 $SPOOL file to IBM's recently announced 6670 Information Distributor. The program handles all formatting and communications functions between the S/34 file and the 6670. Control statements allow the computer user to select reports for printing, number of copies desired, and whether or not to print on both sides of the page. A restart feature allows printing to begin at a specified page. The $SPOOL-6670 program carries a one-time lease charge of $1,400. ZINK & KATICH DATA PROCESSING, INC., Lansing, Ill.

FOR DATA CIRCLE 435 ON READER CARD

COMMUNICATIONS

An asynchronous communications package, ASYNCH, allows this vendor's Z80-based microcomputers to communicate among themselves and with many computers manufactured by other vendors. ASYNCH comprises a hardware driver program and an asynchronous protocol terminal emulator. The package runs under the vendor's RIO operating system. Microcomputer operators can use the package for accessing a host and transferring data and source code files from disk to host. The terminal emulator allows selection of data transfer parameters (line speed, parity, number of data bits) via high-level commands; it also offers a mode for transferring procedure files between the vendor's systems, with error checking and retransmission of erroneous data. The package supports only asynchronous ASCII communications. It does not support synchronous, 2780, or SDLC protocols. ASYNCH is priced at $500. ZILOG, Cupertino, Calif.

FOR DATA CIRCLE 436 ON READER CARD

DATA BASE MANAGEMENT

IQ/net is a data base management system specifically tailored for use in distributed processing networks comprising IBM System/370 and 4300 series processors. The DBMS provides both a Procedural Language Interface (PLI) and a query language for accessing data. The PLI allows applications programs, written in COBOL, FORTRAN, PL/1, or assembler, to access or update data bases; the query language provides Boolean retrieval logic, computation, and data manipulation commands to users via a friendly query language.

IQ/net maintains its own internal data base for locating data held at remote sites; this data base contains physical information (location, organization, header info., etc), security controls, and field definition tables. IQ/net is licensed on a per cpu basis. A standalone version, for use with CMS and VM, carries a paid-up li-

SOFTWARE SPOTLIGHT

STOCK TICKER

Serious investors, traders, and small brokerage houses may be interested in Tickertec-TRS, an applications program for Radio Shack's TRS-80 personal computer, allowing access to the New York or American Stock Exchange tickertapes. The program allows a user to watch the entire tickertape of either exchange on a real-time basis; additionally, users are able to monitor at least 48 stocks (in the basic version of the program), tracking sale prices and volume. The last 10 trades of these stocks are available on demand, as well as announcements, hourly exchange indices, and volume data. The system can maintain two separate alphabetized lists of stocks for the user, allowing the user to separate speculations from long-term holdings. The user also can assign price limits to his holdings, and the computer will notify him when these limits are reached. The Tickertec-TRS software (about 8.5Kb of assembly language code) requires a 16Kb TRS-80 Level II, with expansion interface and RS232 communications. Access to the tickertapes must be arranged through the respective exchanges; currently we are told the NYSE charges $132 per month, and the ASE $46 per month. The basic Tickertec-TRS software sells for $1,000; a version capable of tracking a portfolio of 96 stocks is $1,200, and a disk-based system capable of following 150 stocks is in the works. MAX ULE & Co., New York, N.Y.

FOR DATA CIRCLE 429 ON READER CARD

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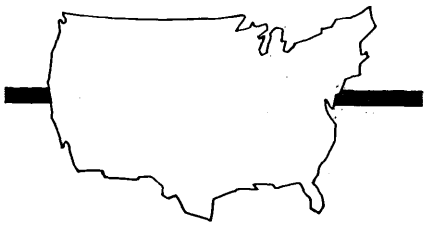

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GENERAL ELECTRIC

cense of $40,000; a second, multiuser version that can run with CMS or CICS has a paid-up license fee of $50,000. Multiple copy discounts will be offered. The package is due for first shipments this December. INFODATA SYSTEMS INC., Falls Church, Va.

FOR DATA CIRCLE 437 ON READER CARD

PERSONAL ELECTRONIC MAIL

An electronic mail package, PAN is intended to allow personal computer users to send and receive messages over the telephone network. Initially offered for the Commodore PET (with at at least 8 Kb of memory), PAN is slated for implementation on other popular personal computers (Apple, Atari, and TI are given as examples). Written entirely in BASIC, PAN allows immediate message transmission, or "time tag" delivery (unattended transmission at a specified time, typically late at night when telephone rates are at their lowest). In order to use PAN, the personal computer needs an auto dial, auto answer modem; currently, 300 bps communications are supported.

At this time, the package is best suited for sending text messages (as opposed to programs or data files); an error rate of roughly one per each five minutes of transmission time is cited. Future work in the PAN development project will seek to improve error handling (the vendor states "an error rate of one error for every two weeks of message transmission appears to be attainable").

Other improvements planned include a file transfer capability and experimentation with communications media other than the telephone system (radio is cited as one potential medium). A perpetual license for the software and a users' manual sell for $12; the users' manual is available separately for $2. PEOPLE'S COMPUTER CO., Menlo Park, Calif.

FOR DATA CIRCLE 438 ON READER CARD

APPLE STATISTICS

A statistics package from this vendor makes use of the Apple II personal computer's high resolution graphics capabilities. High resolution is used for curve fitting data using linear, exponential, logarithmic, or power relationships; standard resolution plots can be used to display histograms and distribution arrays. The package includes a Scientific Data Management System (available separately for $49.95), and programs for curve fitting, probability, general statistics, distribution mathematics, and test statistics. Distribution probabilities can be estimated above or below a point, within a symetric interval, and inside or outside a defined interval. A set of data is provided to give working examples useful in learning statistical principles. The system can handle up to five 100-element vectors of new data, grouped data, or frequency arrays. An Apple with 32Kb of RAM and at least one Disk II is required to run the package. The statistics package, with data management system, sells for $89.95. CHARLES MANN & ASSOCIATES, Micro Software Div., Yucca Valley, Calif.

