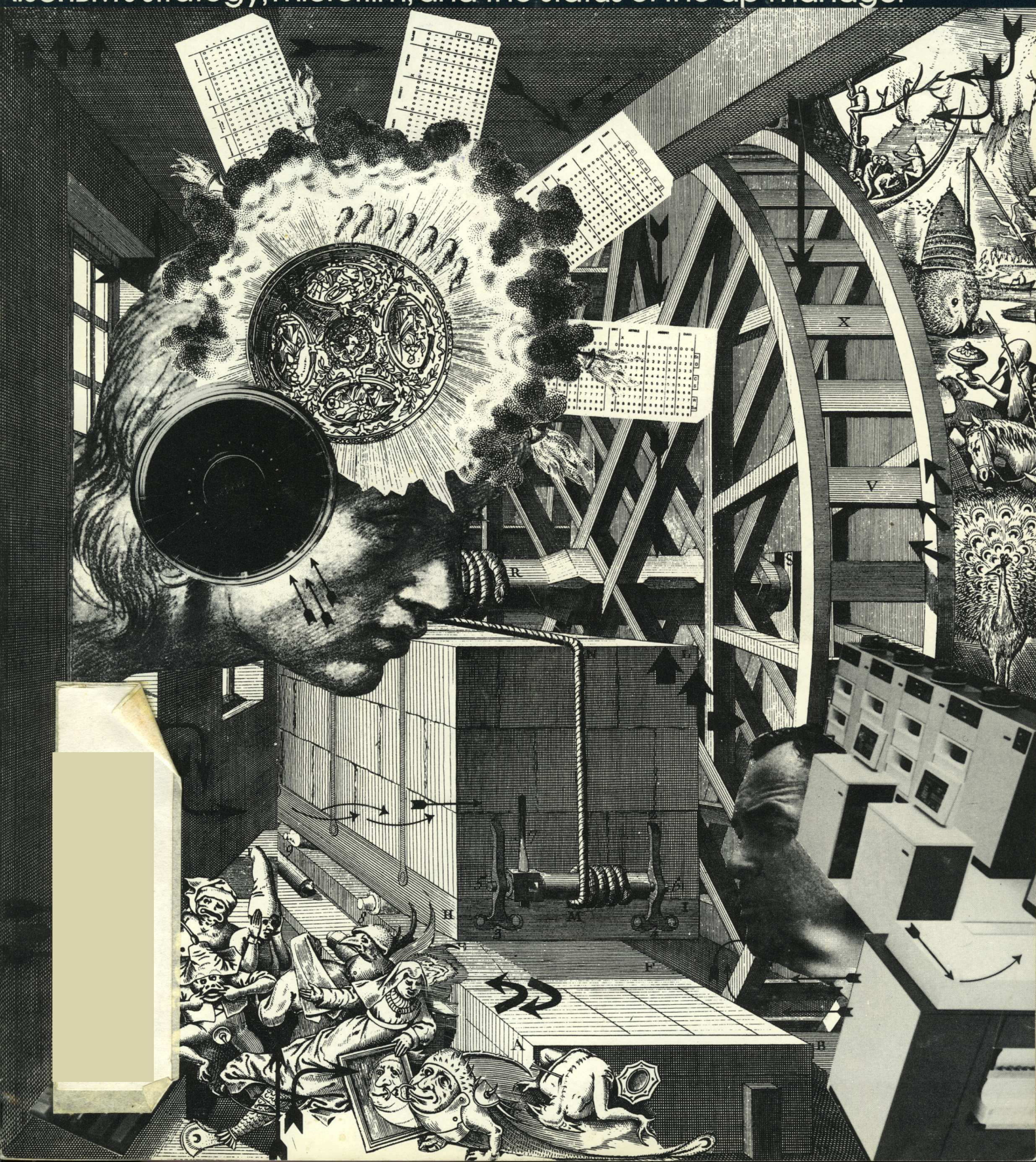
DATAMATION® 74
June

The strange world of the small systems user

Also: IBM's strategy, microfilm, and the status of the dp manager



Series 9000
Our Feature Attraction.

Features aren't something you tack on an instrument in order to make an ad — they're built in over a long period of time and because of a lot of experience. Kennedy OEM Series 9000 transports are like that. We were the first manufacturer to recognize the need for dual-density operation, so we offer both 7 and 9 track, 800 NRZI, 1600 PE or 800/1600 NRZI/PE models. For complete reliability, we've built in features such as Threshold Scanning to automatically compensate for drop-outs or drop-ins, Marginal Skew Check to determine if tape errors are caused by marginal skew, and Read-After-Write Shortened Skew Gate for greater reliability during read after write checking.

For ease of operation, Series 9000 has a front accessible off-line test panel, front access to all major components, quick-release hubs and simplified tape path. Performance features? Series 9000 has data transfer rates of 72 KHz, tape speeds from 10 to 45 IPS, dual-gap heads, and much more.

Features? If we listed them all, we wouldn't have room for the picture. And we think a picture of Series 9000 is worth a few thousand words by itself!

KENNEDY CO.
540 W. WOODBURY RD., ALTADENA, CALIF. 91001
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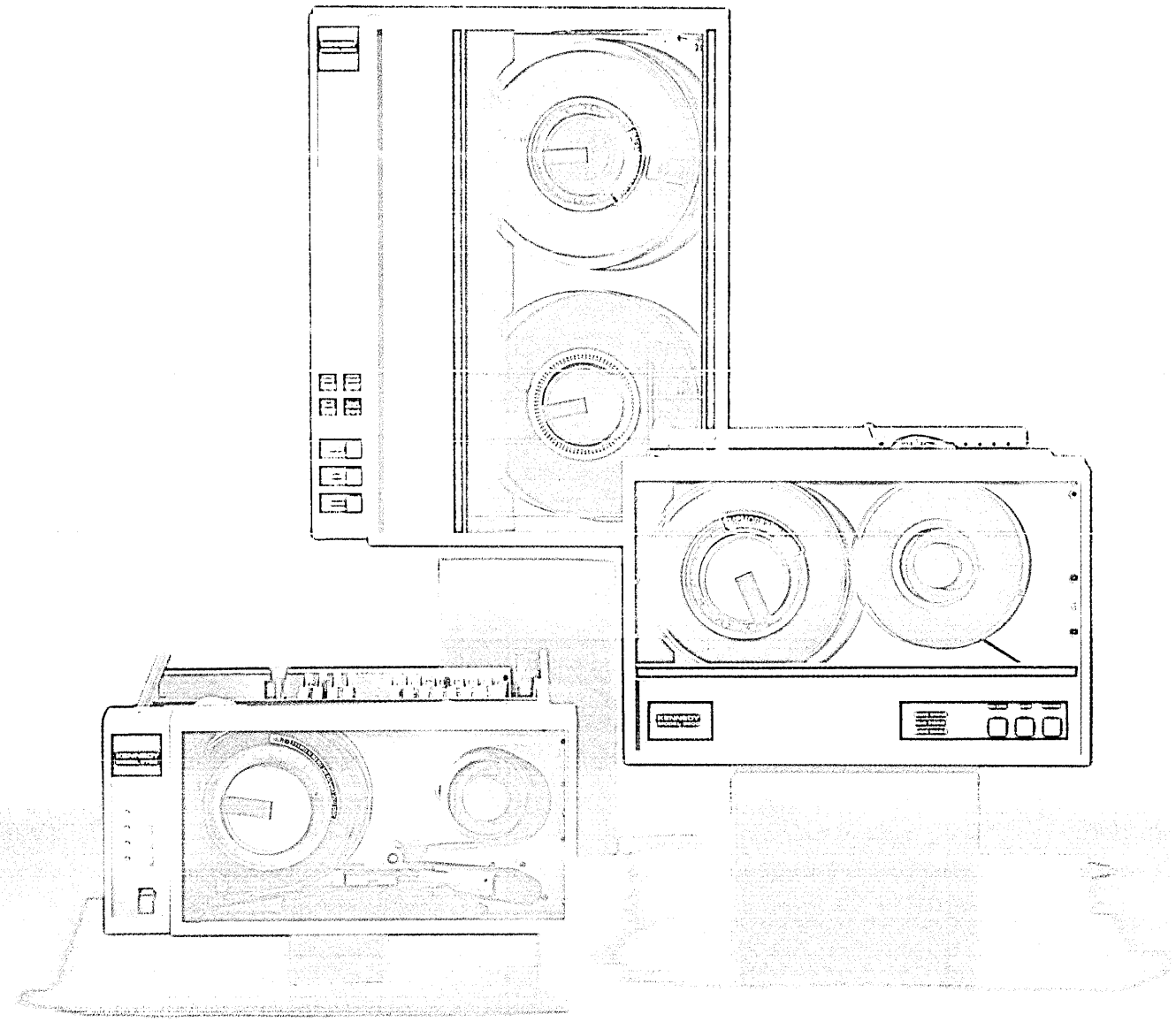
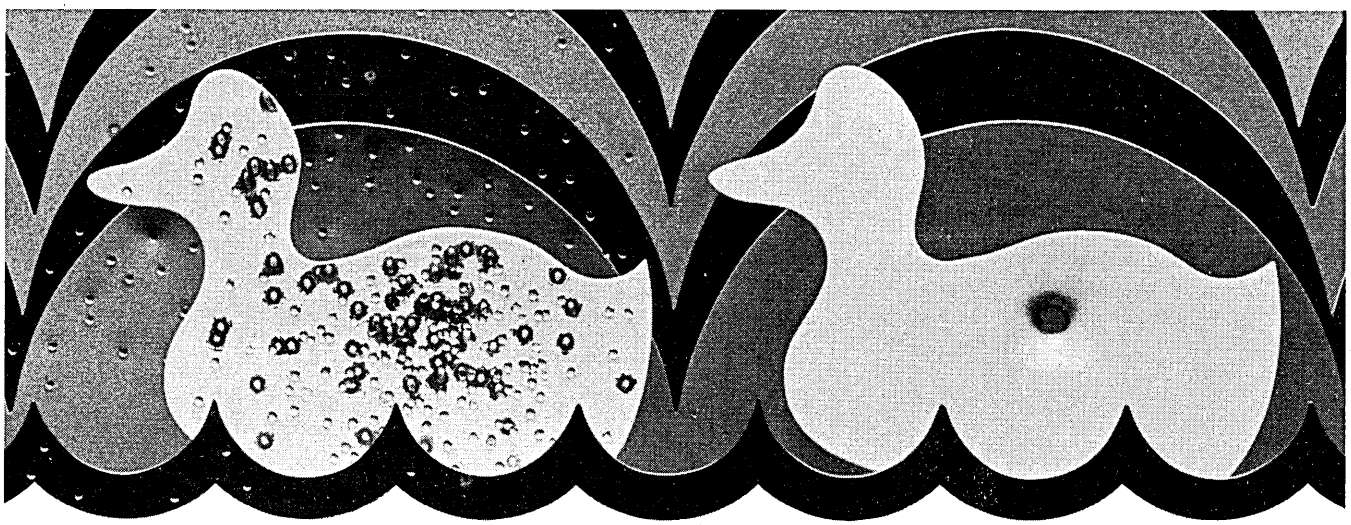


Converting your DOS programs to OS used to be a shot in the dark.



Before UCC TWO. After UCC TWO.

Once you've set your sights on converting to OS, we have the software to make it a sitting duck.

UCC TWO (DUO 360/370) puts you in command of the situation. It lets you run your regular DOS programs under OS control without conversion.

It puts you in charge of your conversion schedule.

So, you can say goodbye to the confusion of a mixed-job shop, the cost of programmers' overtime, the chaos of trying to meet regular schedules during the change-over. You save time, money, morale.

No wonder over 250 UCC TWO packages are in use right now.

UCC leadership software

And it's only one of the OS leadership advantages we have to offer you.

☐ UCC TWO (DUO 360/370).

☐ UCC ONE (TMS). Tape management software that protects your data under OS operation. Provides real-time records of tapes, jobs.

☐ UCC TEN (Data Dictionary/Manager). A comprehensive, tested product. Centralizes, controls data definitions, provides powerful cross reference features, automatically generates data base control statements, facilitates new systems design.

☐ UCC FIFTEEN. Saves hours on restarting OS jobs. Simple, sophisticated software automatically corrects OS catalog, GDG biases before you re-run.

For instant help, call the Software Products Marketing Group at 214/637-5010, extension 3371.

☐ Please send me more information.

☐ Please have someone call me.

Name_____

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Company _____

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7200 Stemmons Freeway
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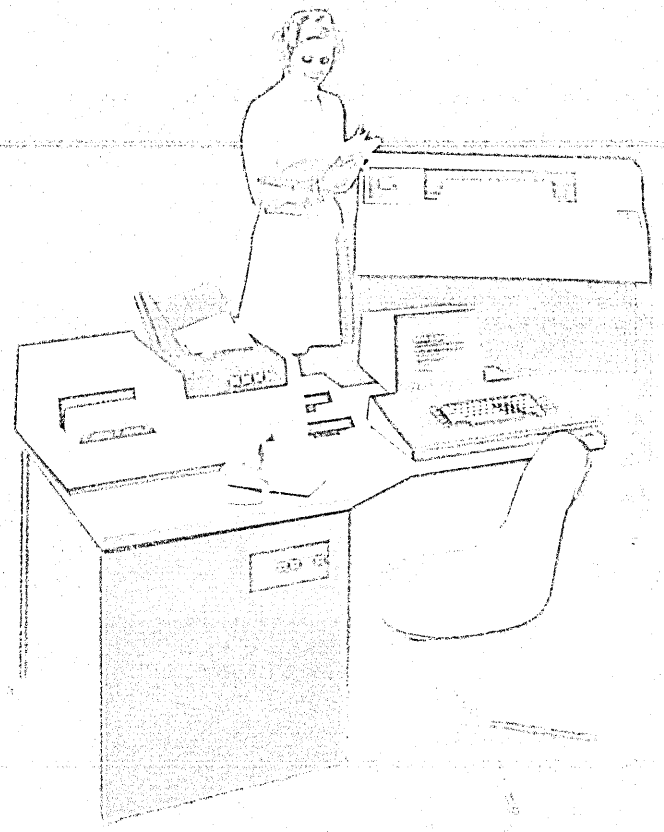
Which RJE you use depends on where you use it.



Your tiny remote office in Sioux Falls?
Your regional headquarters in Atlanta?
Your manufacturing division in Dallas?

At each location your RJE needs are different. So it takes a choice of RJE systems to do the job right.

And at the right price.

MDS offers you a range of compatible systems that lets you match capability precisely to the job. As they work together, they form a Network Approach to job entry that makes data processing work harder, at lower cost.

For instance, there's our new System 2:80 for smaller needs, smaller budgets. At rates to 9600 bps in 2780 or 3780 modes. Choose cartridge magnetic tape to handle data when unattended.

Or tie it to a card reader, a printer, or let it convert from one medium to another. The tutorial CRT guides job set up, makes corrections easier, mistakes fewer.

At your larger sites, you'll want the MDS System 2:400 RJE terminal. It's a high-speed terminal with intelligent pre-processing and data purification. It can also be a 24-key station key-to-disk.

Concurrently. Or alternately.

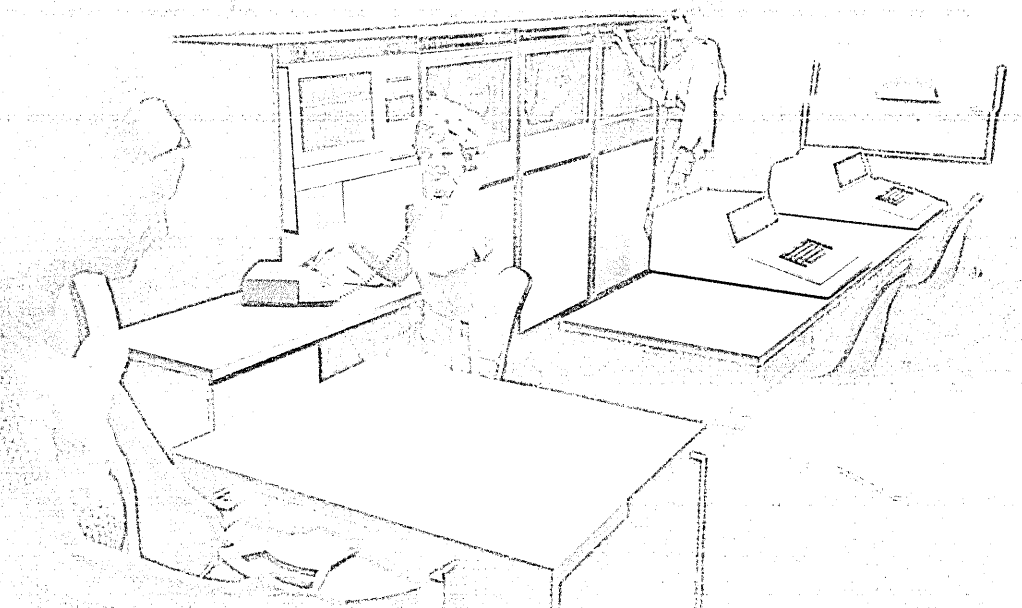
You can have off-line print or media conversion, too. System 2:400 does the big, tough jobs.

For high-volume remote batch key entry, you'll use the 2:400 key-to-disk. Or our new 1:200 key-to-disk (for the 4-to-12 key station shop). It's got all of the big-system sophistication, but it's priced right for the smaller operation.

A selected mix of these and other MDS systems to form a network of distributed data entry alternatives gives you complete compatibility and cascading efficiency.

That's the MDS Network Approach to data entry. For more information about it, talk to an MDS representative. Call or write him at your nearby MDS office. Or contact us at headquarters at 315-797-2424.

Mohawk Data Sciences MDS



The Network Approach to data entry.

CIRCLE 35 ON READER CARD

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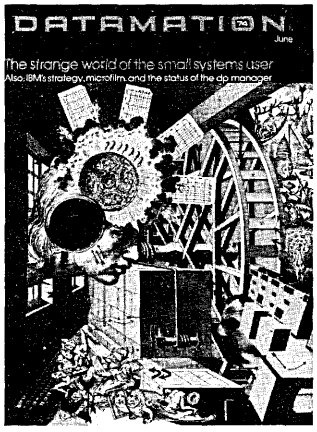
departments



about the cover

To the first-time user, data processing seems a strange and complex world where time frames condense, incongruities juxtapose, and the system is possessed. Learning that people are the villains helps transform this jumble into a collage of controllable sequences. Design is by Barbara Benson.

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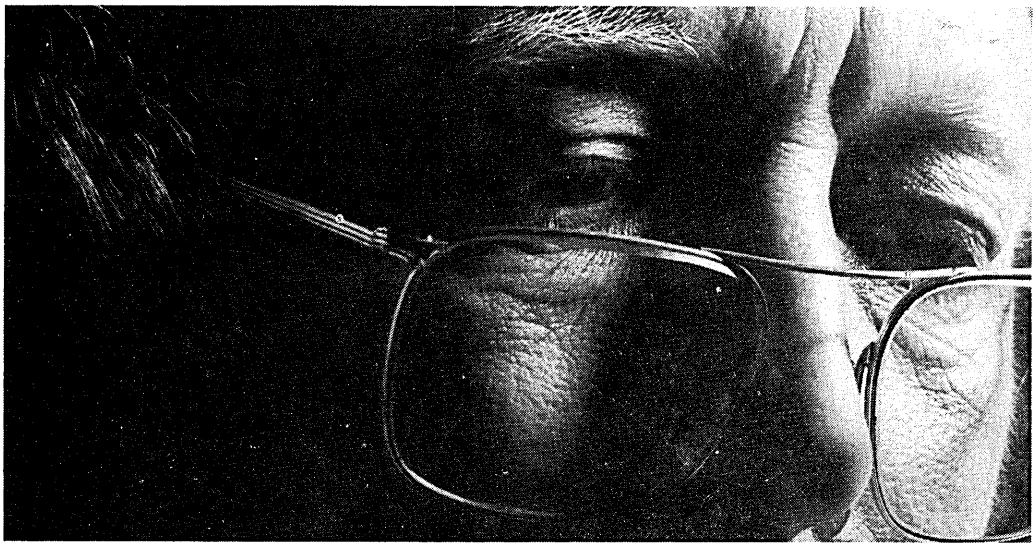
If you can read this you can operate Microdata's new computer system.

That's Reality.



Finally, there's an information management system so easy to operate anyone can use it. We call it REALITY.™

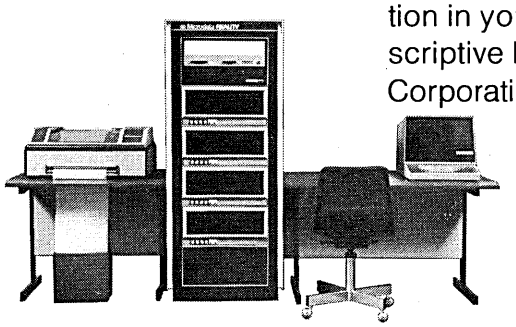
REALITY is a powerful, low-cost system designed for a wide variety of applications such as inventory control, production control and general accounting.

REALITY is easy to use because the user communicates with it in a remarkable computer language called ENGLISH.™ You're reading it right now. It's a Microdata exclusive.

REALITY is simple on the outside, powerful on the inside. It operates on-line in RPG II. So if you're currently using a System/3, REALITY is compatible with your present programming.

Because REALITY combines the hardware and software (we call it firmware), it can handle multiple users and terminals while still providing substantially faster response than large scale data processing machines. Another REALITY exclusive—a single corrective entry will automatically update all related records in a single chain reaction sequence.

Face REALITY. If you're interested in multiple systems, call Microdata at 714/540-6730 for a demonstration in your office. Or write for descriptive literature. Microdata Corporation, 17481 Red Hill Avenue, Irvine, California 92705.



Microdata

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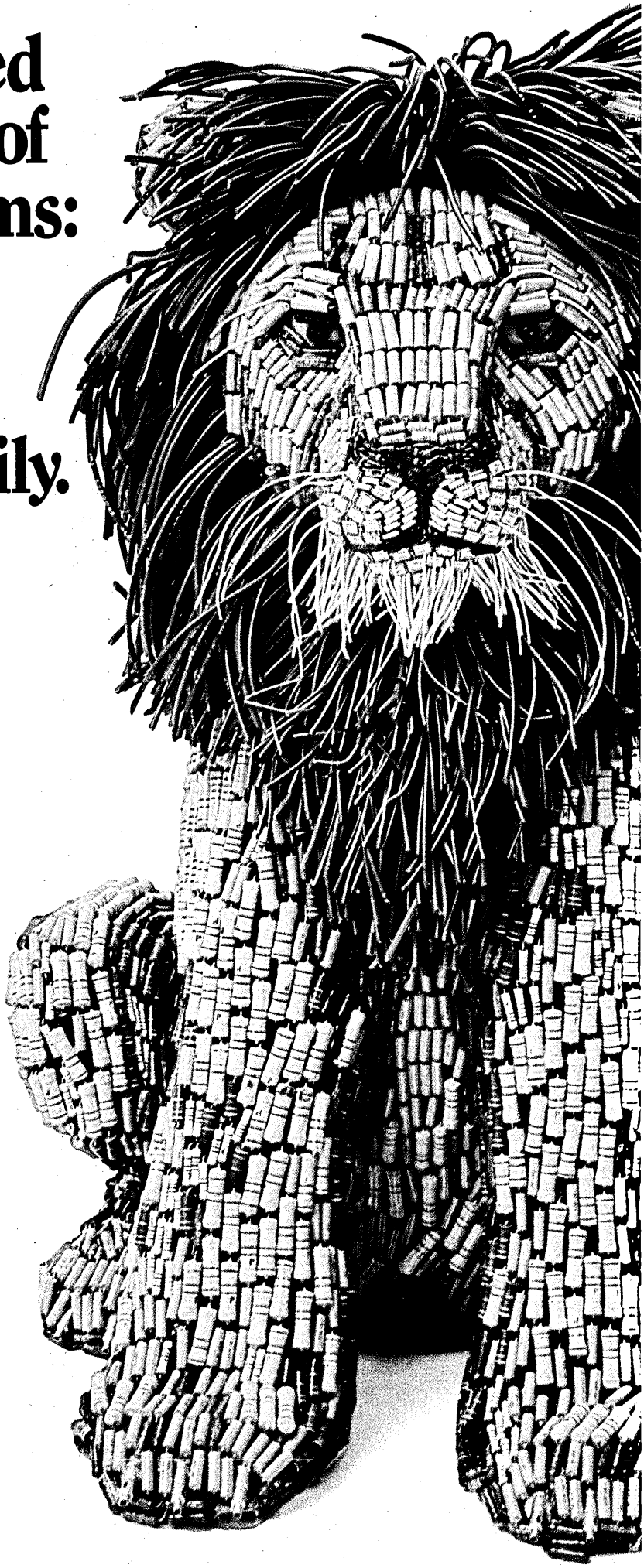
We've introduced our new family of computer systems: Series 60.

Now meet the head of the family.



As you've probably heard, we've just announced Series 60.

Series 60 includes significant large-system capabilities that make it easier for large, dispersed organizations to tap and use the power of the computer where it's needed.

Series 60 with GCOS software offers new advances in data base technology, information networking, and transaction processing—advances that will play a major role in computer operations for the next decade.

Data base management

The organization, processing, and timely availability of data about your business are obviously your first priority. Everything else—hardware, software, programming languages—is there just to help you get at and use this data.

For many companies, this can best be done with one central information source—available to every part of the organization.

Honeywell's larger Series 60 systems provide a powerful data base management capability that lets you define real-world situations and relationships as they occur. With Series 60, you can assemble larger data bases, share files, and modify existing data bases more readily.

Information networking

With Series 60 we developed new data communications techniques, new ways to distribute information rapidly throughout your company—to and from remote locations such as branch offices, warehouses, and factories. We call this approach "information networking."

First, larger Series 60 systems let multiple processors share a common data base as well as peripheral resources. This means increased flexibility and efficiency in information networking operations.

Second, our DATANET* front-end network processors handle communications without tying up the host central processor. And our DATANET* remote network processor does such chores as remote job entry, remote batch processing, and line concentration to further improve data handling and reduce data transmission costs.

Third, our Network Processing Supervisor (NPS) offers a new level of data communications efficiency and control. NPS software controls all communications workloads, performs message switching and extends the system's ability to remain operative and ensure data integrity. NPS is easy to use (design programming time is dramatically reduced) because of its macroinstructions, and because parameter tables make it simple to add terminals and expand the network.

Transaction processing

Honeywell's Series 60, with GCOS transaction processing, now makes online transaction processing practical for many companies who may have previously considered the complexity and cost of such systems prohibitive.

To simplify the system, only data is entered at the terminal. Terminal users don't enter a program, control cards, or even program control statements. They don't even need to know that computer programs exist. Without any specialized training, personnel can activate—through a single entry—the multiple functions necessary to perform complex business transactions.

The GCOS executive

Series 60 strengths like data base management, information networking and transaction processing are all part of the processing environment made possible by Honeywell's GCOS (General Comprehensive Operating Supervisor). GCOS has been widely recognized as the most advanced operating system in the industry. And we've made it even better for Series 60.

Four models of our Series 60 provide the full range of new GCOS multidimensional capabilities—transaction processing, batch processing, remote access processing, and time sharing—all running on one system. This merging of processing dimensions in concurrent operation lets you tailor the processing mix to individual installation requirements. You can even make changes throughout the processing day. And it's more effective than multiple-system installations.

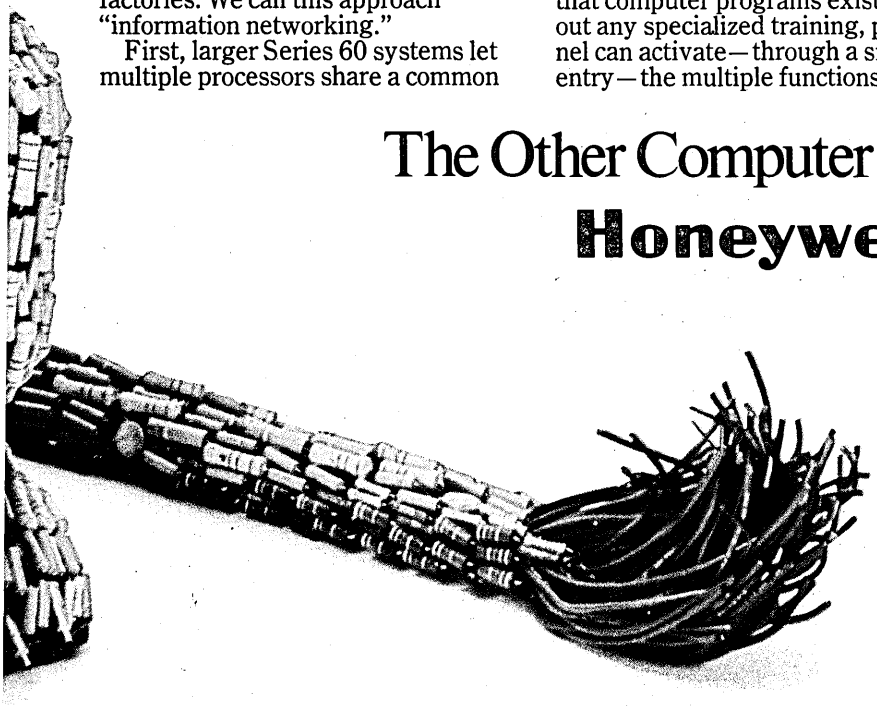
It's easier to get to than you may think

We've done a number of things to make Series 60 systems easier to install. We have conversion aids, programming tools, debugging aids, new COBOL standards, in-depth systems support, and the convenience of our DATANETWORK* time sharing and remote batch service for pre-installation processing.

As a matter of fact, we hope you'll want to learn a lot more about Honeywell's Series 60 family. Just give our local office a call. Or write Honeywell Information Systems (MS 061), 200 Smith Street, Waltham, Massachusetts 02154.

The Other Computer Company:

Honeywell



CIRCLE 60 ON READER CARD

*Honeywell Trademark

calendar

JUNE

Energy R&D Management Briefing and Conference, June 20-21, Washington, D.C. This first comprehensive conference on energy R&D includes speeches by top government officials and key leaders from representative industry groups. Sponsors are three of DATAMATION's sister magazines *(Power Engineering, Pollution Engineering,* and *Research/Development)* and Government Institutes, Inc. Contact: B. L. St. Pierre, Government Institutes, Inc., 4733 Bethesda Ave., N.W. Washington, DC 20014.

JULY

Summer Computer Simulation Conference, July 9-11, Houston. The program will emphasize the present perspective of simulation applied to the solution of problems in the technical, management, and social sciences. The conference will also cover new computer methods, techniques, and hardware related to simulation. Fee: $70, members; $85, others. Contact: M. E. McCoy, Martin Marietta Data Systems, Mail MP-198, P.O. Box 5837, Orlando, FL 32805.

Optical Character Recognition Users Assn. Meeting, July 10-12, San Francisco. Topics for this conference include: government applications; multi-media updating; carbon image processing; forms design criteria; desktop OCR; and oil company and credit card slip processing innovations. Fee: $125 for company official representatives; $50 for each additional person from same company; 20% discount for preregistration. Contact: T. David McFarland, OCR Users Assn., 505 Busse Hwy., Park Ridge, IL 60068.

Conference on Computer Graphics and Interactive Techniques. July 15-17, Boulder, Colo. The emphasis of the conference will be on recent advances in theory and techniques, hardware and software systems, and applications, as related to the field of interactive computer graphics. A preliminary workshop will be held for the computer graphics novice on July 13-14. Fee: $70 for conference, $60 for workshop; discount for preregistration. Contact: Robert L. Schiffman, Computing Center, Univ. of Colorado, Boulder, CO 80302.

Fourth Annual International Computer Exposition for Latin America. July 23-26, Mexico City. More than 10,000 people are expected to attend this annual trade show. Last year, over $2 million worth of equipment, systems, and supplies were sold to attendees from the U.S., Latin America, and Japan. Fee: 10 pesos per day; additional fee for seminars. Contact: Emilio Ferstl, Sociedad Mexicana de Computacion Electronica, A.C., Yacatas 435, Mexico 12, D.F.

Second Jerusalem Conference on Information Technology, July 29-Aug. 1, Jerusalem. The objective of this conference is to arouse interest among governments and international and national organizations, as well as individuals, in the role of the computer in economic and social developments. Sessions are planned on topics within the areas of "computers in an operational environment," "planning, forecasting, and modeling," and "workshops on technology utilization." There will also be an exhibit of equipment. The first Jerusalem conference, in summer 1971, attracted 1,500 participants from 40 countries. Fee: $70. Contact: ILTAM, P.O. Box 7170, Jerusalem, Israel.

AUGUST

IFIP Congress 74, Aug. 5-10, Stockholm. The sixth triennial conference of the International Federation for Information Processing is a major international dp event. Over 40 invited papers will give a general survey and discuss recent advances. More than 200 submitted papers will report on original work in information processing. About 10 panel discussions will explore the state of the art and current trends. Presentations will be in the categories of: computer hardware and architecture, software, mathematical aspects of information processing, technological and scientific applications, applications in the social sciences and the humanities, systems for management and administration, and social implications of computers. An exhibition of computer equipment, from more than 100 organizations of about 15 countries, will complement the program. Fee: Skr 450.00. Contact: IFIP Congress 74, c/o Stockholm Convention Bureau, Strandvagen 7 c, S-114 56 Stockholm, Sweden.

MEDINFO 74—First World Conference on Medical Informatics, August 5-10, Stockholm. Held jointly with IFIP Congress 74, this conference will focus on the expanding field of information processing in medicine and public health, considering technical, financial, human, ethical, and political aspects. There will be an exhibit. Fee: Skr 450.00; or Skr 25.00 in addition to IFIP registration. Contact: MEDINFO 74, c/o Stockholm Convention Bureau, Strandvagen 7 c, S-114 56 Stockholm, Sweden.

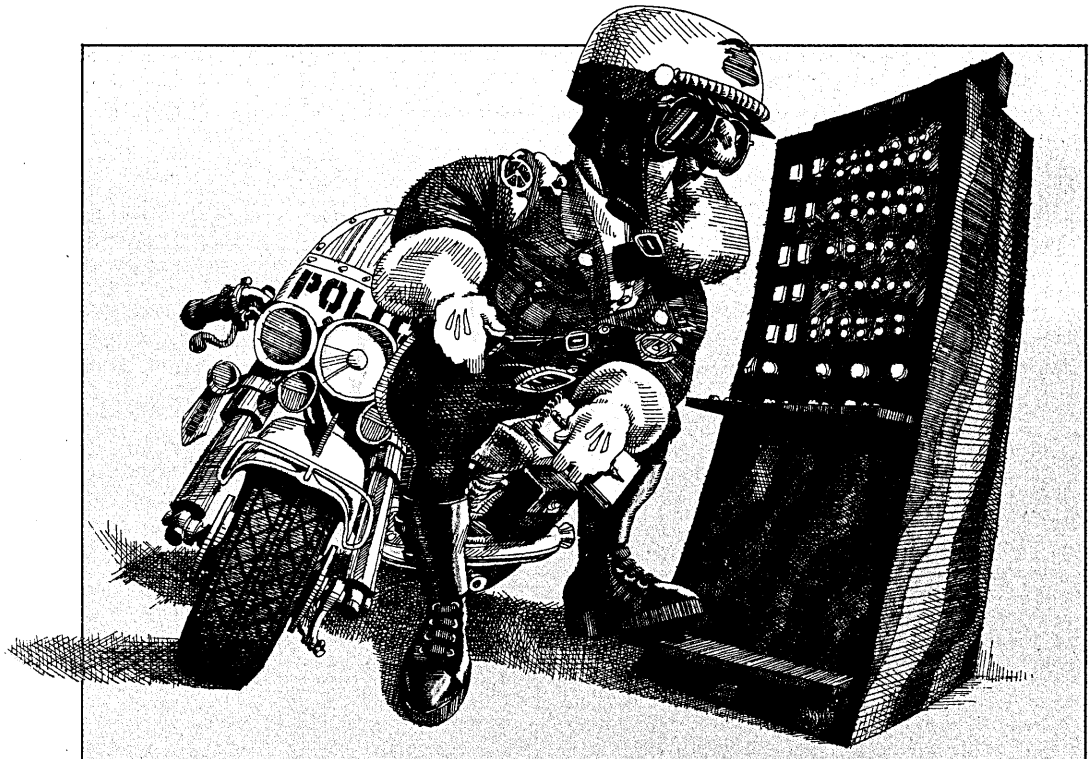
ICCC-74—International Conference on Computer Communications, Aug. 12-14, Stockholm. This second international conference aims to analyze aspects of computer communication in an interdisciplinary fashion. Lectures and invited papers will deal with fundamentals, interactive aspects, technical aspects, and applications. Fee: about $100. Contact: Edward E. Boyar, 1860 Wiehle Ave., Reston, VA 22090; or ICCC-74, Central Administration of Swedish Telecommunications (Gdk), S-123 86 Farsta, Sweden.

Second International Joint Conference on Pattern Recognition, Aug. 13-15, Copenhagen. The program for this conference will cover such aspects of theoretical and applied pattern recognition as: feature selection, image processing, and character and speech recognition. Fee: $60, members; $75, others; add $15 after July 1. Contact: Spadille Congress Service, Sommervej 3, DK-3100, Hornbaek, Denmark.

SEPTEMBER

25th SICOB, Sept. 19-27, Paris. This international show for top management will feature: an exhibition of business machines and equipment, with emphasis on data processing and communications systems; demonstrations of advanced techniques; roundtable meetings; and seminars. Fee: FFr. 5.00; free for foreign visitors. Contact: SICOB, 6, place de Valois, 75001 Paris, France.

Conferences are generally listed only once. Please check recent issues of DATAMATION for additional meetings scheduled during these months.



ITEL can really soup-up your computer.

If you want extra performance in your data processing system, ITEL peripherals have a lot going for them.

Take our money-saving add-on Monolithic Memory. It lets you exceed IBM's capacity limit at far less cost. On the 360/22 up through most 370 models. For example, it expands a 370/155's memory from two megabytes to four megabytes—a 100% increase!

Then, there's our 7330 Disk Drive Subsystem for 360/50, 360/65 and 370 systems. A compact, waist-high unit that handles massive data bases up to 1,600,000,000 bytes. Average access time is a speedy 27 milliseconds.

At ITEL, we couldn't have acquired over half a billion dollars in IBM computer leasing experience without finding room for improvement.

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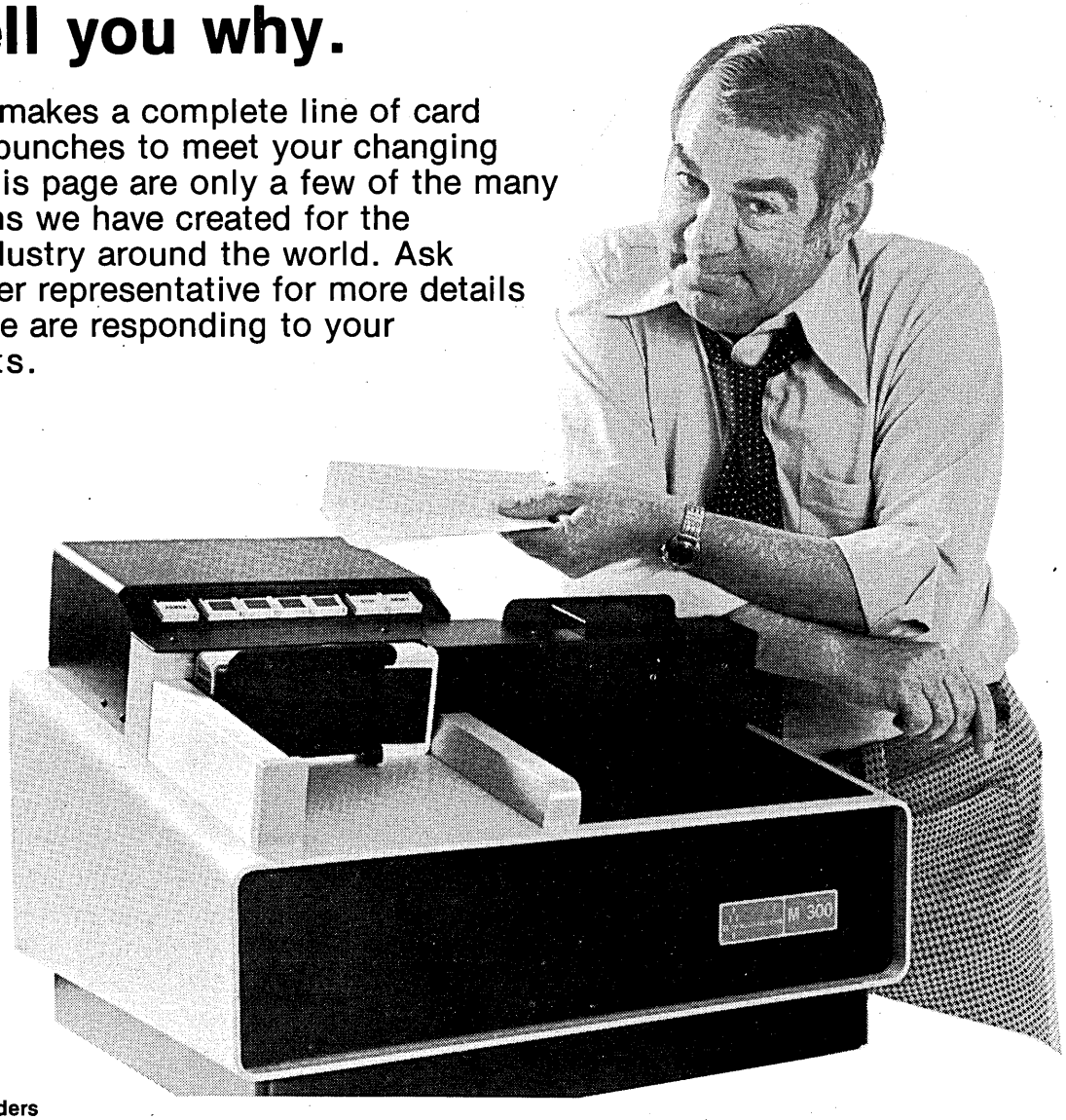
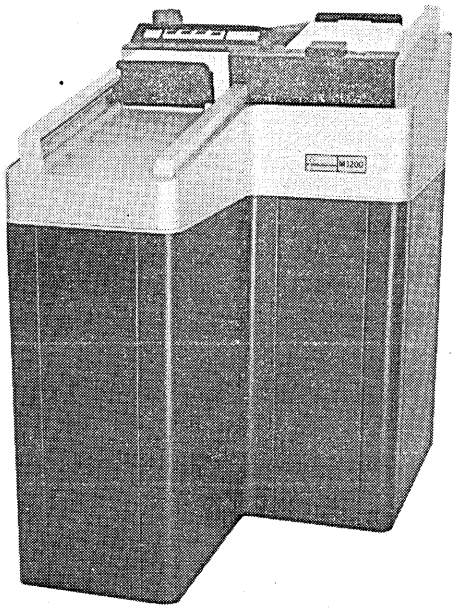
Today, more than 100 of the best known and respected computer companies use Documation readers and punches.

Our family of card handling equipment may tell you why.

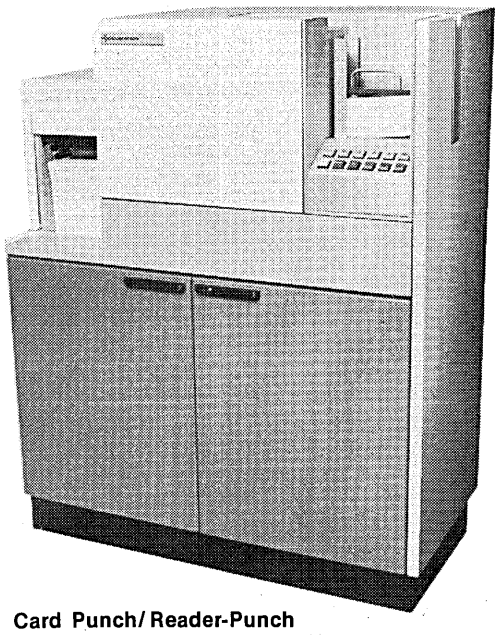
Documation makes a complete line of card readers and punches to meet your changing needs. On this page are only a few of the many configurations we have created for the computer industry around the world. Ask your computer representative for more details about how we are responding to your requirements.



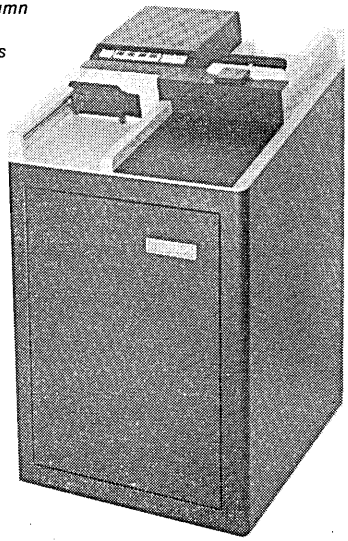
Slant Top Card Readers
Card rate; 300, 600, or 1000 cards per minute. Card Type: Standard 80-column or optical mark. Hopper/stacker: 1000 card capacity



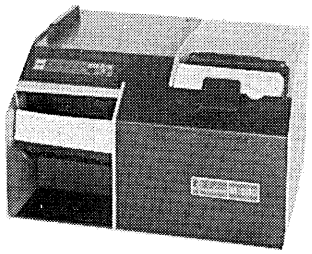
M 1200 Card Reader
Card rate: 1200 cards per minute
Card type: Standard 80-column
or Optical mark
Hopper/stacker: 2250 cards



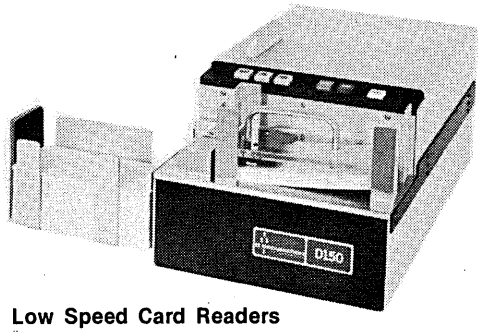
Card Punch/ Reader-Punch
Punch mode: 100 to 285 cards per minute
Read only mode: 400 cards per minute
Card type: Standard 80-column
Hopper/stacker: 1000 cards



Console Card Readers
Card rate: 600 or 1000 cards per minute
Card type: Standard 80-column or optical mark
Hopper/stacker: 1500 cards



M 200 Card Reader
Card rate: 285 cards per minute
Card type: Standard 80-column or optical mark
Hopper/stacker: 550 cards



Low Speed Card Readers
Card rate: 220 cards per minute
Card type: Standard 80-column or optical mark
Hopper/stacker: 400 cards

Twin Head Card Readers

All Documation card readers with reading speeds from 285 to 1200 cards per minute are available to read both standard 80-column and optical mark cards.

the card handlers

DOCUMATION
INCORPORATED
POST OFFICE BOX 1240
MELBOURNE, FLORIDA 32901
TELEPHONE (305) 724-1111
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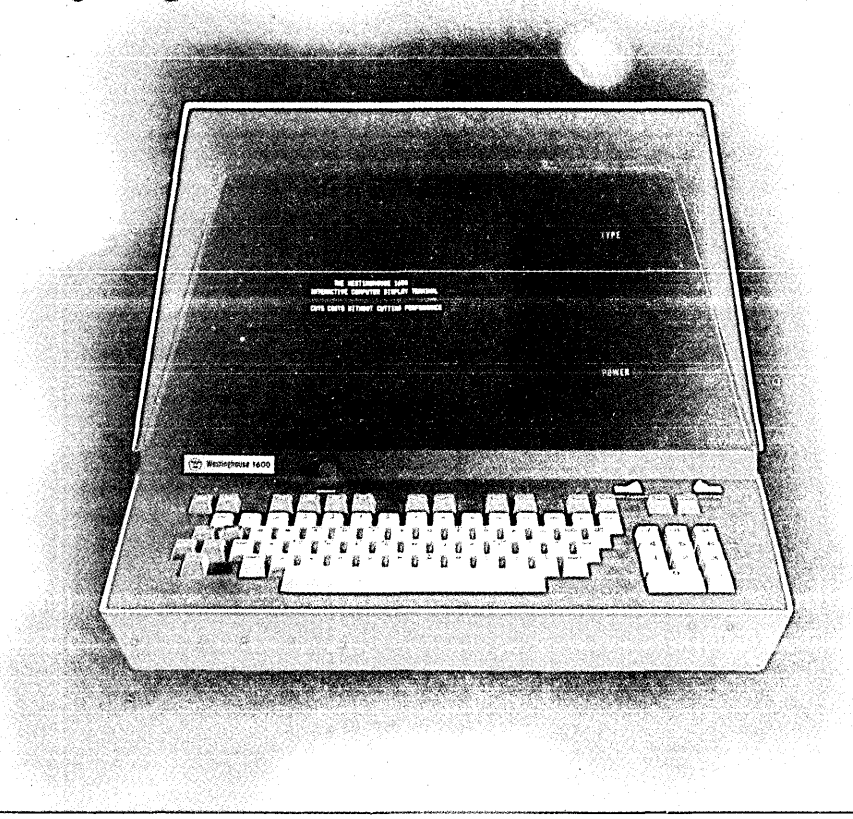
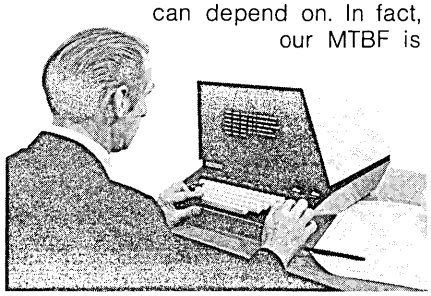
Reliability is burned into every Westinghouse 1600 video display terminal



Before we deliver a Westinghouse terminal, its reliability has been confirmed by a rigorous, 7-day burn-in cycle. Each terminal is placed on continuous, operational test at 40°C (104°F) to screen out possible circuit defects and assure all systems meet their performance specifications.

The result is a terminal you can depend on. In fact, our MTBF is now over 4,500 hours. That spells reliability whether the application is a management information system, coordinated production control, batch entry system or engineering design and testing.



Besides reliability, the Westinghouse 1600 provides the user with exceptional flexibility thanks to an extensive range of features offered as standard in the base price. These include both synchronous and asynchronous operating modes, eleven switch-selectable data rates plus format mode and a full selection of edit functions. In addition, a low-cost option—station address for polling by computer—can yield significant cost reductions by line sharing.

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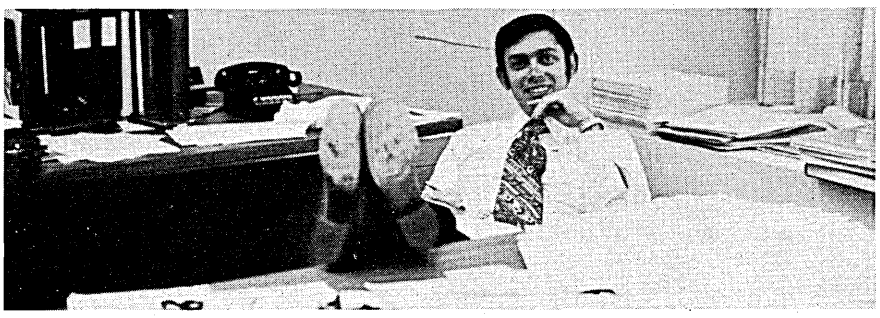
THE RAIN CHECKED OUT

The city of Seattle, Wash. gets an average of 160 days precipitation per year for a total of 33 inches. New Orleans gets some 64 inches in an average of 110 days. These facts, gleaned from the *World Almanac* by John Elliott, who this month becomes the Administrator of Data Processing for the city of Seattle, may not have been the overriding ones affecting his decision to take the job in the northwest city but they were facts he checked out. New Orleans is close enough in distance and in climate to his native Baton Rouge, La. to give him a feel for what he should expect from Seattle's climate. "I learned it rains more often in Seattle but it doesn't rain as hard and, anyway, I like rain," said the affable Elliott, who in moving left a place that doesn't get much of it. For the past six years he had held various dp management positions with the Los Angeles Dept. of Water and Power.



John Elliott

At 31 Elliott is probably one of the youngest heads of a data processing operation for a city of Seattle's size (approximately 600,000 population), but it's a young operation with plans to grow. "I'm enthusiastic about what the city's trying to do up there," said Elliott shortly before leaving Los Angeles. He said a dp staff of "some 50 odd people" was expected to double within a year. The city was in the process of advertising for bids to replace and upgrade an NCR 315. "They've been doing a lot of work on a service bureau basis with Boeing Computer Services and that work's going to be brought into the city organization. And there are a lot of new systems development efforts underway."

Elliott's experience with the Los Angeles Dept. of Water and Power, where he has served successively as information systems associate, EDP project leader, information systems engineer, senior information systems engineer, and, most recently, as manager, business systems development, should stand him in good stead in his new job. In Los Angeles Water and Power it is a standalone operation but in Seattle it's a part of the overall city organization.

Like so many others in the business, Elliott got into data processing via the IBM route. He had been graduated from Louisiana State Univ. in Baton Rouge with a degree in physics when his wife got an opportunity to go to Frankfurt, Germany. IBM interviewers were on campus at the time, he recalls. "Knowing IBM had an operation in Frankfurt I decided to talk to them to find out who I should write to there." He never did get to Germany. Instead he spent 10 months as an IBM systems engineer where he got hooked on dp. He had left IBM and was about to return to LSU to study electrical engineering when the L.A. DWP did some recruiting on campus. He decided to go to L.A. to talk to the DWP. At the same time he talked again to IBM. He decided to accept an "emergency appointment" with DWP and ultimately received a permanent appointment.

Elliott's departure from Los Angeles left a gap in two local organizations of the Assn. for Computing Machinery (ACM). He was finishing up a term as chairman of the L.A. unit of ACM's SIGBDP (Special Interest Group on Business Data Processing), a group he'd served previously as vice chairman and treasurer. And he was a candidate for vice chairman of the L.A. chapter of ACM. Perhaps his organizational talents as well as his data processing talents will be of use in Seattle. What else will he do there? He plans to continue as an amateur cabinet maker and to eat a lot of seafood.

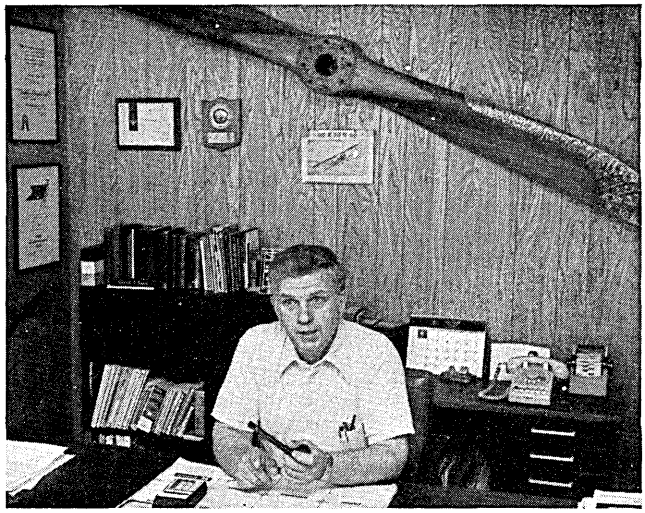
"I'M WORKING TO PUT MYSELF OUT OF BUSINESS"

"Nothing in the world can take the place of persistence. Talent will not; nothing is more common than unsuccessful men with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination alone are omnipotent." These words, taken from a recent McDonald's (you deserve a break today) advertising campaign, are prominently displayed in the Inglewood, Calif. office of Genrik Sirvis, president of Designed Enclosures, Inc. They provide a clue as to how this small manufacturer of a very specialized—and relatively offbeat—product was able to survive the recession, when so many others did not.

DEI manufactures acoustic enclosures for a number of popular terminals, including Teletype products, IBM's 2741, the GE Terminet line, and many others.

After a number of engineering and managerial positions at Wyle Laboratories, Scantlin Electronics, and the Bendix computer div. before it was acquired by Control Data, Mr. Sirvis tired of the big organization atmosphere, "and especially the constant backstabbing and political games in the larger companies." He became an independent engineering consultant, and one of his first contracts dealt with acoustic control. "That really interested me. I looked around and saw

Genrik Sirvis



how little was being done on acoustics in data processing. I knew I'd found something I could do."

It wasn't easy, however, and it was in learning how DEI had to modify its manufacturing and marketing efforts that the persistence paid off. "After constructing the wood enclosures, I'd finish them off with a good coat of varnish so that the buyer would be proud to have it on the machine. Potential customers then said, 'are you kidding? If I put that thing on this terminal, the stockholders will think I'm abusing their money!' So, we had to make the product *less* attractive. Then we found out that people were simply turned off when told that the enclosures were made of wood—even though wood is one of the best substances known for that purpose. Now we tell them it's a high quality furniture veneer, and they're happy. It's the damndest thing —but it's true. Next we found out that nobody wanted to pay $150 outright for the product—but they were willing to rent it for $6 a month forever."

Too small to support the money float necessary to rent equipment, DET faced bad times in the middle of 1972, and Sirvis had to attend a dissident stockholders meeting. "I told them that if they didn't like the direction the company was going, to go ahead and pull out. I told them that if they had dreams of this ever becoming a 50-man operation, to give them up. It's a small operation, and that's the way I like it—small." Within a month, DEI beat out a competitor for a large order from RCA's terminal division. This order turned the firm around. RCA was willing to pay cash for the terminals and put them out on rent.

"The only question mark I've ever had about this business was during the recession. Was I on a learning curve—or just going through an exercise in futility?"

Behind Mr. Sirvis hangs a magnificently finished wooden propeller from an old World War I Spad; "that's the kind of workmanship that used to be common," he said. He talked about the local high school and college kids who help him manufacture the enclosures. "I use the Bill Norris approach —let the young kids come in and work, and when they're through working on my stuff at five o'clock, they're free to use the machines around here to work on their own stuff— as long as they continue to go to school. I get down on them if they don't continue their education."

Is there a danger that equipment manufacturers will acoustically design their products so that there won't be a need for DEI's products? "I hope so! The day I have convinced manufacturers to do something about noise at the point of origin, I go out of business. I'll just start another company—small, of course."

THE WORK PART WAS FUN

When Kenneth G. Harple founded his Modular Computer Systems Inc., he and his co-founders were worried whether they could still work. "We had been in administrative positions for years," Harple recalls. "We wondered —could we still design? Could we still program? Could we still peddle?" Harple and his 17 co-founders at the Fort Lauderdale, Fla., minicomputer company found quickly that indeed they could program, design, and sell. They also found that they could perform more mundane chores like painting the building and installing the plumbing.

Harple recalls that the "work" part of starting up a company was fun and he notes that, now that Modcomp has turned in a $12 million-plus year in sales, his rapidly growing firm is approaching the point in size where the firm's officers are filling managerial positions similar to those they held before they formed Modcomp. The firm is the bright new light in the booming minicomputer industry and Modcomp's emergence in the high end of the mini business was no fluke. Harple, who previously was executive vice president at Systems Engineering Laboratories and, before that, director of engineering at Scientific Data Systems, spent six full months planning the direction Modcomp would take before his firm got wheeling. "I wrote a five year plan," says Harple. "We are all very conscious about planning here. In fact, we spend as much time now planning as we do executing." Appropriately, now that Modcomp is running along smoothly, Harple is spending most of his time on long-range market planning and long-range financial planning.

Kenneth G. Harple

Harple likes to point to his original plan for Modcomp in which he predicted that the firm would do $12 million in sales and be profitable in 1973. Modcomp logged sales of $12.4 million and profits of $782,000 in 1973. Harple, though, is the first to admit that things can go wrong even with the best laid plans. When Modcomp was in its embryonic stages, venture funding was tough to raise, so the founders had to take big salary cuts. The firm was forced to get over the tough start-up phase with less funding than Harple had thought he needed.

Like the people at all successful young companies, Modcomp's employees have worked long and hard hours. Yet there is an easy atmosphere at the firm's Fort Lauderdale headquarters. Harple, for instance, comes to work in a sport shirt without a tie and he likes to kid with Ross Perot's Electronic Data Systems men who are doing some programming work at Modcomp. "The EDS guys with their white shirts and ties and crew cuts are ruining Modcomp's image," says Harple with a smile.

JOHN W. BLANEY has been appointed president of Investment Data Corp., a subsidiary of System Development Corp., Santa Monica, Calif. . . . JOHN A. SHORTAL is the new president and chief operating officer of DynaStor, Denver, Colo. manufacturer of floppy disc memory systems . . . After two years with System Development Corp., most recently as chief technologist, MONROE M. SPIERER has rejoined Computer Sciences Corp. as a principal consultant . . . CLIFFORD J. STUECK, director of EMCON Computer Systems, Emery Air Freight Corp., was elected vice president of Emery . . . FRANCIS A. FRANK was named corporate systems manager by Keane Assoc., Inc., Wellesley Hills, Mass. □

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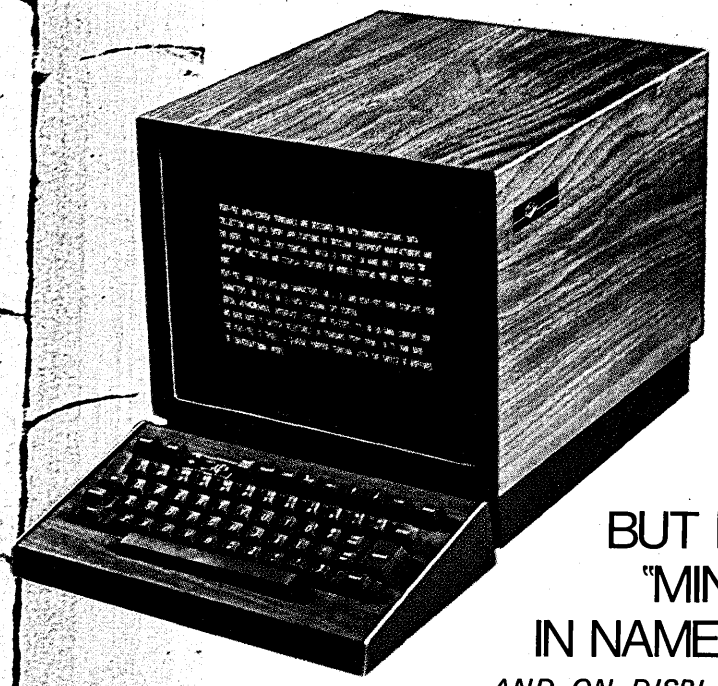

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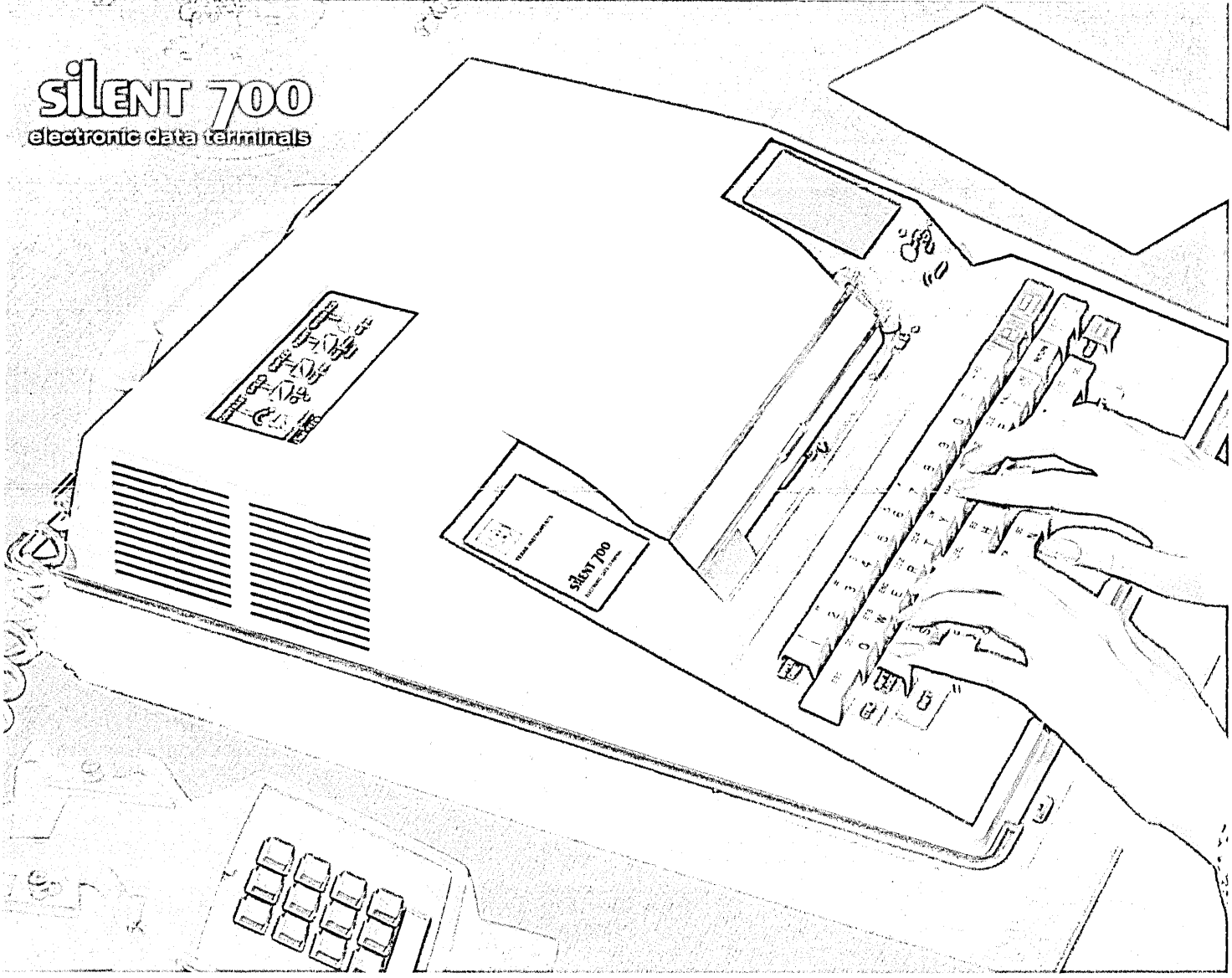

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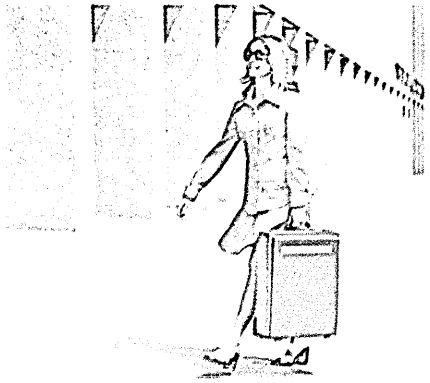

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LOOK AHEAD

WATSON IN COURT--A PREVIEW OF OCTOBER

The Justice Dept.'s two-day deposition of IBM's Thomas J. Watson, Jr. early this spring represented something of a preview of what to expect when the trial itself gets under way next October. For one thing, Justice is relying heavily on the spade work done before in the Control Data-IBM case. Another thing: Raymond Carlson, the Justice Dept.'s lead attorney on the case who took Watson's deposition, will rely heavily on IBM's own competitive analysis statistics. Those statistics show IBM to have a commanding grip on the computer market. But Watson attempted to downgrade the importance of the statistics and appeared to be suffering from amnesia when Carlson queried him on several sensitive issues.

Watson's deposition was not without a touch of humor. When Watson's high-priced attorney Frederick A. O. Schwarz, Jr. graciously offered to get coffee for the small group in the Westchester, N.Y. county court house, Carlson quipped: "That's the highest priced coffee service in the United States."

SO, WHAT ELSE IS NEW?

That great mainstay of IBM--its data processing sales force--is having a good year. John Akers, president of the computer giant's dp div., has told his sales people that the division's marketing performance during the first four months of 1974 has been the best in seven years, as far as living up to the marketing plan is concerned. IBM surrounds its sales statistics in secrecy, but it's safe to say that IBM is exceeding its goals this year.

Marketing campaigns in some recent years have fallen far short of IBM's quota. Presumably its sales performance this year is ahead of 1967, when the sales force did 116% of quota, and 1968, when it did 102%. The best in recent years was 1966, when 142% of the quota was reached.

PRIVACY ISSUE MARS FEDERAL NETWORK PLANS

GSA's plan to build a nationwide information utility (April, p. 150) has been shot down by a multiple barrage from the Office of Management and Budget, Vice President Gerald Ford (p. 99), the Office of Telecommunications Policy, and several congressmen. Most of the critics feared that the data network would cause a massive invasion of privacy by putting every government dossier on-line. GSA has agreed to defer procurement of the network until a later date, but it's understood the critics still aren't satisfied, so further concessions and delays are likely.

NOW IT'S ENTREX GOING TO NIXDORF

When Heinz Nixdorf was negotiating with Entrex some months ago to take over a piece of the shared processor firm's European sales, he employed a little of his famous flamboyance: he arrived at the Boston firm's offices in the governor of Massachusetts' helicopter. In recent weeks, however, the aviational acrobatics are being performed by Entrex president Donald Feddersen, who has been traveling to Germany to talk turkey with Nixdorf.

Nixdorf undoubtedly will be taking over even more of Entrex's European sales; but, more important, we understand that the foundation has been laid for Nixdorf to take over Entrex lock, stock, and barrel. Some sources are convinced Entrex will be merged into Nixdorf's U.S.

LOOK AHEAD

operation before the year is out. A few months ago, Entrex was predicting it would log revenues of more than $13 million for the fiscal year ending in June.

CDC QUIETLY SHOWING MASS MEMORY SYSTEM

Control Data quietly has been showing a very large scale storage subsystem to potential customers, among them the Social Security Administration. The system borrows many concepts from announced and unannounced products: very wide magnetic tape (IBM's project Comanche); storage in very large cassettes (similar in concept to Grumman's Masstape system); and read/write operations under the control of a cpu-addressable mechanical arm (a la Wurlitzer juke box). Performance is said to be comparable to the Ampex terabit memory system.

Social Security officials are interested in the memory system, but say they haven't yet been told by CDC who will write the interfacing software for it--and for which manufacturer's computer model. This should be disclosed when CDC announces the product later this year or in early '75.

ON THE 3790 BANDWAGON

Harris Communication Systems plans to introduce a new remote batch terminal this September. It supports up to 16 satellite stations, has the processing capacity of a System/7 Model 3, and will be priced "significantly" below IBM's 3790 system. Harris hopes to deliver in the first quarter of next year. Other features: 16K byte core in the main processor, expandable to 64K; 29 million bytes of disc storage; 65 nsec internal cycle time; microprogrammed processor and I/O; and FORTRAN, BASIC, and proprietary macro language compilers. It's the company's first major product announcement since Harris acquired it from UCC (now the Wyly Corp.) in December '72.

HOW SOME COPE WITH ENERGY COSTS

Documents to help dp installations cope with the cost and problems of energy are beginning to surface. Panelists at a recent energy symposium sponsored by Aetna Life and Casualty told of documents prepared by IBM and Burroughs on how to save energy in a computer installation. IBM and Burroughs sales representatives are supposed to be familiar with them. CBEMA in Washington has an "information letter" on brownouts.

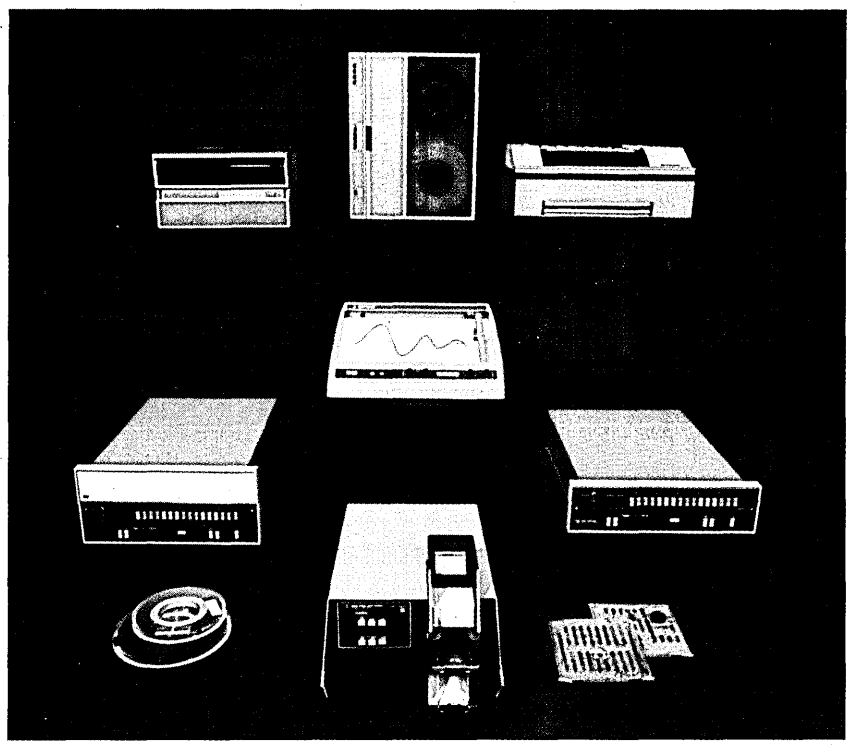
IBM has an installation planning guide on uninterruptible power supplies (UPS) and has done some extensive studies over the years on voltage transients affecting dp operations. These have not been published, but users should ask about them, said the panelists, who noted that such extensive data is a rare commodity.

A representative from Northeast Utilities at the Hartford, Conn. symposium indicated there won't be a crisis this summer; in fact, the energy shortage seems to be nonexistent these days, possibly because oil prices are rising at a rate that satisfies the producers. Aetna's vice president of administration, Robert Clark, says his company's facilities in Hartford are saving 30% in energy consumption, but the costs have already gone up 25%--or a 55% increase if there had been no conservation measures.

BULL'S CLOSE CALL

France's Compagnie Honeywell Bull is breathing a sigh of relief over the defeat of Francois Mitterand for the presidency of France. The

(Continued on page 130)



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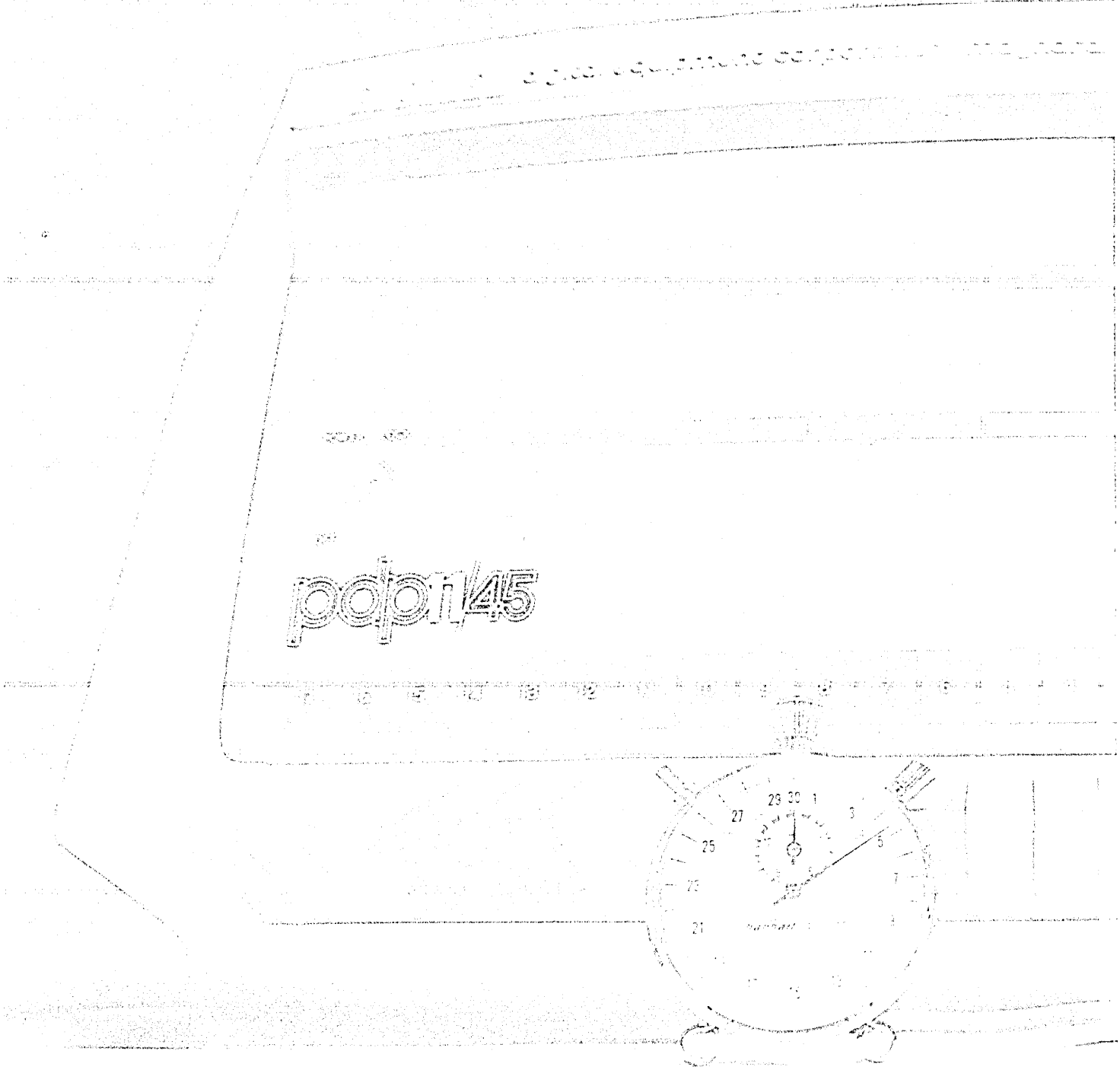

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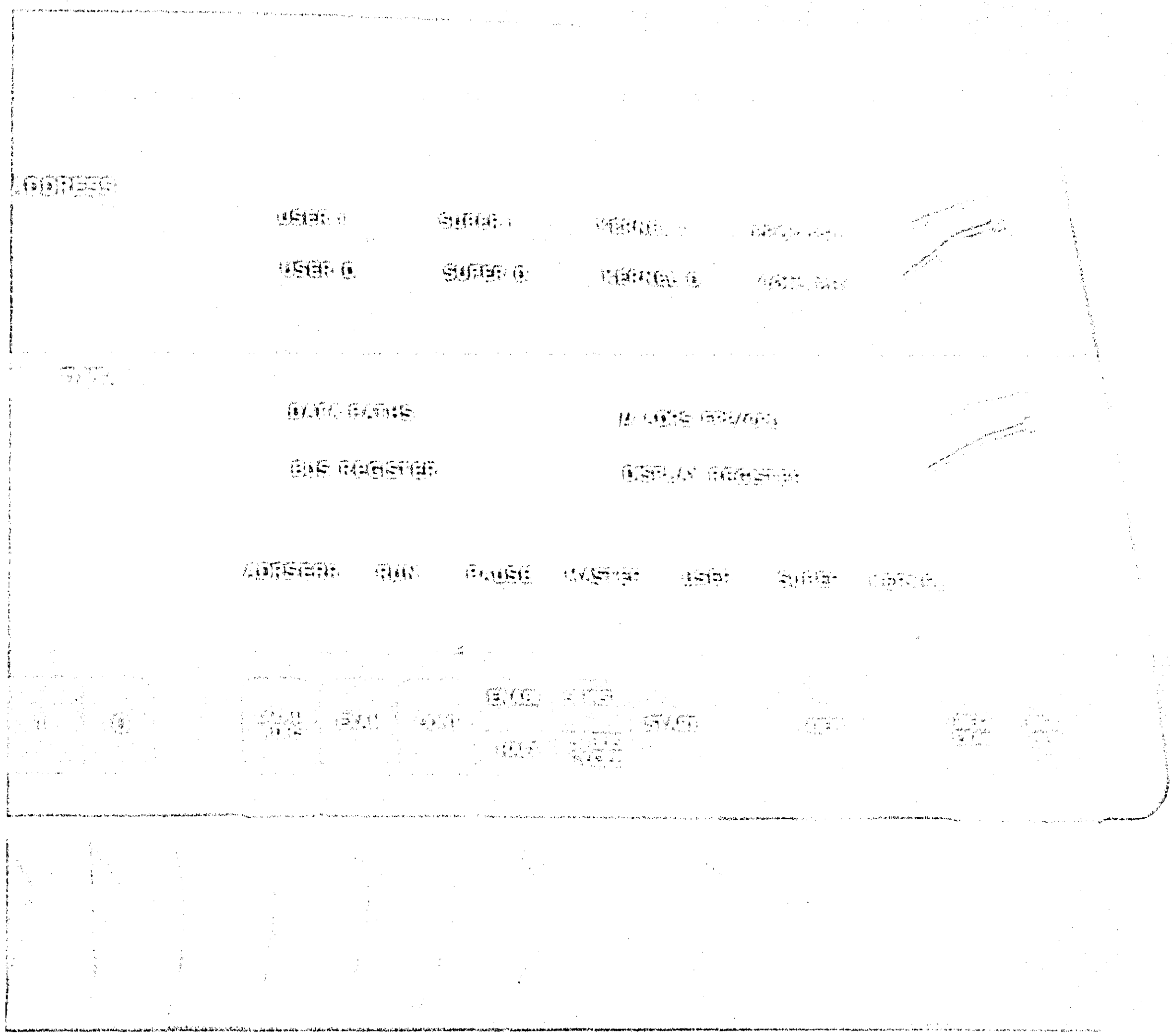

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300 cpm Card Reader	Std	Std	Std	Std	Std
600 cpm Card Reader	Opt	Opt	Opt	Opt	Opt
1200 cpm Card Reader	Opt	Opt	Opt	Opt	Opt
300 cpm OMR Card Reader	Opt	Opt	Opt	Opt	Opt
100 cpm Card Punch	Opt	Opt	Opt	Opt	Opt
275 cpm Card Punch	Opt	Opt	Opt	Opt	Opt
200 lpm Line Printer	Std				
300 lpm Line Printer		Std			
245-1100 lpm Line Printer			Std		
600 lpm Line Printer				Std	
1200 lpm Line Printer					Std
Magnetic Tape	Opt	Opt	Opt	Opt	Opt
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letters

Screams and praises

Congratulations on your April issue. I particularly enjoyed Harlan Ellison's story, "I Have No Mouth, and I Must Scream" (p. 132).

Not only is it good reading, but it's good to have a "what might be" article mixed with the "what was" and "what is" computer articles.

FRANK B. ROWLETT, JR.
Manager of Publication Services
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

In my mind and I hope in many others, there was no relevancy to your publishing the filth that oozes out of Ellison's mind in "I Have No Mouth, and I Must Scream," and nothing remotely pertinent to the "dark side of our technology." This obscene portrayal is indescribably blatant with its horror, violence, immorality, and foul allegory to a kind, loving, and just God. There are already too many Satanic purveyors and publishers of this kind of garbage and their growing audience of addicts.

R. A. SCHLAPPI, CDP
General Supervisor
Programming and Systems
Oldsmobile Division
General Motors Corporation
Lansing, Michigan

I noted with a great deal of pleasure the inclusion in your April issue of the Harlan Ellison story. It is a superb piece of science fiction. However, I also noted, and with a great deal of annoyance, that the integral stops in the layout had been neglected. Thus, what started out to be a fascinating, gripping story was made, by this simple omission, into something considerably less suspenseful.

Your choice of that particular story could not have been in better taste. However, next time please include *all* of the story.

THERESA CROWE
Berkeley, California

Please spare us from more garbage like that heaped on us when you published the article "I Have No Mouth, and I Must Scream." It has no data processing merit and is in very poor taste.

Why waste space for such material?

ROBERT G. FRERKING
Columbia, Missouri

Whether "Harlan Ellison is a phenomenon in the field of science fiction" or not, it is this writer's opinion that his type of morbidity has no place whatsoever in your otherwise selective and well-edited magazine. I've been a constant reader of DATAMATION for over 10 years and, frankly, I was sickened! I suggest that if your trend is toward moral decay and pornography that you change the title and, at the same time, drop my name from your subscription list.

FRANKLIN D. LEUPP
Camarillo, California

Peter platitudes

My compliments to A. Nonymous for his fine piece of literature, "The Inverse Peter Principle" (April, p. 123). However, I feel you have made a mistake by presenting it in the April Foolishness section!

C. HAARLAMMERT
Numerical Control Analyst
Cincinnati Milacron Company
Cincinnati, Ohio

. . . Dr. Lawrence Peter wrote with his tongue in cheek but A. Nonymous reveals the unpleasant truth. Notice which of them needs to fear the wrath of those who realize the shoe fits all too well. The details vary from one situation to another but the Inverse Principle has been widely adopted.

NAME WITHHELD ON REQUEST

"The Inverse Peter Principle" is a brilliant exposition of an example of the "Winsocki Principle." The Winsocki Principle, a humanistic Newton's Third Law, states:

"For every principle (law) as regards society, there is an equally truthful (reliable) inverse principle (law)."

Example:

1. *The Horatio Alger Principle*

"Success is directly proportional to personal attributes, physical ability, and/or mental ability."

2. *The Sour Grape Principle* (Anti-H.A.)

"Success is directly proportional to education, environment, opportunity, favorable circumstances, and plenty of luck."

Thus, those who make it in some measure are proportionately convinced it came about because of recognized, inherent, superior attributes. Those who don't are also proportionately convinced they didn't because of one

Wordsmanship

With regard to Marvin Grosswirth's article "Does Anyone Here Speak English?" (April, p. 117), it is a welcome change to read humorous but truthful articles regarding our highly technical dp field.

Here is an article, written many years ago, which is quite apropos to Mr. Grosswirth's:

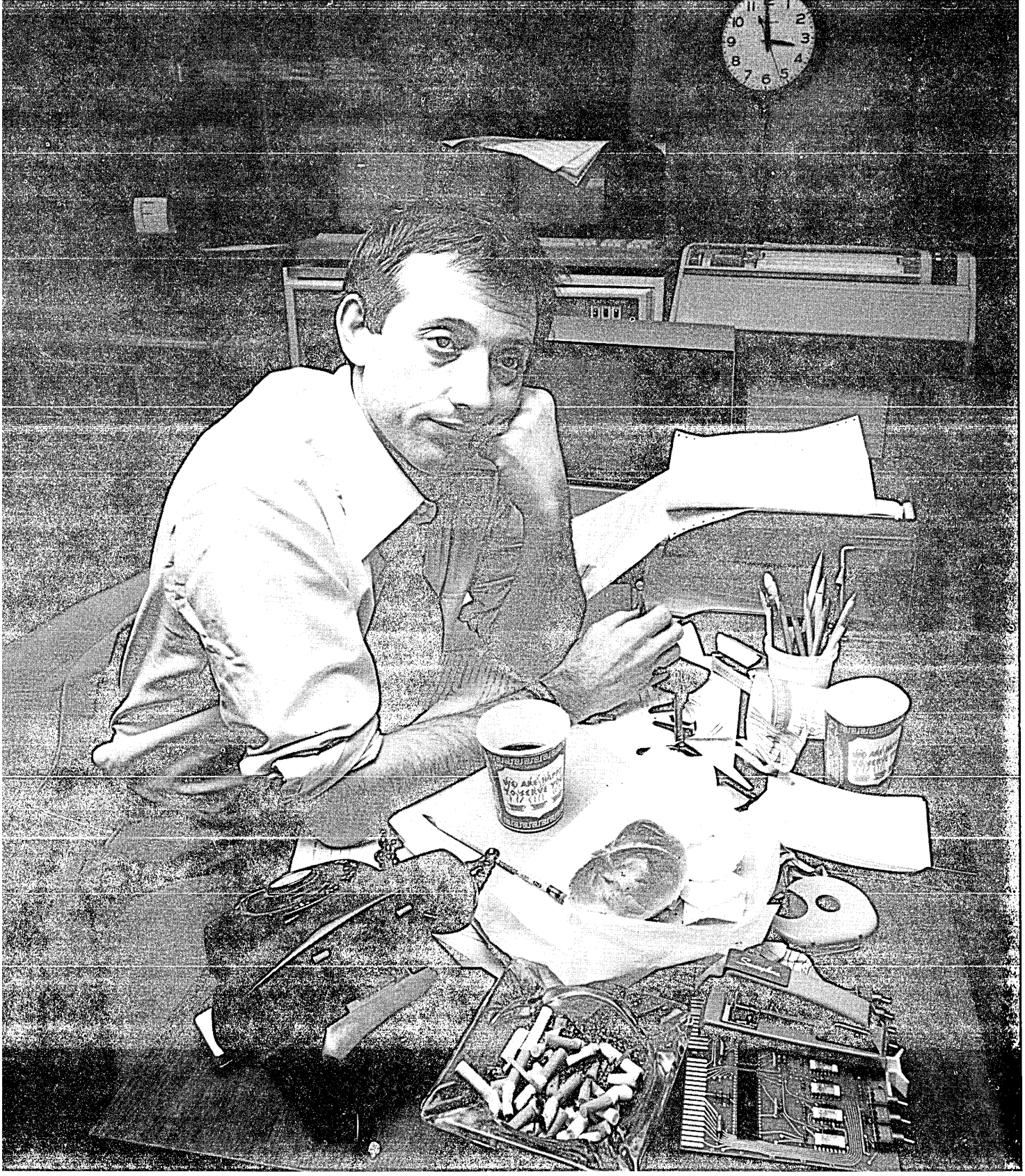
How to Win at Wordsmanship

After years of hacking through etymological thickets at the U.S. Public Health Service, a 63-year-old official named Phillip Broughton hit upon a sure-fire method for converting frustration into fulfillment (jargonwise). Euphemistically called the Systematic Buzz Phrase Projector, Broughton's system employs a lexicon of 30 carefully chosen "buzzwords."

COLUMN 1	COLUMN 2	COLUMN 3
0. integrated	0. management	0. options
1. total	1. organizational	1. flexibility
2. systematized	2. monitored	2. capability
3. parallel	3. reciprocal	3. mobility
4. functional	4. digital	4. programming
5. responsive	5. logistical	5. concept
6. optional	6. transitional	6. time-phase
7. synchronized	7. incremental	7. projection
8. compatible	8. third-generation	8. hardware
9. balance	9. policy	9. contingency

The procedure is simple. Think of any three-digit number, then select the corresponding buzzword from each column. For instance, number 257 produces "systematized logistical projection," a phrase that can be dropped into virtually any report with that ring of decisive, knowledgeable authority. "No one will have the remotest idea of what you're talking about," says Broughton, "but the important thing is that they're not about to admit it."

LEON G. LECLERC
Operations Supervisor
Corporate Dp
Scovill
Waterbury, Connecticut



It's hard to love the hardware when the software is keeping you up all night.

There's a lot of great hardware around. But not much great systems software.

Which explains why a lot of programmers don't get much sleep. And why software development usually ends up costing more than the hardware.

When we make a computer, we put as much work into the software as the hardware.

So there's less work for you to do. And the work you have to do goes a lot faster.

Our Real-Time Disc Operating System (RDOS) lets you work the way you want. Interactively. Or Batch. It has a file management system that doesn't need any work at all. (It'll fit any application as is.) RDOS supports higher level languages. And utilities like MACRO Assembler, Text Editor and Symbolic Debugger make it easy to pull everything together.

And once you've finished your applications software, your job is done. Because RDOS helps run your programs as much as it helps write them.

It even lets you do two things at the same time. Like write new programs while you're running old ones. Or run Timesharing and Batch. Or Remote Job Entry and Timesharing.

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Then maybe you and your programmers can go home and get a good night's sleep.

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letters

or more of the following: high moral principles, adverse environment, lack of justice, or stupid managers.

Lest the reader be misled, it should be noted that the Winsocki Principle has not yet, in the minds of some, evolved any higher than a theory.

J. W. FUSSO, JR.
San Francisco, California

No such countersuit

In the article "Once There Was Only the Control Data Suit" (April, p. 142), about the several antitrust actions pending involving IBM, an error of fact appeared. IBM has not filed a "countersuit" against Memorex. The only legal actions existing at this writing between the two organizations are the actions commenced by Memorex on Dec. 14, 1973. Memorex filed complaints against IBM charging monopolistic practices and asking for damages and injunctive relief. In response, IBM filed an answer but did not file a counterclaim.

ROBERT V. SPELLERI
Manager, Corporate Public Relations
Memorex Corporation
Santa Clara, California

Computer art

With regard to "The Public and the Computer Artist" (April, p. 153), I agree that the field is "characterized by a high technical requirement." However, I would like to point out that this is not always the case. For example, our group, under the direction of Prof. Charles Csuri and primarily through the efforts of Dr. Thomas DeFanti and Manfred Knemeyer, has produced the Graphics Symbiosis System. This system, completely operational for over one year, enables a film maker "to communicate in a simpler and 'far more natural' form." How do we know? Students from the Dept. of Art at the Ohio State Univ. have been successfully using the system without the depth of technical knowledge suggested by the "painter who had to know chemistry in order to mix his paints."

ALLAN J. MYERS
Systems Programmer
Computer Graphics Research Group
Ohio State University
Columbus, Ohio

Errata

Since the publication of my article in your March issue ("Computation in Latin America," p. 73), two small errors have been brought to my attention.

A pocket ENIAC

We thought your readers might be interested in the results of a comparison we recently made between the newest entry in the pocket calculator field, the HP-65, and the first computer ever built, the ENIAC.

The information was derived from the papers we have here about the ENIAC, from the literature put out by Hewlett-Packard, and by direct contact with people in the H-P organization at King of Prussia, Pa., and at Cupertino, Calif.