FOR DATA CIRCLE 449 ON READER CARD

CICS UTILITY

A real-time monitor for CICS systems, the CICS Display Utilities (CDU) lets the system programmer retrieve internal CICS information. CDU can display the status of terminals, files, transactions, programs, tasks, dynamic storage, VTAM and system control information. The package also can display main memory (with translation), system disects (with hex displacements), and ISAM, BDAM, or VSAM records (with translation). Facilities are provided for altering memory or files by overtyping data on the screen. CDU is a release-independent CICS application, and it uses a 3277 model II as a display device. The package can be had for a one-time license fee of $4,800. COMMUNICATION SOFTWARE AIDS, Canton, Mass. ✲

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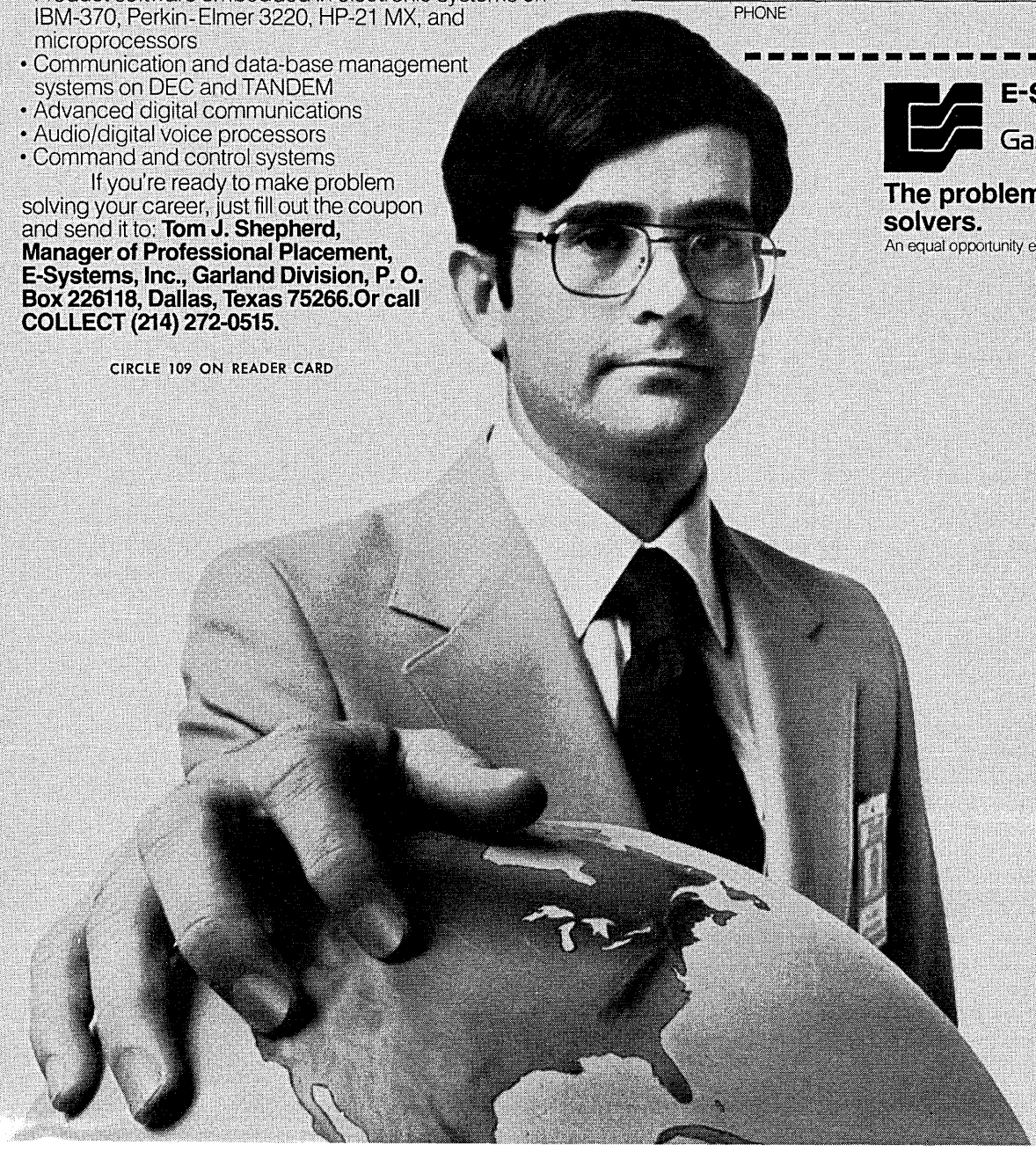

SOURCE DATA

BOOKS

SRA DATA PROCESSING GLOSSARY
by Robert C. Malstrom

IBM's Science Research Associates has recently issued a tutorial and glossary under one cover. The 22-page tutorial intends to familiarize the reader with the basic resources of a computing system and how they work together. The authors tried to emphasize the interrelations of the machines, programs, people, and data that comprise a large installation. Unfortunately, they were not successful.

The words are too few and the parochial biases too strong to take an uninitiated reader through the important concepts of computing in only 22 pages. Thus, an experienced person can critique this tutorial and enumerate what it doesn't accomplish, but the content is too sparse to aid the inexperienced reader.

The back 259 pages claim to present over 5,000 (I didn't count them) definitions of terms used in data processing. Some of the definitions were lifted from the ANSI standards work of 1977. Some of the definitions were lifted from the ISO, TC97 work, and some of the definitions came from IBM or other sources. The entire set of definitions, however, is not edited to a uniform audience profile. Therefore, some definitions appear appropriate for precise debates between lawyers pursuing an antitrust trial, whereas other definitions require so much previous knowledge on the part of the reader that they fail to clarify.

Having once written a glossary, I am sympathetic with the problems the authors failed to solve. Unless one sets a team of lexicographers down to translate all definitions into a consistent vocabulary (a very big job), the resulting glossary will be more like a compendium than a dictionary.

However, the purists among us object when "multiplex" is defined as *simultaneously transmitting two or more messages on a single channel.* One can be just as offended by the ISO definition for virtual address: *The address of a notational storage location in virtual storage.*

Somewhere along the line the authors should have decided upon a statement of purpose for the glossary. If it is to be aimed at professionals in the field, the authors can presume a certain (rather high) level of knowledge on the part of the reader and the definitions can be crisp as long as only standard terms are used in each definition. However, if the audience is intended to encompass managers, computer center directors, lawyers, vendor contract personnel, and insurance underwriters, then the definitions need to be precise and consistent within themselves. The special words used to define new concepts must themselves be in the glossary so the inexperienced reader can build concepts on concepts and definition on definition. It may also be that the glossary was intended to be used as supplementary training material for students and novices within the field to allow them to educate themselves whenever they find unknown terms in any technical literature they are reading. They will not be enlightened by the circular definitions and the lack of a consistent basic vocabulary.

The glossary is fundamentally flawed since the terms of standard practice and the parochial terms of the IBM Corp. are intermixed without suitable identification. Further, hardware terms and software terms are intermixed without clarification. Under these conditions, one can only conclude, "A word means what I say it means because I said it." And thus nothing can be inferred by the presence or absence of a term in this compendium.

Unfortunately the mixture of ANSI, ISO, and IBM produces the same gobbledygook that most of us deal with on a day-to-day, minute-to-minute basis in the field. Consequently, the glossary tends to confuse rather than enlighten. If you buy it in its current state, you just paid $5.57 for a spelling list.

—R. L. Patrick

THE INFORMATION AGE
by William S. Davis and Allison McCormack

This textbook comes very close to fulfilling the need for a single book for an "Introduction to Computers" course. As most of today's engineering and physical science students have already been exposed to computing in elementary or secondary school, this book should be used primarily by nontechnical students who want an overview of computing.

This effort gets especially high marks for its early introduction of data, for not ducking some of the negative aspects of the computer scene, for including word processing and distributive data processing, and for its generally excellent illustrations. One could argue with the authors about the need for presentation of punched card materials, about the order of presentation that introduces magnetic tape before disk and machine code before compilers, but these are personal choices to be made. A dash of Joe Weizenbaum would have been useful and thought provoking in the "Futures" section. The publisher is to be complimented for the rapidity with which this volume appeared. The materials included are fresh. Addison-Wesley Publishing Co., Reading, Mass. (1979, 398 pp. + glossary, index, $13.95).

—P.H. Dorn

CLASSICS IN SOFTWARE ENGINEERING
Edited by Edward Nash Yourdon

Twenty-four diverse articles about structured programming and related theories and practices, most of which are said to have been out of print, have been collected in this new volume. The articles were written by some of the biggest names in programming—there are four papers by Dijkstra, and papers by Mills, Knuth, Boehm and McCracken.

Ed Yourdon has written an introduction to each. He does a good job of putting each work into a historical context and emphasizing the significance of each article, giving clear examples of why and how the ideas in each paper arose, gained acceptance, and were (or are being) applied. Written in a friendly tone, the introductions include interesting tidbits about the authors of the papers, such as funny and/or volatile quotes.

The book was printed by Yourdon Press, using its PDP-11/45 under UNIX,

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and it looks quite nice. Yourdon Press (1979, 440 pp., $28).

VENDOR LITERATURE

DATA BASE MANAGEMENT

Data base management software for this vendor's model 1000 family of computer systems is the subject of a 12-page, color-illustrated brochure. A two-page opening section headed "Data base management: Information logically organized for easy access" provides an overview and sets the stage for the introduction of the Image/1000 data base management system and QUERY data retrieval language. With concepts and implementations covered, the discussion continues with a handful of case studies. Applications explored include production control, cost analysis, environmental monitoring, operations management, and communications. The booklet concludes with an "at-a-glance" listing of features and benefits, and a roster of the vendor's sales offices around the world. HEWLETT-PACKARD CO., Palo Alto, Calif.

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INTERNATIONAL FAX SERVICE

A three-panel color folder describes this vendor's international digital facsimile service. The service's major selling points —speed, economy, convenience, and versatility—are explored. The folder also explains the message preparation process, the network's expanding global coverage, and its future. A rate card and instructions for gaining access to the network from various cities in the United States and its possessions are included. The vendor concludes the folder with a brief description of the company's services and a listing of its regional sales offices. RCA GLOBAL COMMUNICATIONS, INC., New York, N.Y.

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SECURITY ACCESS SYSTEM

A four-page, glossy, color-illustrated brochure describes this vendor's Interrogator 790 Security Access Control System. The brochure gives an overview of the system, and eight of its applications and features: access control, parking, equipment/machine control, printed record, alarms, turnstyles/mantraps, central control, and guard tours/housekeeping control. CARDKEY SYSTEMS, Chatsworth, Calif.

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WORD PROCESSING

Applications of word processing in the insurance industry are explored in a four-page, illustrated guide. Entitled "Word Processing: Coverage For Insurance Paperwork Problems," the brochure examines the use of word processing for preparing regulatory paperwork. The economy and efficiency of using word processing to prepare documents pertinent to the insurance industry are discussed, as are generic office applications such as correspondence. WORDSTREAM CORP., New York, N.Y.

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BAR CODE READER OPTION

Two data sheets describe the Bar Code Reader option for this vendor's Model 1206 Miniterm portable computer and Code 39, the alphanumeric bar code recognized by the reader. Describing the bar code reader, a data sheet outlines features and benefits, as well as listing potential applications and specifications. The data sheet covering Code 39 includes a table of the 44 characters in the Code 39 character set, sample labels, and data on the physical dimensions of recognizable bar code symbols. COMPUTER DEVICES, INC., Burlington, Mass.

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PERSONAL COMPUTERS, ETC.

The 1980 catalog from this personal computing and consumer electronics giant

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comprises 120 full-color pages and another 56 black-and-white pages. Products described range from AC adapters to zener diodes, with stops in between for amplifiers, calculators, educational lab kits, integrated circuits, speakers, and test equipment. Seven full-color illustrated pages are devoted to the vendor's TRS-80 personal computers and related products. This computing section includes a number of configured systems and the recently announced TRS-80 Model II. Other personal computing products offered include printers, diskette systems, voice synthesizer, and voice input unit. A page is devoted to more than 50 ready-to-run software packages. RADIO SHACK, Div. of Tandy Corp., Fort Worth, Texas.

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REPORTS AND REFERENCES

CAM-I JOB SHOP CONTROL SPECS

Computer Aided Manufacturing-International, Inc. (CAM-I) is offering a 420-page volume entitled *Functional Specifications for an Advanced Factory Management System.*

Formed in 1972 by machine-tool and control companies to solve their numerical control problems, the organization's present objective is cooperative development of a viable computer integrated manufacturing system.

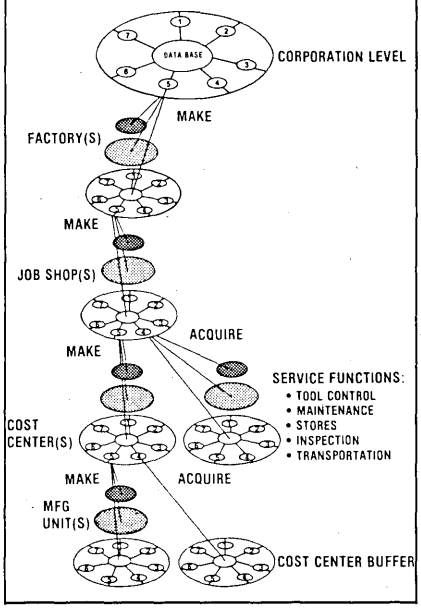
The first Job Shop Control workshop was held in 1977 and led to an Interest Group, the first step toward a Project. In 1978 the Interest Group adopted an approach for development of functional specifications for an advanced job shop control system.