	ENIAC	HP-65	Approximate Ratio
Word size:	10 decimal digits	10 decimal digits	1:1
Data memory capacity:	20 registers	9 registers	2:1
Program memory capacity:	750 instructions	100 instructions	8:1
Input/output:	punched cards	magnetic cards	—
Read rate:	200 digits/sec	50 digits/sec	4:1
Manual switches:	5000	35	140:1
Number of multiplications per second:	360	15	24:1
Cost:	$480,000	$795	600:1
Power requirements:	50,000 watts	½ watt	100,000:1
Size:	10'x100'x4' (4,000 cu. ft.)	3.2"x1.4"x5.8" (26 cu. in.)	270,000:1

What we have now is essentially an ENIAC one can hold in one's hand! Twenty-eight years is not a long time, and the changes have been dramatic. What do you suppose will be developed in the next 28?

GEORGE OTTO
GEORGE A. MILLER
Systems Programmers
The Moore School of Electrical Engineering
University of Pennsylvania
Philadelphia, Pennsylvania

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Automatic equalization avoids the expense of specially conditioned lines. Integrated circuit design gives you fast startup. Solid-state technology saves you space.

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letters

First, in Table 3 (Market Share by Manufacturer) Univac was left out. It should have been included with a market share of 6.2%.

Second, in Table 6 (Average Monthly Salaries in U.S Dollars) the lines for Puerto Rico and Uruguay are inverted, that is, the numbers for one are assigned to the other.

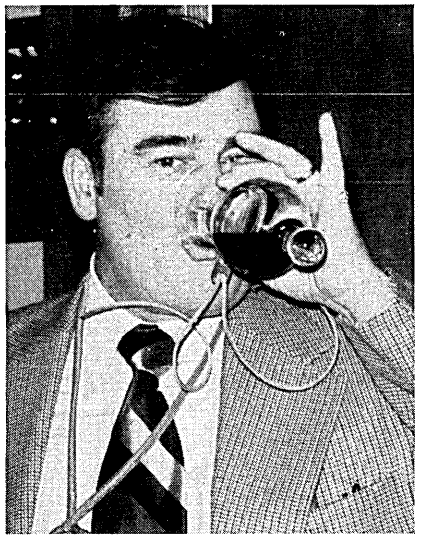
RAMON C. BARQUIN
Massachusetts Institute of Technology
Cambridge, Massachusetts

Bob who?

In the picture sequence on the Digital Computer Assn. (DCA) B*A*S*H, (April, p. 154), your caption failed to note the presence of the man responsible for this event, president Robert D. Stone of Informatics.

Now it may be that Bob Stone or his company requested the omission of his name. (Involvement with DCA is not a universally accepted standard for competence.)

Perhaps it was a software problem. Is it possible that when you submitted the picture to your OCR unit the system failed to recognize Mr. Stone?



(How good is it on people without shadows?)

It also occurs to me that it might be a non-computer memory at fault. Could it be that in someone's personal memory of the glorious event there are lapses?

The most likely situation is that DATAMATION felt that Bob Stone's importance, fame, and good looks made mention of his name redundant. Just in case your readers feel differently, here's his picture.

ROBERT A. BERMAN
DCA Member
Canoga Park, California

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- 3330 – for S/360/50, 65, 67, 75
- 3330 – for all System 370
- 2319 – Double Density High Speed Systems for all System 360's
- 2319 – Single Density High Speed Systems for all System 360's
- 2314 – for all System 360's

Tapes –
- 3420 – High Speed Drives for all System 360's, 370's
- 2401 – Models for all System 360's

Memory –
- Model 30 – 64K to 512K
- Model 40 – 128K to 512K
- Model 50 – 256K to 2000K
- Model 65, 67, 75 – 256K to 4000K

Communications
- 3705, 3704 Plug for Plugs for System 360
- R.J.E. – Hardware and Software for System 360

SOFTWARE

DOS Support Processors
360's to support 360's
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Add computer power and back up support to DOS Systems at low cost

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System 3 to DOS Model 30's

Systems Conversions
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DOS to EDOS

DPF Data Set Optimization
To determine most efficient/cost effective use of disk storage

DPF Portable Benchmark,
A scientifically designed Benchmark to measure effective computer power

EDOS – High Speed Operating System for DOS

Executor – High Speed Accelerator of OS Systems

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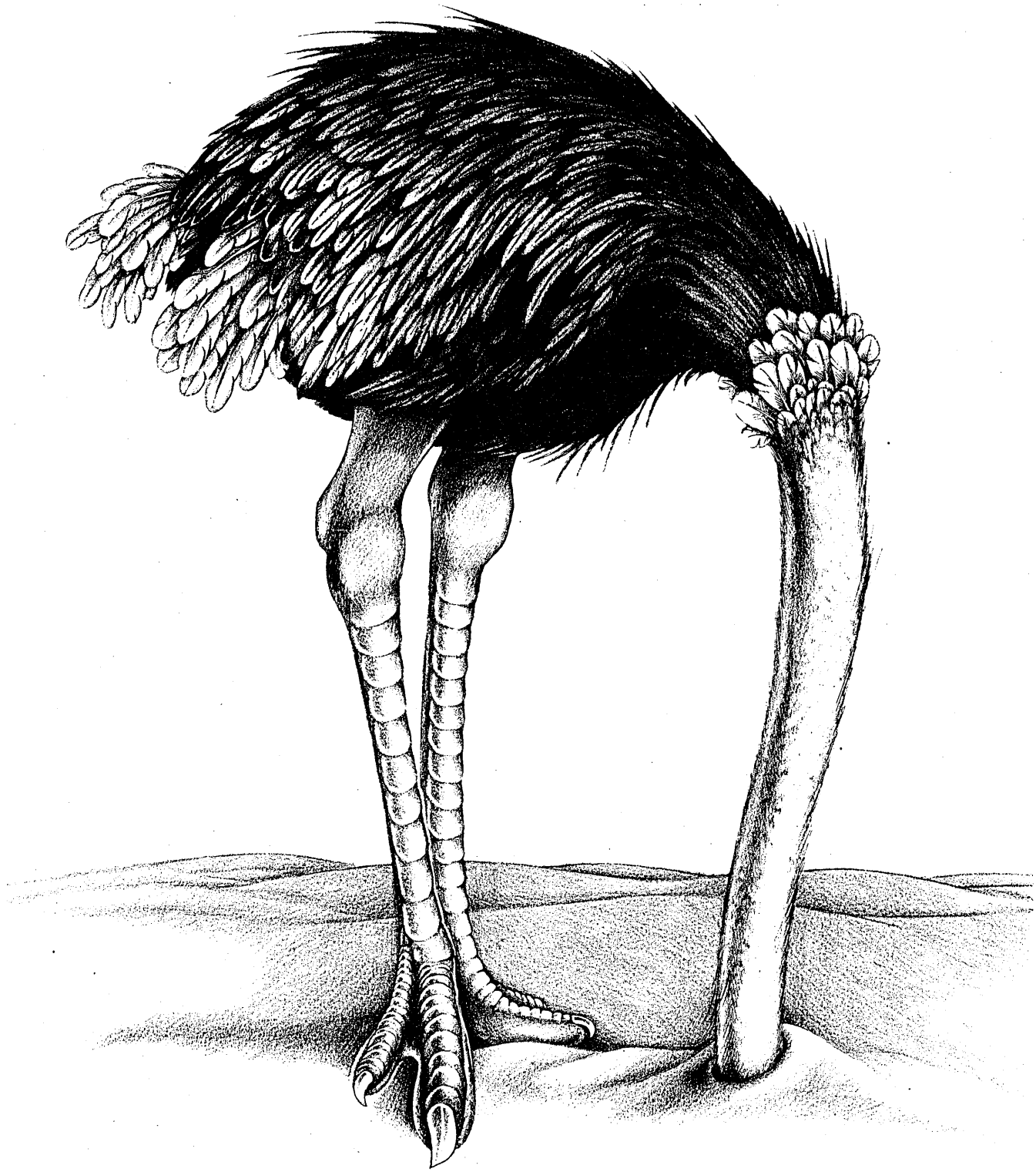
ONE WAY OF COPING WITH YOUR IBM 1130:



THE OTHER:

Face it. The 1130 has been discontinued.

That may not bug you now, but sooner or later you're going to be up a creek.

And the only solution IBM can offer is moving you up to a bigger, more expensive computer with all new software to write.

General Automation has a solution that's simpler.

The DMS.

Even if you think you're happy with your 1130 now, we can replace it with our basic DMS at a monthly cost savings of about 40%.

As your needs grow, our system can grow with you. In fact, we can give you up to ten times the throughput of an 1130. Just add what you need when you need it.

You can even add real-time capability. With a choice of two new operating systems: DPS or CMS.

But you'll never pay more for our DMS than you're paying right now for the 1130. And you can run more than 95% of your existing software without change.

Our specialists are constantly developing more peripherals and software for you. Our user group is constantly trading information on how to get the most from the system.

Now you can see why our DMS has replaced more than three hundred 1130's. Four times more than anyone.

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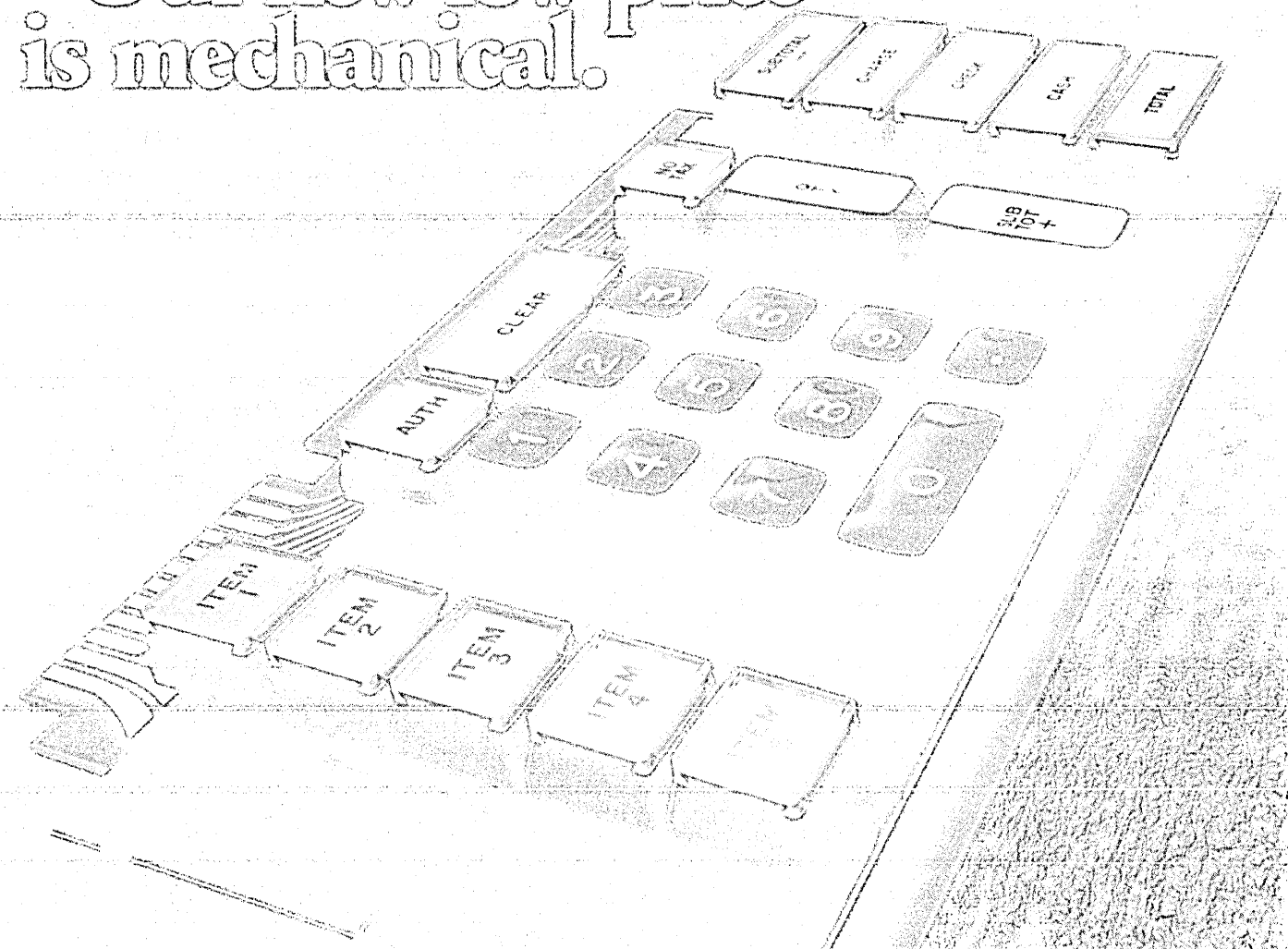


We've expanded your keyboard options dramatically with our new SD low-profile keyboard.

It makes MICRO SWITCH solid-state prices (based on 1975 delivery) competitive with less reliable mechanical-contact keyboards.

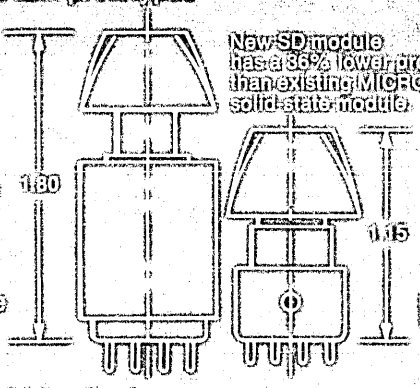
So price is no barrier. No matter what your need. Be it word processing, point-of-sale or other data entry applications.

We've coupled our unique Hall effect switch with an advanced "flip chip" ceramic mounting technique to further increase the reliability of our solid-state keyboards.

And our new low-profile design is ideal for modern compact terminal needs.

Picture a MICRO SWITCH keyboard in your system design. We're ready to talk prototypes now, with production in late 1974. Contact a MICRO SWITCH Branch Office for complete information.

It's the change you've really been looking for.



New SD module has a 36% lower profile than existing MICRO SWITCH solid-state module.

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SOURCE DATA is a new department through which we will provide information on literature, books, films, courses, bibliographies, products, services, and other aids to professional development. Information on this material is welcome.

books

A Review of Computer Glossaries

At least 20 times during the last few years we've been asked by a non-technical executive for an explanation of some particular computer term. Most often, it's not just a single term this person's after, it's a dozen or more different terms. They always ask if there isn't some book where they can look up these terms and get a satisfactory answer. We usually send them a copy of whatever glossary we happen to have handy and let things go at that.

Not long ago, however, a lawyer of our acquaintance needed a definition of the term "software" for purposes of preparing an accurate and comprehensive interrogatory during the course of litigation. Since the authority and comprehensiveness of this definition would have a marked influence on the litigation, we began searching through the various dictionaries and glossaries on hand in order to provide not only a definition, but one which could be authoritatively referenced. Some 40 minutes and six dictionaries later, we threw up our hands in disgust and wondered if we were the only people in the industry who knew what the term "software" meant? The American National Standards Institute sure didn't!

That experience was so frightening that we thought it would be useful to review the available glossaries, dictionaries, and encyclopedias which claimed to define computer terms and see just how good or bad they really are.

Right away, we ran into a problem. We weren't sure what good or bad *meant* in this particular context. So we thought we'd wing it for a while and see if, after reading several of these books, we could come up with some reasonable scheme for evaluating them.

Many hours later, disappointed, word-weary, and desirous of getting something into print before 1976, we decided that the best way to rate these publications was to give them the 1-to-10 special. Our 1-to-10 rating permits us to be blatantly subjective and thus not trammel you with several thousand words of intricate, objective comparisons (which, by the way, we have, in case anyone is seriously interested in such goodies).

Since every dp library should have one or more of these glossaries, this combined list of ratings will give you a good idea of the books to get and not to get. First, however, we'll give you a measure of the 1-to-10 scale and then explain what went into forming our composite picture of each of these documents.

No one in our evaluation scored a 9 or 10! That's the first sad commentary, but at least it lets you know that we have *some* objectivity in mind.

The various dictionaries and glossaries we reviewed differ greatly in their thickness and coverage. We began by taking a common set of terms and comparing the definitions contained in each document. The terms we chose to look up were Check Digit, Compatibility, EBCDIC, Macro, On-Line, Operating System, Real-Time, Response Time, and Software.

Our first annoyance was that many of the reviewed documents contained *no* definition for some of these terms. We then got even more annoyed that several others had improper, imprecise, or just plain incorrect definitions for many terms. In quite a few cases, it was obvious that incorrect definitions were propagated from one publication to another by outright plagiarism (we can understand why someone might want to plagiarize a good definition, but a bad definition?).

We pondered the great mystery of definitions for a while and finally came to some interesting general observations:

1. No one dictionary is so good that it can be used to the exclusion of others.
2. Many of the reviewed documents contained archaic definitions which do not keep abreast of the technology. Such documents may be useful for historical perspective, but are not of any great value in understanding what's happening today.
3. All of the documents could be substantially improved if they were revised by a group of technical specialists rather than an individual author.
4. The ANSI vocabulary is in sad need of revision. (For further comments on this particular work, see Bob Patrick's review in DATAMATION, Jan. 1972, p. 105.)

We should point out that there are two distinct ways in which a glossary can be used. The first of these is as a source of *proscriptive* definition for technical and legal purposes. Such a document requires some national force behind it and its definitions should be current, terse, and dreadfully accurate. None of the documents we reviewed met this qualification!

A second use for a glossary is as an *explainer* of various technical terms. Such explanations should be informative, useful, and written in a free, easy style conducive to learning and remembering. One excellent purpose such explanations serve is to acquaint people with the general terminology they can expect to encounter in other situations. Such explanatory material stands somewhat in between a formal dictionary and a full-scale course in computer technology.

The only book that we found which did a good job of explaining things was Jordain's *Condensed Computer Encyclopedia.* No library should be without one, but we sure wish they'd produce a new edition covering about twice as many terms.

The Meek glossary is a little unusual and deserves some special mention. For this particular volume, the author decided to simply collect definitions from a number of sources and list all of them. This, in turn, presents the reader with an amazing blend of redundancy and conflict. Such a work might be interesting to people wanting to compare various definitions of the same term, but is hardly even vaguely suitable for someone trying to acquire singular knowledge of a particular

The Glossary-Watcher's Glossary Scale (GWGS)

Point Range	Definition
1-3	Save your money—definitely not recommended.
4-6	Keep it if you have it, but watch out—not recommended.
7-8	Recommended. Go get one for your library. Tell your friends about it.
9-10	Clear the shelves, Marion, and let the big boys through.

source data

technical term.

In the January 1973 DATAMATION (p. 136), Bob Patrick wrote an excellent detailed review of the Sippl dictionary. Patrick was highly critical of this particular volume and we wholeheartedly concur. In fact, many of Patrick's critical comments apply equally to most of the materials we reviewed (certainly to all of those that received less than a "7" rating). So, if detail makes you more curious, check the January 1973 issue of DATAMATION.

At this point, let us apologize for any glossaries that are not included in our list. We made an honest attempt to find all we could.

Computer Dictionary and Handbook
by Charles J. Sippl and Charles P. Sippl
Howard W. Sams & Co., Inc. and The Bobbs-Merrill Co., Inc., 1972
778 pp.
GWGS = 5

Condensed Computer Encyclopedia
by Philip B. Jordain
McGraw-Hill Book Co., 1969
605 pp.
GWGS = 8

Data Processing Glossary
International Business Machines GC20-1699-4), Dec. 1972
605 pp.
GWGS = 8

Glossary for Information Processing
by Control Data Institute
Control Data Corp., July 1967
92 pp.
GWGS = 7

Glossary of Computing Terminology
by C. L. Meek
CCM Information Corp., 1972
372 pp.
GWGS = 4

Glossary of Data Communications/ Message Switching Terms
by J. Roy Morris
Informatics, Inc., May 1967
44 pp.
GWGS = 3

Standard Dictionary of Computers and Information Processing
by Martin H. Weik
Hayden Book Co., Inc., 1969
326 pp.
GWGS = 4

Vocabulary for Information Processing
by American National Standards Institute, Inc. (ANSI X3.12-1970) approved Feb. 18, 1970
128 pp.
GWGS = 5

Gerald H. Larsen

Mr. Larsen is president of Unicorn Systems Co., Los Angeles.

The Systems Analysis Workbook
by R. D. Carlsen and J. A. Lewis
Prentice-Hall, Inc., 1973
234 pp. $22.95

Carlsen and Lewis attempted to commit to hard cover a technique they have evidently developed and used successfully over the years. They supply preliminary background information, a full set of forms, some examples of their use, and some rather noteworthy discussions keyed to the forms and samples they present. They attempted to write a book describing an analysis method which was sufficient for the junior analyst or the uninitiated. Instead I believe they have succeeded in preparing an analysis workbook which is suitable for the very experienced.

The trouble they got into is as follows: their backgrounds tend to be in logistics and in stock market systems. It looks as if they are very competent in man-machine systems analysis for these environments. However, the world consists of many other environments. For example, I scanned the document rather carefully and could not find mentioned shared systems where the on-line applications were supported in the foreground and the batch applications were supported in the background. Nor did I find the detail I expected in labor distribution and cost distribution. All of these things tend to be different in dedicated systems than they do in shared systems.

My other problem had to do with the size of the jobs they have undertaken. Now I am sure they think a stock market system is a very large job, but they talk in terms of seven analysts and a *single* system notebook as a completed product of the analysis phase. With a little larger system they would find it necessary to give a more

extensive treatment of data gathering and fact gathering prior to analysis (something they only briefly mention in this book), and then would have to give a rather extensive treatment of the selection of systems analysts and the calibration of the work crew so that you would know how to manage it. In their defense, they do emphasize project planning and control in a way heretofore not treated, and they do state (but do not emphasize) that system development is a disjoint process interspersed with project planning and management decision making.

All in all I like the book very much. I'm going to buy a copy and put it in my personal library. If I had a seasoned analyst and wanted to lay some discipline on him, I'd give him the book to read and insist that he come back to me with the customized versions of the forms and the project plans he was going to use. It's an excellent point of departure for the seasoned analyst, but I would recommend caution before giving the book to the neophyte as he may follow it slavishly and find himself in trouble due to the things it does *not* say.

—Robert L. Patrick

Mr. Patrick is a dp consultant and is DATAMATION'S Editorial Advisor.

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CORRECTION

In our April issue we reviewed the book *Safe: Security Audit and Field Evaluation for Computer Facilities and Information Systems,* and got the price wrong; it should be $24.95. The book also has a new publisher: American Management Assn. Inc., New York.

•

courses

Microcomputers

The Univ. of California at Berkeley will conduct three short courses on microcomputers: "Introduction to Microcomputers with Engineering Applications," Aug. 7-9, $300, held at the Berkeley campus; "Advanced Microcomputer Applications and System Evaluation," Sept. 4-5, $160, at the Berkeley campus; and "Trends in Microcomputer Hardware, Software, and System Engineering Aids," Sept. 6, $80, held at the U.C. Extension Center in San Francisco.

Registration may be made for any one course or for a combination. Enrollment in the first two courses is limited; advance registration is required for all three. For information write: Continuing Education in Engineering, Univ. of California Extension, 2223 Fulton St., Berkeley, CA 94720.

Master's from the Field

Beginning in the fall, Harvard Univ. will offer a master's degree in information sciences for those interested in acquiring a deeper understanding of advanced computing technology to meet the needs of business, industry, and government. Potential candidates for the MIS would typically be dp center managers or dp specialists at corporations or government agencies, or would have some other computer experience. The program will provide the additional training necessary to realize career goals; i.e., advanced information technology, the extension of computer systems to new aspects of an organization, management of large computer-related projects, etc. About a third of the course will be devoted to developing management skills, and the

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REMEX DIGITAL CASSETTE TAPE DRIVES pack highly advanced features into a small, economical package, offering unexcelled reliability in data handling.

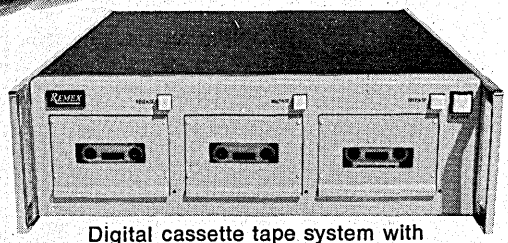
REMEX DIGITAL CASSETTE TRANSPORTS combine precision tape drives with necessary read/write and control electronics. An excellent module for building high reliability/high performance systems, at a low O.E.M. price.

THE COMPLETE DIGITAL CASSETTE SYSTEM with one, two or three drives to give you full parallel data storage with phase encoding, error detection and correction. DTL/TTL compatibility and with complete interface packages. Very competitively economical.

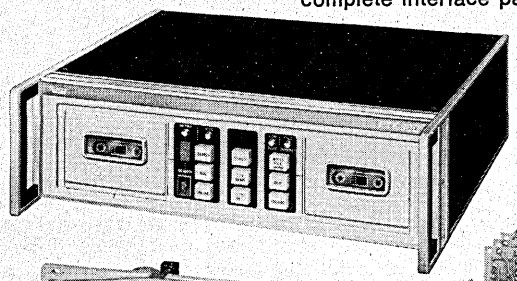
THE EXCLUSIVE REMEX Punched Tape Emulator that simply plugs into your punched tape system to increase its read/write speed up to four times, and its storage capacity up to 10 times. And you use both your existing hardware and software!

AND NOW, advanced floppy disk drives and floppy disk systems. They're real honeys.

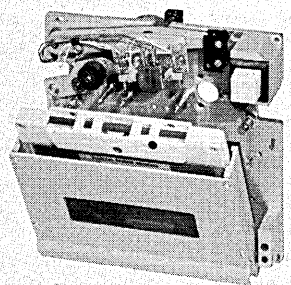
For full information on all or any part of the complete Remex line, write Remex, 1733 Alton St., Santa Ana, California 92705. (714) 557-6860. *In Europe and the U.K., contact S.p.A., Microtecnica, Torino, Italy.*



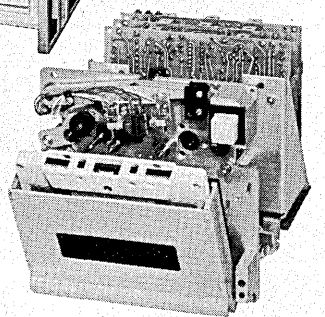
Digital cassette tape system with complete interface package.



Plug-compatible Punched Tape Emulator



Digital cassette tape drives



Digital cassette transports

We work with you!

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rest will be exposure to technical concepts.

The student will be expected to devote the equivalent of a full year's course to the design and execution of a significant project for which design proposals and progress reports will be prepared; a written report will be required at the conclusion. The project can be undertaken either at Harvard or in the field.

For additional information, write: MIS Program, Harvard Univ., 33 Oxford St., Cambridge, MA 02138. Applications for admission may be obtained from: Admissions Office, Graduate School of Arts and Sciences, Harvard Univ., Byerly Hall, 8 Garden St., Cambridge, MA 02138.

Instruction for Multinationals

Multinational companies that want to conduct uniform internal business education programs on a worldwide basis can now rent video-assisted instruction packages for direct delivery to their overseas units. More than 2,000 hours of instruction will be available on courses ranging from electronic data processing to management development. The plan permits multinational corporations to draw from libraries in six countries outside the U.S. (England, Sweden, Germany, Mexico, Australia, and South Africa).

The video-assisted education format permits classes to be conducted under an instructor's guidance, or to be self-instructed to allow students to move at their own pace. Each course includes printed guides, text, and reference material for the student and program coordinator.

Additional information is available from: Advanced Systems Inc., 1601 Tonne Rd., Elk Grove Village, IL 60007.

Seminars

Control Data Corp.'s Institute for Advanced Technology will hold seminars on: "Design of Off-line Systems," in San Francisco, July 8-10, and Washington, D.C., Aug. 19-21; "Data Communications Systems," in New York, July 24-26, and San Francisco, Aug. 21-23; "Architectural Design of a Computerized Data Communications Hardware System," in Washington, July 17-19, and New York, Aug. 7-9; "Terminals in On-line and Remote Computing Systems," in Los Angeles, July 17-19, and New York, Aug. 7-9; and "Software Systems Design for a Data Communications System," in Denver, July 10-12, and Washington, Aug. 14-16. Cost: $350 each for the first four, $395 for the latter one.

Further information: Registrar, The Institute for Advanced Technology, Control Data Corp., 5272 River Rd., Washington, DC 20016.

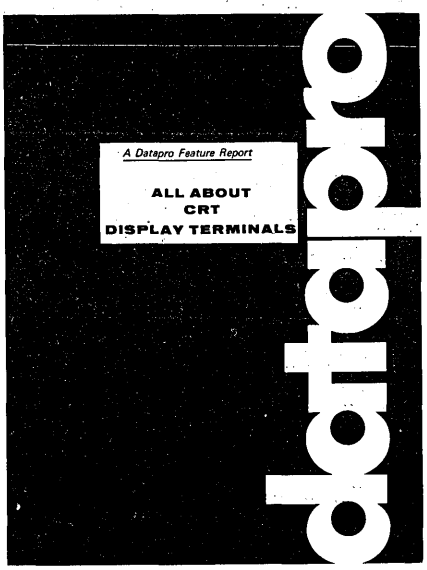
literature

Computer Specs

The Computer Review, formerly *Computer Characteristics Review*, is now issued annually in a loose-leaf binder, supplemented by two updates during the year which are included in the $35/year price. It lists the important features of virtually all digital computers and peripheral devices commercially available, along with comparative prices for several typical system configurations, and a directory of manufacturers worldwide. GML CORP., 594 Marrett Rd., Lexington, MA 02173.

Crt Terminals

A user survey entitled *All About Crt Display Terminals* reports on user reactions and presents detailed characteristics and pricing on 162 commercially available display terminals from 65



suppliers. The survey attracted a total of 394 responses representing user experience with 7,858 terminals. Price: $10. DATAPRO, 1805 Underwood Blvd., Delran, NJ 08075.

EFTS

Report of the Automated Clearing House Task Force is an effort to establish industrywide standards for the electronic transfer of funds nationwide. The American Banking Assn. report recommends that a national automated clearinghouse association be established for continued analysis of problems and opportunities, that automated clearinghouses be established in each region of the U.S., that action be taken to increase general understanding of the concept to insure full development, and that all parties concerned step up education and marketing research efforts. The 94-page report can be ordered, for $10, from: AMERICAN BANKERS ASSN., Order Processing Dept., 1120 Connecticut Ave. N.W., Washington, DC 20036.

European Potential

Three reports given in-depth analyses and forecasts for various European markets.

The Computer Terminals Market in Europe is a 287-page analysis forecasting the market through 1982 by country for: typewriter-oriented terminals, alphanumeric visual display units, graphic display units, remote batch terminals, point-of-sale terminals, banking terminals, industry data collection, cash receipting and ticketing systems; average unit prices are also forecasted. Many other areas, applications, and chances for success are evaluated.

The Computer Performance Evaluation Market represents the emergence of an industry still in its infancy. A 190-page report forecasts the market through 1983 in numbers, dollars, and unit costs for hardware and software monitors, simulation packages, consulting services, and more.

The Personal Calculator Market is a 134-page report, the scope of which includes consumer models, science and business models, number of units, average unit pricing, and worldwide sales volume projected through 1980.

In-depth information on many other aspects of these topics are covered in the three reports. Information, a detailed table of contents, order forms, and a catalog of Frost & Sullivan reports in print may be obtained through the reader service number. FROST & SULLIVAN, New York, N.Y.

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Viewpoint

A Turning Point in Data Processing: Technology, History, and the Law is a 30-page paper based on the premise that the computer industry is undergoing radical changes, including a peculiar combination of shrinkage and expansion, due to technological innovation. The paper attempts to concisely describe these developments, outline the structure of the industry and the influence of these technological developments on its economics, note sociological forces governing the be-

Single-source computer service is a put-up or shut-up business. We're putting up.

We have a world-wide network of service facilities, staffed with well-trained and experienced service technicians. And backed up with logistics and technical support that would make any service organization envious.

We've put together an operation that is specifically intended to cure the perennial service headache of mix'n'match systems. Raytheon Service Company will provide leasing companies, users, and owners with a single source for competent service at any EDP installation, anywhere in the free world. And we'll give any manufacturer good reason to think twice before he takes on the effort and expense of building an internal service organization. Raytheon Service Company. One source for great service — in North and South America, Europe, the Far East — or wherever your equipment might be. We *are* putting up. Try us. Call or write Mike Salter, Commercial Marketing Manager, Raytheon Service Company, 12 Second Avenue, Burlington, Mass. 01803. (617) 272-9300.

RAYTHEON

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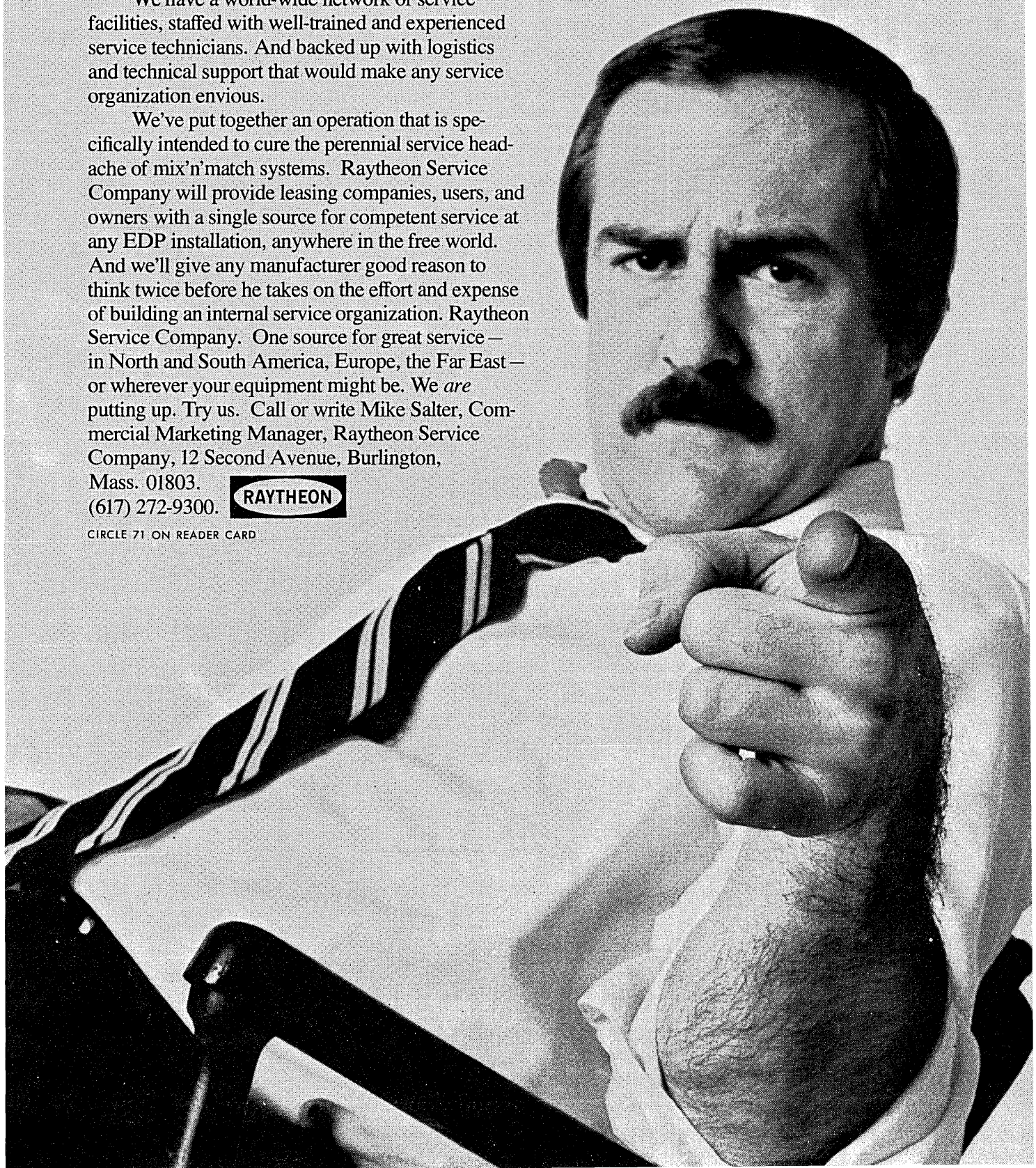

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havior of IBM, examine the use of the law to control changes, and give conclusions and recommendations. The point of view of the paper stresses the relationship between technical, economic, and social conditions. The author invites comments and criticisms from readers for incorporation, with credit, in later editions. Cost: $5 (Calif. residents add sales tax); postage and billing added if remittance does not accompany order. WORDSWORTH SYSTEMS, 2020 Graham Ave., Redondo Beach, CA 90278.

Remote Plotting

The birth and development of time-shared remote plotting, the present capabilities of remote computer graphics, ratings of the types of systems currently available, and a glossary of related technical terms are included in a 14-page booklet. ZETA RESEARCH, Lafayette, Calif.

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Executive Newsletter

The *Romac Review for Presidents* is a "confidential newsletter," first published by Romac and Assoc. (a professional personnel consulting firm) in Winter 1974. It contains articles, survey information, and better business suggestions on "major areas of executive concern" in the fields of dp, accounting, and finance. ROMAC AND ASSOC., Boston, Mass.

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Abstracting Service

The Communicator is a weekly computer news and abstracting service, summarizing product announcements, industry trends and analysis, company news, management changes, financial results, new publications, antitrust matters, and many other subjects of interest to management. Information is obtained from more than 50 computer and business publications—though not from DATAMATION, judging from our copy of the newsletter. Subscription cost is $55 for six months, $95/year; sample issue available free through reader service number. THE COMMUNICATOR, Marblehead, Mass.

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Point-of-Sale Study

This 64-page study of the point-of-sale terminal industry is based primarily on interviews with representatives of the major equipment suppliers and on a user survey of about 70% of the currently installed base of POS terminals. The major conclusion is that a dramatic conversion to complete electronic POS equipment will occur during the next five years, with 1975 the turning point. Cost: $175. CREATIVE STRATEGIES INC., Suite 100, Executive Bldg., 1032 Elwell, Palo Alto, CA 94303.

products & services

Intelligent Display System

A 12-page brochure describes the Sycor 250 intelligent display system. The system consists of a series of IBM 3270-compatible remote display stations, standalone terminals, and printers, and features two screen capacities, two keyboard arrangements, and dual-tractor printers. SYCOR INC., Ann Arbor, Mich.

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Media Protection

The reasons for protecting magnetic media, methods of determining what records should be protected, and the degree of protection needed are described in *Magnetic Media Protection.* WRIGHT LINE, Worcester, Mass.

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Process Control Systems

A brochure describes the building blocks—computers, operating systems, high level programming languages, and hardware—that make up process control systems built around small computers. DATA GENERAL CORP., Southboro, Mass.

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Autocoder to COBOL

Help has arrived for those installations still emulating IBM and Honeywell second generation computers. According to CACI, Inc., automated conversion of the old programs into COBOL is impossibly complex, and reprogramming manually is very costly. The ACT II system was designed to provide a cost-effective compromise between these two types of conversion. The procedure, consisting of manual pre-processing, automatic translation, and manual post-processing, is demonstrated through a complete example in *A Quick Look at the Autocoder to COBOL Translator.* CACI, INC., Los Angeles, Calif.

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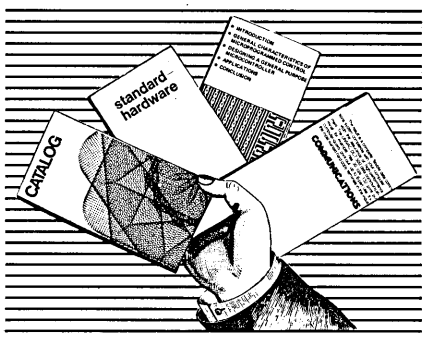

Educational Software

An eight-page brochure describes over 75 Huntington computer programs that can be used as classroom aids. The Huntington programs, developed by the Polytechnic Institute of Brooklyn, simulate experiences in biology, chemistry, mathematics, earth sciences, social studies, and physics. DATA GENERAL CORP., Southboro, Mass.

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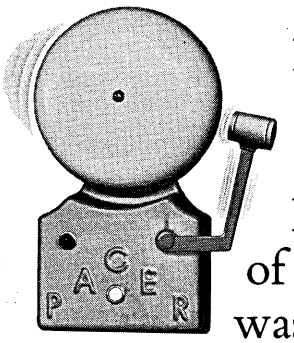
"Look, J.G., think of the shells as our wholly owned subsidiaries and the pea as the revenue from the new stock offering. Now, for the IRS it becomes a case of now you see it now you don't!"

The Bully.

ADDS new Consul 980. It'll take on anybody in the magazine.



Round 1.

This is the tale of one tough terminal.

It seems like a month of Sundays since ADDS was just a new kid on the block. Back then, all we had were big ideas and a reputation to earn.

Well, we earned it. And the story of our new 980 TTY compatible terminal is a good example of how.

A Technical Knock-out.

If you've ever eyeballed our Consul 880, you know how the 980 looks: the "Gorgeous George" of CRT terminals. But these two have a lot more in common than good looks and 1,920 characters; they share a reputation built on design, engineering and service. Not to mention some 100% pure sweat.

But the Bully goes an extra round.

A very famous fighter would have probably put it this way:

Now inserting or deleting characters is fine, but the 980 also edits a line at a time!

Our character set displays a black on white face, and it comes in upper and lower case!

The computer can read the cursor position, and that is certainly a welcome addition!

Besides all that, if you please, protected formatting; graphics and function keys!

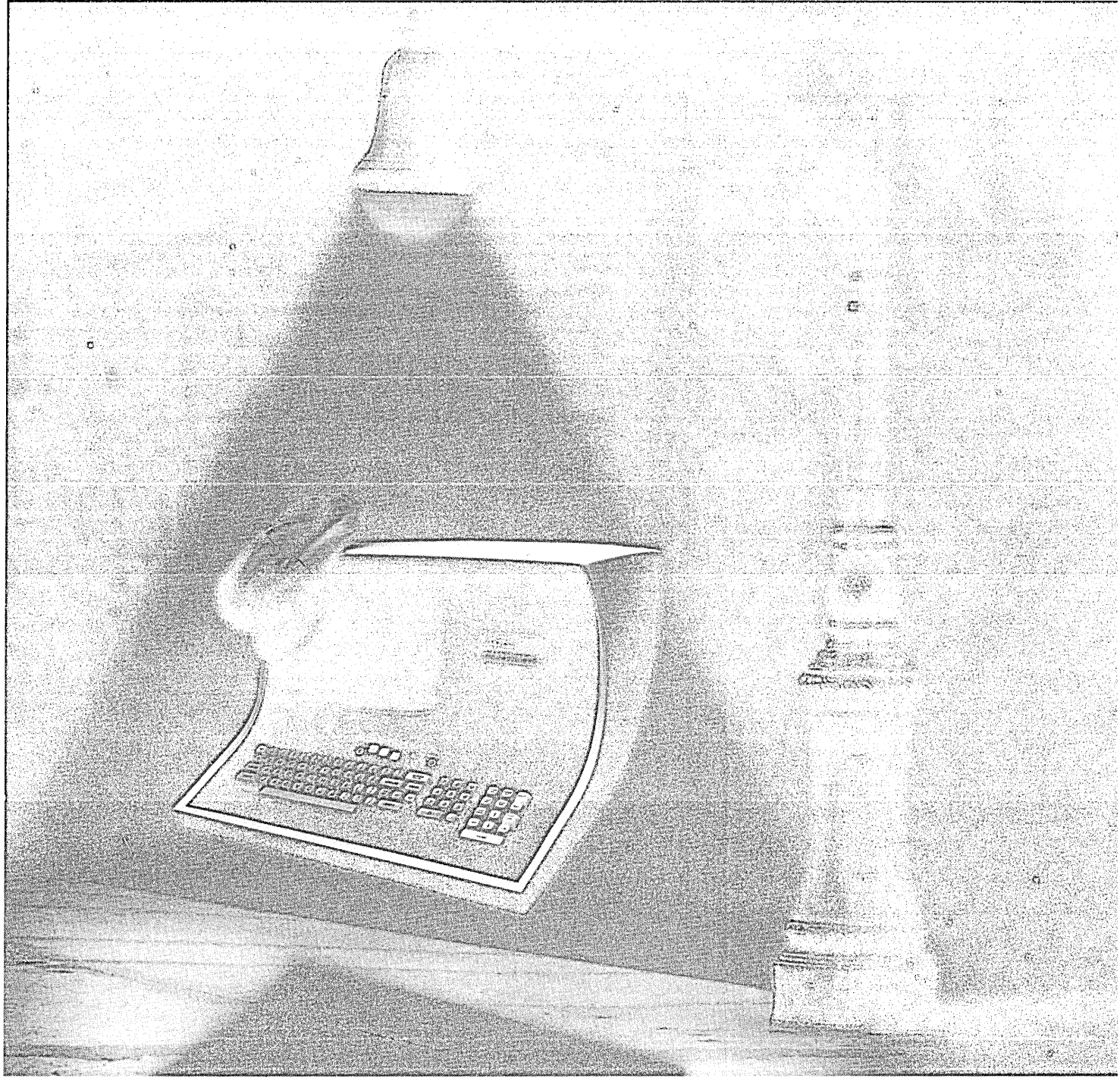
Printer and cassette ports, and just in case, current loop as well as EIA interface!

As if all these features didn't suffice, it's an entirely remotely controllable device!

Now we hope you understand fully, just why we call 980 the Bully.

Hitting below the belt.

If you're expecting a championship terminal like the 980 to



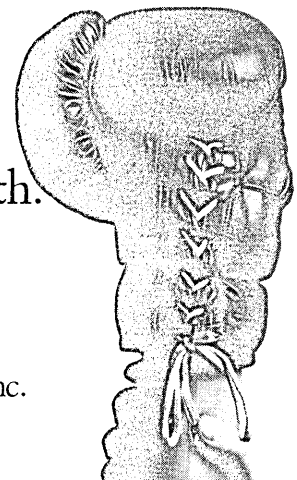
cost you an arm and a leg, hold on to your socks. $2800. Everything included. With OEM discounts of over 30%. Need we say more?

The Title.

We think we've got one unbeatable terminal in our corner. If you'd like some more information, or even a ringside seat demonstration, call the Bully's manager at 516/231-5400. Or write Applied Digital Data Systems, 100 Marcus Blvd., Hauppauge, New York.

Every contest has one winner. Sometimes it's a technical decision. Sometimes it's a knock-out. And sometimes it's both.

Consul 980.



ADDS

Applied Digital Data Systems Inc.

CIRCLE 72 ON READER CARD

Preparing the people is the most difficult part of installing a small-scale business computer. The hardware seems to be no trouble at all.

STUDIES IN SMALL-SCALE

Small-scale business computers are introducing many new users to the data processing fraternity. Sometimes the introduction goes smoothly, and sometimes it is traumatic. To find out what makes the initiation easier for some than for others, DATAMATION moved in with a few new System/3 users in the Los Angeles area. We spent up to six weeks with them, learning their problems and getting somewhat comfortable in their environment. Some of them never got comfortable about the idea of having their problems aired in a magazine, however, and so two of the following four case histories are presented anonymously.

In each of the four cases, the System/3 was to be the organization's first real computer. In almost all other respects, the four sites are different. When we left one site, the delivery of the machine was still optimistically anticipated. At another site, we sat through the delivery and installation. The two remaining sites already had their machines when we interviewed the department managers, but both had had quite different experiences. In only one of the cases did IBM know we would be there.

Case I: Getting ready for the machine

The Metal Products Div. of the Keene Corp. has plants in Santa Fe Springs, Calif. and Parkersburg, W. Va. The Santa Fe Springs plant manufactures only one product, steel grating, but that product is made in hundreds of shapes and strengths and material combinations to suit applications such as bridges, cat walks in oil refineries and missile sites, and decorative grilles for architects. Last year's sales were in excess of $4 million.

For years, eam machines and an old IBM 6405 accounting machine had served the division's bookkeeping needs. Recently, however, the Parkersburg office had acquired an 8K S/3 model 10 card system and had been very happy with the results. The president of the division, Jerry McGee, wanted to use the S/3 to help make his Santa Fe Springs branch more competitive in bidding against local competitors. "Parkersburg has been getting some really good information out of the system, such as gross margin on order input daily. I'd like to have access to information like that. Also, I know that we bid some jobs too high and sometimes lose them, whereas others we bid too low and don't make a fair profit on. We've always accepted the average. I know we can do better."

Concerned about the level of service it could receive from service bureaus, Keene decided to install an IBM 3780 data transmission terminal in the West Coast office and transmit data for processing in Parkersburg. To handle the expected additional workload, Parkersburg upgraded its system to a 16K disc-based configuration. This seemed like a logical approach, but there were problems. First, some of the Parkersburg personnel reportedly found it difficult to adjust to the disc-oriented system. Equally unexplainable was the fact that IBM was never able to get the 3780 to operate properly, and it was subsequently taken out. "I tried to find out more about the problem," says McGee. "I have an engineering background, so when I talk engineering to someone, I usually escalate the questioning up the ladder quickly in order to find the level of knowledge I'm dealing with. I asked the salesman whether the input going to Parkersburg was in digital form. He said that there was no need to get that involved—that it was a problem and that his job was to take care of my problems for me. After repeatedly trying to get a yes or no answer out of him, he finally admitted that he didn't know—but that he could find out if I really had to know. Now, that to me is a real disappointment. In the first place, I'm not so sure that I automatically want him to take care of all my problems for me. And secondly, I think that if he didn't know the answer to my question, he should have said so in the beginning. I tell all my sales people that when they get into situations like that, to never hesitate to throw up their hands and say, 'gosh, I don't know the answer to that question, but I'll find out for you.' I think it's much better done at that stage than later." The 3780 was cancelled—and the 16K disc system in Parkersburg was cut back to an 8K card system.

However, the mold was already set for an IBM system in the California facility so the plant placed an order for its own System/3, a 16K disc system slated for delivery next month.

The people problem

Keene located Gary Dunlap, a veteran of two prior S/3 system implementations, and hired him as the dp manager. His first problem was trying to find an operator willing to run the 6405 machine until the S/3 arrives in July. "I'm not very impressed by what

COMPUTING

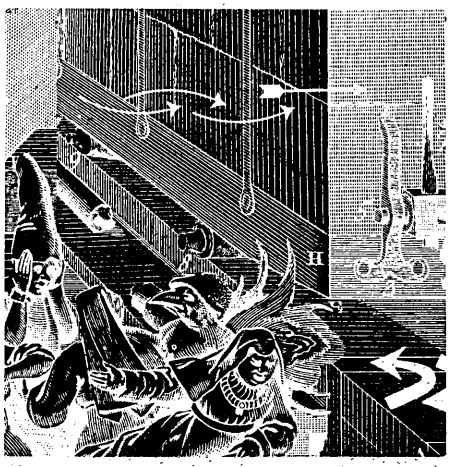
by Michael William Cashman, Associate Editor

I've seen come out of places like the Control Data Institute and other schools. You offer some guy a chance to get in on the ground floor of what will almost certainly be a growing dp operation, he takes one look at the 6405 and says he's a computer operator—he doesn't run things like that. The funny thing about it is that we had to look for a woman to run the 6405 and then the S/3 when it comes in. We were lucky enough to find one. The ironic thing about it is that, simply because she's a woman, she commands a lower salary for that position than a man does—and men were unwilling to do all the things we're asking of her."

In Dunlap's eyes, computing is not the problem. "Anybody worth his salt should be able to do a reasonable job of it. The problem is in people's attitudes toward the computer and the dp manager. In a manufacturing environment such as this, the dp manager has to be familiar with all of the company's procedures, production flow, accounting, inventory, etc. He also has to be a part-time psychologist to soothe the feelings of those who feel threatened by the computer's impact on jobs they've done the same way for years."

"In every installation I've been in, I have been resented to some extent because people think I'm out to build an empire. Also because I'm the new man. In their eyes I have to take territory away from them in order to have some of my own. It's an uncomfortable situation: if I don't ask questions all over the company to learn about the way things are, I'll get hit with the 'well, why didn't you ask the people who've been doing the job for years' question. And if I do ask them, they seem to feel like 'you're the new computer wizard; you're supposed to know these things already!' There's no way out!"

"I think the basic problem is that most people not familiar with the computer think that it will replace them, if they are in the production areas. Either that, or it will fix things up fast on the managerial levels: 'we've been fouled up until now, but let's just



get that computer in here and everything will be okay.' I call that the band-aid approach. It just doesn't work that way. Another problem is in some of the courses IBM must be teaching for management. Managers who have never known anything about computers go to one of these little seminars and come back to me and say 'shoot this report out' or 'shoot that out.' They just don't realize what's involved."

One problem mentioned by many System/3 users was the lack of adequate test time. But Keene is so anxious to get its data processing operation going that it has even run some current data behind the test decks in the 60 hours of test time allotted by IBM—much to the local IBM office's chagrin. One benefit of this, however, is that Keene has been able to make its operation more efficient. This simple little application program shows the type of thing that can readily be accomplished in a manufacturing environment:

An analysis of production labor tags revealed that one man was doing most of the circular cutting on grating. This is considered the hardest operation to perform in the production area and was supposedly being rotated among all the workers. Not wishing to be dependent on one employee for a critical operation—and not wanting that employee to always be stuck with the most difficult job on the lot—Keene quickly scheduled a class on circular cutting, taught by the proficient employee. The chore is now being rotated much more regularly, and the other employees aren't afraid to tackle it.

The computer is anticipated with optimism. After a conversion of the functions being performed on the 6405 accounting machine, the S/3 is expected to tackle some more sophisticated problems, such as sales analysis and inventory. Mr. J. C. Fojo, division controller, is looking forward to being able to meet the corporate headquarter's schedules. "The closing schedules necessitate working more Saturdays than I want to in order to get figures back to Parkersburg. I've never been exposed to the power of a System/3, but if it can handle this kind of thing as fast as I'm told, then I can't wait till it gets here."

Also, Keene has thousands of dol-

lars of steel lying outside the production areas in a place called the "boneyard." It is so named because these steel pieces are trimmings from larger pieces, as remnants of special sizes that customers didn't take delivery on. It is a nearly impossible task to manually keep a running log of what is contained in the boneyard, but it will be possible with the S/3. When orders are received, Keene will be able to check the boneyard file to see if the order can be at least partially filled from stock already on hand—an important consideration with the steadily increasing cost of steel. Says Dunlap, "If we could reduce the size of the boneyard by 20%, we could pay for the computer within a year."

Case II: The delivery

The Western Growers Assn. in Newport Beach, Calif., is a non-profit agricultural service organization whose 400-plus members in California and Arizona account for nearly 50% of the fresh vegetables, melons, potatoes, and strawberries annually consumed in the U.S. WGA's staff performs a multitude of services for its members, in subjects ranging from marketing services to labor relations, legal services, claims services, transportation, standardization, some specialty cookbooks—and even a monthly magazine. With an S/3 coming on-line, WGA's data processing department was hoping to automate many of these activities. Once again, this firm decided to go to in-house data processing capability because of its concern for adequate service bureau support.

A major benefit inherent in the installation of a computer is that it requires the user to organize data in a consistent manner. When Richard L. Lafferty was brought in as WGA's dp manager, his first job was to create the data bases required for the applications programs. In WGA's case, the application that justified the S/3 is insurance claims service; other applications that will be run are fortunate by-products.

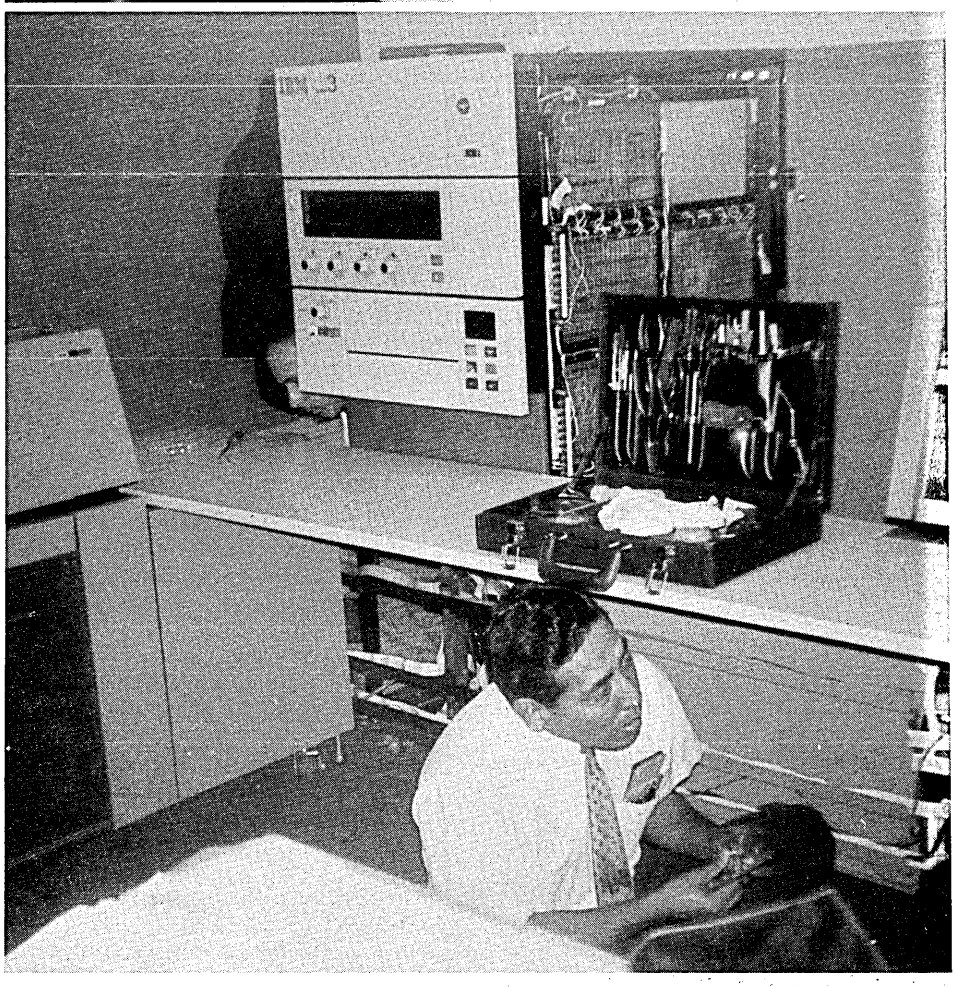
Lafferty is a veteran of one prior System/3 installation, and operated an NCR 500 in Vietnam for the Army. He is very high on IBM equipment—as is every System/3 user we've talked to. "From what I've seen, it can't be beat. I think that some companies have beaten IBM at its own products—such as Decision Data's card preparation equipment—but as far as I'm concerned, nothing can touch the S/3 itself." From previous experience, Lafferty plans to substitute for some IBM media products, such as 96-column cards and disc cartridges, but as far as the hardware is concerned, it will remain totally IBM. "I've seen finger-pointing (between vendors) on mixed configurations and I won't stand for it. When we upgrade the memory size—as we almost certainly will—it'll be all IBM. The security is worth the extra charge."

Lafferty and his boss Edward Parsley, who is assistant to the executive vp, don't seem to have the people problems of some other installations. "If anything, the reverse is true here," says Lafferty. The people here don't know what to expect of a computer, but they're certainly not afraid of it. In learning how things are done at WGA, I've been able to show people easier ways to do their jobs—and even propose some new applications. Their reaction has unanimously been, 'you mean you can do *that*?' It has been very positive, and I think it will last—if I do my job, it will."

Jumping through hoops

The S/3 model 10, with 16K of memory and five megabytes of disc, was slated to be installed sometime during the week of April 22. During that week IBM notified the customer that the equipment would arrive at approximately 2 o'clock Thursday afternoon, April 25. Arrival day was punctuated with calls from the excited IBM salesman asking whether the system had arrived yet, and from the customer

At Left:
Keene Metal Products Div. president Jerry McGee: "I'm not so sure that I want IBM to take care of all my problems for me."



engineer: "Be sure and call me as soon as it gets there so I can start assembling it." At 1:57, the machine was delivered by "Data," a moving company specializing in edp equipment. "I suspect IBM's jumping through hoops since they know a magazine is on the scene," he said. "The last installation I saw didn't quite go *this* smoothly."

After two days of methodical assembly by a pair of IBM customer engineers—who never fail to impress onlookers with their efficiency—the system was turned over to an IBM software technician for generation of the specific system required by WGA. After running diagnostics, the S/3 was turned over to WGA at 10 o'clock Monday morning, April 29, and has been running problem-free production since that time.

Case III: A smooth transition

"John," the data processing manager for a successful law firm in the Los Angeles area, felt he could speak more frankly about his company's recent acquisition of an S/3 model 10 if he and his firm could remain anonymous. "Lawfirm's" transition from manual to electronic data processing is one of the smoothest ever to come to our attention. One could infer from this that John had had prior dp experience, but such is not the case. His training as an accountant and office manager had brought him into contact with nothing more sophisticated than calculators and adding machines, and he was extremely concerned about switching to an in-house dp capability.

True to form for a first-time dp user, Lawfirm had one application that eventually forced it to go into data processing. That application was accounting for the time its people spent on cases. The firm's administrative partner had opposed the acquisition of a computer for several years, feeling that the firm was not ready for the step. However, the capacity of the accounting department to produce control information for management was being increasingly taxed. A new managing partner took over the administration of the firm and soon thereafter attended a conference on law office management. He returned convinced that Lawfirm "wasn't in the 20th century without a computer."

Lawfirm then contracted with a large consulting firm that specialized in working with law firms for help in answering two questions: Was the company "ready" for a computer—both in the sense that the workload justified getting one, and in the sense that its files and procedures were appropriately organized to make the transition easy? And, if it was ready, how should it pursue the matter? The consultant confirmed that the company should switch to data processing, but left it to John and his management to decide whether to use a service bureau, time-sharing services, or an in-house system.

The eventual winner, in-house processing, was running last in John's mind at that time. Why did he change his opinion? The answer to that question is "control"—together with some savvy salesmanship on the part of an IBM representative.

John at first evaluated outside service bureaus. "I found one that could satisfy our needs. But it seemed expensive, and I began to worry about turnaround time and our lack of control over the organization." Similar swift dispatch was given the idea of time-sharing. "Time-sharing is a compromise, and by its very nature a compromise means that you get less than you want or need."

"But I still didn't like the idea of an in-house operation," he says. "I'm a professional (in my business), and I believe in leaving these kinds of things up to the professionals (in dp). Hell, we're amateurs."

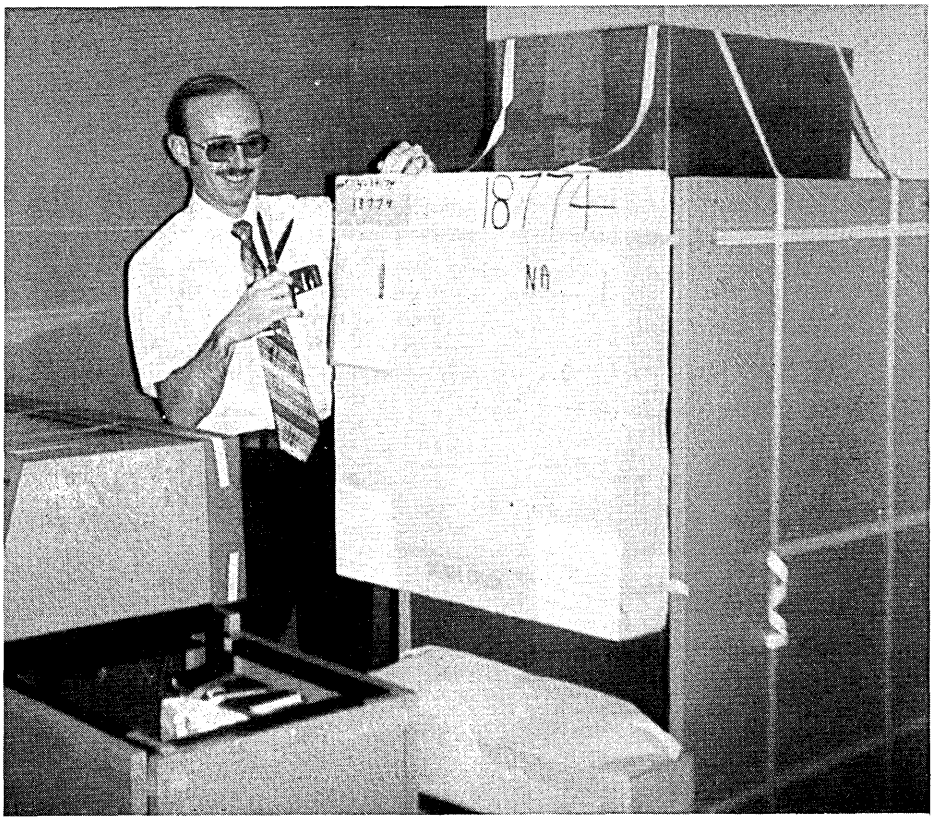
Reluctantly, John set about contacting two potential dp hardware vendors, IBM and Qantel. Apparently he never felt very serious about Qantel, although he took the time to visit a nearby company in another business that used Qantel hardware.

John and his firm's management were convinced they should enter the world of data processing one step at a time, and decided against installing their own machine. John informed his IBM salesman of this fact but was persuaded to meet for another half-hour to talk about it. At the meeting, the salesman presented a list of other law offices in Los Angeles which used the S/3, and asked if John would like to visit some. John had not known that other law firms in the area were using the computer and was encouraged to hear some familiar names. He said he would very much like to visit an installation.

"I spoke with people who were as new to this as I, and I began to believe we could do it. If they can do it, so can we." Unlike the Qantel salesman, the IBM rep took him to see firms which

At Left:
Following two days of assembly and checkout by IBM customer engineers, Western Growers' System/3 started problem-free production processing at 10 o'clock Monday morning.

Below:
An impromptu tape cutting ceremony is staged by Dick Lafferty, WGA's data processing manager.



were in his business, were the same size as his firm, and were processing the same applications he would be. "I saw that the people they had were the same kind of people we had. They just weren't doing things manually."

John went back to his managers to tell them he thought the decision could be changed, and won approval to order a 12K model 10 System/3.

Now that things are running smoothly, "I suspect we will be used as a showcase for firms in our neighborhood," he says. "None of the firms in this immediate area have computers, so I suspect I'll show up on one of those lists pretty soon and maybe show some of my neighbors the installation."

In-house computing isn't so bad

"I've sure changed my mind about in-house computing. If there's a problem—and I expect to have problems—I can get my hands on it quick. I just can't take the chance of relying on someone else's level of service."

Why didn't John more deliberately contact several dp system suppliers and evaluate their offerings and prices? "I'm new at this. My principals were trusting me to do the right thing. I knew that the System/3 worked with law firms as large or larger than ours. I didn't have to be the guy to find out if it would work. And besides, there are a lot of fears that go with getting into data processing for the first time; the word 'IBM' goes a long way toward alleviating those fears."

The same goes for peripherals and supplies from other vendors. "I'm going to run a straight IBM shop for a year." He knows that he can buy discs for much less than IBM asks, for example, and he even has one from Nashua he keeps for his backup system. But the one on the machine is from IBM, because if something happened, his management "would not understand why I would risk efficiency for economy."

There is another factor in his disinclination to shop. "I asked IBM about using other manufacturers' disc cartridges, and they said if the system goes down and it's a competitor's disc that causes it, there's nothing they can do to repair it. Oddly enough, we did have a problem with one of the first three discs we bought from IBM. The salesman took care of that, and other than a minor printer problem, the machine has performed very well."

John located another law office that was willing to sell a time-accounting package it had developed. The price was $5,500. Unfortunately, an additional $5,000 would be required to tailor the package to Lawfirm's requirements. In discussing the problem with his IBM salesman, he was given the name of an independent software house willing to build an all new package for only $11,500, an additional $1K. John immediately opted for it. Lawfirm has no present plans to develop an in-house programming capability. The company will instead rely on the local software house, with which they are quite satisfied.

In deciding how to use the time accounting package, Lawfirm had two alternatives, to get the data from the lawyers' time logs into the machine and use the machine to edit it or to manually edit the data before entering it. They chose the second, and carried it a step further, perhaps because John's background is in accounting. Lawfirm now manually balances a whole day's time logs for all lawyers and all cases before entering any transaction for that day into the data base. "We insisted that only good numbers go into the machine. I want our computer to seem infallible."

"The Boneyard." Says Keene's Dunlap, "If we could reduce the size of that stockpile by 20%, we could pay for the system in a year."

No people problems here

"I couldn't have looked my people in the face if I hadn't at least offered them the chance to step up to the computer. I therefore offered the operator's job to our bookkeeper; and we promoted our timekeeper to the position of controls clerk. It has worked out well. I'm especially gratified by the way both girls have grabbed hold of the machine. They don't seem to watch the clock, and it's obvious they are enjoying their jobs much more now. I told the operator that we'd pay for any training she'd like to take to expand her knowledge of the system, and she has just jumped at the chance. Sometimes that's a problem, though. When she goes to the IBM training center, we have to double up with the controls clerk on the machine. We got into trouble doing that the first time, so now we log every move made by anyone on the machine other than the operator. That works much better."

He has the time to reflect on his firm's transition from manual methods a little now, although he is still working Saturdays on various conversions. "It has its rewards—like the first really good run with real data and all the numbers came out right. But I found myself blowing up at the smallest things. I've never blown my top like that in my life. So I had to tell myself to slow down, that all this would pass. One particularly dark day my IBM salesman called. He sensed something. He took me to a nice quiet out-of-the-way place, and I even had a drink at lunch time, rare for me. I poured out my problems to him. He listened to me until I was finished. He said everybody is going through this and that everybody has to. A year from now all of these start-up problems will be behind you and you'll think of it as a kind of basic training. Not that all of your problems will go away—they won't."

"Things have gone better. We even had a contest to name the new computer. Everyone thought it was a lot of fun."

John is now a part of the computer fraternity and, on balance, is enjoying himself. Plans for the future call for

joining some user groups, including Group/3 and the National Assn. of System/3 Users (NASU). "I think user groups are important. At least they are to me right now. If I get one good idea a year from them, or find out what everyone else is doing, it will be well worth the time and the cost."

Case IV: Recovering from a poor start

Not all System/3s go in quite so smoothly and start producing quite so quickly as the one at Western Growers. A small company just south of Los Angeles found itself with a staggering inventory problem, and engaged a consultant to oversee the implementation of an S/3 model 10. The consultant proceeded to write programs for payroll, accounts receivable, etc., with an eye toward tackling the inventory problem with a bill of materials processor and an inventory requirements planning package. He was still writing even after the machine arrived.

The company, which we will call "Roughco," decided to get an in-house dp manager, and "Bob" was hired through an employment agency. Bob had a good deal of experience on other equipment, but not much on an S/3. To make his initiation more difficult, he had to spend much of his time firefighting at first.

Bob feels that an in-house manager *can* do a better job than a consultant, but he does not feel bitter about having been forced to pick up the pieces. "That was a year ago," he says, "and I'm just now finding out that the information he was given was wrong. He wasn't correctly told what the needs were."

Getting a good, written specification for a job to be coded is still the toughest part of his job, he says. "It's awfully easy to offer up a verbal spec. I would think that since it's going to take weeks to write the program, they could take a couple of hours to write down exactly what they need. But that eats into the time they need for their regular jobs, so they don't do it. Besides, we need the programs so fast."

"Another problem is in production control. Every time we get a new production control man, they all want something different in the way of reports."

Bob got a good deal of help when he needed it from an IBM SE, and is very high on IBM and IBM equipment. The System/3 is the least of his problems. "I've used other manufacturers equipment, but I don't think anybody has a system that can touch the /3. The programs are easy to install, and the system never goes down."

He is still bringing a tough situation under control at Roughco. After a full year, the inventory program has just begun to run right. He admits that for awhile he even considered that the people responsible for the data were padding the numbers to make themselves look good. "But it was just one of those subtle things that took awhile to find," he says.

Bob impresses us as a man still very much in a hurry. His first line of support still probably comes from IBM. It certainly no longer comes from consultants. User groups? "Don't have time for them."

At least things are up and running at Roughco, and the road ahead looks smoother.

Conclusions

If there is one message that comes through loud and clear from the four case histories here—and one that we've heard many times before—it is that the majority of problems associated with small-scale business computers are people problems. Those companies, like Lawfirm, that "promote" existing employees to computer positions seem to be able to eliminate or reduce some kinds of people problems, at least those related to staffing.

The other kind of people problem has to do with resentment on the part of departments that interface with the computer department. With the right kind of preparation, the users face the delivery of the machine with optimism —like Mr. Fojo at Keene who looks forward to taking off a few Saturdays. In many cases, especially like those at Roughco and also Keene to some extent, it's possible that dp can become a scapegoat. When early promises cannot be supported, as occurred at Roughco, or when users are oversold on dp's advantages, as Dunlap suspects happened at Keene, it can become impossible to build the right rapport with users.

The burden of making dp work and building its acceptance falls almost entirely on the new dp manager. His is one of the toughest and loneliest jobs. He must be familiar with systems design, equipment, his company's business needs, accounting procedures, and a dozen other things. He must sometimes be a part-time psychologist, too. He needs all the support he can get.

Says Lawfirm's dp manager, "If I could make one change in the way we did things, I'd want not to be totally responsible for the project by myself. It's so lonely. There's no one to bounce ideas off, commiserate with. No one to say something sounds like a good—or bad—idea. I felt that my bosses left me alone to carry too much by myself. It would have been better to have someone at my level, or higher, in the company, to share the experience."

Another lesson can be learned from the contrast between Lawfirm's use of a consultant and Roughco's. Lawfirm went to an established consulting company with special expertise in Lawfirm's business. The consultant was given a specific assignment and seemed to perform it acceptably well. In Roughco's case, the consultant apparently was not qualified and did not know the firm's business, something Roughco is still paying for a year later.

There also seems to be a wide range of complexity in the installation of any small business computer. An installation in an accounting department where the computer replaces an older accounting machine is very likely inherently easier to do than one in a production environment. Part of this difference in the complexity of installing a machine is certainly due to the fact that well thought out manual procedures already exist for accounting applications, while firms like Keene have put off taking inventory on their boneyard because it is too tough to do manually.

Finally, to give credit where it's due, the equipment seems to be the smallest part of the problem. The S/3 goes in easy, goes up fast, and stays running.

A picture of an "average" System/3 shop begins to form. It is a place where in-house computing may have been avoided in the past but where circumstances and workload have forced a decision to install a machine. In most of these places, the name IBM carries a good deal of weight, and even acts as an insurance policy for the dp manager's job (at least in his own mind). In the shops we have visited, the users are reluctant to turn over their processing to a service bureau, fearing the loss of control of their operation and also the possibility of being kept from the machine when they need it.

The dp managers in these "average" places feel alone and are eager to share thoughts with others in similar situations. There may be 20,000 such people in that many places in the U.S. now, and it is likely that nearly every company doing $5 million a year will eventually join these ranks. Each one of these managers will go through an initiation that parallels one of our case histories to some degree. Which case history he parallels will depend a good deal on how much he can learn from those who have gone before. Hopefully these conclusions we've drawn will help. □

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As laboratory computing becomes ever more essential to scientific investigation, the ability to teach it in college science departments will become mandatory

FORMAL INSTRUCTION IN LAB COMPUTING

by J. R. Brandenberger

Real-time data processing in the physical sciences has increased sharply over the past decade as increasing numbers of investigators have turned to laboratory computers to process data on-line. Computer-based systems are presently analyzing hundreds of bubble chamber photographs each day, acquiring Hall Effect data over a wide range of programmed temperatures, controlling the scanning of fission tracks in solid samples, and so on. Applications that involve computer control are becoming common as well. Computers frequently control spectrometers, basing decisions upon real-time analyses of incoming data. By integrating computers and experiments into closed-loop systems, investigators acquire data at higher rates, reduce data in real-time, monitor experiments more meaningfully, optimize conditions more readily, record a large number of observables for later reference, and investigate possible systematic errors exhaustively.

As laboratory computing becomes increasingly common during the next few years, the demand for expertise in the field will rise sharply, and colleges and universities will contemplate offering formal coursework in this area. In anticipation of this development, a study of the feasibility, suitability and *modus operandi* for teaching laboratory computing to undergraduates was conducted recently. This article summarizes the results of that investigation.

Assuming for the moment that formal instruction in this area is desirable, we proceed immediately to the question of feasibility: can the average undergraduate science department afford a laboratory computer for teaching purposes? If so, what amounts of space, staff time, and technical assistance are required? Obviously these are questions whose answers will vary from one department to the next. However, there are some simple, rather general answers: any physics, chemistry, or engineering department that sees fit to equip its undergraduate laboratories with sophisticated instruments costing in the neighborhood of $10,000 to $15,000 each, can and should begin to think in terms of developing a laboratory computing capability during the next few years. Installations will vary depending upon whether networks or time-sharing systems are available. Some departments will feel that they need complete, self-contained systems even though this approach is more costly. In any case, space is not a problem because these systems are rather small, and maintenance contracts are unnecessary because the systems are very reliable. One member of the existing staff should be able to oversee the operation; students or existing technical help should be able to handle most of the repairs.

Next we consider the computerization of a specific, well-known experiment in hopes of making a strong and obvious case for the computer. The Franck-Hertz experiment will serve as our example, primarily because of its suitability for teaching laboratory techniques. This experiment involves the excitation of mercury atoms from their ground to first excited states—the excitation being induced by electron bombardment in a vapor-filled tetrode located in a small oven. To observe the transitions, one scans the plate voltage and notes a sequence of equally-spaced dips on an otherwise rising plate current. The accepted interpretation of this I-V characteristic is that the spacing between adjacent dips corresponds to the first excitation potential of mercury.

A satisfactory execution of this experiment calls for an investigation of the extent to which four subsidiary conditions—filament temperature, grid potential, screen potential and oven temperature—influence the dip separations on the I-V characteristics. From the standpoint of data acquisition alone, an on-line computer with analog-to-digital hardware would be useful. Recognizing, however, that a thorough investigation of the subsidiary conditions requires the acquisition and analysis of *hundreds* of complete I-V characteristics, one begins to appreciate the dividends that computerization would yield. Given a laboratory computer, one could perform his data analysis in real-time, program a comprehensive investigation of the subsidiary conditions, and still have time to investigate possible systematic errors.

Numerous undergraduate experiments in the physical sciences lend themselves to on-line data acquisition, real-time analysis, and computer control. Students at Lawrence Univ. have attempted such experiments as the Franck-Hertz experiment, a determination of the energy gap in Ge, a measurement of the rise and fall times of a CdS detector as a function of light level and light history, a measurement of the charge/mass ratio of the electron, etc.

Course in lab computing

A formal course in laboratory computing is presently being offered at Lawrence Univ. by the author. The aims of the course are to survey the principles of lab computing, introduce students to assembly language programming, convey an appreciation for the tradeoffs involved in high vs. low level programming for laboratory applications, and reinforce the formal material in the course by requiring that each student develop and program an on-line, real-time, computer-controlled experiment of his own choosing. Prerequisites for the course include an introductory sequence in physics, an elementary electronics course, and some high-level programming experience. Ten or 12 undergraduates enroll in the course each year.

Since the student projects play a major role in the course, formal guidelines are set up to insure that students make steady progress on their projects throughout the course. During the first six weeks of the term, students are required to get their experiments running off-line in a fashion that requires negligible further development before attaching to the computer. To progress beyond this point, students are asked to demonstrate the off-line versions of their experiments, and to provide convincing evidence that there is negligible risk of damage to the computer once the experiment goes on-line. During the remaining four weeks of the

term, experiments are attached to the computer, programs are developed, and completed experiments are demonstrated to the class.

Students feel that the amount of material covered in the first few weeks of the course is a bit staggering, but this is understandable because the instructor tries to cover both LABBASIC and assembly language programming as quickly as possible. Expectations concerning proficiency in assembly language programming are carefully defined and often repeated: students are expected to be able to write assembly language drivers for the laboratory peripherals, but in most cases these will be subroutines that will link to LABBASIC or FORTRAN main programs. By the end of the third week, most students have developed adequate confidence to write assembly-language programs of the required sort, whereupon the number of lectures is reduced from three to two per week in order to free more time for project work. Beginning in the ninth week, students devote full time to their projects.

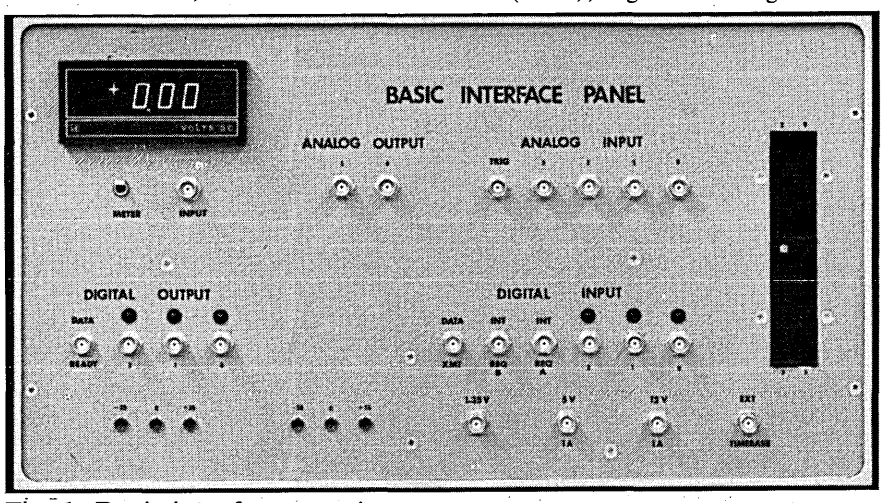


Fig. 1. Basic interface panel.

The course appears to be a success. Students come to appreciate the tradeoffs between high and low-level programming, and they become sufficiently good assembly language programmers to be able to choose the low level route whenever necessary. They also become familiar with common interfacing tasks such as voltage scaling, isolation and how to achieve it, filtering, response and delay times, synchronization techniques, complications associated with long transmission lines, etc. Most realize that computerization is not as simple as they expect, but they become more and more convinced of its utility. Interest in the course seldom wanes; in fact most students claim they slight other courses in order to devote more time and energy to this one. During the final weeks of the course, the computer is used around the clock.

Hardware requirements

The computing system chosen for this project is more powerful than most laboratory computers.[1] The author agrees with other investigators[2] that a minimal laboratory computer requires 8K words of fast memory, a terminal, laboratory peripherals, and some provision for mass storage (usually high-speed paper tape), but he finds the disc operating system on the Lawrence machine to be indispensable. It is the author's opinion that a paper tape system, regardless of its speed, sooner or later discourages program variation and refinement because the manipulation of paper tapes is so tedious. This drawback is serious because it undercuts one of the major justifications for computerized experimentation: the ease with which one should be able to investigate possible systematic errors by varying the control program.

The unique capabilities of a laboratory computer stem from laboratory peripherals—analog-to-digital converters (ADC's), digital-to-analog converters (DAC's), digital I/O systems, programmable clocks, etc.—and the manner in which they interact with the processor through interrupt structure. Four separate ADC inputs, two separate DAC outputs, 16 input and 16 output logic lines probably represent a minimum capability. The ADC and DAC systems should be bipolar and differential, with 12 bits of resolution and comparable stability and accuracy. The ADC system should have a sample-and-hold feature so as to permit the monitoring of reasonably fast signals. Priority interrupt capabilities are important on a laboratory system. One wants to be able to activate certain laboratory peripherals so that they can interrupt the processor at appropriate times, be serviced by the central processor, and then revert to an idle state while the processor resumes the original activity.

To simplify the interfacing of experiments to the computer at Lawrence, inputs and outputs to and from the peripherals have been centralized on a panel called the Basic Interface Panel (Fig. 1). Here the user can access inputs to the ADC system, outputs from the DAC's, the 72 digital I/O lines, and miscellaneous other features. Connections to the panel can be made through BNC and/or edge connectors. The panel also offers +5 V, +12 V, ±15 V and ±35 V supplies for external amplifiers and logic, a 1.353 V reference voltage derived from a mercury cell, and a digital panel meter for testing purposes.

The laboratory computer at Lawrence would cost about $25,000 today. A similar disc-like system that offers only magnetic tape storage would cost about $18,000, whereas a disc-like system with less convenient interrupt structure and less powerful instruction set would cost about $15,000. In the future, however, one can anticipate lower prices as solid state memories and increasing amounts of LSI circuitry come into widespread use. The cost of a system comparable to the one described in this paper should drop as low as $10,000 in three or four years.

Software requirements

Software needs for laboratory computing have been discussed at length elsewhere[2] and need not be reviewed here. The *modus operandi* mentioned above, however, does bear repeating: whenever possible, programming should be done in a high-level language such as LABBASIC or FORTRAN. In those instances where speed, timing, synchronization, efficient use of core, etc., require assembly language coding, the necessary routines should be coded as subprograms that link to LABBASIC or FORTRAN main programs. In this way the scientist (who is not a professional programmer) can minimize the amount of I/O and floating-point code that he must write at low-level.

The LABBASIC language

LABBASIC is a high-level language developed for those applications of laboratory computing where programming ease is of primary concern and compromises in execution time and core

[1] This system consists of a DEC PDP-11/20 with 8K of 980-nsec core, an RC11/RS64 64K disc, a TC11/TU56 dual DECtape unit, a bipolar AD01-D ADC system with 4 inputs multiplexed to a single sample-and-hold, an AA11-D DAC system with two separate DAC's, a KW11-P programmable clock, a ROM boot for the DOS monitor, two DR11-A digital I/O modules, and an ASR-33 Teletype.

[2] S. P. Perone, *Digital Computers in Scientific Instrumentation*, McGraw-Hill, New York, 1973, C. L. Wilkins and C. E. Klopfenstein, *Proc. of Conf. on Computers in Undergraduate Curriculum*, U. of Iowa, 10.1, 1970, C. L. Wilkins and C. E. Klopfenstein, *Proc. of 2nd Ann. Conf. on Computers in Undergraduate Curriculum*, Dartmouth College, 269, 1971, and *Laboratory Computer Handbook*, Digital Equipment Corp., Maynard, Mass., 1971.

use efficiency are acceptable. A superset of PDP-11 BASIC, LABBASIC combines the simplicity and power of BASIC with unique laboratory capabilities made possible by the addition of five new verbs— ADC, DAC, LOGIC, ENABLE and DISABLE—and the generalization of four standard verbs—GOSUB, RETURN, OLD and SAVE. With this expanded verb repertoire, users can make a variety of high-level calls to laboratory peripherals, mass-storage devices, user-developed assembly language routines, and high-level interrupt handlers. Laboratory versions of BASIC have been available for some time, but most appear to be inadequate in one or more of the following areas: the use of meaningful mnemonics for coding calls to laboratory peripherals, the support of hardware interrupt features, and the flexibility with which assembly language routines can communicate with high-level main programs. In these three areas, LABBASIC is comparatively strong and unique.

Under LABBASIC the SAVE and OLD commands can be used to store and retrieve user programs on DECtape. To specify DECtape rather than paper tape as a medium, one issues the command SAVE(N) or OLD(N), where N, the storage sector index must lie in the range between 1 and 25. LABBASIC DECtapes have 25 storage sectors, each one capable of storing 4,608 words; to conserve core space, directory management features have not been provided for this system.

Analog-to-digital conversions are called with the ADC verb. Its argument list admits considerable variation, as the following calls illustrate:

```
10  ADC(1,X2,A)
15  ADC[1,X2,Z(2)]
20  ADC(0,X1,D;2,X8,E;3,X4,F)
25  ADC[3,X2,S: 5, 1000]
```

The simplest type of ADC call,

```
ADC(channel, gain, LABBASIC
    variable)
```

requests an immediate conversion of the voltage existing on the selected channel (0, 1, 2 or 3) at a prescribed gain setting (X1, X2, X4 or X8) followed by storage of the value in the variable's storage location. Within 1 usec of the initiation of the conversion process, digital output bit 0 on the interface panel is set for synchronization purposes.

This call can be extended to say as many as eight channels, gains and variables; for example the statement:

```
20 ADC(1,X2,A; 0,X8,B; 3,X1,C)
```

calls for a sequence of three conversions starting on channel 1 and ending on channel 3. Since the entire string of conversions is completed before the results are converted to floating-point format, the time interval between successive conversions is quite small (about 50 usec). If the call is to be suspended until a trigger signal is received at the ADC trigger input, the user encloses the argument list in square brackets rather than parentheses.

Another type of ADC call involves a timed burst of conversions:

```
ADC[channel, gain, array name: #
    of samples, time interval]
```

The first three arguments are similar to those described above except that the variable must be a one-dimensional array. When LABBASIC encounters the colon, however, it interprets the trailing arguments to be the desired number of samples and the desired time interval between successive samplings. To expand a timed call to a sequence of channels, one merely includes additional channel/gain/array combinations separated by semicolons. Timed calls can be triggered by applying an appropriate signal to the ADC trigger input.

Digital-to-analog conversions are called with the DAC verb; its general form is:

```
DAC(channel, LABBASIC expres-
    sion)
```

where the first argument must be either 0 or 1 (only two DAC's are available) and the value of the second argument must lie between +1.0 and −1.0. Execution of this call leads to an output voltage on the designated channel equal to 10 times the value of the second argument. Execution time is about 5 msec or more depending upon the complexity of the expression.

The LOGIC verb, which handles most of the calls to the digital I/O lines, requires a single argument—either an octal constant as in:

```
45  LOGIC(5)
```

or a LABBASIC variable, as in:

```
65  LOGIC(V)
```

In the former case, the call is interpreted to be an output command; LABBASIC places the binary equivalent of the octal constant on the digital output lines. In the latter case, the call is interpreted as an input command. LABBASIC converts the input bit pattern into its floating-point equivalent, and sets the LABBASIC variable equal to that value.

Interrupt features

LABBASIC supports the interrupt capabilities of the clock and digital I/O modules. That is, these peripherals can be programmed to interrupt the processor at appropriate times, thereby permitting real-time data reduction amidst data gathering and control operations. Interrupt programming involves the verbs ENABLE, DISABLE and RETURN, the first two being new and the third a generalization of the standard BASIC verb. When referring to the clock, the ENABLE verb requires three arguments enclosed in square brackets:

```
ENABLE[line number, maximum
    # of interrupts, ΔT]
```

The first argument identifies the first line of the high-level interrupt handler to which LABBASIC jumps when an interrupt request is granted. The second argument specifies the maximum number of interrupts that are to be granted before the clock's interrupt structure is disabled, and ΔT is the timing argument which, when multipled by 0.1 sec, specifies the time interval between successive interrupts. While a given interrupt is being serviced, the processor denies all other interrupt requests. Only when LABBASIC executes a RETURN statement (at the end of an interrupt handler) does the system restart the clock, once again become receptive to interrupt requests, and resume the process originally interrupted. The number of interrupts need not eventually equal the second argument in the ENABLE statement in order to shut down the interrupt service. Instead, one can use the DISABLE verb which, when interpreted, leads to a disabling of the interrupt structure.

To activate the digital I/O modules for interrupt service, one uses a slight variation on the ENABLE verb with only two arguments. Interrupt request signals are connected to the appropriate connector on the Basic Interface Panel; these signals must be TTL-level transitions from Lo to Hi dwelling at the Hi long enough for the request to be granted (typically 20 usec).

Linking programs

LABBASIC's GOSUB (. . . .) verb represents a generalization of the conventional GOSUB statement and serves to link LABBASIC programs to assembly language routines. When LABBASIC encounters a GOSUB (. . . .), it passes control to an appropriately loaded assembly language program. The GOSUB (. . . .) verb can have any number of arguments—the following calls represent valid examples of GOSUB (. . . .) statements:

```
10  GOSUB(2)
20  GOSUB(2, A, X*2 + 3.5578,
        W(38), I)
```

Upon yielding control to the assembly-language routine, LABBASIC leaves one of its registers pointing at the left parenthesis. It is then up to the programmer to decode and/or evaluate all arguments in the list. Often this task is expedited by trapping to LABBASIC modules for ASCII-to-integer conversions, numerical evaluations, and the like.