The present volume documents this work and spells out the "closed-loop distributed information system" being worked on by the Factory Management Special Project, formed this year.

The two main sections of the volume are Functional Specifications—Problem Definition, System Description, Conclusions, and Appendices—and the System Development Plan. The figure describing the conceptual model of the system description is shown here. Also described in this first chapter are algorithms and and information flow, external interfaces, user/system interfaces—including the basis for a generic factory-command language—hardware options, economic feasibility (how to do cost/benefit and investment risk analysis), and a short but direct section on human factors. Our favorite sentence in the section on human factors is the concluding one: "Successful implementation will be more a function of the managers' skill in designing and managing the change process than in optimizing the solution to the problems of manufacturing."

The appendices include a glossary, survey of shop personnel, survey of commercial software, relational data base concepts, hardware survey, evaluation of operator data collection devices, environ-

NESTED MANUFACTURING ENTERPRISE MODEL



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mental flow diagrams, and references.

The System Development Plan chapter includes a management overview of specifications, a proposal for the development of a CAM community, and a section on development tasks and deliverables.

The volume is well written and features many diagrams. $500. CAM-I, Inc., 611 Ryan Plaza Dr., Suite 1107, Arlington, TX 76011 (817) 265-5328.

INTERNAL ACCOUNTING CONTROLS

Arthur Andersen and Co., the nationwide accounting firm, has produced a 314-page handbook, *A Guide for Studying and Evaluating Internal Accounting Controls.*

The executive summary admits that internal controls are not very exciting, but with the incidence of white collar crime, questionable business practices, and the Foreign Corrupt Practices Act of 1977, senior managers need to be concerned that their internal controls are at least state of the art. This handbook is a well-structured guide to the state of today.

They have chosen an organizing principle which divides a corporation's financial activities into four transaction processing cycles: Treasury, Expenditure, Conversion, and Revenue. With a series of exhibits, they trace the flow of transactions through each of these four cycles.

Once the objectives for the four financial cycles are enumerated, they proceed to detail 35 risk identifiers. Each risk description is complete with its own set of objectives, applicable techniques to achieve the objectives, and a list of the ramifications if the objective is not achieved. All of this constitutes a massive structured checklist covering internal financial controls.

The final chapter is a discussion of controls in general and the robustness of certain specific controls. The last 100 pages or so contain some cleaned up case study material, which provides examples of the structured auditing technique in action.

For its intended purpose the handbook is a good one. As with any checklist, the *experienced* practitioner will find comfort in his knowledge of 90% or 95% of the material, and benefit from that all important 5% that provides some new way to look at an old problem or defines a problem previously overlooked. The commercial message is blessedly subdued and the writing is clear and understandable. If you have an internal auditing group you are trying to modernize (see DATAMATION, November 1978, p. 139), or if you have a hotshot group of internal auditors that is trying to modernize you, you should be familiar with this handbook. Copies are available from any Arthur Andersen office. **R.L.P.**

INTERNATIONAL PRIVACY LAWS

AFIPS has put together *Selected Documents on Data Protection*, an inch-thick compilation of European and Canadian regulations covering the collection and processing of personal data. Included are the most recent "OECD Draft Guidelines on Transborder Data Barriers and the Protection of Privacy," which are pretty general, and the Council of Europe "Draft Convention for the Protection of Individuals with Regard to Automatic Processing of Personal Data."

It would probably take someone familiar with the way the law works to derive the most from the report, but interesting comparisons can be made. There are some similarities in the provisions of the laws of various countries—Germany, France, Sweden, Norway, Denmark, and Austria are covered, as well as Canada. Most laws provide for an officer and/or institution to be responsible for data protection—the Federal Commissioner for Data Protection in Germany, The National Data Processing and Liberties Commission in France, the Data Surveillance Authority in Denmark, etc. Another similarity among many of the laws is a clause restricting the collection of information pertaining to race, religion, political beliefs, criminal records, and sexual matters.

There are many differences between the documents. Compare, for example, the statement of the purpose of data protection in the German law: "...to prevent harm to any personal interests of the person concerned that warrant protection," to the opening line of the French law: "Data processing shall be at the service of every citizen." The next section of the French law reads, "No judicial decision involving an appraisal of human conduct may be based on any automatic processing of data which describes the profile or personality of the person concerned. No governmental or private decision involving an appraisal of human conduct may be based solely on any automatic processing of data which describes the profile or personality of the person concerned."

In Norway the King must give permission for a credit information service to to be formed, and "as regards enterprises under the control of foreign interests, terms and conditions may be prescribed concerning the form of establishment and the composition of company management." The King may also require the same permission for any other enterprise offering "personal information services" with the amendment having been added stipulating that the option may not prevent banks for operating credit information services in accordance with appropriate legislation.

Most of the laws have clauses about the right of the individual to obtain

data stored about him, and most have provisions for the removal of data that is no longer necessary; in some countries this is a requirement, in other countries it seems a request must be made for blockage or erasure.

The Austrian law begins, "Any person shall have a right to demand that personal data concerning himself be kept secret provided he has an interest warranting protection therein, notably as concerns respect for his private and family life." It continues, however, "The right by subsection 1 may only be curtailed where necessary for the protection of the legitimate interests of a third party..." While the final sentence does read, "In the event of such curtailment the confidential treatment of personal data shall remain the primary concern," one wonders about the strength of a right that is subject to "interests" of a third party.

Canada's privacy law differs substantially from the rest of the document. Their Bill C-25, called the Canadian Human Rights Act, begins with the laws against discriminatory practices. Included in the discriminatory practices is the payment of different wages to male and female employees performing work of equal value in the same establishment, buttressed by the stipulation that wages may not be reduced in order to eliminate a discriminatory practice. The Canadian Privacy Commissioner is a member of the Human Rights Committee.

Selected Documents on Data Protection is available for $21 from the American Federation of Information Processing Societies, Inc., 1815 North Lynn St., Suite 800, Arlington, VA 22209 (703) 243-4100.

SMALL BUSINESS SYSTEMS

An outfit called Customer Satisfaction Research Institute which does consulting and custom studies is offering short reports on vendors of small business computers—NCR, IBM, Burroughs, and DEC, as well as two reports on nonbusiness applications of minis, a Data General report, and another DEC report.

Written from interviews with over 500 users, the reports rate satisfaction with equipment on a percentage basis. These percentages are compared with last year's statistics and with a compilation representing the "industry at large."

While comparison of these figures may be meaningful, survey questions like "To what extent are you satisfied with the hardware installation effort?" obviously invite ambiguity. I might be "very satisfied" because the machine arrived, while you might be "somewhat dissatisfied" because you didn't know what to expect. We are also somewhat skeptical about the value of selected quotes from users such as, "Well, we just get excellent hardware and maintenance service" and "...it's like dealing with a circus."

The reports are written to a nontechnical audience and include a short glossary of basic computer terms (like cpu). $35 per report. From CSR, 4901 College Blvd., Suite 107, Leawood Manor/Shawnee Mission, KS 66211 (903) 381-8209.

PERIODICALS

SATELLITE COMM

A new weekly newsletter devoted to news of satellites and related financial and celestial matters is being offered by the publishers of *Television Digest*. The newsletter is full of hard news about satellite, broadcast, and CATV ventures, including coverage of FCC actions, market information, international news and a regular column on government actions in brief (actions such as launchings, contracts, earth stations applications and earth stations granted). Lots of good quotes from industry insiders are featured, and there are amusing tidbits such as the report in a recent issue that an extraterrestrial mortuary is being proposed—urns would be put into orbit via the space shuttle for a mere $2,995 (NASA approval is not expected). A subscription to *Satellite Week* is $327 per year. Contact *Television Digest*, 1836 Jefferson Place, N.W., Washington, DC 20036 (202) 872-9200.

ENGINEERS GOING SMALL BIZ?

While engineers often use large in-house computers for both business and engineering applications, they have begun switching to smaller computers that can be front-ended to the big computer or used standalone for simple calculations, for the processing of important functions such as project management and cost control, according to Kenton Johnson, editor of a newsletter on the subject. Engineering uses of micro, mini, and desktop computers is the topic of the new monthly, called *Engineering Computer Applications Newsletter*, or *ECAN*. Johnson explains one of the reasons engineers are interested in budgeting closer to real time: because people are likely to work on several projects, the allocation of jobs and people can be an intricate matter.

The newsletter will feature guest articles from experts and case histories from users. Guidelines for equipment selection will be included, and vendor profiles and comparisons can be expected in future issues. Subscriptions will be $24 yearly. The premier issue is being offered at no charge. Write Kenton Johnson, Editor, *ECAN*, 5 Denver Tech Center, P.O. Box 3109-P3Y, Inglewood, CO 80111 (303) 771-5307. ✲

The Marketplace...

ADVERTISERS' INDEX

SOFTWARE SERVICES

CIRCLE 164 ON READER CARD

CIRCLE 165 ON READER CARD

CIRCLE 166 ON READER CARD

CIRCLE 167 ON READER CARD

CIRCLE 168 ON READER CARD

CIRCLE 169 ON READER CARD

CIRCLE 170 ON READER CARD

CIRCLE 171 ON READER CARD

CIRCLE 172 ON READER CARD

CIRCLE 173 ON READER CARD

CIRCLE 175 ON READER CARD

CIRCLE 176 ON READER CARD

CIRCLE 177 ON READER CARD

CIRCLE 178 ON READER CARD

CIRCLE 179 ON READER CARD

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the technological leader in microcomputer systems, is looking for a few outstanding people.

Since 1972, when we developed and delivered the world's first microcomputer system, we have maintained the technological leadership in this rapidly growing industry. Our company is now planning a joint venture with the National Enterprise Board of England. Q1 Corporation aims to become in the microcomputer field what DEC is to minicomputers and IBM is to medium-scale computers. We now have openings for a few outstanding people.

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B.S. or M.S. in Computer Science. Two to five years experience in writing compilers, interpreters, operating systems, communication protocols, device drivers. Assembly language of the 8080, Z80, and 8086 helpful.

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B.S. or M.S. in Electrical Engineering. Two to five years experience in digital design using microprocessors.

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Two to five years experience in programming business applications on mini or microcomputers in PL/1 or other high level languages.

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SCIENCE/SCOPE

A new ring and moon around Saturn were among the discoveries made by NASA's Pioneer 11 spacecraft during the historic first flyby of the giant planet in September. The spacecraft's electronic camera, an imaging photopolarimeter, also supplied close-up pictures of Saturn's banded cloud structure. Another instrument, an infrared radiometer, found atmospheric temperatures from -279° to -288°F on Saturn and its largest moon, Titan. The readings for Titan reduced the possibility of biologic activity in the organic gases of the moon's reddish smoglike atmosphere. The polarimeter and radiometer were built for NASA's Ames Research Center by the Santa Barbara Research Center, a Hughes subsidiary.

Secure and nonsecure voice communications can be handled simultaneously by an advanced radio-telephone switching system that provides channel-to-channel crosstalk isolation above 100 dB. The system, developed by Hughes for U.S. Navy shipboard use, eliminates the need for separate equipment for plain and secure voice channels. Hughes' advanced microcircuit technology, including extensive use of large-scale integrated circuits, has given the system a high packaging density, high reliability, and low power consumption.

An advanced goggle that allows soldiers to see at night has been developed by Hughes for the U.S. Army's Night Vision Laboratories. The device, called a holographic one-tube goggle, employs thin-film diffraction optics and advanced electronics. It amplifies dim visual light and near-infrared radiation, then superimposes the enhanced image over the wearer's view. Aided by studies on how the brain overlaps the field of view of each eye, human engineering specialists designed the goggle so that the image intensifier tube, which extends from above the bridge of the nose, would not block any portion of a person's view.

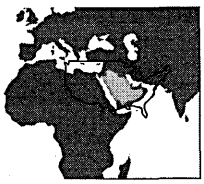
Hughes Radar Systems Group has career opportunities for engineers, scientists, and programmers. We design and build many of today's most complex airborne and spaceborne radar electronics systems, including data links, electronic warfare systems, and display systems. We need systems analysts, microwave specialists (antenna, receivers, transmitters), circuit designers (analog, digital, RF/IF), scientific programmers, mechanical designers, product design engineers, systems engineers. Rush your resume to Engineering Employment, Dept. SE, Hughes Radar Systems Group, P.O. Box 92426, Los Angeles, CA 90009. Equal opportunity M/F/HC.