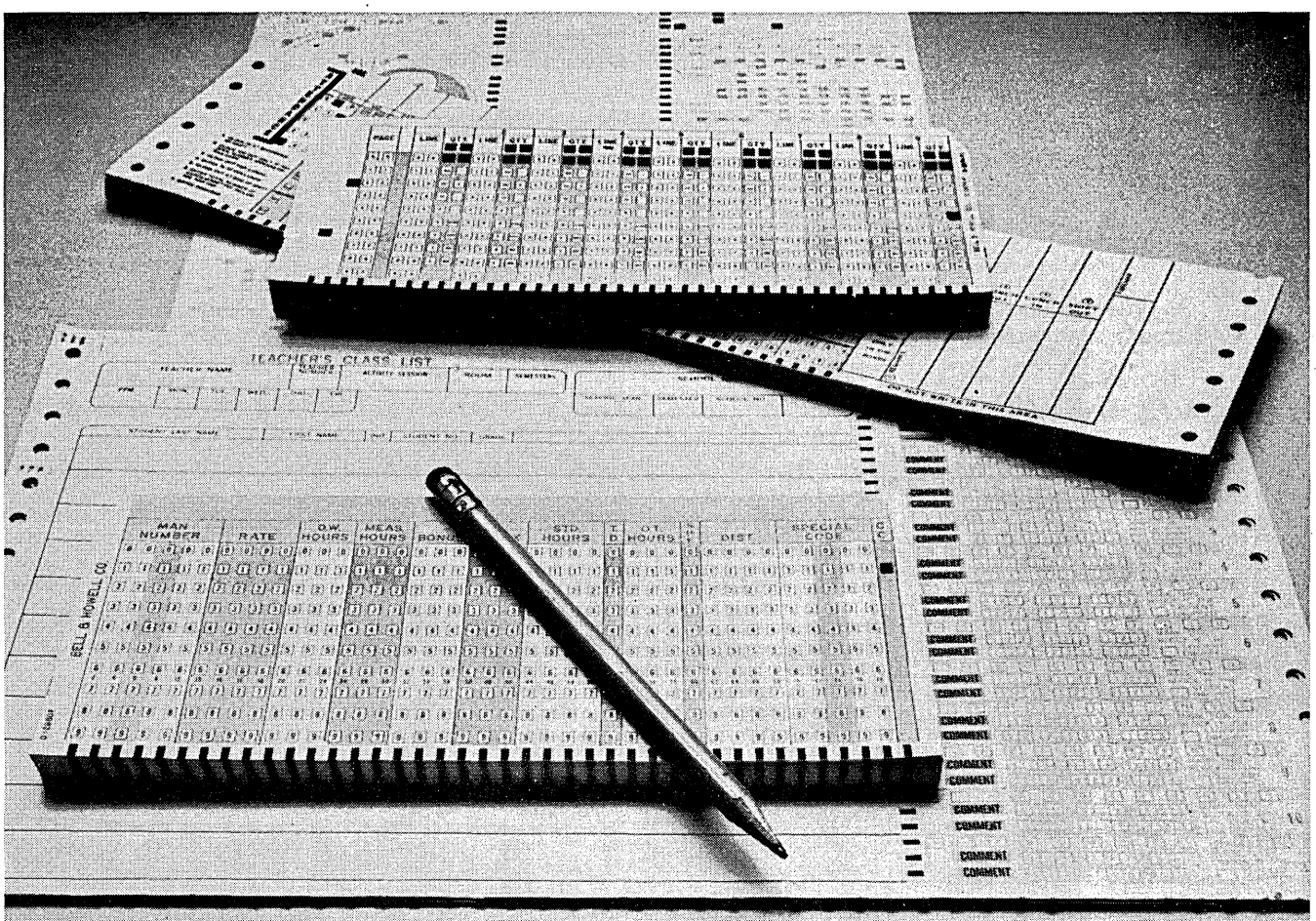
The premise that laboratory computing will soon become widespread

INSTRUCTION

can hardly be questioned. Minicomputer manufacturers obviously view the scientific sector as a significant part of their expanding market. Instrumentation manufacturers are moving into the minicomputer business itself because they foresee a growing demand for computer-based instrumentation systems. The major multichannel analyzer manufacturers and the manufacturers of signal-enhancing equipment are also moving in this direction. Significant segments of the scientific community might hold out against computer-based instrumentation systems, but sooner or later these groups will capitulate because in the not-too-distant future, instrumentation manufacturers will be building microprocessors into instrumentation systems.

The cost of teaching laboratory computing is still a bit high, especially when one realizes that the teaching of this material must be viewed as an enrichment of an existing program rather than as some kind of innovation that will lead to economy. However, it is the author's opinion that the capacity to teach lab computing both strengthens and broadens the base of an undergraduate science department. Majors and non-majors with or without professional ambitions seem to find the techniques of laboratory computing interesting. Future employers and/or thesis advisors cannot help but view expertise in this field as very desirable. Certainly, if the commonly accepted projections related to hardware costs, the proliferation of minicomputers and microprocessors, and the demand for real-time expertise continue to move in the present directions and at the current rates, then there can be little doubt that programs similar to the one described should be established at many undergraduate institutions. □

Dr. Brandenberger is an assistant professor of physics at Lawrence Univ., Appleton, Wisconsin. His primary interests lie in the areas of atomic physics, fundamental constants, and lab computing. He has a PhD from Brown Univ.



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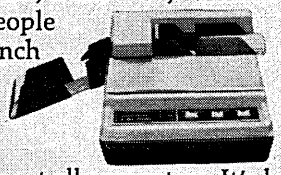

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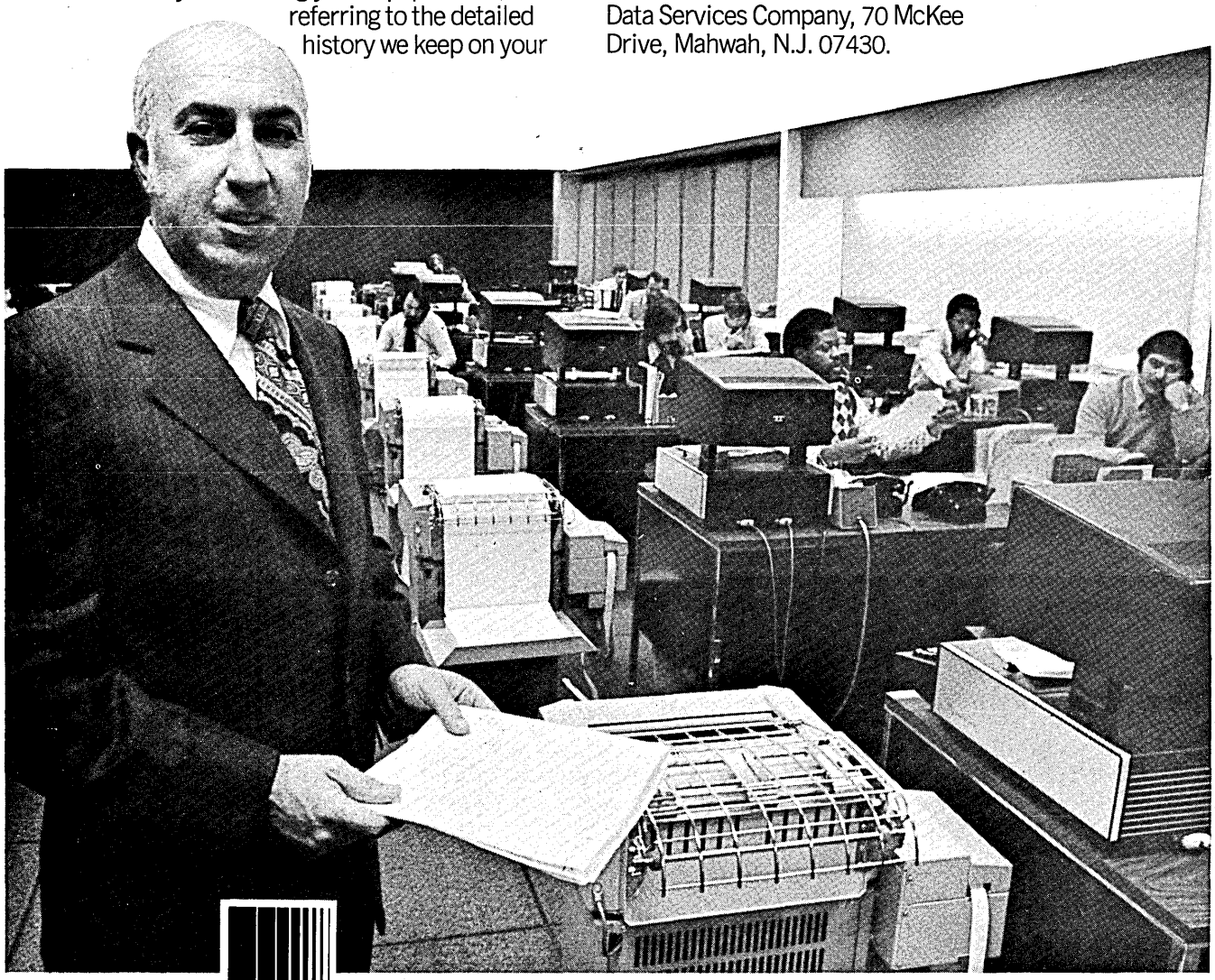

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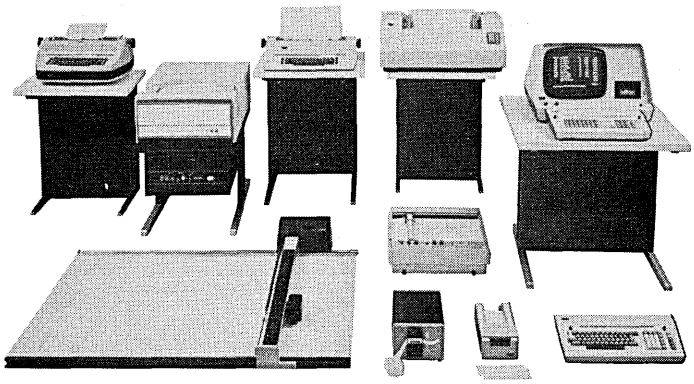

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As late as 1970, IBM's terminals were uncompetitive and vulnerable. Since then the 3270, a new communications method, and the gas panel display have been introduced. More is on the way.

IBM's STRATEGY IN TERMINALS

by Ronald R. Cooke

IBM's approach to terminal product development in the pre-1970 period, like that of most of its competitors, was essentially one of rifle shooting specific targets of opportunity as they were identified. Frequently, these developments were initiated in response to the apparent success of competitive announcements, and although the resulting program encompassed some very successful products, it lacked cohesive direction and comprehensive planning. Several market opportunities were missed, and the integration of terminal strategy with cpu hardware/software systems migration strategy had not occurred. Using this approach, average terminal program profitability had fallen to 11% by 1968, and IBM estimated its share of the market to be 57%. (If Teletype equipment is included, the IBM market share is closer to 40%.)

A strategy evolved during 1968 to pursue the job and operator oriented market segments. IBM's goal was to capture 85% of the terminals on 75% of the communication systems, and thus have 64% of the total terminal market. Each new terminal developed was to have a profitability objective of 30%. Weaknesses were identified in low speed terminals, a product area dominated by Teletype Corp., and crt displays, where vendors such as Univac and Sanders posed a considerable threat.

The terminal segment of the total edp market drew increasing attention during 1969 and 1970. Of the various, and sometimes conflicting, forecasts that were made, those completed during the later part of 1970 seem to have been the most reliable. Comstat (Competitive Statistical Analysis: an IBM corporate group charged with the responsibility of tracking the sales of competitive vendors) was now including terminals in its evaluation of market penetration made by plug-compatible manufacturers (PCM) and oems. The Management Committee (MC) had escalated terminal planning to the status of a Key Corporate Strategic Issue, and specific responsibilities had been assigned in the development of terminal products. DPD (DPD or DP: Data Processing Div.) estimated that 3,041 IBM 360 mainframes were supporting teleprocessing (TP) systems and that by 1975 this number would grow to 6,772 360/370 systems. Assuming a compound growth rate of 26% from 1970 through 1975, the total market for terminals attached to IBM mainframes would increase from 112,000 units in 1970 to 376,000 units in 1975.

The emphasis on terminal planning and development had produced sufficiently satisfactory results to allow their removal from the Key Corporate Strategic Issues list in December of 1970. By that time, the MC felt that the necessary steps had been taken to properly organize the planning and marketing of terminal products. Remote computing would now become a subtopic of NS/FS new systems strategy, and data communications would be folded into the corporate management system.

The selection of technology upon which to base terminal product development had evolved from a commitment to N-channel circuits to a (management) preference for P-channel circuits because of their cost and

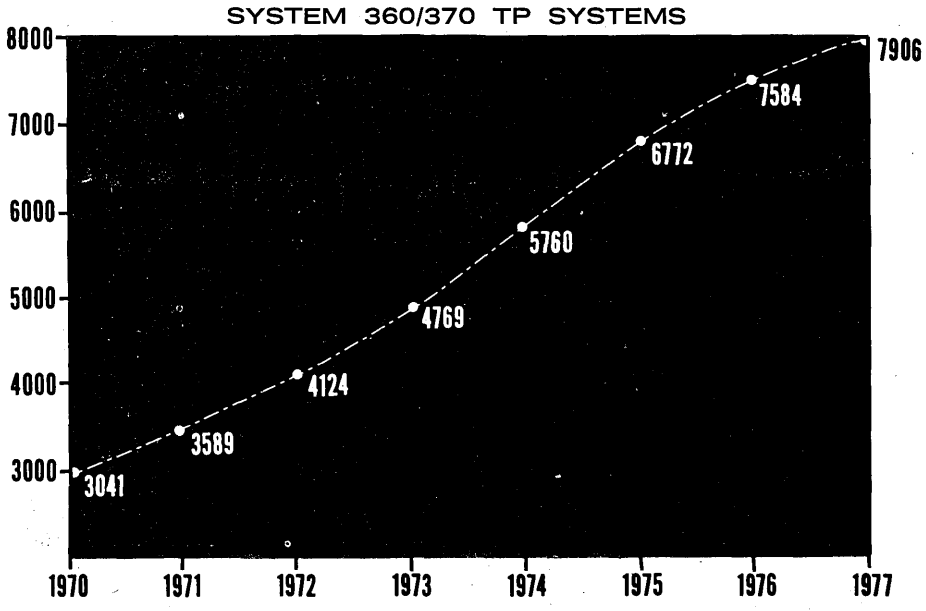

Fig. 1. IBM's early projections for 360 and 370 systems supporting teleprocessing convinced the Management Committee to devote more time to the terminal product lines, and reaffirmed the desirability of virtual storage operating systems.

This article is taken from a chapter on terminals in Quantum Science Corp.'s "Telex/IBM Multiclient Study." This study evaluates the marketing, product planning, and sales strategies of IBM and its competitors, as revealed in documents made public as part of the discovery proceedings in the Telex vs. IBM litigation.

manufacturing advantages. The long range goal was to be heavily involved with LSI/FET technology.

IBM's outlook

The similarity of data preparation and terminal products has led IBM to the conclusion that the majority of its standard data preparation/terminal product offerings and many of its custom terminal requirements can be met through the use of the building block approach where a common set of components (displays, keyboards, controller modules, etc.) are used throughout these product sets. Consequently, IBM concentration is now on low cost technology (printers, power supplies, a new crt display, gas/plasma panels, keyboards, and supporting programmable LSI/FET logic) and a comprehensive planning approach to product development.

Terminal products will be used to increase cpu sales, and increase the size of installed cpu systems. There will be a heavy integration of terminal software/hardware architecture into host operating system and applications software packages. Emphasis will be on the exclusivity of IBM's combined hardware/software approach. The software control of remote terminals through user-defined software will be gradually introduced in a series of new product announcements.

When you're IBM

IBM's *pre-1970* assessment of its position in the terminal market would have to be:

1. Conservative. The diversity and volume of user applications was not clearly understood, nor was the resulting impact on cpu and terminal hardware/software migration.
2. Unimaginative. The use of terminals as a means of "growing" accounts, while a natural sales strategy, was not yet a real consideration in cpu hardware/software marketing strategy.
3. Vulnerable. While the weaknesses of IBM terminal products were recognized, there was never the same intensive effort to meet the competitive challenge that can be seen in the multivolume plans and careful organizational assignments that characterized cpu, memory, or peripheral programs. The evolution of terminal technology and its impact on the price/performance characteristics of future product offerings did not receive sufficient directive attention during the pre-1970 period.

Yet, despite the noncompetitive nature of many of its products, despite being a follower rather than a leader in the introduction of new technology and concepts, and despite the fact that its salesmen occasionally preferred to accommodate competitive terminal equipment rather than grapple with the problems of internal offerings, IBM continued to be the leader in the sale of terminal systems. IBM could always seem to marshall the "total systems vendor" concept as an effective selling tool.

When you're IBM, the only solution to a terminal systems problem better than a 360/40 is two 360/40s, or better yet, two 360/50s. The watchword was sell cpu's, sell core, and sell disc files. In short, sell a hardware solution.

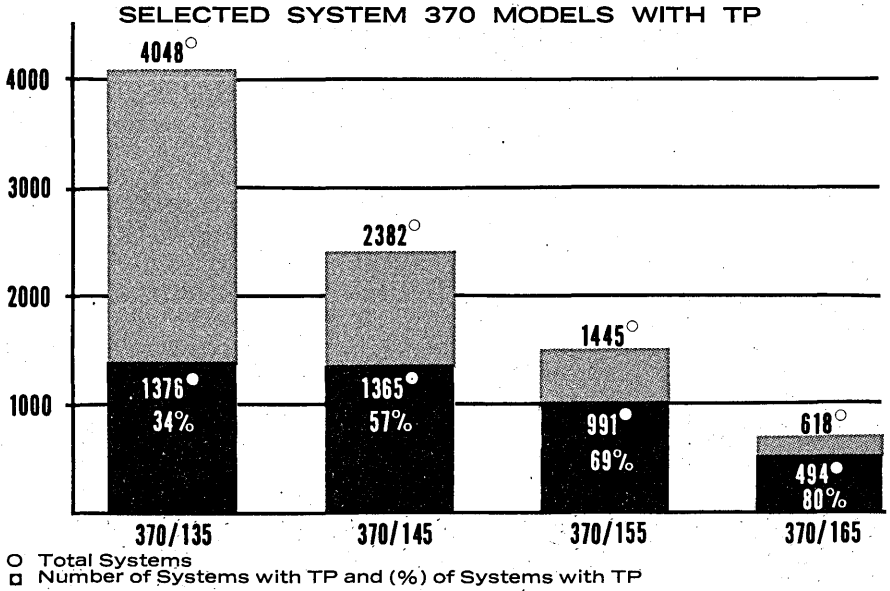

Fig. 2. IBM's internal discussions centered on the amount of systems growth which would be generated by expanding terminal systems. It was evident that teleprocessing sells hardware.

Market projections

The growth of the teleprocessing market is covered by the Telex/IBM papers as it relates to cpu, core, and software systems migration. IBM's considerations then centered on the relationship of systems growth required to support expanding terminal systems.

The growth of 360/370 TP systems from 1970 through 1977 has been charted in Fig. 1. Based on data available to IBM in December of 1970, it reflects IBM's evaluation of TP systems growth assuming the availability of VS1 and VS2. This projection is further amplified by Fig. 2, which projects the 1975 year-end inventory of Systems 370/135, 145, 155 and 165 with TP system support.

Forty-six of the 105 programs listed by DPD Market Development in October, 1970 were either projects or feasibility studies associated with on-line applications. Among those listed were financial terminal support, automated communications, course writing, FASTER enhancements, 2250 graphics support, manufacturing media processing, securities systems, and interactive airline terminal support. Most of the remaining programs were aimed at System/3. The IBM Advanced Administrative System (AAS) which processed IBM's internal order, installation, inventory, and billing data, was assumed to be a forerunner of the application systems which would be in common use during the middle and late 1970s.

Table 1 (p. 58) depicts the projected total number of terminals by system and the average number of terminals per individual cpu. Table 2 (p. 59) shows IBM's estimate of competitive terminals installed at year-end 1970.

The 3270 (ANR) project

In April of 1970, IBM projected that its revenue from display systems would grow from $44 million in 1970 to $200 million in 1975. Included in this projection was project ANR, an Alpha Numeric Replacement for the 2260. The development cycle for ANR was started before the Management Committee had approved the processor-based strategy for terminal products, and prior to IBM's program emphasis on the development of "in-house" low cost circuit technology. Consequently, ANR lacks the software capability defined in later planning cycles as being desirable and has been built, at least initially, with vendor-supplied components. As a project, ANR suffered from its own "communications prob-

lem" because well along in the development cycle the program was indirectly criticized when IBM's exposures in the information display market were described by DP as being unknown. This problem was rectified the following month, however, when the Management Committee reviewed the CTC (Corporate Technology Committee) approved strategy on displays which included ANR and the VLCD (Very Low Cost Display) program. It is evident that with the swing of planning emphasis to Viatron-like technology, ANR became a less popular concept.

While the technology of the 3270 may not be what IBM would like to see in future products, its functional capabilities came none too early to rescue a troubled 2260 program from the assaults of Four Phase, Raytheon, Sanders, and Computer Terminals Corp. (Datapoint). While IBM will undoubtedly have to pursue a processor approach similar to Sanders or Raytheon in the next generation of display products, the 3270's availability at this point will allow IBM to develop a whole new set of display software support for integration into its new data base/data communications systems environment.

In August of 1971, IBM (in the quarterly competitive reviews) identified the minicomputer-based crt systems as being the greatest threat to the 3270. It was felt, however, that the flexibility or slight pricing advantage of these configurations would not be a

SYSTEM	Compound Growth Rates from 1969/1970 26%	30%	35%
370/135			
Total Terminals	20,280	24,302	29,006
Terminals/CPU	15	18	21
370/145			
Total Terminals	70,227	84,156	100,452
Terminals/CPU	52	62	74
370/155			
Total Terminals	97,642	117,008	139,666
Terminals/CPU	99	118	141
370/165			
Total Terminals	44,690	53,554	63,924
Terminals/CPU	90	108	129

Table 1. Terminals by 370 System, 1975.

Key Dates in IBM's Strategy Planning

IBM recognized that its communication programs effort lacked cohesive and comprehensive direction. "Getting it together," however, required a repetitive process of review and planning.

March 11, 1968. The first ground rules had been laid by the CTC* for determining the hardware strategies needed, and some generalized directions for uniting communications development with terminal development had been discussed. The overall relationship of terminals to account strategy, market share, and technology, however, was still uncertain and IBM needed to assign responsibility for the development of an overall TP systems strategy.

July 1968. The DP Group was assigned to study the size and direction of the terminal market, and to estimate IBM's share.

October 1968. Communication products were tagged to be included in Comstat statistics beginning in 1969, and an initial strategy to go after the job and operator oriented markets was discussed the following month. DP group had reviewed the interaction of terminals with IBM's competitive/profit posture and reached the following conclusions:

- Raleigh's manufacturing costs were in line.
- Labor rates and burdens had a negligible effect on costs because of the low labor content in manufacturing.
- There was no cost advantage to manufacturing terminals overseas.
- Terminal capability (products) did not really impact the win/loss statistics in cpu sales.
- Single vendor responsibility as an inducement to buy IBM terminals was inversely proportional to the user's sophistication.
- System size, particularly in memory, increases rapidly with the addition of terminals.
- Cpu growth tends to occur regardless of who supplies the terminals.
- As systems configurations grow in response to the addition of terminals, the overall percentage of profit for the total system tends to remain about constant.

* CTC, Corporate Technology Committee, a group chartered to review the feasibility of using new technologies, ensuring that new product developments would be based on the best technology "reasonably" available, and to ensure the integration of products in the development of major programs.

The market for terminals was projected as being $47 million in 1968, $67 million in 1970, and $125 million in 1973. Terminal profit had now declined from 24% to 9%. Project ANR (the 3270 crt display system) was "in plan" at this time.

March 10, 1969. An "Action Plan" to develop an overall strategy had been initiated for large data base systems. By mid-1970, the planning emphasis initiated by this study would have a substantial impact on IBM's assessment of 370 core requirements for TP applications, the need for VS in order to effectively utilize interactive devices, and the interrelationship of operating systems, applications, and terminals as a cohesive system.

April 1970. The CTC approved a strategy on information display systems. The weakness of the 2260 in the face of considerable independent competition was recognized. The action plan included the introduction of ANR (3270) during 1971 using vendor supplied components, the development of new IBM circuit technology, a new VLCD (Very Low Cost Display), and a gas panel display. IBM did not anticipate having a superior technology across the terminal product line until 1975. Revenue was now expected to grow from $44 million in 1970, to $200 million in 1975.

July 1970. A Communications task force had been formed and its work reviewed. It was concluded that IBM had a significant exposure in terminals, multiplexors, and modems. As a result, multiplexor development schedules had been moved up, and emphasis had been placed on the sale of modems. There was still a lack of strategy in the low end of the multiplexor line, a major exposure in the area of terminals, and a concern that the programming overhead associated with OS would limit the effectiveness of communications based systems in a high traffic environment. IBM's approach to message switching was judged to be confused as a result of a diffused product responsibility. The brightest spot was Carnation (IBM's Private Branch Exchange, PBX, product program) where IBM was judged to be technologically ahead of competition.

The conclusion was that IBM must provide a total system to be

em. The 3270 was, therefore, as being equal or superior to any product on the market.

Carnation project

e most significant development in nunications since the Caterfone ion in 1968 has been the FCC deci- approved unanimously, to allow independent carriers into the specialized common carrier field. This entry was upheld by the federal court in Philadelphia in December of 1973.

Concurrent with these developments, IBM's Management Committee has assumed the position that there should be no regulation of data processing, that common carriers should be allowed to enter the data processing field (but with specific safeguards), that IBM should identify user data communication requirements and cover these with the carriers, and that carrier facilities should be capable of both voice and data transmission. The FCC was inclined to take a position that data communications as administered

TERMINAL CLASS	ON IBM CPU		ON COMPETITIVE CPU		TOTAL	
	Installed	On-Order	Installed	On-Order	Installed	On-Order
ch	21,395	2,932	33,768	7,108	62,782	12,427
;tom	2,371	2,750	49,555	6,220	55,774	9,118
	7,868	210	9,548	1,068	22,250	2,615
;rator	7,302	4,635	15,159	2,159	22,811	7,794
I Displays	3,987	3,093	13,605	11,641	19,065	18,623
TOTAL	42,923	13,620	121,635	28,196	182,682	50,577

e figures reflect terminals installed at year-end 1970. had about 100,000 terminals installed, or 35% of the market. It seems apparent that the document these ;ers were taken from was not accurate; there should have been more competitive equipment installed on IBM mainframes than shown here. (The "Total" figures include some terminals that could not be split between competitive cpu's and IBM cpu's.)

le 2. Competitive terminal installations.

successful in a market characterized by complex systems and mass terminal utilization. For that purpose Systems Development Div. (SDD) was now in the process of setting up a communications subsystem architecture group in Raleigh. The Management Committee, while agreeing with the presentation, concluded that IBM's most serious problem was the lack of low cost technology in circuit components, power supplies, and printers. Emphasis would also have to be placed on finding ways to minimize the maintenance requirements of relatively low cost products.

December 1970. The number of communication products under development had been reduced substantially. This allowed IBM to focus its attention on the standardization of technology and the centralization of architectural planning. Problem areas identified included escalating field engineering costs, the lack of low cost I/O technology, and the need for marketplace emphasis. There were, at this time, no less than three task forces in session to help with the resolution of IBM's direction in the terminal/communications market.

March 1971. The ongoing Management Committee review of the communications marketplace indicated that in the areas of keyboard printers, keyboard displays, low speed batch terminals, high speed batch terminals, and communication controllers, IBM's strengths of maintenance support and reliability (RAS) were still being offset by functional price/performance deficiencies. IBM's keyboard printers were deficient in function relative to competition, the 3270 crt display system, although a superior offering, was too high in price to cover the entire display market, and while the 3735 was clearly a competitive low speed batch terminal, it lacked sufficient printer, cassette, and ASCII options. System/3 was now a strong, high speed batch terminal offering. The 2780, however, was rated as being deficient because of its lack of flexibility.

The MC agreed that this was a fast growing marketplace, that IBM's position in it was weak, and that its high growth potential was not exploited by the current plan. It was noted that IBM's data entry devices shared the same cost/functional problems which plagued terminal products.

June 1971. The CTC returned to the MC to again review the communication system strategy. Raleigh and Kingston had recently been "remissioned" with the intent of redirecting technical and product activity. Raleigh was now responsible for batch terminals and multiplexors, Kingston for interactive terminals, and line switching. IBM's new strategy called for the tailoring of TP products from a series of standard modules. Some 60 people were in place to work on industry applications. Every third level product would be a basic processor with native I/O device attachment capability. The required universal (LSI/-FET) controllers would be the basis for a family of products due for announcement in 1973. The exposures of this approach were identified as being the risk of selecting the wrong technology, and the management problem of implementing the standardization policy.

March 1972. This newer program was subsequently reviewed by the MC. The CTC reported that there was a need for an overall data entry strategy which would encompass both Systems Development Div. and General Systems Div. products. It has been previously agreed that the development of a compatible product line was a key objective in the data entry strategy, and the architectural responsibility had been assigned to Raleigh. CTC concluded there still was no overall plan covering IBM's product sets from key entry to intelligent terminals and operator oriented systems. There was an overlap and noncompatibility between SDD and GSD product lines.

July 1972. The strategy had been reidentified. Working jointly with the Marketing Div., SDD and GSD planned to standardize second level products to achieve lower costs, provide applications solutions to industry problems through a combination of unique terminals and proprietary microcoded programs, and develop a family of data entry products based on the second level modules used for terminals. Additional work would have to be done to assess probable competitive response to this strategy, develop price/performance targets for products in these areas, identify the need for high performance systems, and define the required advanced technology programs. The objective would be to grow at a compound annual rate in excess of 25% per year. Profitability remained a problem. □

and run by private vendors would come under its jurisdiction. The MC concluded that IBM and AT&T would eventually come into conflict, but IBM preferred to do this in private rather than in public. The proposed higher rates for terminal interconnection, based on usage, would have a negative effect on the growth of the terminal switching and device market, as would the constraints posed by the lack of sufficient data communication facilities by the mid-1970s.

The provision of switching is defined as the interconnection of communication transmission facilities between two or more users. Carnation performs this function as an in-house Private Branch Exchange (PBX). It was in the product test before the end of 1968. The financial program at that time projected 1,623 units, $1.5 million in revenue, and a profit margin of 19.4%.

A Carnation Task Force reported to the Management Committee on February 12, 1971. The conclusion was that it should be announced in the U.S. during 1972. The profitability estimate was raised to 19.8% with a profit crossover point of 1980. In March the follow-on presentation concluded that Carnation would significantly enhance IBM's total communications capability in a number of ways. It would:

- increase terminal availability while decreasing effective usage costs,
- improve message switching capability by reducing connect time,
- ease the data communications growth path by increasing the flexibility of audio enhancements and video switches,
- and allow the future tie-in of common functions for related products, such as the 3705, 2790, and System/7.

The MC agreed with the conclusions of the Task Force, but questioned the need to have line switching optimized on voice transmission as opposed to data transmission. It was fairly clear that a different switch would be required to optimize on the transmission of data, as opposed to voice communications, and this would be to IBM's advantage. DPD gave strong support to the plan because of the 55 million NSRI (Net Sales Revenue Increase: the net increase of sales revenue for a given period over the previous period) points forecasted during the plan period, and the natural tie-in to the rest of IBM's product line. New forecasts indicated a domestic profit margin of 15.6% at the medium price, and 16.7% at the high price. Worldwide profit margins would be 22% and 21.6%, respectively. The assumption had now been made that IBM would move aggressively with Carnation abroad; and, therefore, expenses related to the domestic decision would be those which are made exclusively for that purpose.

The DP Group recommendation was accepted, based on the fact that Carnation was a unique product offering, a new business opportunity, enhanced IBM's communication systems capability, and would serve as the basis for future communications development.

However, the decision to market Carnation domestically was not so easily made. In August of 1971, it was pointed out to the MC that the domestic sales environment differs from that found in World Trade. It is essentially a lease market, configurations are typically larger than those in Europe, and the existing vendors are few and well entrenched. Additional problems relate to the need for providing turnkey contracts covering the acquisition of headsets, wires, maintenance, and operating expenses. Eighty per cent of the forecast was tied to older buildings where it is necessary to install over weekends. It was agreed that there were significant exposures and these would be compounded by the necessity of dealing with multiple vendors on an installation by installation basis.

By January, 1972 Carnation 1 (2750) had yielded net sales in Europe of 98 units against an original objective of 44 units. Twenty-six of these were internal to IBM. The plan for Carnation 2 (3750) included a January, 1972 announcement, 40 sales during 1972 (plus 15 more 2750s), $400,000 of additional revenue, a total forecast of 900 customer acceptances over a 10 year period, a revenue of $1.6 billion for World Trade, and a profit of $209 million (a 13% profit margin). The plan was rejected because it failed to obtain sufficient purchase revenue and a revised plan was requested.

A domestic Carnation?

IBM would like to announce Carnation domestically. The positive aspects of such a move include the pursuit of a new marketing opportunity, and the integration of TP systems with voice switching functions. This move would make it even more difficult for a PCM to pursue the IBM terminal market because Carnation could be interrelated on a software basis to the 3704/3705 communication controllers and hence host mainframe software.

On the negative side are the low profit aspects thus far encountered with Carnation, the problems that moving into the domestic PBX market would pose, and—not least of all—the potential problems of dealing with AT&T.

There are six factors which will guide this decision:

- Can acceptable profit margins be secured?
- Will the introduction of Carnation materially enhance the security of IBM from PCM competition?
- Would IBM be able to remain free from FCC regulation and/or disclosure procedures?
- Can the plan for Carnation be integrated with a plan for providing nationwide private line services? And if so, how will FCC regulation be handled?
- What competitive options are open to AT&T?
- Assuming a move with Carnation causes AT&T to gradually withdraw as an IBM customer, would the profit from Carnation offset the long term profit loss from AT&T?

The outcome is not clear.

Potential IBM moves

Clearly, IBM is no longer as conservative, unimaginative, and vulnerable in its terminals program. For instance, it is possible to project the following potential moves by IBM in the 1974-1979 timeframe:

1. Color display and graphics capability can be added to the 3270.
2. The cross-fertilization of data entry devices with terminal products is a natural fallout of an architectural approach which proposes to build TP systems from a series of related microprocessor modules.
3. Recognizing that the best terminal is a service-free terminal, IBM will emphasize the diskette and MOS/FET approach to terminal memory.
4. Using the gas panel display, or the VLCD, it will be possible to develop massive in-house data entry/retrieval systems.
5. Synchronous Data Link Control (SDLC) will be emphasized, to the exclusion of other data transmission methods, starting in 1975.

Also, in 1970, IBM developed a strategy for STOCKS (Small Terminal Oriented Computer Systems; i.e., those of less than $12,000 excluding terminals). The strategy consisted of six parts. It would:

- be a processor-based system,
- have the ability to communicate with the host computer concurrently with its associated terminals,
- allow stand-alone processing,
- be oriented toward in-house communications capability,
- provide an orderly migration to greater capacity, and

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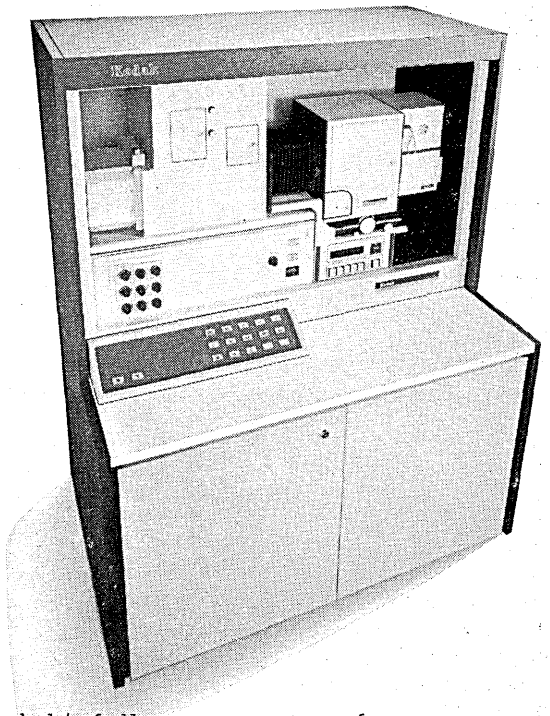

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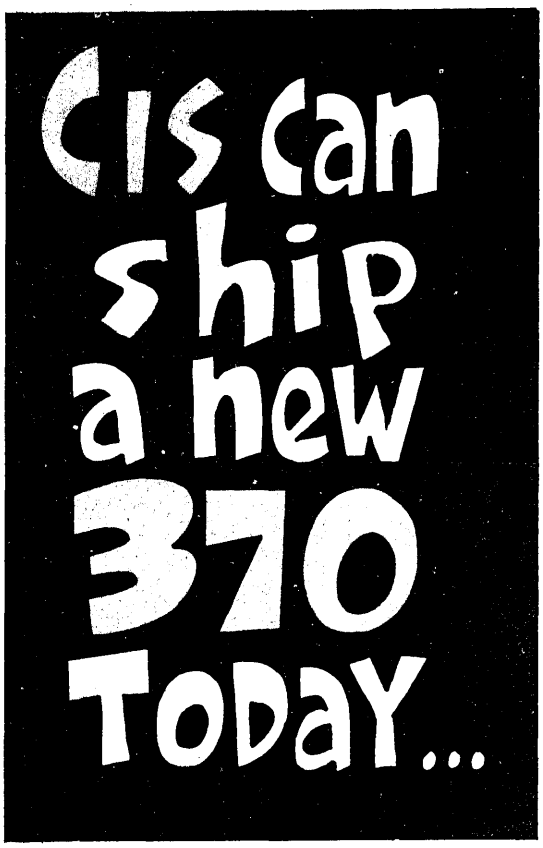

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- would achieve its maximum acceptance through installation and use.

This product was to compete directly with minicomputer-based terminal systems in the newly combined data preparation/entry/retrieval market. (It may already be here, as the 3790. Or it may yet be introduced.)

Market control

Model 360 users had been aggressively altering IBM telecommunication access methods during the late 1960s in order to improve their TP systems' flexibility and efficiency. Obviously, IBM had to respond to these efforts in order to maintain account control over the migration of user hardware/software systems. VS and VTAM (STAM) were developed with the intent of providing a more sophisticated TP systems software environment. Inherent in these offerings is a more complete interlocking of operating, access, and applications software systems which will make it more difficult to modify any one without impacting the other. In addition, the software furnished for terminal support at the cpu level and in the terminal itself will *assume* the existence of these interrelating systems. It will have an applications orientation as IBM tailors specific terminals to specific industry requirements in a broad integration of device, access, and data base/data communications (DB/DC) management packages.

IBM will seek to further expand its industry by industry penetration by emphasizing the role of dedicated information systems as a service provided by the customer's edp department. IBM then steps out of the role of hardware vendor and into the role of systems vendor in which hardware and software are carefully integrated; i.e., IBM will provide a capability for accomplishing a task tailored to the needs of each industry.

Terminals will play a role in encouraging this migration by providing the specific functions required by the applications of each industry. The capability thus made visible by the terminal will include the necessary host cpu software and hardware to support its function.

IBM will support this approach with an aggressive terminal hardware/software development and marketing program. Increasing sophistication in the use of VS will yield opportunities to convert off-line data preparation functions to a series of on-line data entry sub-tasks, where each application can be tailored to specific industry requirements.

Selling quantities of terminals is one thing; making an acceptable profit is another. IBM's overall profits from its terminal program had dropped to a low of 9% during the 1966-1970 timeframe. The profits derived from its terminal products suffered because of the poor ratio of maintenance, software, and manufacturing costs to revenues. IBM is attempting to improve this ratio by developing "maintenance free" terminals, manufacturing them from a common set of low cost modules, and tying terminal revenues to unique host cpu software/hardware capabilities where the higher price of an IBM terminal is justified because of the applications functions it provides. This latter move utilizes the software capability of the terminal to remove IBM, so far as is possible, from the classic environment of PCM competition.

The one value of this equation which poses the greatest threat to profit is software. Terminal support must now include host cpu operating system/application software packages and programmable terminal software systems. Field software support costs will impact long term terminal program profitability. It is one thing to lease a non-programmable terminal, another to place a "programmed terminal," where the manufacturer defines the terminal software, and still another to allow a user to program a remote terminal through the vehicle of host-generated routines derived from a parameter-driven package. A fourth approach, which assumes a user can write his own remote terminal software, exposes a vendor to all of the support problems encountered in the distribution of host cpu software systems. And this support is required for a unit that rents for a fraction of the cost and may be miles from a vendor support center. It is this last profit problem that IBM must now face—and control—in order to assure its terminal program will be profitable. □

Mr. Cooke is a senior staff scientist specializing in teleprocessing systems for Quantum Science Corp. He has held marketing and sales positions with Control Data, Sanders Assoc., Honeywell, and AT&T.

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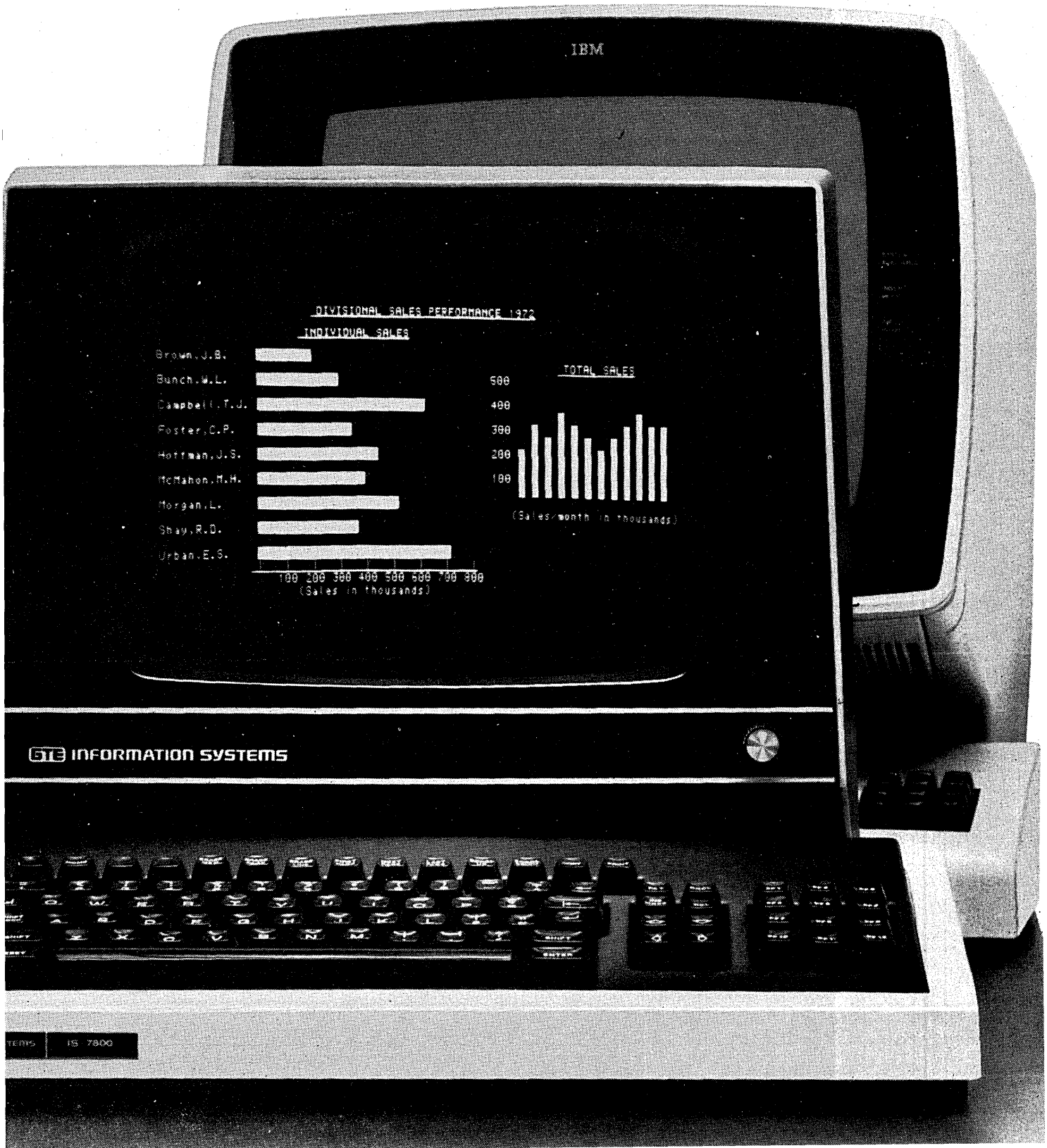


A sampling of firms, representative according to installation size and type of industry, shows where control of the dp function lies

THE DP MANAGER'S STATUS

by Robert J. Greene

One of the often debated issues within firms having dp installations is the organizational level and reporting relationship of the Manager of Data Processing. "Who does the Manager of Data Processing report to in your firm?" is a question which has made an appearance on a number of survey questionnaires over the last few years. The results of these surveys have not been entirely illuminating however, since summarized percentages give no clue as to the effect of the size of dp installation and the type of industry in which the firm is engaged.

A representative sampling of the over 1,200 firms participating in the *Weber Salary Survey on Data Processing Positions*[1] was selected in order that the effects of installation size and type of industry on the DP Manager's reporting structure could be analyzed. Three hundred and thirty firms were included in the analysis. The firms were classified by industry and by size of dp installation according to the coding schemes used in the data gathering mechanism for the survey.

The table shows that in over half the sampled firms the DP Manager reported to a Vice President (107 cases) or Chief Executive Officer (38 cases).

The effect of installation size is not strikingly apparent, with the exception of the shift from Controller to Corporate Director-MIS as installations become larger. There is a common sense rationale for this tendency, since as the data processing function becomes larger its Manager tends to attain a higher level in the corporate hierarchy. When the installation is sufficiently large this Manager will probably be at a level very near or equal to that of the Controller. It is interesting to note that for the largest category of installation, over $50,000 per month, the Corporate Director-MIS is the position to which the dp function is most likely to report.

Industry

By type of industry, there are a number of tendencies which are of interest.

Manufacturing—The Controller has responsibility for dp in 25% of the firms, compared to a total sample figure of 14%. The Financial VP was named substantially more often than any other functional VP.

Transportation—The President was the responsible executive in 37% of the transportation firms, as compared to a total sample average of 10%.

Utilities—The Corporate Director-MIS position exists more frequently in utilities than in any other industry category. The Treasurer and "VP-Other" titles have jurisdiction over edp much more frequently than in the total sample.

Retail—The VP-Operations position is the one most often given the responsibility for dp.

Finance, Insurance & Real Estate—70% of the firms in this industry category assign data processing to a position which is at a Vice Presidential or higher level. The Chairman, President, Executive VP or Senior VP have this responsibility in 38% of the firms in this industry category.

Services—This industry category very closely approximates the total sample, except that the Director of Administration managed the dp function more frequently than the sample average.

Government—The Director of Finance is most often the official responsible for the dp function. The Comptroller position is most common in governmental agencies, hence this position is named more frequently than in any of the other industry categories.

	Percentage reporting by installation size (monthly rental)						
Position title to which dp manager reports	$0-6,000 (26 sites)	$6-12,000 (28 sites)	$12-25,000 (76 sites)	$25-50,000 (66 sites)	Over $50,000 (134 sites)	% of total sample (330 sites)	Number of sites
Chairman of the Board	—	4%	—	—	3%	2%	5
President	11%	21%	9%	12%	7%	10%	33
Asst. to President	—	—	—	2%	½%	⅔%	2
Executive VP	4%	4%	13%	3%	7%	7%	23
Senior VP	—	—	—	3%	4%	2%	8
VP-Finance	8%	7%	9%	11%	9%	9%	30
VP-Administration	—	4%	12%	11%	6%	7%	25
VP-Operations	—	13%	3%	5%	8%	6%	19
VP-Data Processing (or Information Systems)	—	—	1%	7%	3%	3%	10
VP-Planning	4%	—	3%	—	3%	2%	7
VP-Development	—	—	1%	—	½%	⅔%	2
VP-Other	4%	4%	3%	3%	6%	4%	14
Treasurer	8%	—	5%	3%	2%	3%	11
Secretary	—	7%	—	—	—	⅔%	2
Comptroller	8%	4%	1%	—	1%	2%	6
Controller	26%	21%	21%	14%	8%	14%	47
General (or Branch) Manager	15%	—	4%	6%	9%	7%	23
Director of Finance	—	—	1%	—	2%	1%	4
Director of Administration	8%	7%	4%	3%	—	3%	9
Corporate Director-MIS	—	4%	4%	11%	12%	8%	28
Director-Other	—	—	4%	—	2%	2%	6
Asst. VP	—	—	1%	2%	2%	2%	5
Manager-Misc.	4%	—	1%	6%	5%	4%	11

[1] Published in late 1973 by A. S. Hansen, Inc., 1080 Green Bay Rd., Lake Bluff, IL 60044

Conclusions

Recent surveys have shown pronounced tendencies for the data processing function to report to a higher level within the organization today than it did 10, or even five, years ago. As data processing is presently being applied in more areas within the organization than ever before, this is a logical finding.

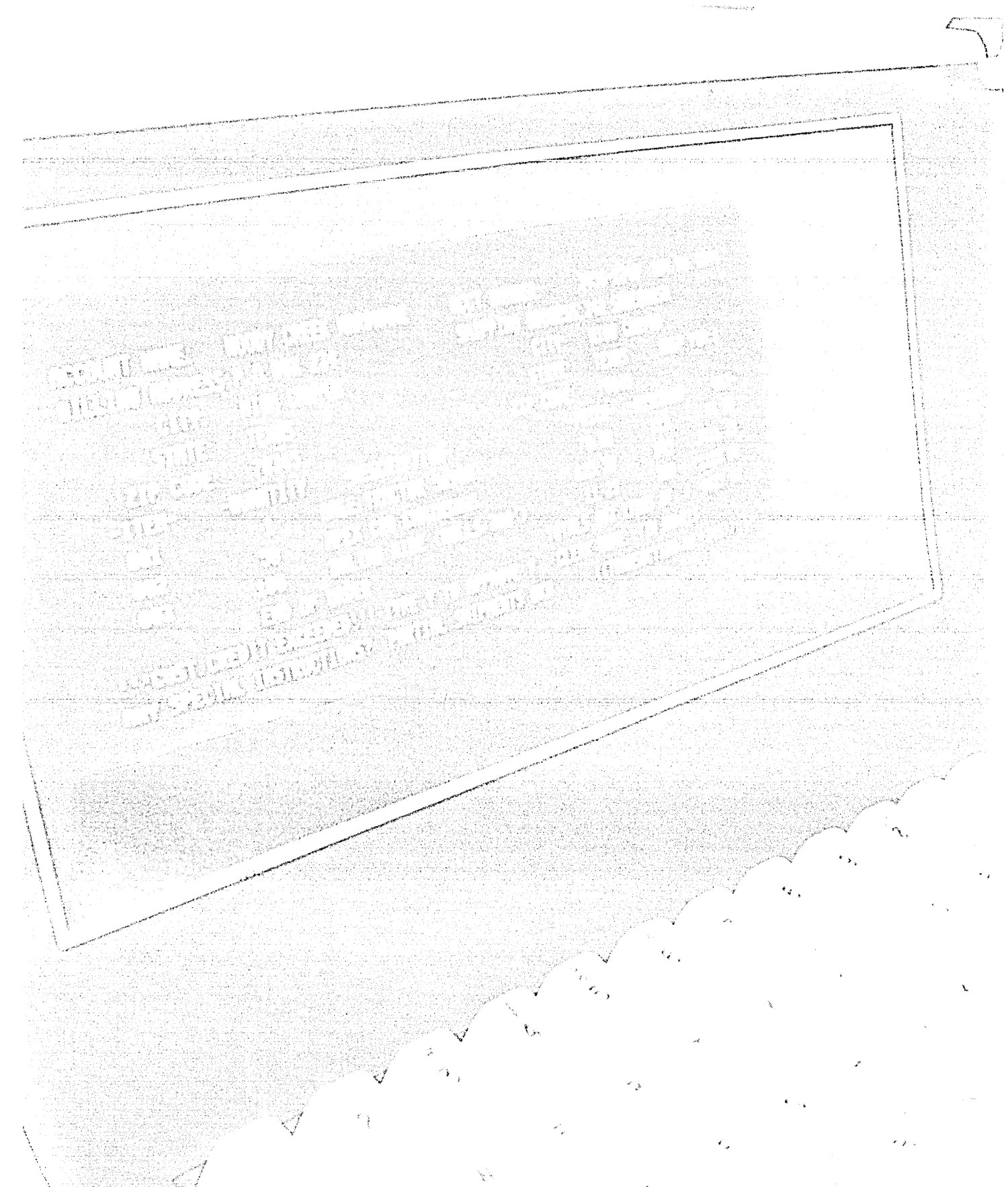
The surprising fact arising from this analysis is that in 1973, when complex computer networks were being used to serve the needs of all major functions within a majority of firms, only one-fifth (actually 21.67%) of the firms had their dp resources reporting to executives with a companywide organizational scope (Chairman, President, Asst. to President, Executive VP or Senior VP).

The impact of placing the control over a firm's dp resources in the hands of an executive whose scope encompasses only a single function is primarily determined by the personality of the executive and the nature of the decision-making process which determines how the dp resources will be used. Often a committee representing the major functions within the firm controls data processing resources. This does not, however, obviate the effects of having the chain of command linked directly to a single function.

There may be no "wrong" or "right" involved in the dp reporting structure. There are, rather, a number of considerations which must be made to insure that the data processing resources of a firm are employed in the most effective manner. Since dp should be applied to the attainment of the overall objectives of the firm, thorough consideration should be given to the reporting relationship. Every safeguard should be used to insure that that relationship does not impede the return the firm receives from its investment in data processing. □

Mr. Greene is a Compensation Consultant with Philip H. Weber Salary Administration Services of A. S. Hansen, inc. He has an MBA from the Univ. of Chicago.

A New Benchmark ir



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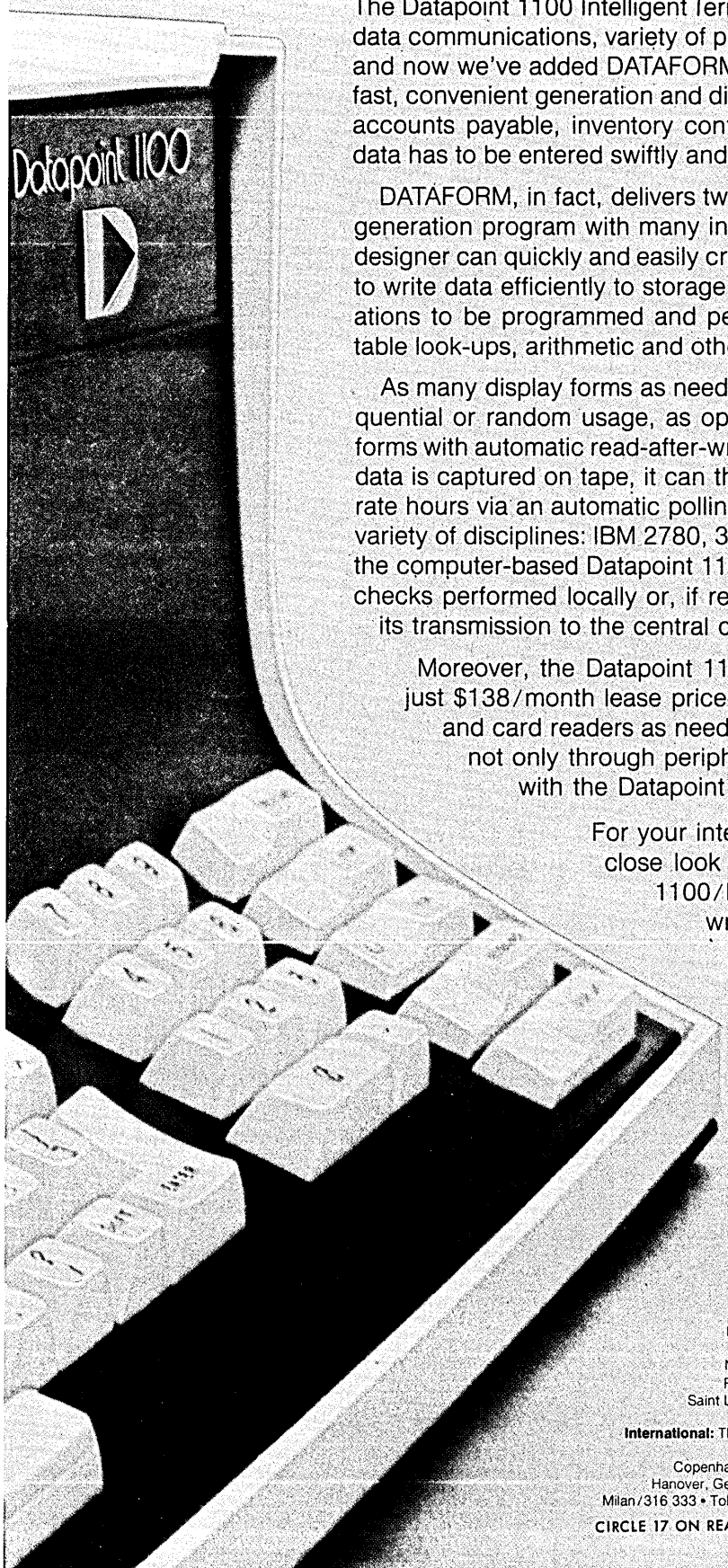

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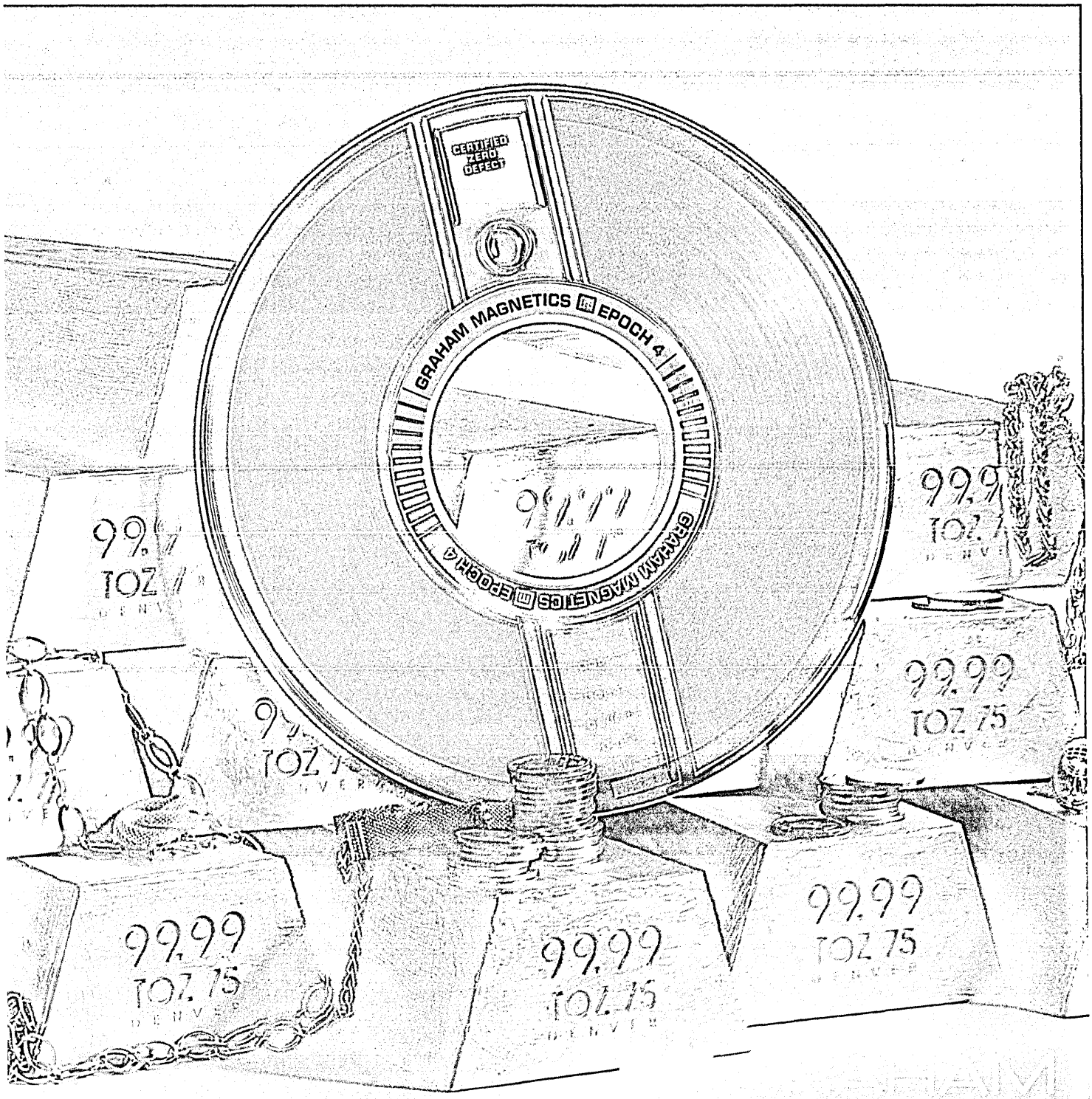

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A well-documented argument for the reductions in cpu and channel use and the increase in throughput to be achieved by off-line COM

EVALUATING COMPUTER OUTPUT MICROFILMING

by Richard D. Hawks

When evaluating computer output microfilm (COM) as a means of printing computer-generated data, elimination of paper forms cost alone may justify a purchase. However, many fail to recognize that off-line COM peripherals increase computer efficiency and throughput.

This article defines and explains how COM can affect a computer system. It also provides a mathematical formula for determining how COM affects a user's computer system. To effectively evaluate a system, we must look at more than the operating speeds of printers and COM devices. More specifically, we must look at current printing techniques, channel/cpu interference, I/O time spans, device characteristics, printing analysis, and user and COM software. The computer models used in this evaluation are the IBM 360 models 40 and 50 and the IBM 370 models 145 and 155.

The primary components that affect an I/O evaluation are main storage cycle time, multiplexor channels, and selector channels. Other factors that can affect an I/O evaluation are the control units and the devices under their control, and the software programming conventions used to write the data.

Since the channels for IBM 360 models 30, 40, and 50 and IBM 370 models 135, 145, and 155 are physically integrated within the cpu, they are constantly contending and interfering with the cpu for storage cycles in order to access the data to be read or written. Also, the multiplexor microprogram generates additional cpu interference because the multiplexor channel, unlike the selector channel, services more than one device at a time.

The amount of cpu interference generated by the multiplexor and selector channels depends on such factors as:

- Record lengths
- Device operating cycle times
- Execution of START I/O's
- Execution of channel command words (CCW's)
- Data transfer rates
- I/O interruptions

Based on the channel statistics generated in Fig. 1, the following comparisons can be made. A program writing data via a multiplexor channel generates more channel/cpu interference than it would if writing the same data via a selector channel. This interference adds to the cpu processing time required to complete a job. Fig. 2 shows the total amount of cpu time (cpu processing plus cpu/channel time) required for a job, based on an IBM 370/155, and points out that as the total cpu processing time for a program decreases, the channel/cpu interference time assumes a larger percentage of the total cpu cycle time re-

Computer system	Channel type	1,000 pages	100,000 pages	200,000 pages	300,000 pages
IBM 360/40	MPX	9 min.	15 hrs.	30 hrs.	45 hrs.
	MPX-B	1.3 min.	2.2 hrs.	4.4 hrs.	6.6 hrs.
	SEL	0.23 min.	0.4 hrs.	0.8 hrs.	1.2 hrs.
IBM 360/50	MPX	2.4 min.	4 hrs.	8 hrs.	12 hrs.
	MPX-B	0.8 min.	1.3 hrs.	2.6 hrs.	3.9 hrs.
	SEL	0.20 min.	0.3 hrs.	0.6 hrs.	0.9 hrs.
IBM 370/145	MPX	2 min.	3.3 hrs.	6.6 hrs.	9.9 hrs.
	MPX-B	0.7 min.	1.2 hrs.	2.4 hrs.	3.6 hrs.
	SEL	0.17 min.	0.28 hrs.	0.56 hrs.	0.84 hrs.
IBM 370/155	MPX	1.4 min.	2.3 hrs.	4.6 hrs.	6.9 hrs.
	MPX-B	0.5 min.	0.8 hrs.	1.6 hrs.	2.4 hrs.
	SEL	0.02 min.	0.03 hrs.	0.06 hrs.	0.09 hrs.

MPX —Multiplexor channel operating in byte mode with multiplexing between bytes or groups of bytes.
MPX-B—Multiplexor channel operating in burst mode.
SEL —Selector or block-multiplexor channel.
Timings are author's estimates based on manufacturers' timing tables.

This figure displays the amount of interference generated by the channels based on writing varying amounts of data. For the multiplexor channel the calculations assume that the print lines were written via command chaining with 10 lines per chain. It was also assumed that the control characters for the printer attached to the channel were native mode printer control characters (IBM 1403 printer commands). The calculations for the selector channel assume that each page (132 characters by 64 lines) was written as a physical block and that command chaining was used in order to write two blocks at a time.

Fig. 1. Channel/cpu interference table.

Cpu processing time per page of data in milliseconds	Total program processing time in hours	Total channel interference in hours			Percent of total cpu time represented by channel interference		
		SEL	MPX-B	MPX	SEL	MPX-B	MPX
500	14.0	0.03	0.8	2.3	0.2%	5%	14%
400	11.2	0.03	0.8	2.3	0.3%	7%	18%
300	8.4	0.03	0.8	2.3	0.4%	9%	21%
200	5.6	0.03	0.8	2.3	0.5%	13%	30%
100	2.8	0.03	0.8	2.3	1 %	22%	45%

SEL — Selector, block-multiplexor channel.
MPX — Multiplexor channel operating in byte-multiplex mode.
MPX-B — Multiplexor channel operating in burst mode.

Fig. 2. Estimated channel / cpu interference for printing 100,000 pages.

quired for running a job.

The input/output time span is the physical time required for a device to record a fixed amount of data. The evaluation for I/O time spans pertains primarily to the IBM 1403 printer, which would normally be written to via the multiplexor channel, and the IBM 2400 series magnetic tape units, which would normally be written to via a selector channel. Also considered, for purposes of evaluation later, are the IBM 2311, 2314, and 3330 direct access devices.

The I/O time spans for the magnetic tape units are based on writing full data pages per physical tape block. The time spans for the direct access facilities are based on optimum block sizes (i.e., 3591 for the 2311 and 7182 for the 2314). Fig. 3 shows the I/O time spans for the above devices based on writing varying amounts of data.

Based on the statistics generated in Fig. 3, an impact line printer is up to 30 times slower than a high-speed magnetic tape unit. Although the 2314 and the 3330 are slightly faster than 2400 series magnetic tape units, in the opinion of the author, direct access devices are still not economical devices for storing large sequential historical files.

Also to be considered when evaluating channels and I/O devices are the recording characteristics of input/output devices. Fig. 4 displays the approximate storage capacities for the following recording devices and mediums:

1. 2400-ft. magnetic tape reel
2. IBM 1316 disc pack (used on IBM 2311)
3. IBM 2316 disc pack (used on IBM 2314)
4. IBM 3336 disc pack (used on IBM 3330)

Due to the packing density of magnetic tape at 1600 and 6250 bpi, the author is of the opinion that magnetic tapes are by far the most economical storage medium available today.

Device characteristics	Estimated I/O times	
	1,000 pages	100,000 pages
Impact line printer 1100 lpm	58 minutes	96 hours
Magnetic tape 60 KC 9-track 800 bpi	2.5 minutes	4.1 hours
Magnetic tape 90 KC 9-track 800 bpi	1.7 minutes	2.8 hours
Magnetic tape 120 KC 9-track 1600 bpi	1.3 minutes	2.1 hours
Direct access 156 KB	1.4 minutes	2.3 hours
Direct access 312 KB	0.68 minutes	1.1 hours
Direct access 806 KB	0.27 minutes	0.5 hours

Fig. 3. I/O time spans.

Recording medium	COM-formatted pages	Characters	Maximum character capacity
Tape written at 800 bpi	2,376	21,664,368	22,809,600
Tape written at 1600 bpi	4,490	40,939,820	45,619,200
Tape written at 6250 bpi	13,470	122,819,460	136,857,600
IBM 1316 Disc Pack	795	7,248,810	7,250,000
IBM 2316 Disc Pack	3,200	29,177,600	29,180,000
IBM 3336 Disc Pack	10,967	99,997,000	100,000,000

Fig. 4. Estimated device recording comparisons.

On-line vs. off-line vs. spooling

By spooling rather than printing directly on-line, one increases the effective use of the cpu as well as job throughput. One advantage of spooling is that the execution time of jobs is decreased, since the job is finished when the printed output has been written to a high-speed device via the selector or block-multiplexor channels. Also, total printer throughput is increased somewhat due to the efficient I/O programming usually found in the writer programs (i.e., command chaining).

By printing off-line from the main cpu, the execution time of jobs is decreased because the data to be printed does not have to be read back into the cpu by the writer program. There are obvious advantages to off-line printing; since an output writer program is not required, more cpu and storage cycles can be used by the processing programs, thus decreasing job execution time. Also, the data to be printed does not have to be read via the selector channels by the writer program, so there is less channel contention among competing devices and a savings in selector channel/cpu interference. Since the printing is done off-line, additional cpu interference normally generated by the multiplexor channel is eliminated. In addition, since the data is being spooled at selector channel tape speeds, the final output may be available to the user more expeditiously.

Fig. 5 shows the theoretical differences in total cpu/channel time used for the various printing methods. Even though spooling does allow for com-

Estimated cpu/channel time in hours for 100,000 pages

Printing concept	Program processing time				Channel/cpu interference				Total cpu time			
Models	30	40	145	155	30	40	145	155	30	40	145	155
On-line	5.6	5.6	5.6	5.6	2.2	1.3	1.2	0.8	7.8	6.9	6.8	6.4
Spooling	5.6	5.6	5.6	5.6	3.0	1.9	1.8	0.9	8.6	7.5	7.4	6.5
Spooling for off-line printing	5.6	5.6	5.6	5.6	0.4	0.3	0.3	0.03	6.0	5.9	5.9	5.6

An estimate of 200 msec of cpu time per page was used for all models above. The channel cpu interface was calculated with the multiplexor channel operating in burst mode. For the spooling example an additional amount of cpu time should be added to the above total cpu time to compensate for the cpu cycles required by the writer program.

Fig. 5. Printing techniques.

pleting more jobs within a specific time span, as can be seen from the figure it does not solve the output bottleneck problem inherent to slow-speed I/O devices. The total job throughput time is determined by the speed of the printer.

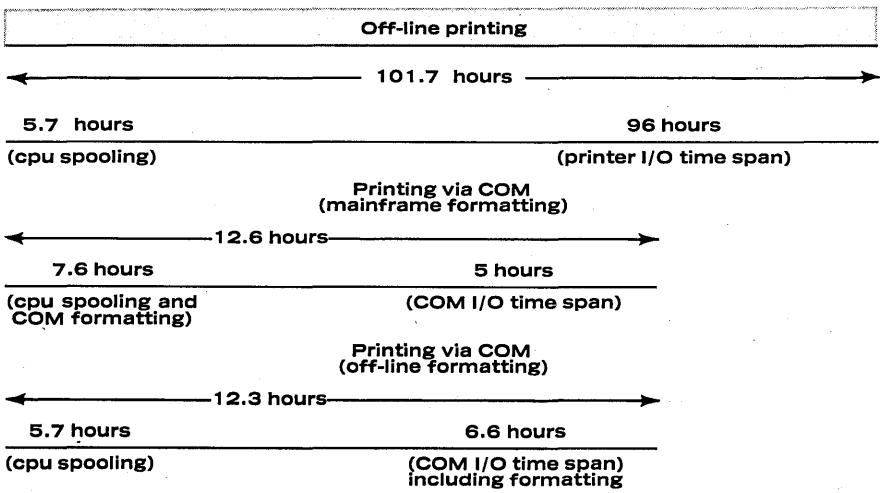
Of all the printing methods discussed, off-line printing is the only one that affords the user the benefit of spooling (thus letting him run more jobs), and also allows for more effective cpu use.

As noted previously, off-line printing is an efficient means of printing computer-generated data, based on cpu utilization and job throughput. However, one of its shortcomings is the speed of the off-line printing device. For example, the job shown in Fig. 5 would require at least 96 hours to print.

A computer output microfilmer, in an off-line configuration, affords the user the cpu benefits derived from off-line printing with the added benefit of printing the job at least 20 times faster. Fig. 6 is a time-span analysis comparing off-line printing to printing by way of an off-line computer output microfilmer. As can be seen from the comparison, COM provides more than an 80% increase in total job throughput over current conventional printing methods.

Since COM allows the user to spool all printer-destined output via the high-speed selector (or block-multiplexor) channels, it is very important for the COM software to operate the channel efficiently. One of the obvious ways is by writing full pages at a time, thereby decreasing the amount of I/O interruptions caused by channel and device end. COM software should also alternate the buffering, so that channel and device I/O time are overlapped with page formatting time.

In Fig. 6, two methods are shown for producing data via COM. One involves having the data formatted for the COM on the mainframe as it is being spooled to magnetic tape. The other method employs the use of a minicomputer attached to the COM. In the latter approach, the COM formatting is done off-line on the minicomputer. An installation with many small applications totaling 100,000 frames could possibly vary slightly from this example because of operator interventions for tape handling.



The cpu spooling used was 200 msec per page; for COM mainframe formatting, 75 msec per page was added to the cpu spooling time. The computer used was the IBM 370/155.

Fig. 6. Estimated off-line printing time for 100,000 pages.

360/30	$100\% - \frac{(P + 0.23 + 6.6 + 1.3 + 4.0)}{(P + 1.3 + 58)} =$
	$100\% - \frac{(P + 12.1)}{(P + 59.3)}$ = Percent increase in total job throughput
360/40	$100\% - \frac{(P + 0.2 + 4.1 + 1.3 + 4.0)}{(P + 0.8 + 58)} =$
	$100\% - \frac{(P + 9.6)}{(P + 58.8)}$ = Percent increase in total job throughput
370/145	$100\% - \frac{(P + 0.17 + 1.7 + 1.3 + 4.0)}{(P + 0.7 + 58)} =$
	$100\% - \frac{(P + 7.2)}{(P + 58.7)}$ = Percent increase in total job throughput
370/155	$100\% - \frac{(P + 0.02 + 1.3 + 1.3 + 4.0)}{(P + 0.5 + 58)} =$
	$100\% - \frac{(P + 6.6)}{(P + 58.5)}$ = Percent increase in total job throughput

Fig. 7. Formulas for percent increase in throughput.

Based upon our evaluations and the tables showing our conclusions, a formula can be derived that will approximate the percentage increase in total job throughput that results from printing via COM. Starting with the following generalized formula, specific formulas can be developed.

$$\text{Percent increase in total job throughput} = 100\% - \frac{\text{job throughput time (COM)}}{\text{job throughput time (printing)}}$$

The "job throughput time (printing)" variable consists of the following:

P—Program processing time
SCH—Selector channel/cpu interference (see Fig. 1)
MCH—Multiplexor channel/cpu interference (see Fig. 1)
I_2—Input/output time span for the printing device (see Fig. 3)

The "job throughput time (COM)" variable consists of:

P—Program processing time
FMT—COM-formatting time
SCH—Selector channel/cpu interference (see Fig. 1)
I_1—Input/output time span for the magnetic tape device (see Fig. 3)
COM—Input/output time span for the COM device

Workable formulas for determining the percentage increase in throughput can be developed from these variables. The formula for COM vs. on-line printing is:

$$\text{Percent increase} = 100\% - \frac{(P + SCH + FMT + I_1 + COM)}{(P + MCH + I_2)}$$

The formula for COM vs. spooling/printing is:

$$\text{Percent increase} = 100\% - \frac{(P + SCH + FMT + I_1 + COM)}{(P + 2SCH + MCH + I_2)}$$

These formulas imply that no overlap occurs between the cpu variables (P, SCH, FMT, MCH) and the device I/O time span variables I_1 and I_2. In actual computer operations, overlap certainly does occur in varying degrees depending on the specific programming application, computer system, vendor operating system, and, in a multiprogramming environment, job mix.

If total overlap between cpu processing and I/O device recording is assumed, then we can compare the de-

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vice speeds in determining the throughput increases as would be the case for I/O-bound applications. However, this approach, when used for applications that are cpu-bound to some degree, would indicate a greater throughput increase via COM than would actually occur. Therefore, the formulas assume no overlap (the worst case) in order to present a more realistic and accurate analysis of the increase in throughput. For most applications, the throughput increases that are derived from the formulas are the minimum increases that would occur.

Based upon the above formula for COM vs. on-line printing, the formulas in Fig. 7 can be derived for the IBM 360/30 and 40 and for the IBM 370/145 and 155. These formulas assume an 1100-lpm printer, a 120 KC phase-encoded magnetic tape unit, and a 0.24 sec/page COM throughput time.

Computer system	Formatting (F) No (NF) formatting	User program cpu processing time per page (P) 100 msec	200 msec	300 msec	400 msec	500 msec
IBM 360/30	F (400 msec/page)	77%	75%	73%	71%	70%
	NF	89%	86%	84%	82%	80%
IBM 360/40	F (250 msec/page)	81%	79%	77%	75%	73%
	NF	88%	86%	83%	81%	79%
IBM 370/145	F (100 msec/page)	86%	83%	81%	79%	77%
	NF	88%	86%	84%	81%	79%
IBM 370/155	F (75 msec/page)	86%	84%	82%	79%	77%
	NF	88%	86%	84%	81%	79%

F—COM formatting on mainframe computer
NF—COM formatting on minicomputer (non-mainframe)

Fig. 8. Job throughput increases via COM.

For the MCH variable the burst mode is used. Fig. 8 is a table of job throughput percentages derived from the formulas.

Based upon the evaluation, one can see that there are three key areas within a dp system that are favorably affected by COM: channel utilization, CPU utilization, and job throughput.

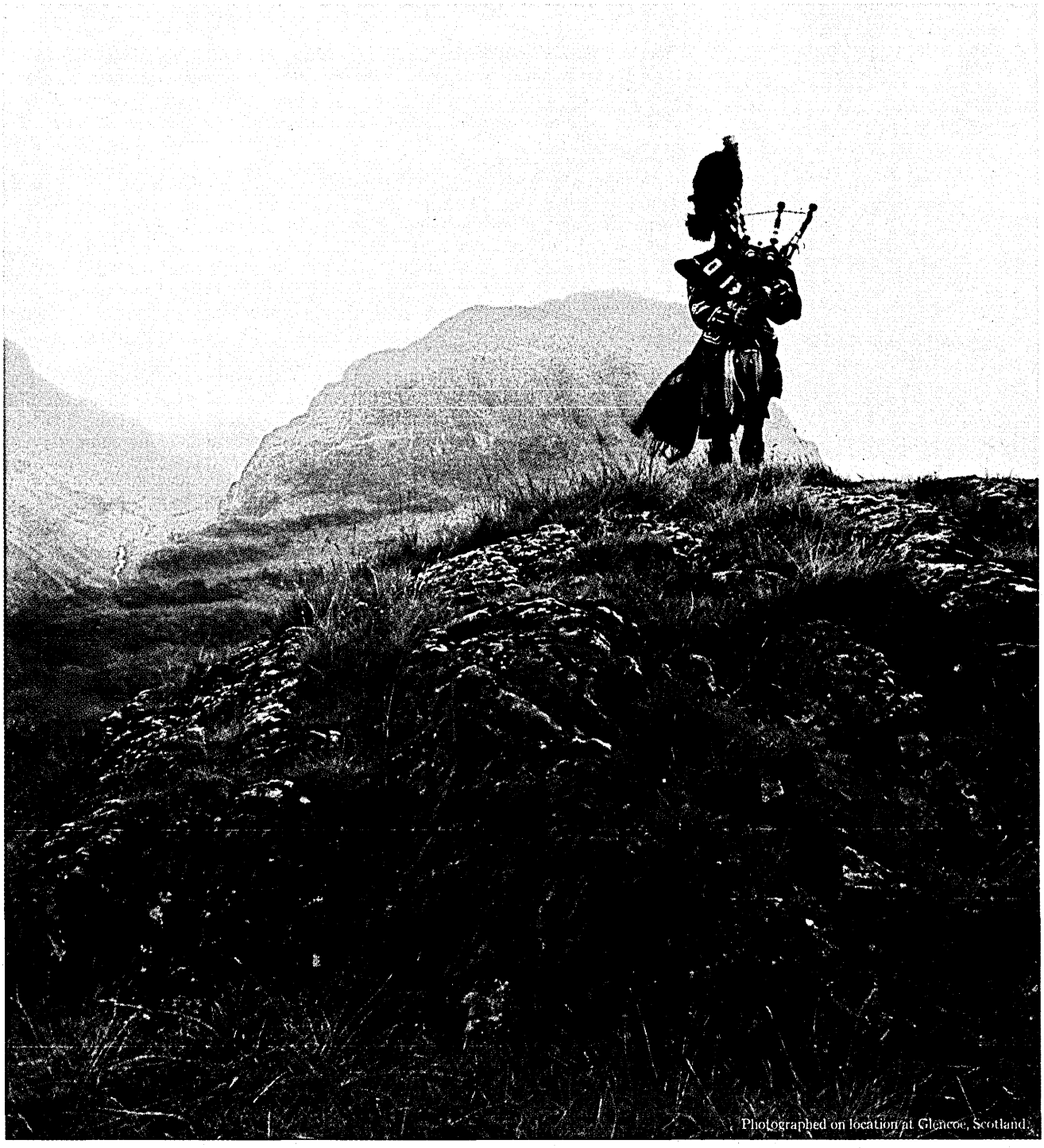
COM provides for increased channel use since it employs high speed selector or block-multiplexor channels. As was shown in Fig. 2, this can amount to a 96% decrease in channel/cpu interference (cpu cycle stealing) for an application requiring printed output. Since vendor supplied output writers pass the same data via the selector channels twice and the multiplexor channel once, the user can decrease the channel time by two-thirds by going directly to a magnetic tape formatted for COM, due to spooling. This means that other programs requiring devices will operate more efficiently in a multiprogramming environment since the channels will be available more often.

Since the channels are integrated within the cpu for many of the third generation computers, by increasing the channel utilization one has increased the use of the cpu itself. More importantly, when one considers the movement to virtual memory systems, it becomes increasingly important to cut down on channel inefficiencies where possible in order to reduce thrashing due to the paging inherent in virtual memory systems.

Job throughput probably the most important of the three areas affected by COM. Simply stated, computer output microfilm can increase throughput up to 80% for applications generating printed output.

Due to the continuous expansion of data processing applications within organizations, the dp manager must constantly reevaluate his computer environment in order to achieve maximum utilization. Responsible personnel must strive to get the highest return on their company's investment. A computer system is like a production process in that it generates information as a product, and companies must find more efficient and faster methods to get that information. Computer output microfilm can help. □

Mr. Hawks is a product specialist for COM products with Eastman Kodak. He was previously with the Kodak Microfilm Technology Software Project designing and writing software for COM. He has a BS from the Univ. of Southern Mississippi and has done postgraduate work at California State Univ.



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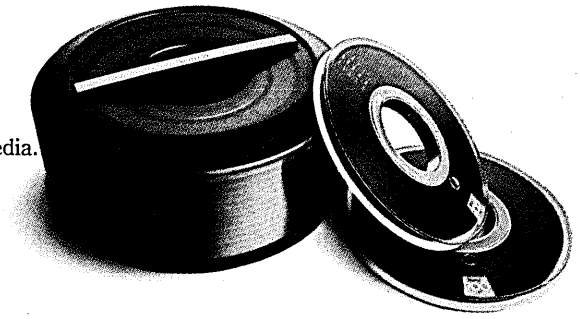

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Once again Congress must decide whether the U.S. should convert to the metric system. It has voted "no" for the past 184 years

THE FRENCH FAD

by Chet Cohen

The French Revolution gave the world Napoleon, pockets in men's pants, the guillotine, and the elegant set of measuring units called the metric system. Only the pockets ever really caught on in this country, but for the past 184 years our Congress has made fitful efforts to switch us onto the metric system, always stopping short of a mandatory changeover.

In 1974 still another Congress and another President are faced with the same dilemma that has dogged Congresses and Presidents for nearly two centuries: is the changeover even possible? If it is possible, is it wise? Or is it, as Napoleon admitted in 1812, "a tormenting of the people for mere trifles"?

Since 1965, when Great Britain announced it was abandoning the British Imperial units of weights and measures, which we non-imperialists call our "customary" system, there has been the expectation that the U.S. would soon follow. For those persons who may be holding their breath for this great event to occur, it would be instructive to review what has happened in the past whenever there was serious talk of buying "the French fad."

When it appeared that the prometric forces in the U.S. might actually prevail in 1902, an influential engineer named Frederick Halsey summoned up the spirit of manifest destiny, blended it with a little racism, and laid to rest what he termed the metric fallacy.

A sample of Halsey's rhetoric:

> We hear much of the unity of the Anglo-Saxon race—unity in language, in customs, in laws, in popular government, in progress, in ideals, in civilization. In nothing is this unity more marked than in weights and measures—the foundation of that commercial and industrial structure which others may imitate but cannot copy. Representative of their historic methods of development, foundation of their industrial life and bond of union between all sections—shall all these be destroyed for this French fad?

Frederick Halsey had a collaborator named Samuel Dale who would also win no prize for international diplomacy. Dale wrote:

> The words yard, inch, pound, ounce, dram, and grain are short, crisp expressions, and each conveys a distinct impression to both the eye and the ear. The metric units with their Greek and Latin prefixes and wearisome suffixes have a strange, monotonous sound and appearance. It is difficult to connect the idea with the metric word. As some one has well said: The metric units resemble a party of foreigners in uniform; they all look alike and jabber alike.

This sameness in the sound of metric units might in fact be a flaw. Recently a Los Angeles newspaper ran a story on the metric system, leading off with a silhouette of Marilyn Monroe and the numbers 91—61—91. At the end of the story the writer said that the numbers were Marilyn's measurements in *millimeters*. That would be a chest measurement of less than four inches. Fortunately we remember Marilyn and knew at once that the measurements had to be centimeters. It is harder to imagine a writer saying 36 feet when he meant 36 inches.

There are other ways of putting down metric system advocates. If your opponent is a technically-trained person you can say to him, "Laplace was proved to be incompetent." That disposes of the best known of the group of scientists who molded the metric system into final proposal form 100 years after a French country vicar had first proposed it.

Pierre Simon Laplace made historic contributions to astronomy and to the theory of probability. But then he asked Napoleon to make him Minister of the Interior, and the great Bonaparte did. Laplace was no administrator and no politician. Napoleon fired Laplace for incompetence in six weeks,

a very short tenure even for a French Minister of the Interior. Napoleon was not a patient man.

Patience is the *sine qua non* of metric system changeover, we learn from reading Congressional testimony of the past two years. In the Senate hearings of 1972 and the House hearings of 1973, many witnesses cautioned against precipitous legislation. That is, we do not deny the superior quality of the French system, we merely need more time to study the ramifications of changing over. That's what John Quincy Adams said in 1821; it seems to be equally true in 1974. For example, the American Concrete Pipe Assn. wrote to the House subcommittee: "Under planned metrification, a voluntary conversion time period would seem best since the various industries would find it easier to pace their changes. Of course, the optimum time could be never for some areas, which suggests that some cutoff time would seem necessary. Ten years is too short, since we need to start the thinking with a new generation, and 20 years might be a more reasonable time period." So let no nation mistake our deliberateness for arrogance. Americans do not hurl themselves impetuously into a radically different system which could, after all, prove to be only a fad.

Besides, while we must applaud all the other industrial nations of the world for going metric, diplomacy demands that we show our genuine regard for those sovereign states which still use our own customary measures, namely: Barbados, Burma, Gambia, Jamaica, Liberia, Nauru, Sierra Leone, Tonga, and Yemen.

Patience may be rewarded this year if Congress gets around to passing the Metric Conversion Act of 1974. It would be a nice gesture of conciliation to the French, who are mad at us for never consulting them and seldom even bothering to call. Better yet, it will be legislation that even Halsey and Dale could support, because it will be quite innocuous. Mainly it reminds us that since 1866 it has been legal to use metric units in the U.S. and that anyone who wants to make something of that is free to try. The President will appoint a Conversion Board to produce a national plan in about two years. Congress can reject the plan. Federal agencies themselves can convert if they want to, but they must not use their purchasing power to coerce private firms into supplying goods made to metric measurements. Teachers are asked to habituate young minds to think in metric units so that the next generation will grow up in centimeters.

That such a weak bill as the 1974 version of the Metric Conversion Act is before Congress ought not to be taken to mean that conversion will not occur. Au contraire, the proposed law is in the softsell genre that works so well with Americans. Off their guard they would be more likely to accept cleverly disguised metric goods.

Americans are willing to change when no one is pushing, but the fact that another method is better is no assurance it will catch on with us. We were complaisant when our printers stopped using the long final "s" as in Congreſſ. On the other hand, simplified spelling failed because we were told that our system was inferior. Goodness knows we would all rather spell knowledge as nawlej, but just let some outsider ridicule our spelling and we close ranks.

Why hasn't a more vigorous conversion bill captured the hearts and minds of Congreſſpersons? Such a law might be a nightmare to enforce. John Quincy Adams, before he became the sixth president, saw that danger and warned Congress that a compulsory metric system could turn out to prove "the impotence of authority." In this century we have already verified the impotence of authority once by the prohibition of liquor. That law was contrary to the will of the people and it had to be repealed. What elected official would go out of his way to antagonize his constituents? And over a foreign fad, at that.

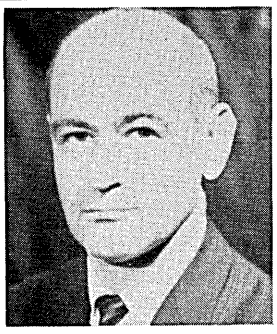
So if we get any new law at all this year, it will be a soft one. In metric system forensics, there is soft conversion and there is hard conversion. If you need a one-inch bolt and the man at the hardware store sells you a 2.54-centimeter bolt instead, and you find that it fits the hole that was drilled for a one-inch bolt, that's soft conversion. But when the boltmakers stop making one-inch bolts and all the holes drilled to receive them become obsolete, that's hard conversion. Your ordinary hardware store is not yet enthusiastic about hard conversion.

Hard conversion is opposed by the Alphonse and Gaston Act which is not legislation but of a stronger prudence. Its text is let the other guy go first. Architects say they will draw plans in metric as soon as metric building materials are plentiful; suppliers won't make metric materials until they have the metric orders in hand from contractors. Should distillers begin bottling liters and half-liters before tipplers demand that they do? The dilemma is supposed to be solved through a planned, systematic, coordinated nationwide approach, but that just is not the American way and everyone knows it.

The British change of heart in 1965 was a real surprise, considering the Norman Conquest and other humiliations at the hands of the French. If they had consulted their own Encyclopedia Britannica they would have remembered that Talleyrand set new standards for "vices, venality, and treachery." The same Talleyrand who in 1789 sponsored a draft law in the Constituent Assembly to introduce a uniform system of measurements in France, thus starting it all. How soon they forget.

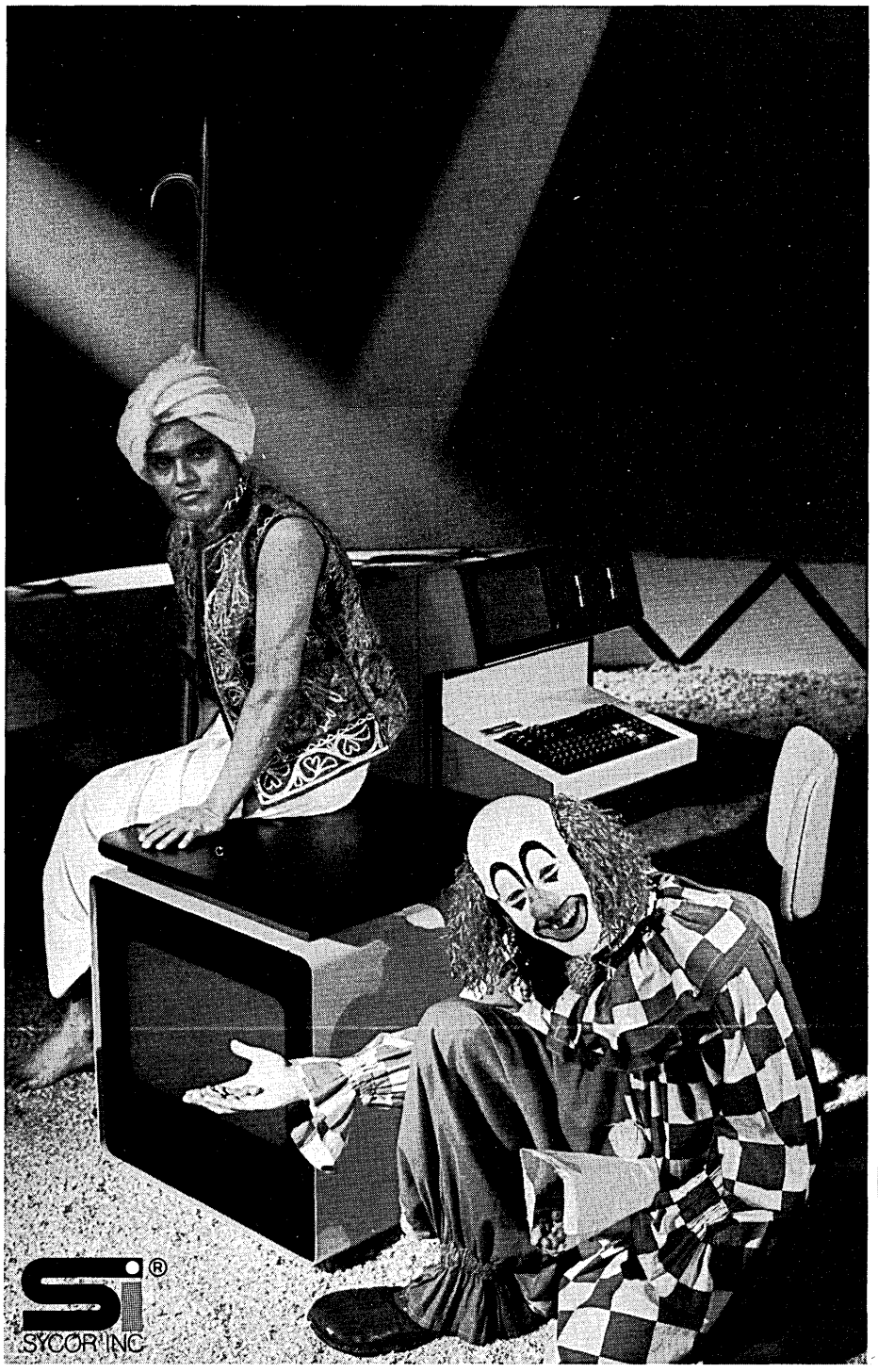
When the changeover comes (at this point it would be malicious to say *if* it comes), it could be the most heralded event in U.S. history. I checked the *Readers' Guide to Periodical Literature* back to 1929 and found a succession of writers trumpeting the arrival of the metric system in our daily lives. Year after year authors have written it's coming, here it is, this is it now, it's really coming this time, this time for certain, no kidding. Magazines published each proclamation of the millenium but became flip as the years went by, sinking as low as "Here Come the Meter" (*Reader's Digest,* 1972) and "Take Me to Your Liter" (*Nation's Business,* 1970). A compulsion to pun afflicts all metric system authors except those employed in the National Bureau of Standards, whose people have learned to suppress their amusement over the matter. Since the bureau was created in 1901 it has had the onerous task of promoting conversion.