How a fighter aircraft's radar performs during exercises can be determined from data gathered by a new recording system. Hughes devised the equipment for use with its AWG-9 weapon control system on the U.S. Navy's F-14 Tomcat. The recorder stores up to an hour of data, pilot and voice communications, and a time base. The information is sufficient to analyze the radar's performance from search and detection through missile launch. In the past, only highly modified test aircraft could provide this data because tactical aircraft have little or no room for additional electronics. Space was found on the F-14 by removing an electronic countermeasures unit that goes unused on training missions.

Abqaiq, Saudi Arabia

No baseball, no morning paper, no pizza, no autumn leaves.

But here's the great life that makes Aramco people stay on and on.



If you never considered working in Saudi Arabia because you think it's all sand and hardships, consider this.

3,500 Americans like you work for Aramco in Saudi Arabia now. Ask them why they stay and they'll tell you that, besides money, it's the casual lifestyle, American-style hometowns, top-notch schools, and vacation travel they used to only daydream about.

Where on earth is Abqaiq?
Located close to the world's largest oilfield (Ghawar), Abqaiq is the center of a giant oil-gathering and processing system that handles 60% of all the oil produced by Aramco, the world's largest producer.

Does Aramco's paycheck justify living in a desert kingdom?
Yes! You get a base salary competitive with top U.S. oil firms. We compensate you for overseas cost-of-living differences.

On top of that, Aramco pays an **incentive of up to 40%** for overseas employment, and you are reimbursed for any foreign or U.S. Federal income tax on the premium. So your premium is tax-protected.

Another benefit: employees overseas participate in Aramco's Retirement Income Plan on an **accelerated** basis.

With this financial package, no wonder 3,500 Americans like you work for Aramco in Saudi Arabia today.

What can you do with all that money stuck out in the desert?
Aramco people use 40-day paid vacations (every 12½ months) and 12 paid holidays (average) to visit fabulous places like the Pyramids, Greek Islands, Mt. Everest, the Serengeti Plain, Hong Kong.

Doesn't a child's education suffer so far away?
No! Aramco has a modern American school system. Teachers are primarily American and more than 75% of them have master's degrees. The teacher-student ratio is 1 to 15 in grades 1 to 6; 1 to 20 in grades 7 to 9.

If you get seriously ill, or need dental surgery; where do you go?
Aramco's Dhahran Health Center is one of three hospitals outside the U.S. accredited by the Joint Commission on Accreditation of Hospitals. The Dental Clinic is as fine as any in the States. Better than most.

Aramco recruiting ads mention "comfortable housing for families and singles." Is that on the level?
At first, you'll live 12 to 18 months in adequate but not terribly attractive off-camp temporary housing. Next, it's on to comfortable on-camp temporary housing. Then, based on a housing priority-point system using job level and length of service, you'll get your permanent residence that's a carbon copy of a home in a warm climate like Arizona or Southern California.

What jobs are open today? Can a person advance?
Aramco's operations are so big that our job opportunities are probably unduplicated anywhere. Challenging jobs are open in administration, refineries, gas plants, support facilities, everywhere.

We need accountants, medical personnel, technicians, teachers, vocational trainers, communications specialists and materials forecasting specialists. And scores of engineers: in construction, project management, operations and maintenance—for operations in oil, gas, petrochemicals, EDP, computers, transportation, utilities, name it.

You'll have challenges, early responsibilities, learn new technologies, and management advancement opportunities.

Interested? Send your résumé in confidence to: Aramco Services Company, Department DM110079A, 1100 Milam Building, Houston, Texas 77002.

CHALLENGE BY CHOICE

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SERVICES COMPANY

Readers' Forum is designed for an exchange of ideas and experiences. Your contributions are invited.

READERS' FORUM

SEARCHING FOR SUPERMANAGER

In a recent five-day period I received no less than seven phone calls from headhunters and corporate recruiters looking for a new breed of manager. The calls started out in the usual way: "We're looking for . . . and wonder if you might know anyone who might be interested." (That translates to "Are you interested in a job change?") Any visible manager in a "hot" area gets lots of calls like this in an average month or year, but *seven* in one week?

An interesting part of this exchange was the nearly identical set of job qualifications being sought. Apparently, a mythical superman (or superwoman) is wanted, someone who has high-level data processing experience, telecommunications experience, office automation implementation and management experience, and a feel for the special personnel considerations involved in office support management. And since this person will essentially be in the administrative management chain, several seekers specified salaries in the under-$35,000-per-year bracket!

Now, first of all, there are very few people in the entire world with this special combination of skills and experience. And all of them are obviously gainfully employed—mainly in strategic planning or pilot project implementation for the few firms who have actuallly gotten started in office automation projects. Where will other firms get such talent?

In an incestuous industry like office automation (and word processing before it), the temptation is to hire away trained talent by a kind of salary war. But this can only be a short-run solution. In the long run, firms will have to look for talent and enthusiasm rather than complete experience—and plan to spend the time and dollars to create a competent information processing manager.

In the much longer run, these highly desirable people will then train cadres of very special implementers, managers prepared to learn multiple disciplines, to perform the analysis required for the design and management of integrated systems, and to keep people skills and sensitivities in the forefront of their management style. Such trained disciples will be an integral part of the successful implementation of any office automation plan —and the payoff will be in high salaries and enormous job satisfaction.

The first step—should *you* want to participate—is obvious: use your current training as a stepping-stone and acquire know-how in related areas. Prepare for the world of the '80s when all corporate information will begin to come together, forming the most valuable corporate asset of all.

—Amy D. Wohl
Levittown, Pennsylvania

WE'RE DOING IT ALL WRONG!

A curious phenomenon has occurred over the last several years in the field of software system documentation.

"Good management methodology" has dictated that the internals or maintenance documentation of a program will be a complete set of English text information bound together in volumes that for complex programs often reach several feet in width. The text information gives a system overview, explains each item and structure in the system's data base, shows control flow and data flow through the system, defines each major executable function, breaks down those functions into procedures, elaborates each procedure and its local data base, and cross-references both procedure calls and global data references.

All of that is good information. The curious phenomenon is that placing this documentation in volumes separate from the program is *totally the wrong approach.* Documentation information about a software system belongs, in most cases, in the listing of the program itself.

Programmers, in general, hate documentation. It seems that the personality traits needed for programming preclude the ability or the desire to describe the programs produced. Computing managers, in general, hate the grub work of programming detail. One of the factors that motivates a technologist to move out of programming and into management is this dislike for detail. Listing reading is the first chore that most managers reject when upward mobility snatches them from the world of the coding pad. And thus we have a built-in crisis situation—those most responsible for the quality of software are those least able, by inclination and eventually by atrophied ability, to evaluate it.