Somewhere in this favored land there must be persons still scheming to persuade the rest of the world to give up its vain dream of a "best" system and to adopt the American Customary, formerly known as the British Imperial. If that happens it will set a new standard for sheer unmetricated Gaul. □



Mr. Cohen is a Los Angeles writer and training director who has studied the metric system carefully and agrees that something should be done about it. He has a doctorate in education from UCLA.

WHAT'S GRAY, HAS 2½ MILLION CHARACTERS OF MEMORY, AND WORKS FOR PEANUTS?



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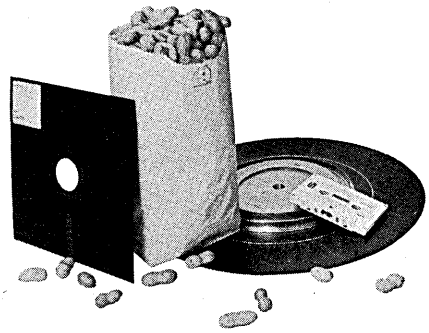

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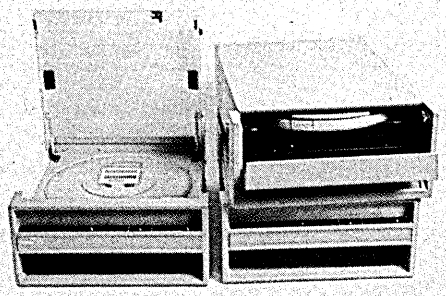

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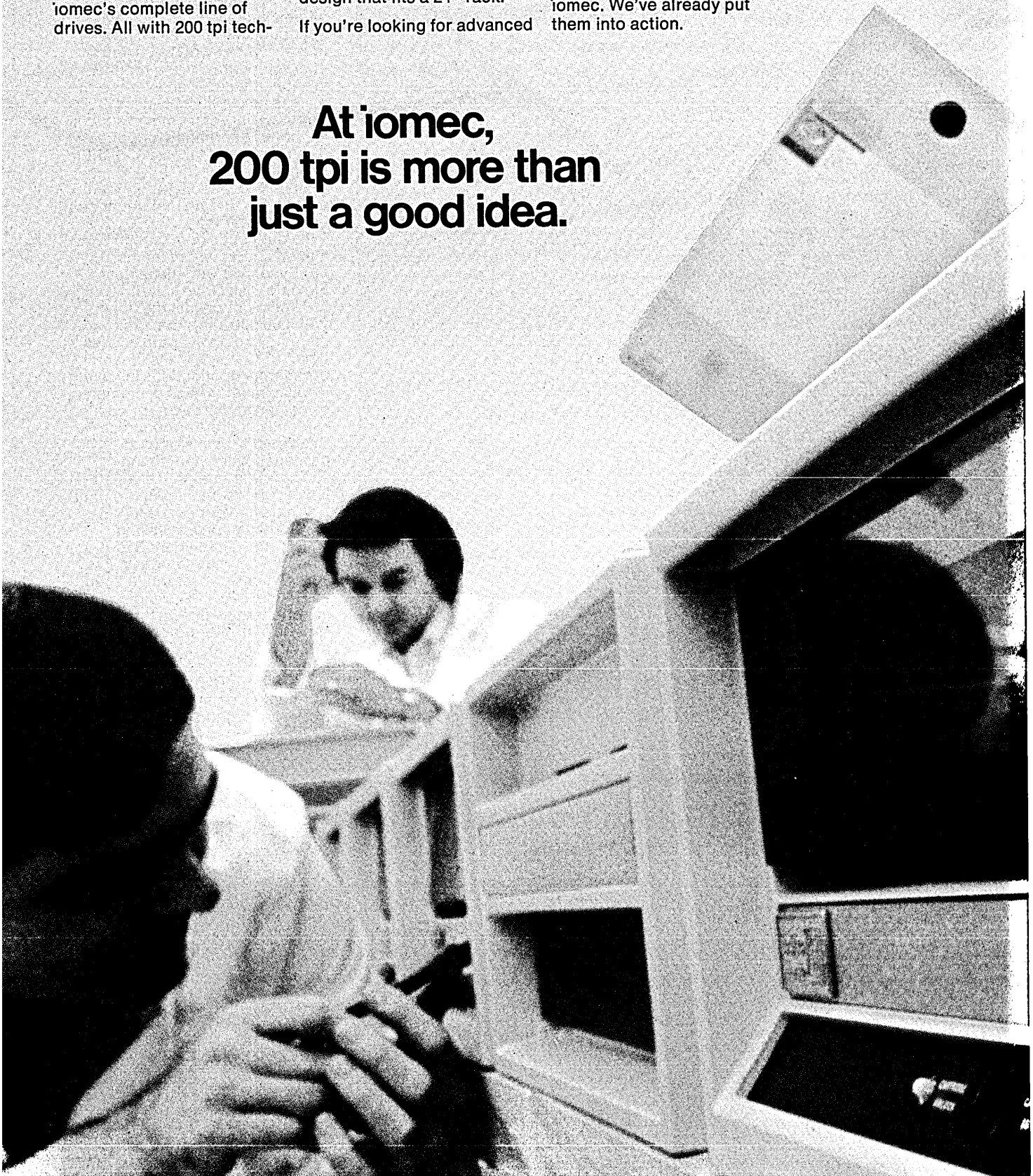

Systems techniques born in military and space applications are not appropriate for the social tasks to which they are being applied

CAN SYSTEMS ANALYSIS SOLVE SOCIAL PROBLEMS?

by Ida R. Hoos

Not since Archimedes developed the principle of the lever has there appeared so useful a concept as "the systems approach."

Nothing new to either engineering or data processing, the notion has, nonetheless, become symbolic of the space age, one of its pillars of prestige being its role in space spectaculars. The systems approach, under its various names and guises, "civil systems science," "public technology," etc., has become *the* way to plan, program, or do whatever wants doing. And "systems capability" has taken on the accrued attributes of omnipresence. This term, in its current usage, denotes the ability to design, devise, revise and/or analyze systems.

Here we encounter the first booby trap, that of definitions of the word *system*. Little can be learned from Webster's Dictionary, where some 17 different meanings are offered. The literature contains many more, among which the following seems generally accepted: "a set of interrelated components working together to accomplish a certain objective."

Acceptable, perhaps, but not very useful, for this definition applies with equal appropriateness to TWA and to my toaster. Herein lies the making of another booby trap, that of fallacious analogy, for to impute verisimilitude where only superficial similarity exists is to invite nonsensical conclusions. For example, the heart is a pumping system; therefore, a plumber can repair its leaking valve. Another false analogy pertains to skill transfer (or "systems capability"), for, on this basis, the fixit man who repairs my toaster could logically be expected to cope with any aspects of TWA that come under the heading of *system*—its fleet of aircraft, its worldwide reservation and ticketing network, its luggage transfer and tracing mechanisms, or its pilot and personnel training procedures.

This example is not mere pedantry but illustrates the way in which the systems approach has been rationalized as the nostrum for society's ailments, past, present, and future. Here, at last, are "space age techniques" to win wars, design strategies for peace, curb crime, design better urban environments, improve managerial efficiency in both the private and public sectors, and generally guarantee a braver new world. Like the *jinn*, defined by Webster as "rational, but intangible beings," these tools are presumably appropriate to our every task and ready to serve all our purposes.

Systems analysis epitomizes the space age. When the overworked cliche, "A nation that can put a man on the moon can . . ." is evoked as evidence of technical prowess, reference is being made to the systems methods used with such singular success in space exploration. Another pillar of its prestige is derived from the British World War II experience, when, under the name of operations research, the techniques were credited with having won the Battle of Britain.

. . . far fewer MIS's than the sales literature would have one believe have been put into operation . . .

Secretary of Defense Robert S. McNamara, with his dazzling whiz kids from Rand, added a triumphant chapter to the saga of systems analysis. That the wizardry was short-lived, that subsequent investigations by Senator Proxmire and the GAO found the systems approach to be directly responsible for cost overruns, for unconscionable boiler-plating and other fiscal abuses were cavalierly ignored. A legend once born, mythology was in the making. And those persons who could have penetrated the miasma swathing the high priests chose, instead, to take personal advantage of it. McNamara's band spun out to all branches of government, where they occupied high places and immediately imposed the program budget and cost/benefit juggling as the way to "rational" decision-making. No one elected to keep the emperor honestly naked. And so systems analysis and its counterparts and components, management information systems, cost/benefit ratios, program budgeting, performance and production evaluations, and the like pursued a chameleon's course, appearing in various guises at every level and branch of government. And at every stage of this numbers game there appeared professionals, paraprofessionals, and pseudo-professionals—all bent on solving society's problems "scientifically" and "rationally."

In its journey from conventional engineering tasks and texts, from the realm of the military and outer space to the inner city and its cares and concerns, systems analysis has lost the methodological rigor that governed its application in accustomed fields; but certain forms have persisted, and always the rationale of the *rational* has persisted. It is this loss of rigor that has helped make of systems analysis in practice an opportunity for enormous boondoggling. It is the idea of the "rational" that represents the prime booby trap, for, by the very ascription of *rationality*, there are built-in assumptions about *whose* conception of rationality is reflected. Rationality is not a dye vat into which all may be dipped and come out the same color. Rationality is neither absolute nor constant, but depends on the frame of reference. Rationality knows many times, places, and forms. What could be economically rational could be irrational socially; what could be socially rational could be political dynamite; what could be politically rational could be totally irrational from an engineering point of view. And when time is introduced as a desideratum, short-run and long-run rationality may be mutually antithetical. To use it as the foundation for transferring systems analysis is, therefore, a serious fallacy.

Representing the fusion between the "hard" and the "soft" aspects of computer technology, the information system forms a vital step in systems design and analysis and provides an entering wedge for the involvement of engineers. The information system also adds a number of booby traps to the list. Moreover, as an example of both theory and practice, it offers a unique opportunity for extravagant boondoggles. Gargantuan systems that, with the ingestive propensities of snakes, have subverted and swallowed up the very organizations they were purported to serve are the outcome of a chain of apparently innocuous circumstances. Electronic data processing introduced in the mid 1950s to hasten the paper flow, reduce clerical costs, and increase efficiency in information handling was the first step. The logic was clear, economic justification unassailable, and the role for an information technologist assured.

But two decades and two computer generations later the promises are still illusory. To be sure, records move faster, but their volume has increased exponentially. In Parkinsonian fashion, they have expanded to fill all computer time. Clerical costs soar; the price of processing paper is rising astronomically but invisibly, as any accountant charged with allocating company expenses can attest.

"Efficiency"—by any other name

If "efficiency" could be equated with overburdened transmission facilities and consumption capacity, frustration and frayed relations in-house and outside too, then the current edp systems, in banks, universities, government agencies, insurance companies, and the like would rate high. But it is interesting to note that despite the complaints of the dissatisfied and the caveats of the enlightened, very few basic changes and improvements are being made. There is always more of the same, with blame laid disingenuously on the "systems," as though Operation Tanglefoot had happened all by itself!

The next "logical" step has taken the form of the management information system (MIS). This is now endemic in large organizations, the stock-in-trade of hardware and software merchants, and the epitome of management science to a generation of engineering and business school graduates.

Russell Ackoff reports some curious characteristics of MIS's; the first concerning the assumptions on which they are based, and the second on the mythology surrounding them. He says that they are sold on the false premise that what constitutes a critical deficiency for managers is a lack of information—more of which would, presumably, improve their decision-making. And he observes that far fewer systems than the sales and professional literature would have one believe have been put into operation and that, among those implemented, most have not performed as well as expected and some have been outright failures.[1] Ackoff's review, done seven years ago, could be updated with no appreciable loss of validity.

Even the theory, then, leads us to a number of booby traps. We all need information to get our job done, to make better decisions, in short, for a myriad of good reasons. Handling information is a complicated business calling for the skills of a specialist. So we make the easy, and erroneous, assumption that we need an information expert. In theory, this sounds fine and sensible, until we raise such questions as: What is meant by an 'information expert'? Is he the person who builds or understands computers? Is he proficient in designing the software? Or is he a specialist in the subject matter at hand, so that he can recognize the difference between the busy and the necessary, the pertinent and the peripheral?

In Gertrude Stein's rose-is-a-rose fashion, an information expert is taken to be an expert on information . . .

To judge by the raft of RFP's and responses I have studied, these questions aren't taken into consideration. In Gertrude Stein's rose-is-a-rose fashion, an information expert is taken to be an expert on information, his authoritativeness a matter of incestuous validation. When he is employed to develop an information system, the organization gladly relinquishes to him the full responsibility for its data—its gathering, processing, storing, etc. This is done because bureaucracies follow the path of least resistance. They do the least work they can to maintain their existence. Turning the job over to someone else, especially when the job is edp, has become so popular a form of bureaucratic behavior that the State of California has its medical records processed in Texas, service bureaus in Chicago handle the nationwide bookkeeping of insurance companies, and private entrepreneurs in rented storefronts take in batch jobs from anyone.

The information system has grander connotations than mere edp but shares many of the same pitfalls. The "expert" to whom the work is relegated is really expected to do much more than sit at a console or debug programs. He is essentially the nerve center of the enterprise in that he selects the information, decides how it will be handled, and opens or closes accessibility to it. Discrimination has to be practiced; choices have to be made; judgments, often normative, must be passed. And these require an intimate knowledge of the subject matter at hand. Lacking this, as most information technologists do, there is a marked tendency toward substituting quantity for quality. With the curious cost/benefit calculus that makes the more the cheaper, everything is swept in. Instead of being responsive to the needs of users, information systems are so busy gathering, processing, and generating data that they have become ends in themselves, the larger system whose objectives they were designed to serve all but forgotten.

Examples abound, with results sometimes comical, sometimes trivial, and sometimes disastrous. But even though the booby trap map is well marked we can confidently expect more of the same.

Fallacies and fiascoes

Abetted by grants from such federal agencies as the National Institutes of Health, information experts have designed systems that have diverted effort from the task at hand (namely, to deliver health services in some more efficient or more effective way), to a preoccupation with forms and figures, with no time or money left for anything else and with headaches for everyone. In many instances, it costs more to process the information about a patient than to cure him. And more specialists live off the systems set up to conquer certain diseases than die from those diseases.

In the field of education, information systems churn out minute details on such relatively unimportant matters as how many children were sent home with runny noses in Santa Clara County last Tuesday, but fail to divulge where the money from a huge bond appropriation disappeared to. In welfare, systems can, on command, spew out a mass of data about parentage, education, size and composition of family, state of health, work experience, etc. but all of this is rendered totally useless when, by the stroke of a pen, a president or governor changes the categories of grant structure. The rising costs of welfare, used so often as a political whipping boy, can be at-

[1] Russell L. Ackoff, "Management Misinformation Systems," *Management Science*, December 1967, p. B-147.


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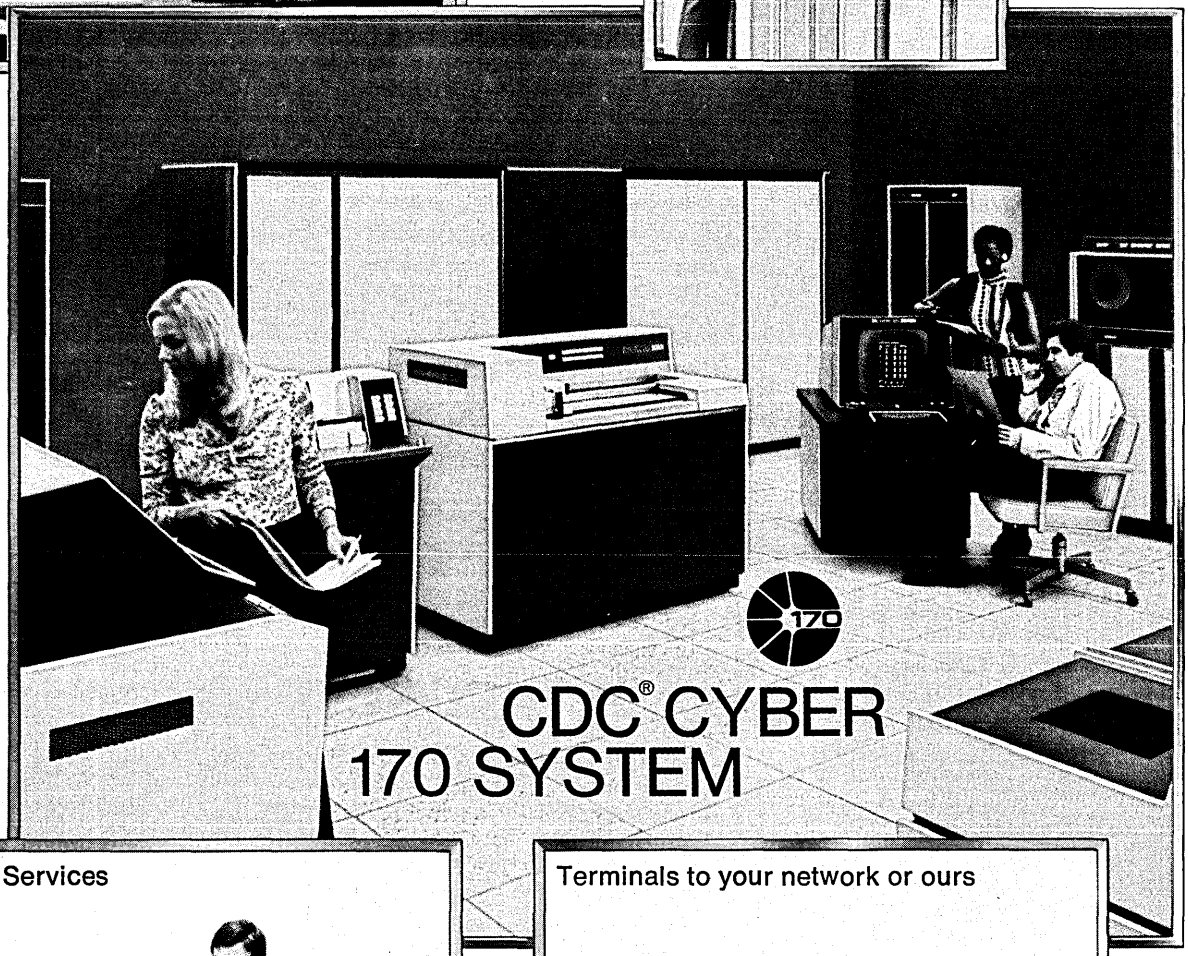
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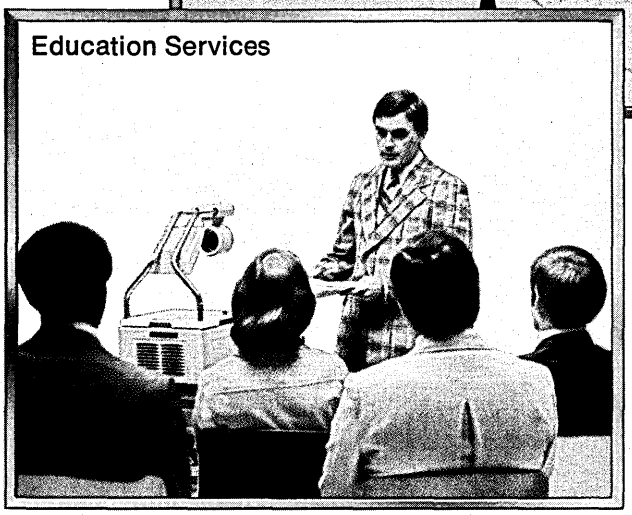
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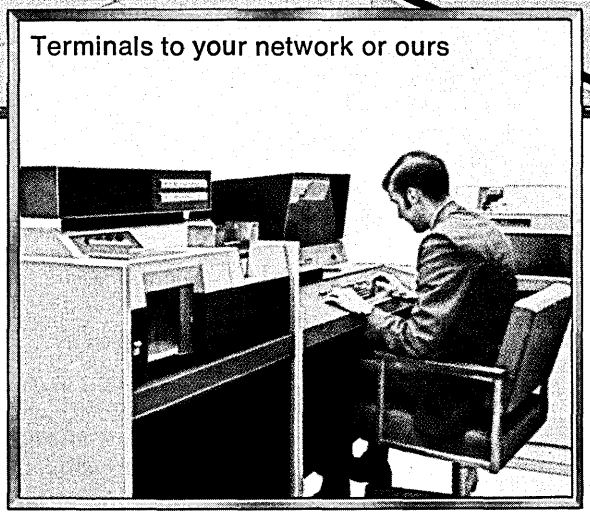
Terminals to your network or ours

tributed as much to the information boondoggle as to the social services provided the indigent.

Crime is a favorite target of information technology, especially with the lure of generous funds forthcoming from Safe Streets legislation. Many cities throughout the country have invested in elaborate police information networks (PIN), oddly called Criminal Justice Information Systems. To be of any conceivable legitimate use, PIN's must be comprehensive. What, then, should they include? Most designers favor a reservoir of data on convicted offenders. But this assumes that all law breakers have been convicted or are known to the law, and that everyone who has been convicted is a criminal and prone to recidivism at that. If, however, the PIN aims at *potential* offenders, another popular category for such systems, the dilemma becomes apparent when one raises the question: potential by whose standards?

The dilemma for the designer of a system of criminal justice information has two horns on either of which impalements occur. Leaning in the direction of oversimplification, i.e., that criminality is that which got punished, then only the hapless and the helpless will be affected.

If, however, one moves to the other extreme and tries to take into the law's embrace all potential offenders, the results will be equally ludicrous. An effort to do this for the State of California in a Criminal Justice Information System produced grids so fine that the network caught not only potential *offenders* but potential *jurors* as well. What this really meant was that the system was a trap into which everyone fell. So blatant a manifestation of Big Brotherhood alarmed even some of the doughty sheriffs to whom the proposed information system was submitted for preview!

Even though there is no honest way to resolve this dilemma, law enforcement agencies continue to send out hopeful RFP's and "experts" from universities, aerospace corporations, consulting firms, and think tanks respond as if they did not know better. The streets are no safer, and they will not be; the dollars that should be spent patrolling them, improving the courts and practice of law, and correcting the evils of incarceration are being squandered on harnessing space age concepts where old fashioned horse sense is wanting.

For fallacies and fiascoes, nothing quite approaches the excesses in information systems on land use and transportation, jointly mentioned here because of the many similarities observed in their treatment. Both are extremely popular because of (1) the current awareness of population growth and spread, (2) the new recognition that present modes of transportation may be inadequate and inappropriate in the gasless era to come, and (3) the substantial funds from foundations and government flowing their way. The shelves of every planning agency from coast to coast are sagging with the fruits of the exuberant labors of information technologists. Unclassifiable, inconsistent over time, yielding detail remarkable only for its contribution to confusion, information systems in transportation and land use operate in much the same fashion as the sorceror's apprentice, spilling out their contents until they flood. They inundate when they should illuminate.

The California experience

The notion of applying systems techniques to social problems got a head start in the mid-'60s when Edmund G. Brown, then governor of California, seized on it as a way of (1) helping aerospace and defense corporations diversify their product, thus combatting the retrenchment with which they were faced, (2) providing employment for skilled manpower threatened with job loss because of the impending cutbacks, and (3) utilizing a reservoir of talent to duplicate in the social arena the remarkable feats of military and space conquests. So welcome was the transplant of the tools from technical to social matters that the California experiment, conspicuous for its pioneering, became a historic landmark, criticism of which smacks of unpatriotism, perhaps even subversive opposition to "progress."

. . . dollars are being squandered on harnessing space age concepts where old fashioned horse sense is wanting.

The original four contracts, for $100,000 apiece, proved little more than the power of politics and salesmanship, but they blazed a superhighway to what became big, big business. Despite assurances by committees reviewing the responses to the 50 RFP's, that merit was the sole criterion, selection of aerospace companies out of the array of contenders that included computer manufacturers, accounting firms, research associates, and the like was not due to pure chance, nor to their undisputed superiority over all other competitors. The fact that Lockheed, North American Aviation, Aerojet-General and Space-General were chosen lent initial credence and impetus to the subsequent campaign by aerospace firms to dominate a market not yet displaying its full potential for bullishness.

Systems of criminal justice, transportation, record handling and waste management were designated as the four experimental areas, and in doing so, Governor Brown stressed magnitude and complexity as the factors making them most amenable to technological handling. In every case, simplistic solutions and platitudes couched in ponderous technical jargon resulted, with a built-in sales pitch for follow-on contracts to improve on what was deprecatingly referred to as "the first cut." On the erroneous assumption that statistics on convicted offenders constituted crime in our society, the Space General team concluded that certain age and ethnic groups in specified socioeconomic classes were the target population and developed a set of preventive measures. For example, they proposed that the unemployed be given jobs, that the uneducated be motivated to return to school, and that broken families should be made whole by bringing parents together for meetings, if necessary through the offering of financial incentive. In all of this, cause and consequence were a hopeless jumble; meaningless correlations were teased out of dependent variables, with much little-Jack-Hornerism on the part of the engineers-turned-social scientists.

The transportation experts were much more at home in the fancy of the twenty-first century than in today's plain reality. They waxed poetic over "trains gliding through tubes at the speeds of today's jetliners"; "ships that 'fly' a few feet over the waves at several hundred mph, only to nestle gently to a dock"; "pipelines which can deliver produce from farms to distant markets in a matter of hours." Displaying monumental ignorance about the work lives of most Californians, they offered this prediction: "The office employee of tomorrow may well be able to schedule his five hours of work anytime during a 12-hour period, perhaps within the confines of his own home in the foothills of the Sierras or on the coast of Northern California." Presumably the Sierra foothills and the Mendocino Coast represent a kind of haven to Los Angeles-based engineers. But, applying their own concept of the "freeway effect," they should have known that a mass migration to the mountains and beaches by all the white-collar workers in the Los Angeles Basin would immediately divest those areas of the very idyllic quality

that made them desirable. They need only to visit Yosemite on a summer Sunday to see the freeway effect and how sylvan slums are created. As for the present, the team of engineers lost itself in a jungle of models, regional, demographic, econometric, and came up with the not-at-all-surprising conclusion that more models were needed.

The information experts approached their task with zest, information technology being what they apparently knew best. Probably accepting a self-issued mandate that theirs was not to reason why . . ., they scoured the state from top to bottom for forms used, records kept, and reports issued, and then proceeded to develop a fast post office, a kind of exchange where everything was the same. Because integration and centralization were the main themes, movement of paper would not be much faster and, with queuing, etc. could actually be slower. The briefings by the team were impressive: flip charts with interview forms, number of agencies reached, rank of officials who cooperated. The message was conveyed through a picture—a map of the state overlaid with drawings of files stretching from the Oregon border to Mexico, this to imply that unless the state adopted the proposed electronic system, there would not be enough storage capacity to house all the accumulated data. (This argument was a little lame, since it made a case for edp, already commonplace, when what was needed was a thorough rethinking of the state's "white plague" and not just a new shuffling device.) Cost estimates were far off the mark, reflecting as they did only the initial, and none of the operating expense.

The waste management study proved useful in one conspicuous respect; it lent rational and scientific justification to a course of action already favored by the political powers in Sacramento. On the argument that all waste matter in water, land, and air is part of one system and that jurisdictional boundaries had contributed to environmental insults, the engineering team proposed that a "czar" be appointed, with authority over the whole complex of resources. The merits of this recommendation need not be debated here.

> Social engineering and social technology are bastard concepts . . .

Two items are of interest, however. First, this recommendation was tacked on at the end in a summary section and had no direct relationship to the foregoing findings; it was simply a common sense statement that could have been made without a systems study. In the second place, contrary to the schematic flow model that had boxes and arrows to prove that the ecological system is an entity, the wholeness was soon forgotten as the engineers busied themselves with the same old categories, each treated as an end in itself. Not surprising, then, that the follow-on contract was for a specific and separate solid waste management study for one small region of California.

Perhaps it is unfair to direct criticism to the engineers (and dp people) who, after all, are only doing what is asked of them. They have been directed to bring science and engineering, through technology, to bear on societal problems. With the systems approach the prevailing paradigm of our time, can we blame them for demonstrating the validity of Abraham Maslow's sage maxim: "If the only tool you have is a hammer, you tend to treat everything as though it were a nail"? Perhaps we should look farther and direct our criticism to government bureaus which should know better but

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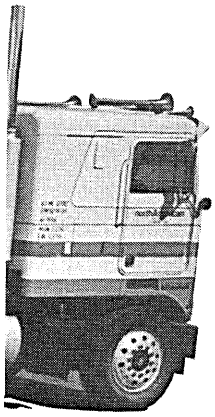

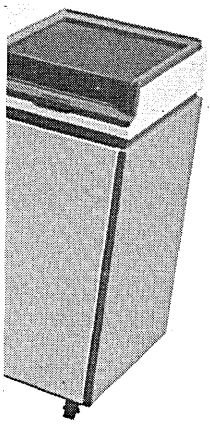

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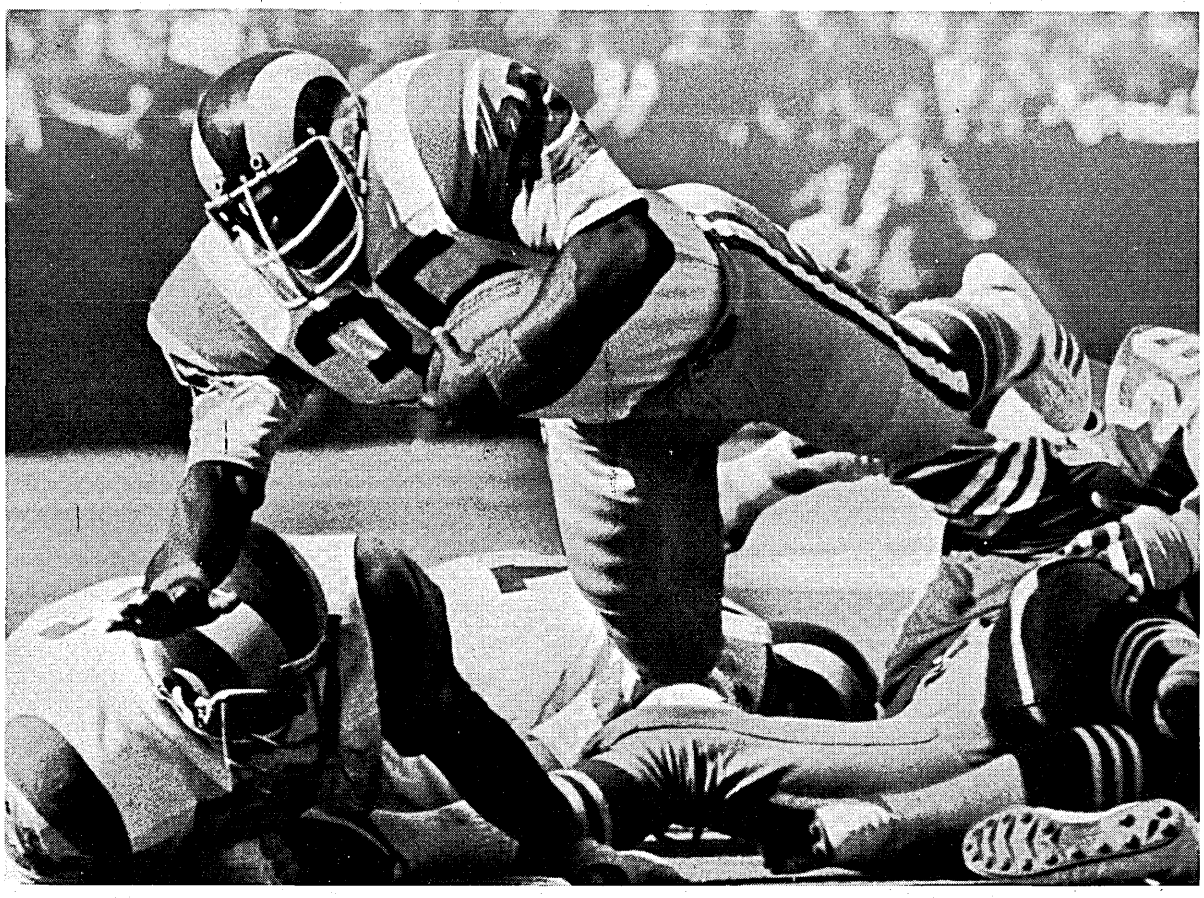

CIRCLE 68 ON READER CARD

which still perform the rites of the Cargo Cult. (The Cargo Cult is a tribal custom practiced in the Melanesian Islands by natives who, having seen "silver birds" laden with treasure (cargo) materialize out of the sky after U.S. Sea Bees cleared the jungle for runways during World War II, still periodically cut down the brush and wait for the "silver birds" to return.)

At the behest of such prestigious and respected agencies as the National Science Foundation and the General Accounting Office, there is strong pressure to "formalize the participation of scientists or engineers . . . in seeking solutions to the major problems confronting our people."[2] Congress has pondered a Civil Science Systems Administration and out of legislation has emerged "Public Technology, Inc.," dedicated to carrying out the President's high-minded and totally unworkable mandate, to build a full generation of peace, help the poor, feed the hungry, provide better health, housing and education, clean up the environment, bring new dignity and security to the aging, guarantee equal opportunity for every American, and build the strong economy that makes all these possible. This is a large order, and as yet there is little evidence that "the highly promising, sophisticated new methods . . . particularly systems analysis computerization, and the mathematical simulation in 'models' of the dynamics of complex problems are adequate to the awesome assignment. But one cannot blame the engineers for trying. Everyone else who is pushing systems is.

Meanwhile, the roster of problems grows. Does the state-of-the-art of systems analysis advance commensurately? I think not. To be sure, there are plenty of exercises in technical virtuosity. The journals are full of them, and no meeting of a professional society escapes them. But all we are getting are paper-and-pencil solutions to social problems, games when we are concerned about reality. Construing all of society's ailments as though they were malfunctioning "systems" has invited the "hammer" treatment and encouraged boondoggles of epic proportions.

Moral responsibility

Could it be that engineers are misconstruing their social mandate? With commencement exercises exhorting greater social commitment, and professors urging a deeper dedication to social values, engineers are being pushed into new roles. They are caught between the urge to do their own thing well, which in the extreme form leads to trained incapacity, and abandoning their specialized capabilities in favor of a generalized doing of the public good. A moral commitment is certainly desirable; a social conscience on the part of engineers would be commendable. But this is not to say that they should feel impelled to attack social problems badly but, instead, that they should do engineering better. Perhaps the well-meaning engineers should sublimate their urge toward social relevance in less esoteric and more mundane matters that would be in the public interest —for example, medical electronics that do not cause death while monitoring to preserve life; overpasses that carry the normal weight of pressure and do not cave in; tv sets free of fire hazard, electric shock potential, and radiation leaks; cars that perform safely even without the vigilance of Nader's crusaders. Instead of trying to be jacks-of-all-trades—health, welfare, education, crime, and so on—they would do better to maintain their mastery of their own.

Systems analysis for social problems

Systematic and analytic review of the systems techniques would reveal that they are not appropriate to the myriad of social tasks to which they are being applied. In order for the desired technological transfer to take place, certain conditions have to be met and certain assumptions made explicit. In engineering, the use of systems analysis in a given problem is predicated on the knowledge of a family of parameters that describe and define the system in precise terms. There is explicit recognition of a set of values of those parameters in relation to optimal performance of the system. In social planning, no such undisputed parameters or criteria exist.

Some of the very underpinnings for the technology transfer are demolished by the methodical analysis performed by Professor L. A. Zadeh, of the Electronics Research Laboratory of the Univ. of California's College of Engineering. Examining the generally accepted claim that the systems approach has been proven for its great capacity to deal with complexity, certainly a characteristic of social systems, Professor Zadeh finds that, as the complexity of a system increases, "our ability to make precise and yet significant statements about its behavior diminishes until a threshold is reached beyond which precision and significance (or relevance) *become almost mutually exclusive characteristics.* It is in this

[2] Report of the National Science Board, *The Role of Engineers and Scientists in a National Policy for Technology*, National Science Foundation, 1972, p. 5.

sense that precise quantitative analyses of the behavior of humanistic systems are not likely to have much relevance to the real-world societal, political, economic and other types of problems which involve humans whether as individuals or in groups"[3] (italics added). Professor Zadeh has developed what he calls the principle of incompatibility, to describe the unsuitability of these techniques to social problems.

If, in spite of this high-powered demolition, the confirmed advocate were to try to hide behind the old Maginot Line of defense that claimed that the *approach* was sound and that only the *applications* were faulty, he should be reminded of the statements made by Dr. Robert A. Frosch, when he was Assistant Secretary of the Navy. Underscoring the incompatibilities later stressed by Zadeh, Frosch pitted the systems world against some aspects of the real world and, in so doing, disencumbered the loaded argument that the approach is good and only the uses defective.

> To the charge that I am writing about bad systems engineering, I can only say that I am taking a pragmatic view. The thing is defined by what is done, not what is said; and if what I am describing is bad systems engineering, I can only say that I seldom see any other kind.

He demonstrated that these techniques are proving to be—

> a poor substitute for real science and engineering. They are at the least, not doing what they are advertised as doing, if they were not *making things worse*. It could be that things would be even worse without these new techniques, but I would like to ask some questions and suggest some reasons for believing that systems engineering, systems analysis, and management, as practiced, are likely to be part of the problem, and indeed causative agents.[4]

There are many useful functions that engineers can perform in a technological society such as ours. A clearer conception of "public technology" could, in fact, formalize their involvement so as to protect the public from the abuses being perpetrated in the name of systems science. Probably the greatest service the engineering profession could deliver, consistent with the Hypocratic Oath being proposed for it, would be one of disenchantment—to let society know the true limits of technology. "Social engineering" and "social technology" are bastard concepts, internally inconsistent and intrisically contradictory. As the stuff out of which has come a cornucopia of contracts of beneficence, they are great for boondoggles but, in the final analysis, bad for the public good. □

Dr. Hoos is a research sociologist associated with the Space Sciences Laboratory at the Univ. of California at Berkeley. Her general interests are in technology and society, and she has conducted studies on automation, retraining, and the applications of systems analysis and related techniques to management, especially in public policy.

[3] L. A. Zadeh, *Outline of a New Approach to the Analysis of Complex Systems and Decision Processes*, Memorandum No. ERL-M342, Univ. of California, College of Engineering, Electronics Research Laboratory, July 24, 1972, pp. 2-3.

[4] Robert A. Frosch, "A New Look at Systems Engineering," IEEE *Spectrum*, September 1969, pp. 24-28.

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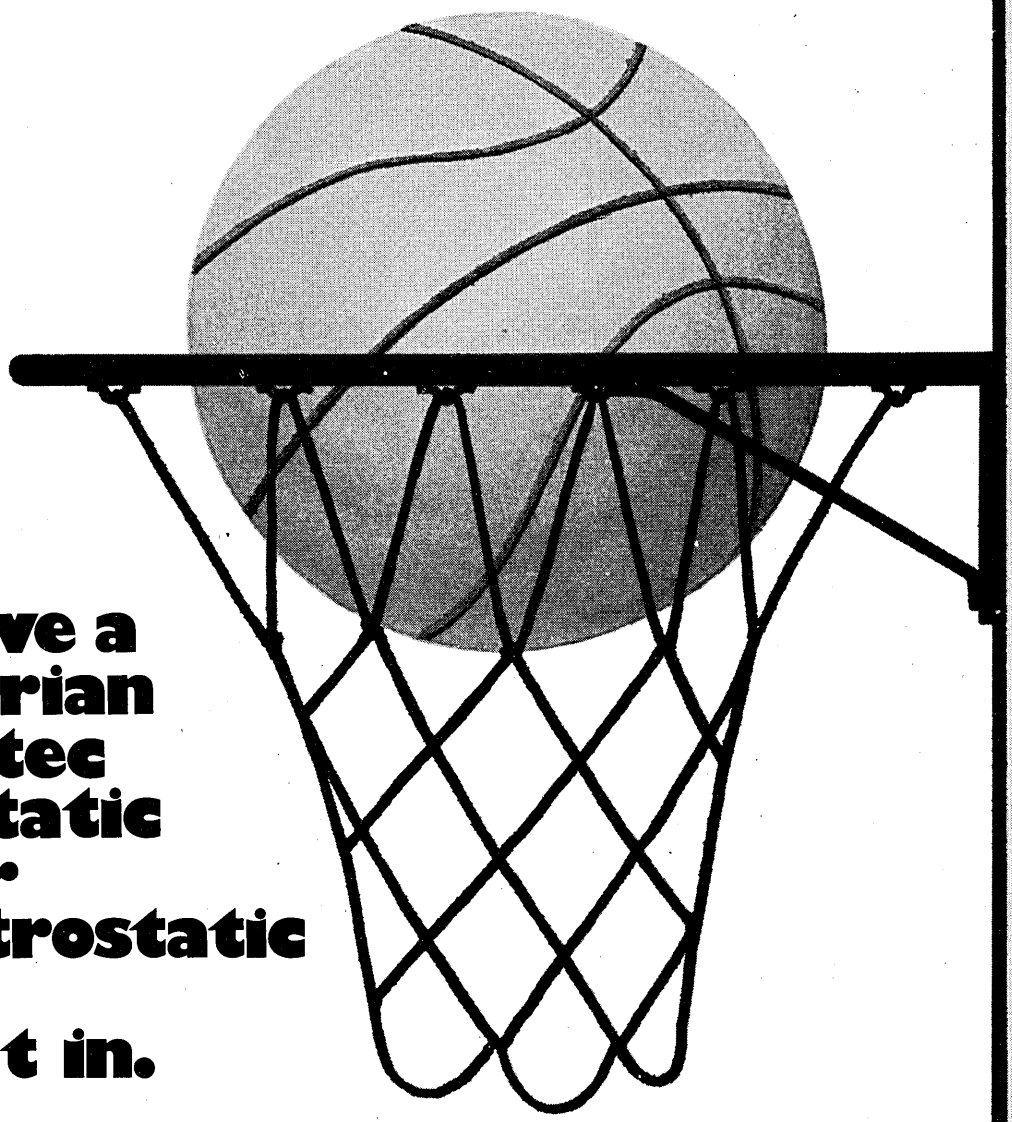

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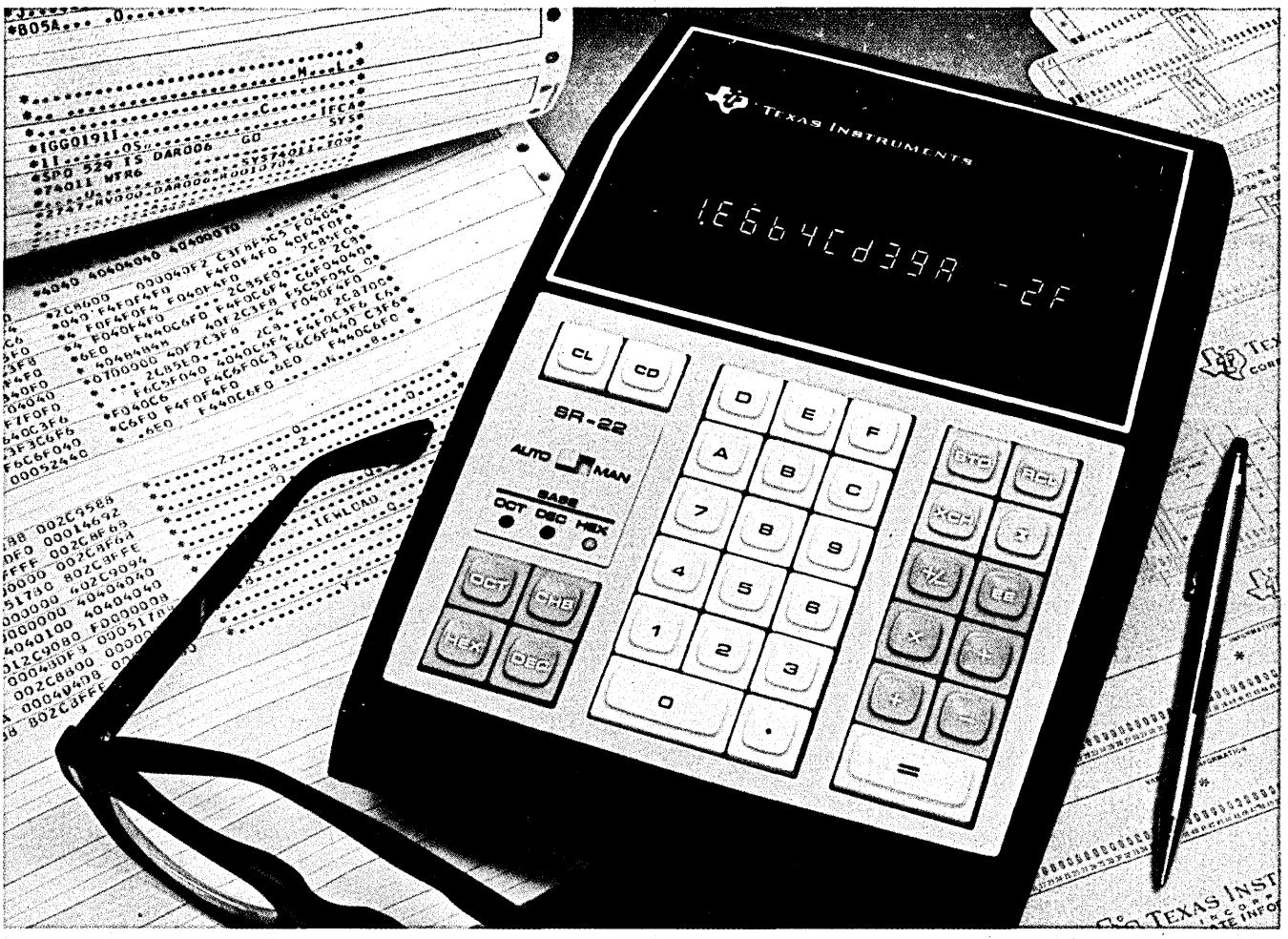

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Six examples point out that the simplest way of doing things is usually the most effective; the trick is to think before you act

SIMPLICITY IN PROGRAMMING

by Robert J. Mercer

Common sense and many recent authors tell us that simplicity is a virtue, that simple systems are easier to design, construct, test, and manage. Such is the thrust of various books, articles, letters, and symposia on software engineering and such topics as structured programming, top-down design, and chief programmer teams. (See especially the series of articles in DATAMATION, Dec. 1973, and their bibliographies.)

Yet we have often been lured away from simplicity by considerations of imagined need, or "policy," or (most often) projected cost savings. Many of these excursions have gone awry. Common sense and Santayana ("Those who do not remember the past are condemned to relive it") also suggest that we should attempt to profit from, or at least not repeat, the mistakes of the past.