The intersection of these two problems—programmers hating documentation tasks and managers hating code reading tasks—is an inevitable bad compromise. Managers are, of course, responsible for the production of documentation, since programmers abdicate that responsibility. And managers would never consider, of course, placing the documentation in the program listing, since by doing so they would be placing it out of their reach.

There are two prime reasons for producing internals or maintenance documentation. The first and most important reason is to enable programmers responsible for a software system to understand it. A second rather unrelated reason is to provide top-level material for preimplementation design reviews. This discussion deals only with the former.

Internals documentation is written for programmers. This is an important point, since it distinguishes this kind of software documentation from most other kinds. User manuals,

for example, are meant to be read by users. Specifications are meant to be read by both customers (to give them the ability to determine the problem being solved is the one they want solved) and designers. Test documents are meant to be read by customers (to determine that proper reliability techniques are being employed) and testers.

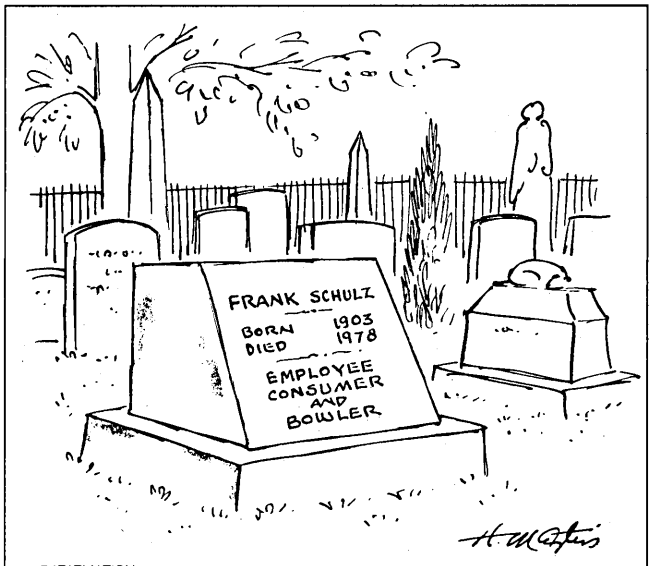
Internals manuals are the least transient of software documentation. Whereas specifications and test documents, for example, point to a specific event (requirements review, acceptance testing) and then become only matters of historic record, the internals manual (and the user manual) must remain valid as long as the software system remains useful.

The target audience and the long-term value of the internals manual are too often forgotten in the rush to get the documentation produced and accepted. Worse yet, these factors are usually forgotten once the initial approval for the documentation is received. The result is, and most programmers would support this alarming statement, *most software internals documentation is inadequate to meet the needs of its target audience, and, worse yet, what is present is frequently out of date and thus unreliable.* Our present approach to documentation is thus largely a failure.

RIGHT SOLUTION TO THE DILEMMA

What, in fact, do programmers responsible for revising a piece of software do? They go to the listing. This listing is, of necessity, accurate, since it is the program in all the real senses of the word. For the same reason it is complete. Thus, the only accurate and current representation of a program, in today's technology, is frequently the program listing. This situation forces the only reasonable solution to the problem of software internals documentation: most of it must take the form of readable programs and commentary within the listing. The explanations for a piece of software should be placed with the encoded representation of the software. If the code is changed, it is much more likely that the documentation will be also (although it is still, obviously, not assured!). In addition, the explanations in the listing will be more likely to be readable by the intended target audience—a programmer. They will also be in the most necessary place. The accuracy and completeness of the listing will also tend to apply to the documentation.

Some recent trends in modern programming technologies enhance this point of view. Structured programming, particularly in languages with adequate control structures where indentation systems can graphically assist in the understanding of the code, produces programs which at the logic level are sometimes self-documenting. (This should not, however, be taken to mean



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that the function and philosophy of the code are understandable without supplementary commentary.) In addition, languages and link-loaders permitting the use of readable and self-defining names take an even longer step toward self-documenting programming. DO VALIDITY TEST is a self-defining procedure name, for example, whereas DOVT is devoid of all but the most cryptic meaning. (Note that unfortunately most contemporary link-loaders thwart this capability for externally referenced names, usually limiting programmers to the unfortunate FORTRAN-imposed de facto standard of six-character names.)

Be that as it may, the correct answer to the problem of internal documentation is heavy usage of the listing—lots of commentary, performing the same role as the now-traditional separate English text; good, readable names; and graphically clear structure. At the detail level, the result will tend to be complete and accurate internals documentation.

Top-level documentation, on the other hand, should probably still occur as English text in a separately bound volume. With the distinction between top and detail levels in better focus, we can now supplement the traditional role of internals documentation to include some previously lacking features: design decision information and underlying philosophic goals. In addition, a better link between the top level and detail level can be made. The internals document can contain pointers to and explanations for the role of the middle-level software components which tie together the top and detail levels.

This discussion of good internals documentation has evolved into the following recommendations: top-level software definition (a document, probably slim) should include an overall structure summary, overall data base summary, design decision data, underlying philosophy, mid-level structure(s), mid-level data base(s), and pointers to detail-level information in the listing. Detail-level software definition (listing) should include a commentary for detail structure, detail data base, detail functions, and implementation anomalies; readable names; and structured, indented code.

All of this tidy-sounding discussion leaves one loose end dangling. Remember the two underlying facts, the programmer's hatred of documentation and the manager's hatred of detail? Putting detail documentation in the listing tends only to be a solution to the first of these problems; in fact, it makes the latter problem worse. Clearly, the software manager must still be responsible for achieving the production of internals documentation, and we have tucked it away in the last place he wants to look—the listing.

However, there are two factors that mitigate these problems and can eventually result in snipping the dangling loose ends. For one thing, programmers are much more likely to produce well-commented listings for separate documentation. Thus, the manager's motivational task is made easier. For another thing, inevitably managers must be able to read listings. It is as absurd for a first-line software manager to avoid listing-reading as it would be for a first-line tv-manufacturing manager to avoid looking at the tvs he is responsible for. A manager must be able to inspect and understand the product he or she is responsible for. The listing, in all the workable meanings of the word, is the software product.

If it is accepted that managers must be able to read listings, at least at the commentary level and probably beyond, then the last argument against detail documentation in the listing dissolves.

What is left, then, is some new forward motion toward something that many have discussed but few have achieved—self-documenting software. Programmers can write it and rely on it, and managers (enhanced by some reborn skills) can control it and motivate it. But bear in mind the top-level overview document is still vitally necessary, and to that extent the self-documenting goal is closer, but still out of reach.

—Robert L. Glass
Seattle, Washington

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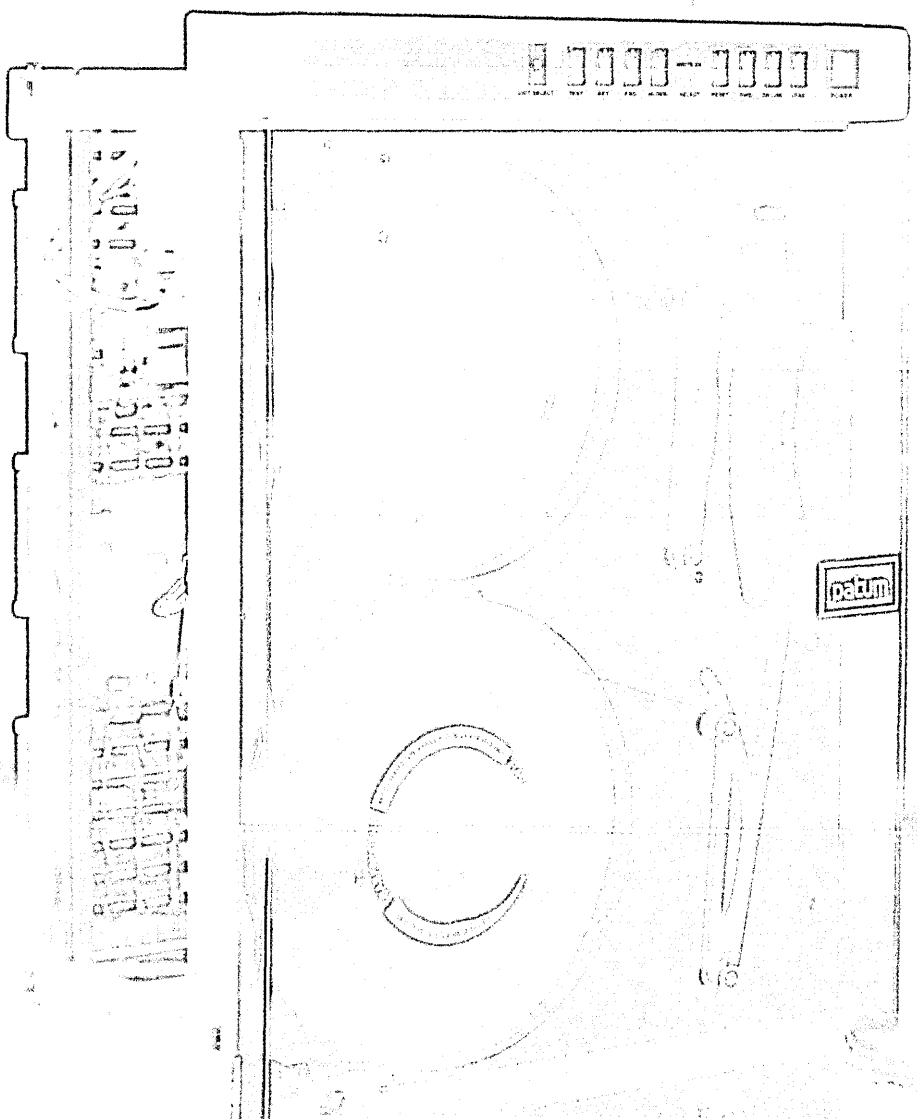

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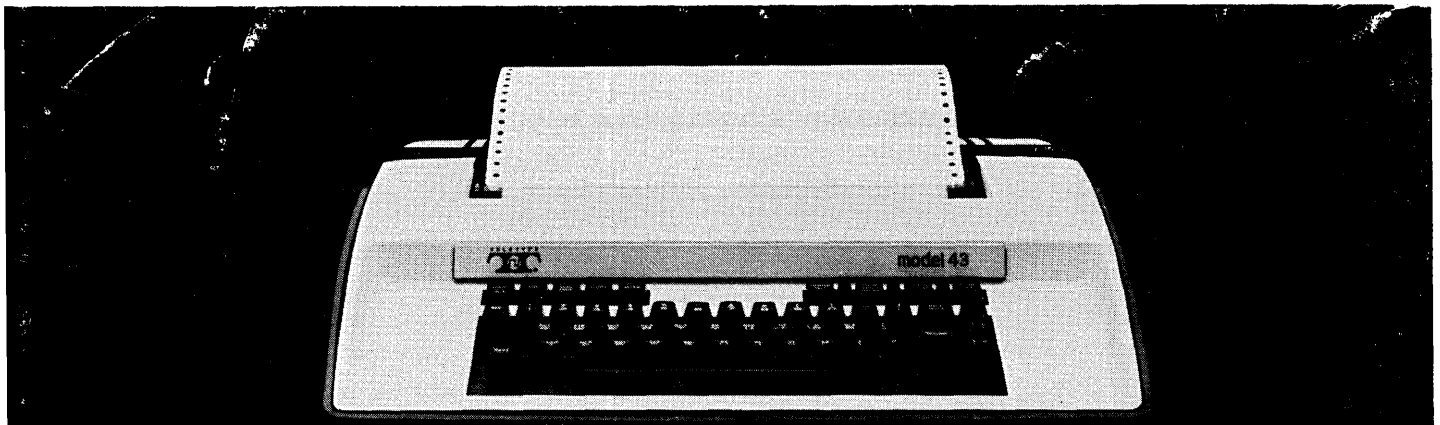

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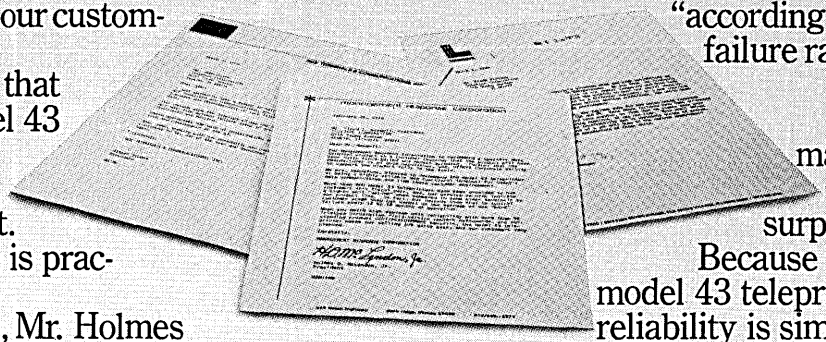

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