We will now look at some past projects for failures in heeding the precept of simplicity. The examples, though not detailed or identified, are all true and are taken from one small corner of the software development field. How many more exist?

Example 1

The simultaneous development of a product (a set of operational computer programs) and the tools to build that product (the operating system) led in one project to delays and complications of considerable cost. Programming progress was slow because needed capabilities in the operating system were either unavailable or unreliable. The delays forced a cutback in the level of effort on the applications programs; the prime contractor cut off the analysis subcontractor; upon resumption the needed analytic support was not available; the programming contractor needed substantial assistance to complete the job. *Simplicity demands first things first.*

Example 2

In one proposed system three computers were supposed to serve as joint master processors, driving five large scientific computers and many smaller processors for communications and displays. No operating system for such a configuration was available, not even from the manufacturer. The task was given to a subcontractor that had never written any significant operating system. The concept was much too complicated for the state-of-the-art. The primary error, an unnecessarily complex system design, was eventually recognized, and a drastic simplification was undertaken. Mercifully, the whole project was cancelled, but with huge termination costs. *Work within the state-of-the-art.*

Example 3

A certain military/scientific problem had (quite reasonably) grown far beyond the capabilities of the available hardware and software. A substantial programming effort was mounted to solve the problem on an essentially inadequate machine. An extra storage disc had to be acquired for the project. After considerable difficulty, including the development of special restart procedures because of the long runs involved, and a major reorganization of the program, it was finally checked out.

Meanwhile similar problems were being solved almost routinely on a large third-generation computer at another installation. Indeed, the old computer in this example was replaced within a year after the program was operational.

The simple solution here would have been the timely acquisition of appropriate hardware. Comparative costs (of complex programming and new hardware, in this case) are always weighed. But do we always remember that the costs of complex solutions are relatively unpredictable?

Example 4

In another example, the simple use of hardware power would have been cheaper than was the quest for efficiency through complicated analyses. The exposition is mildly technical. Suppose that we require both an accurate numerical solution of a differential equation and also the partial derivative of that solution with respect to a parameter. A simple treatment, available to any calculus student, is to differentiate the differential equation with respect to the parameter, obtaining another differential equation (called a variational equation) whose solution is the required partial derivative; the two differential equations are solved simultaneously using standard numerical methods. The "efficient" solution is to obtain the partial derivative from an approximate analytic solution to the original differential equation. A complicated, tedious derivation of the analytic solution and its partial derivative is required, but the numerical solution of the variational equation is avoided.

Experiments have shown that the latter method is indeed faster, although only marginally so when good numerical techniques are used; but they have also exposed cases wherein the approximate partial derivatives are inadequate. When this occurs there is a triple uncertainty as to the cause; the approximate analytic formulas may be plain wrong, only incomplete, or just improperly coded. Even the type of error is hard to diagnose. If it is one of incompleteness, another iteration of the analyze-code-test cycle must be undertaken, with uncertain prospects.

There *is* a pay-off for operational efficiency, but *the methods should be first developed in small, controlled studies.* When bound by PERT charts or

launch dates, the simple solution must be chosen.

Example 5

But when an efficient and reliable scheme is developed, it should be used and reused, interfaced as necessary, and not discarded for irrelevant reasons. In one atrocious example a contractor replaced the manufacturer's sine-cosine routine with one written in a "specified" high-order language. It was badly done—both good programming practice and the established method were disregarded, to the extent that one application was spending over 50% of its execution time in the new routine! *It would have been simpler to let well enough alone.*

Example 6

It would be hard to justify a whole new programming effort (using, of course, the methods of the new revolution) for a particular application if a good general purpose program is available. But there is an approach that provides the benefits of top-down design, and the basic simplicity and economy of re-use, as described in the final example.

Just looking from the top down at the problem of generating a particular series of space satellite position reports, a dozen input cards were defined. They did not resemble in format or number the input cards (150 of them) that the established program (called MSAP, a very large and flexible program with many input items and options) required to do the job. But it was a relatively simple matter to write a small input processor that reads the dozen and generates the 150. Aside from the obvious advantages, this approach also:

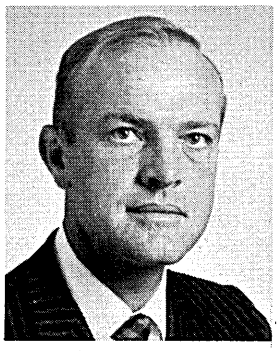
(a) Sacrifices none of the power and flexibility of MSAP—the input generation program just copies any MSAP input cards, and thus may be used with intermixed MSAP cards to vary from the standard options.

(b) Permits the checking of input data before the big problem is called in.

On the other end, it was even easier to write an output extraction program that automatically selects and numbers the proper pages.

Developed in this manner, the system functions as though it were custom designed for the particular problem (and in a sense it was), and yet uses a proven reliable program, without modification, for the essential calculations.

The current revolution in programming stresses simplicity—design simplicity through top-down development, and coding simplicity through structured programming. The small size of chief programmer teams and the often mentioned size restriction for subroutines are also aspects of the quest for simplicity. However, the principle is more widely valid, and it will be tragic if the programming revolution focuses on the new techniques and fails to recognize or apply the underlying principle. □



Mr. Mercer is the manager of computing for one of the projects of the Aerospace Corp. in Los Angeles. He has an MA from UCLA, where he did his first programming on the SWAC.

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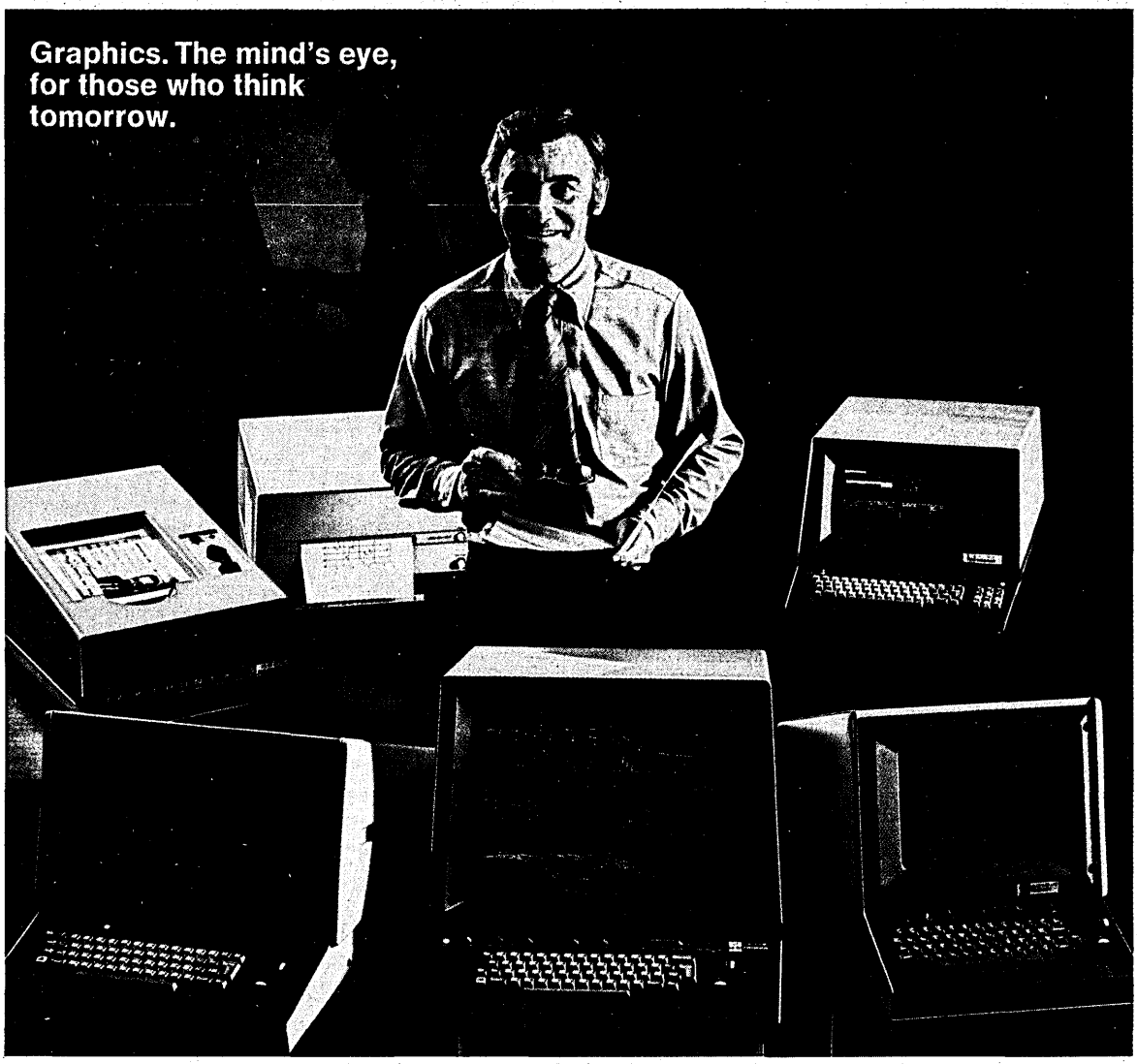


CIRCLE 61 ON READER CARD

news in perspective

Although attendance at the National Computer Conference fell short of the 35,000 that had been predicted, it still was the world's largest gathering of computer people this year. Edith Myers, who anchored a staff of seven DATAMATION editors covering the event, presents a report on the conference's sessions, exhibits, special events, and atmosphere, beginning on this page . . .

W. David Gardner analyzes some implications of the Supreme Court's refusal to review a lower court ruling that IBM must turn over 700 "privileged" documents to the Justice Dept. in its antitrust case which goes to trial in October, page 111. The whole issue of documents in the case has been a staggering problem, he notes . . .

The head of Fujitsu's computer operations tells of the Japanese company's plans to produce the Amdahl Corp. computer, page 114. Edward K. Yasaki, back from a month in Japan, tells how Japanese mainframe manufacturers are resigned to playing catch-up with IBM . . .

"The on-going insanity of a never-ending war, vicious raids, and counter raids, might make discussion of computing in Israel seem mundane," says Angeline Pantages of her report on computing in Israel, page 117. Her observations are from a visit to the tiny, war-weary nation early this spring.

Conferences

The NCC: Something For Almost Everyone

Attendance Was Low, But Exhibitors Are Happy

It was a week of fallen and falling governments. It was cold in Chicago and sometimes rainy. The National Computer Conference attendance, at 25,909, fell considerably short of the 35,000 that had been predicted by the sponsoring American Federation of Information Processing Societies (AFIPS). But most everyone liked the show.

There was mixed reaction to the enormity of the conference program—119 sessions with as many as 10 taking place at the same time. The purpose was to broaden the vertical application flavor of the conference, but this did not have a major effect on attendance. Although the number of sessions was increased 32% over last year's 90, the increased turnout of 5,849 represented only a 21% improvement over the 4,836 who attended the program in New York. Donal Meier, chairman of the 1975 NCC in Anaheim May 19–23, said he's aiming at a more modest 80 sessions for that event.

That the exhibitors were happy was evidenced by the fact that next year's booth space was 73% sold by the close of this year's show. "We usually sell 50% at the show," said an AFIPS spokesman. A representative for Okidata Corp. said he was so happy he signed up for twice as much space next year.

Otis Page, vp of marketing for Shugart Assoc., Sunnyvale, Calif., said he liked the show because he got time with people who were hard to reach other ways. He managed a half hour of conversation with Edwin de Castro, president of Data General.

IBM was there with a big, slick booth, big block letters, and a film show accompanied by whiny electronic music which many wished the giant had left back in Armonk. There were no computers in the IBM booth. In fact, the only mainframe at the show was an IBM 370/155 in the Control Data Corp. booth, hooked onto a full complement of CDC peripherals and memory.

While not slick like IBM's or big like Control Data's, the booth of Data Disc, Inc., Sunnyvale, Calif., had a unique charm. Hand painted with an antique look, it probably represented one of the lowest budget exhibits—under $1,000. It was constructed for Data Disc as a community project by students at San Jose State College.

Art and Images

Tab Products of Palo Alto, Calif., turned its booth into an art gallery, displaying computer-related art by 18 Palo Alto schoolchildren, and asked NCC visitors to vote for the best one, which turned out to be by Paula Bohan, a 17-year-old senior at Palo Alto High. The company said ballots were cast by 2,245 NCC visitors, who will receive copies of the winning painting.

Pictures of another sort were taken away from the show by 887 visitors who had the patience to wait in lines which resembled those for *The Exorcist.* They were at the booth of Spatial Data Systems, Inc., Goleta, Calif. The attraction was Spatial Data's Computer Eye 108, an input device which digitizes continuous tone pictorial images for computer processing. At the show it was hooked to a Centronics printer to produce face shots of guests as they stood before a tv camera.

"It was great," said Spatial's Fred Clarke. "We came away with several hundred prospects. We could have done it faster. In fact everybody that builds printers offered us a faster printer; but to do it faster would have defeated our real purpose, which was to explain our new approach to data image processing which combines optics, closed circuit tv, and computer technology."

Micros and minis

The increasing mixing of the microprocessor, microcomputer, and minicomputer businesses was graphically illustrated at the show by several different exhibitors.

Digital Equipment Corp.—often referred to as the IBM of the minicomputer industry—unveiled its new low-ball 12-bit computer, the PDP-8/A. The MSI machine was shown for the first time in

boxed version.

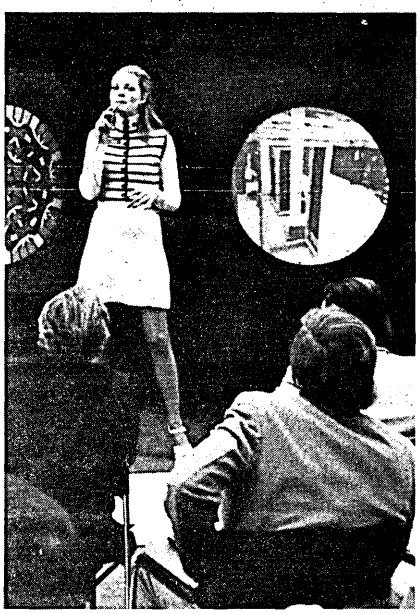
Moreover, the price is low. In quantities of 100, the basic cpu board costs $572, while a more complete desktop model with operating system, power pack, and programmer's console costs $1,117. The 8A operates several sophisticated PDP-8 operating systems as well as more than 200 PDP-8 software programs.

More significant, however, was DEC's new MPS (Microprogramming Series), which was featured at the show. The 8-bit microprocessor is built around an Intel 8008-1 cpu chip. DEC has added its own chips for other standard features like buffering and interfacing and, in addition, the firm is offering six software programs. The unit including the cpu and 1K of RAM sells for $445 in quantities of 1,000.

Intel, too, was exhibiting at the computer show for the second time. The semiconductor firm's Microcomputer Systems unit exhibited three cpu's, but the chief interest was on Intel's newest machine—the 8080.

"We're finding a tremendously broad range of applications for the 8080," said an Intel spokesman. "You name it—anywhere where random logic was used before. Instrumentation, crt's, POS, even games."

Although Intel does not provide much in the way of applications software, the firm does provide development tools to assist the user in designing and developing his own microprocessor systems and applications software. The 8080 sells for $360 in single quantities.



Another semiconductor firm making a big push into the microprocessor area at the NCC was National Semiconductor, which is offering both 16-bit and 8-bit machines. National Semi emphasized the idea that it provides standard hardware which users can use to program their applications.

Big, small show

Without exception exhibitors praised the facilities. With 300 exhibitors in 800 booths, it almost looked like a small show in the spaciousness of McCormick Place. There were some grumblings from visitors about overheated meeting rooms, rumbling traffic sounds overhead in the Levine and Yau auditoriums (perhaps Stephen S. Yau and Samuel Levine, chairman and co-chairman of the conference respectively, had reason to regret lending their names to the rooms), and the frigid walk from McCormick Place to the McCormick Inn for some meetings. And the Film Theater was moved so many times one visitor referred to it as "the floating crap game."

Many of the traditional technical topics outdrew the vertical application

The NCC drew almost 26,000 computer people to Chicago's enormous McCormick Place in May to view the displays of more than 200 companies, some with pretty ladies, some practicing hard sell, and some—like IBM (lower left on page 101)—with soft sell film shows. Exhibitors liked the turnout. Before the show ended, they'd signed up for 73% of the booths available for next year's exhibit in Anaheim, Calif.

programs during the conference. For example, 500 persons turned up for a session on intelligent terminals in a room with a capacity for 345, while in an adjoining room with the same capacity, only 120 yawned through a session on health care planning. Some observers likened the reaction of visitors to that of a person visiting the library to browse. There was so much to absorb, many only scanned the sessions, walking in and out to the distraction of speakers and their audiences. It led Univ. of Colorado's Dr. Daniel Couger to exclaim to a reporter, " NCC crowds are the most discourteous I've ever seen."

There were, of course, exceptions. More than 300 persons crowded a room for 200 to attend a session (that ran overtime) introducing computer people to computer output microfilm. Well beyond the noon termination time, the 100 or so overflow crowd still was standing attentively.

Waiting for Ford

Equally attentive was the crowd that filled the Arie Crown Theater on the conference's fourth day to hear a talk by Vice President Gerald R. Ford. Many waited a long time, entering the theater at 11 a.m. to hear a speech scheduled for noon that didn't start until 12:45.

The Vice President strongly hinted to his dp audience that the federal government's plan to build FEDNET—a nationwide, packet-switched communications network which, according to one estimate, would cost more than $100 million—might be delayed. An RFP already had been issued, and bids were due shortly; but Ford, at NCC, said "I am concerned that federal protection of individual privacy has not yet developed to the degree necessary to prevent FEDNET from being used to probe into the lives of individuals . . . Prior to approving a vast computer network affecting personal lives, we need a . . . privacy impact statement." A week later the General Services Administration dropped the FEDNET project, under orders from the White House, and presumably will buy packet-switching services from commercial sources.

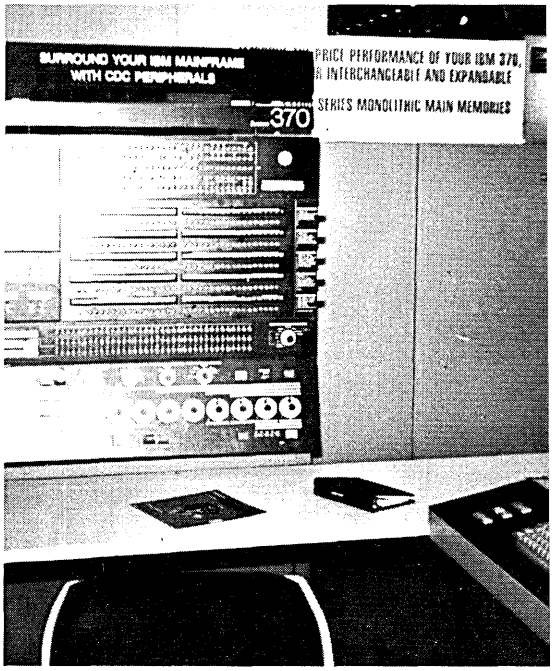
Ford added that a White House privacy committee he heads "is proceeding with a project to develop recommendations for assuring that personal privacy rights are given systematic and careful consideration in the planning, coordination, and procurement of federal data processing and data communications systems. Our objective is to formulate an action plan by June 30."

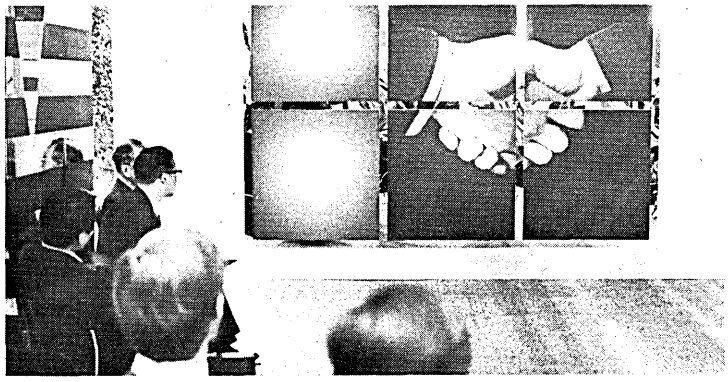
Ford's presence at the conference probably had something to do with the record press registration of 375. It definitely had everything to do with the armies of special police and secret service men who swarmed McCormick Place the day he spoke. Despite their presence someone managed to spike coffee backstage at the Arie Crown with LSD. Ford didn't drink any of the coffee but six stagehands did. The hallucinatory drug was discovered when they began to act strangely some nine hours after the Vice President had departed.

Security and/or privacy

Security and privacy were big topics again this year in the session rooms, with the two terms sometimes used interchangeably. Tom O'Rourke, president of Tymshare, Inc., objected to this in a session on utility computing. "Privacy," he said, "involves the use to which information is put. Security is the protection of data from unlawful, illegal access."

Some weren't so sure that privacy and/or security are important issues. In a session on Research in Data Security, Dr. Anita Jones of Carnegie-Mellon





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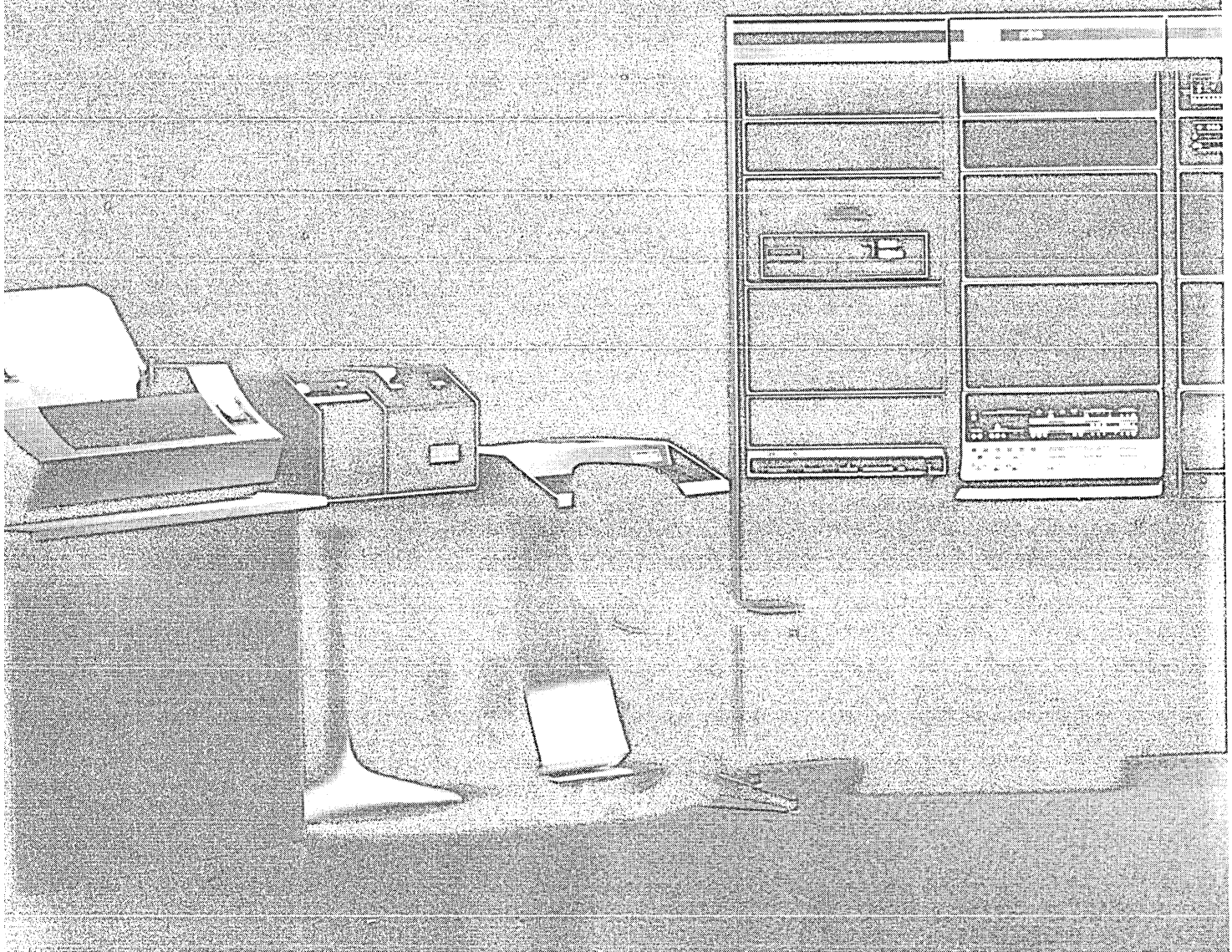

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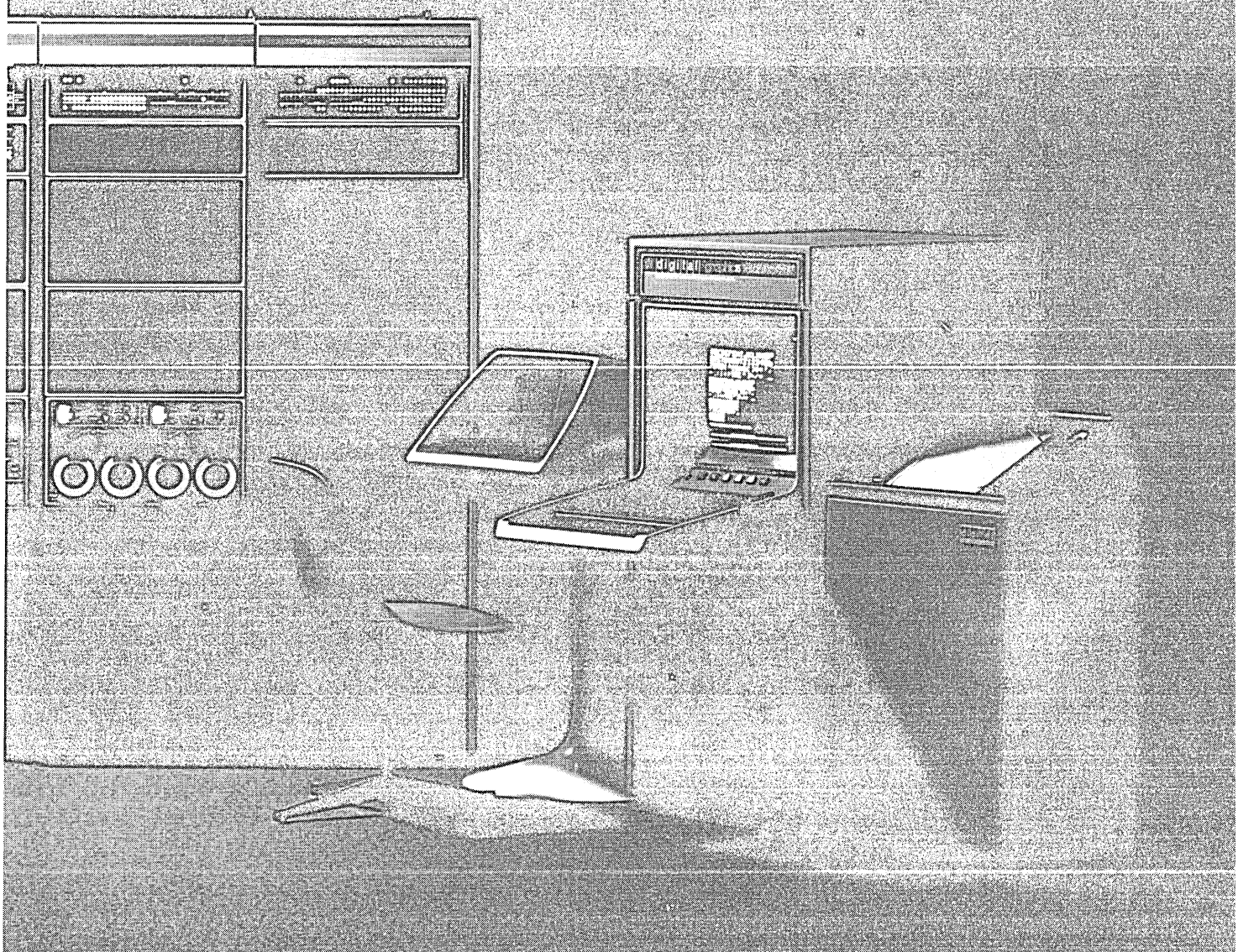


Univ.'s project Hydra reacted to Ford's speech. She commented that the administration is trying to divert the public's attention from Watergate. The sudden furor over privacy, she said, is one of those diversions. The result, she worried, may be hastily drafted policies that cannot be implemented. "These people—the legislators—need to know what technology can and cannot do."

Question and answer

A session titled "Report on the IBM Data Security Study" brought forth this question: "What practical steps can be taken to combat top management overreaction to the garbage being written and verbally disseminated by the paranoid peddlers who have set themselves up as data security experts but, in fact, have no real world background or experience?"

The answer, from IBM's Lee Danner: "All we're saying is there is a potential. It's up to you to decide if there's a problem."

The session was a final report on what many had believed was a $40 million two-year study of security problems funded by IBM and carried out by the giant, the Massachusetts Institute of Technology, TRW, and the State of Illinois. The reason for this misconception was an announcement, by then IBM chairman T. Vincent Learson at the 1972 Spring Joint Computer Conference, that committed IBM to an investment of some $40 million to study and develop data security techniques. As it turned out, only $2 million went into the joint study. The remainder is being spent internally on IBM projects.

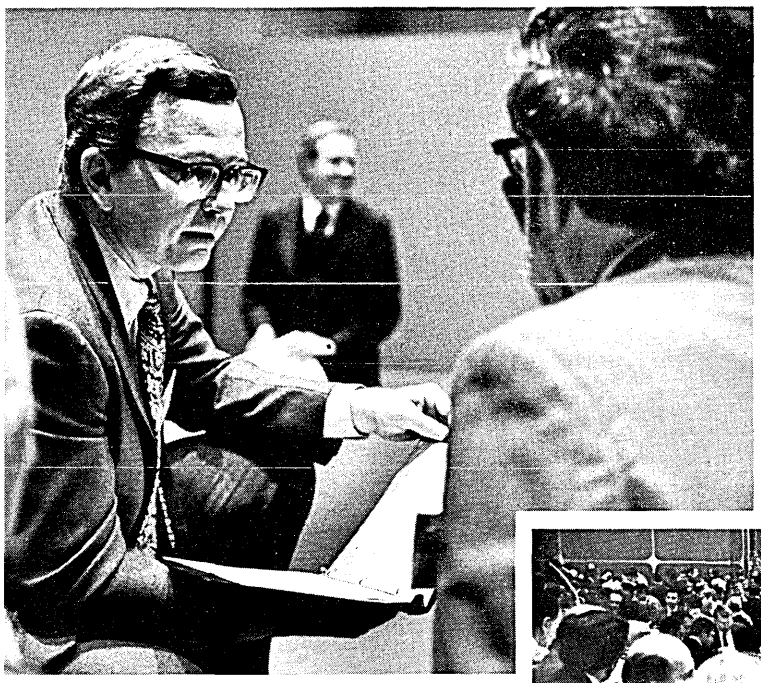
Each of the study sites involved in the joint program installed IBM's experimental Resource Security System (RSS), a software addition designed to make their computers' operating systems highly secure. The NCC session was largely a report on their experiences and conclusions.

Jerry Short of TRW concluded that "no existing system is completely secure; that automated tools are required for security; and that computer security is only a part of total information security."

In answer to a question, Danner told the audience that RSS is not available on a general basis. What will be available as a result of the study, sometime this summer, are publications and video tapes.

Another speaker who felt security as a problem is overrated—"overblown" was the word she used—was Cheryl Traver of Stanford Univ. In a talk in a session on Data Base Administration, she noted that, while overblown in importance, security is a matter of concern to the user and one which really boils down to a people problem involving such things as unlocked doors and careless use of wastebaskets.

Another illustration of people as a security problem was given in a session on Electronic Funds Transfer Systems by Bruce Smyth of the Federal Reserve Board. He told of a missing message involving Culpepper, the fed's message switching system. Exhaustive investigation, he said, led to a low-paid page at



AFIPS president George Glaser, above; luncheon speaker Clarence Spangle of Honeywell; and Prof. Edsger W. Dijkstra of Burroughs, who won the Harry Goode Memorial Award. Lunch was a busy time for NCC visitors who heard talks by Spangle and AT&T's chairman John D. deButts. Many skipped lunch Thursday to hear Vice President Gerald R. Ford's address in Arie Crown theater at McCormick Place.

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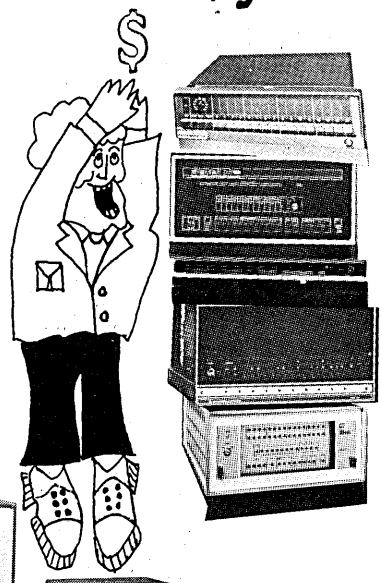

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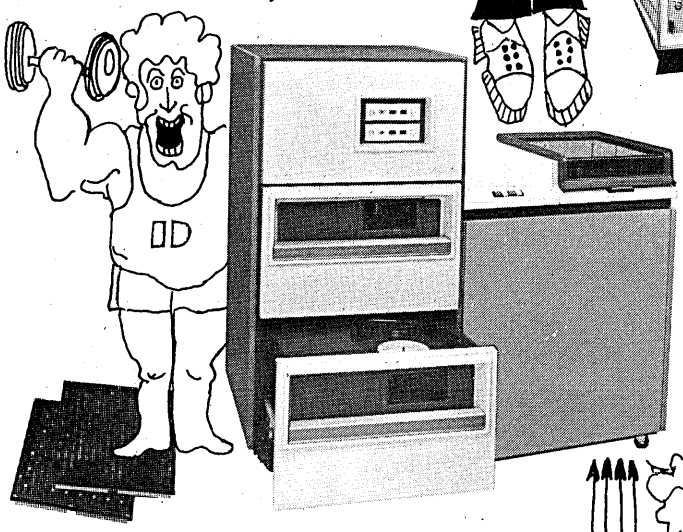

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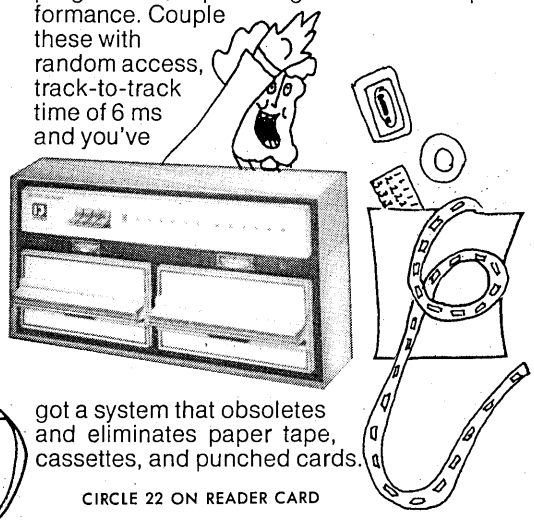

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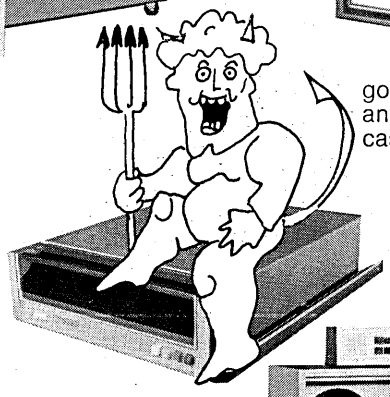

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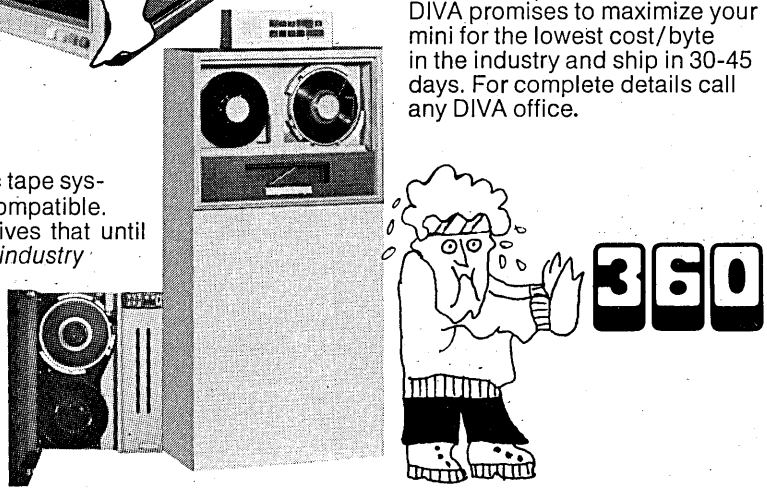

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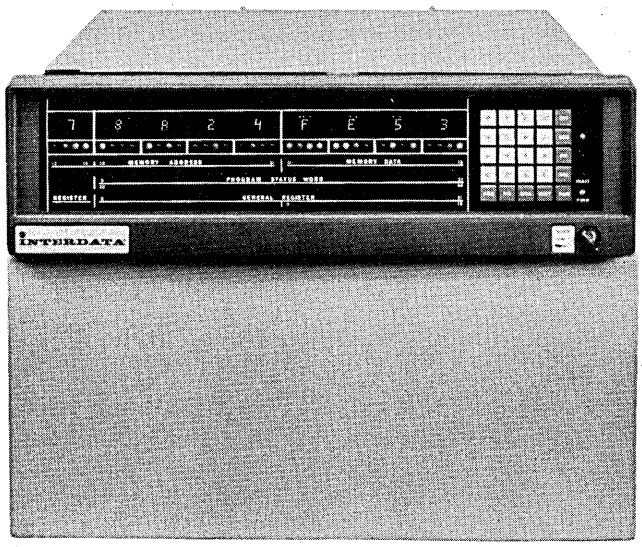

Performance	7/32	Nova 840	PDP-11/40
Word length	32	16	16
Memory speed (nanoseconds)	750	800	900
Maximum memory capacity (bytes)	1,048,576	262,144	262,144
Addressing range (bytes)			
Direct	1,048,576	512	65,536
Relative	±16,384	±256	±32,768
Indexed	1,048,576	65,536	65,536
Double indexed	1,048,576	No	No
General-purpose registers	32 32-bit	4 16-bit	8 16-bit
Index registers	30 32-bit	2 16-bit	8 16-bit
Vectored interrupt levels	Yes	No	Yes
Minimum interrupt overhead time (usec)	6.5	47.5	46.5

Price	7/32	Nova 840	PDP-11/40
32 KB processor	$ 9,950	$12,930	$15,345
64 KB processor	14,450	19,330	26,925
128 KB processor	23,450	35,630	44,725
256 KB processor	41,450	61,230	80,825
1 Megabyte processor	171,650	Not available	Not available

Source: Data General Price List, 5/15/73. DEC PDP-11/40 Price List, 6/73. DEC OEM & Product Services Catalog, 1972. Auerbach Minicomputer Characteristic Digest, June, 1973. "How to use Nova Computers", 1973.

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a receiving terminal who had pocketed the message and forgotten it.

Glaser on people

People was the big concern of AFIPS president George Glaser in his keynote address. "I'm uneasy about certain aspects of our success," he said, "specifically, those that have to do with the quality and quantity of professionals who practice the somewhat arcane arts of information processing.

"We are having a painfully difficult time achieving the level of professional maturity that would stimulate and reward the continued self-renewal of individual competence . . . Professionals help people. They do not worship things. Yet it seems to me that far too many computer people are unduly impressed with their machines."

In accepting this year's Harry Goode Memorial Award, Professor Dr. Edsger W. Dijkstra of Burroughs Corp. in The Netherlands also touched on the critical role of people in computing. He was accepting, he said, on behalf of a cause. "The cause in case is the conviction that the potentialities of automatic computing equipment will only bear the fruits we hope, provided that we take the challenge of the programming task seriously and provided that we realize that what we are called to design will get so sophisticated, that Elegance is no longer a luxury, but a matter of life and death."

And people was the subject of one entire session titled "Certification of Computing Personnel: Prospects & Potential Impact." Paul Armer didn't streak as had been hinted (and admittedly hoped for by some in the audience), but he was there with some diversion in the form of a fancy hand-drawn seal proclaiming a CVP, for Certified Vice Participant, which he pasted on the podium when Bob Reinstedt of the Rand Corp. got up to speak. Reinstedt is vocally anti-testing and anti-certification.

This was a lively session even though it filled the final time slot of the whole conference, with differences of opinion both on the panel and in the audience. And it had lively panelists. In addition to Reinstedt, who guessed he was talking about construction of a 10 ft. pole since he was on a certification panel and he wouldn't touch certification with a 10 ft. pole, there were: Donn Parker, talking on one of his favorite topics, the horrible things people do in general, and jailed programmers in particular; Herb Grosch, who avowed he was a CVP—Certified Vistle Plower; and attorney Bob Bigelow, who argued not only for certification but for recertification and decertification.

One area of disagreement centered on a situation in Oregon (see May, p. 18) involving a programmer who blew a system to call attention to its weaknesses. Some, like Parker, thought he had gone too far. Others sided with Vistle Plower Grosch, who thought he had done the right thing.

Despite differences, the consensus of the panel and the audience seemed to be that certification is a good thing. Bigelow warned that it should be done before the government gets into the act with licensing. He noted that the Society of Certified Data Processors wants licensing.

The not-so-new notion of a large, influential user association received prominence during the NCC when the Computer Industry Assn. announced a "no-strings attached" offer of $50,000 to whatever group wanted to start one and could come up with two matching offers. CIA Executive Director A.G.W. (Jack) Biddle hinted that AFIPS and CBEMA might be the logical ones to do this. AFIPS President Glaser received the suggestion with a forceful "no comment" at a press conference, but explained that the federation had not yet been approached by the CIA. Honeywell's Robert Bemer, attending the press conference, quipped, " . . . and if anybody here wants to know CBEMA's position, go see BEMA."

Biddle said after the conference that several "prominent individuals" on the West Coast already had assumed leading roles in proposing support from other trade organizations. He said the CIA decision to make the $50,000 available was made at a board meeting only the day before the press conference announcing it. "We'd been talking a long time about the need for an independent user organization and we decided we'd put our money where our mouth is."

Communications was, as usual, a hot topic at the conference. AT&T's board chairman, John deButts, addressed the Industry Luncheon. He spent most of his time talking about how valuable computers were to his company. Perhaps the most significant aspect of the speech was that he didn't once mention interconnection.

VAN's are a joke?

In a session on large-scale network experiences, panelist George Feeney, vp and general manager of GE's Information Systems Div., said the value-added carriers "are a joke," adding, "personally, I don't believe in the viability of any of the present or planned specialized carriers."

Feeney's basic point was that AT&T, because it controls the nation's communications channels, has the power to dominate the datacom marketplace. Bell hasn't done so yet, he indicated, because the market isn't yet big enough,

AFIPS to Counsel Feds on Privacy

The American Federation of Information Processing Societies (AFIPS) has put off until November a decision on whether to open a government relations office in Washington. But the organization of 13 computer-related societies has formed a committee on privacy which will have close government ties.

The privacy group, called Special Committee on the Right of Privacy, is headed by Dr. Willis H. Ware of Rand Corp., who was chairman of an advisory committee to the Dept. of Health, Education and Welfare on automated personal data systems (Sept. 1973, p. 112).

AFIPS president George Glaser said the committee was formed at the suggestion of Philip Buchen, executive director of The Domestic Council Committee on the Right of Privacy, a federal committee headed by Vice President Gerald R. Ford. He said Ware's committee will advise Ford's group and "probably carry out specific projects for it." Although AFIPS didn't allocate any money to the committee, Glaser said the federation has $10,000 available to finance new projects.

The decision on the much-discussed Washington office was made at a board meeting following the National Computer Conference last month in Chicago. At that meeting the federation also accepted as new members the Data Processing Management Assn. and the 9,000-member Institute of Internal Auditors. It also approved a constitutional change that would give full membership status to any member society wanting it.

All but six of the constituent societies hold affiliate memberships, a status that prohibits them from representation on the AFIPS executive committee and from sharing in disbursements from the federation's NCC surplus. Their status has been established by an admission committee.

Glaser said the constitutional change will become effective July 1, 1975 if the board approves it at a second vote to be taken at a meeting in mid-November. □

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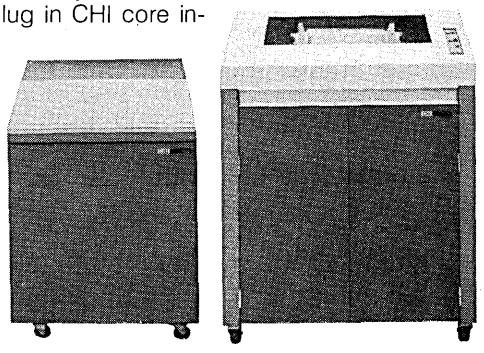

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but Feeney stressed that it's growing rapidly.

At another computer networking session, this one on interfacing, somebody in the audience criticized IBM's practice of making "de facto changes" in system design which reduce the user's ability to exploit new services. Panelist Richard Ryniker, of IBM's Watson Research Center, answered in effect that the VAN (value-added network) carriers should take care of such problems.

At a session entitled "Large Information Processing Networks—Development and Operational Experience," Richard Sprague of Payment Systems, Inc. predicted that, by the end of 1976, there will be 600K point-of-sale terminals in operation, versus about 300K currently. By 1980, Sprague added, the nation will be overlaid with a network of one to two million terminals, located at points of sale and elsewhere, providing a variety of electronics funds transfer services.

Another speaker at this session, George E. Buchik, director of systems for Gimbel's, the New York City department store, predicted that the next major development in POS will be a shift from batch to interactive operation.

Many conference attendees were complaining that session titles, in many cases, bore little relationship to the content of the talks. A case in point was a series of sessions titled, "What Manufacturers Would Like to See Happening in Point-of-Sale." For the most part it could have been better titled "What we (the manufacturers) have to offer you (retailers) in point-of-sale equipment.

But there were some manufacturers who threw in suggestions of what they would like to see. Michael McHale of Unitote would like to see a constant willingness (on the part of the retailers) to change and a continued emphasis on merchandising systems. Mike Coleman of Litton Sweda would like to see a slowdown and standardization. John King of Bunker Ramo called upon retailers to "get consumer feedback."

The POS sessions generally were poorly attended, perhaps due in part to a concurrent Supermarket Institute convention in Dallas. About the poorest drawer among them was a session on "Voluntary Standards for Retailing" at which a handful of people made a very large room in the McCormick Inn seem even larger.

Irv Solomon of the National Retail Merchants Assn. (NRMA) told this small group that the NRMA will make an announcement July 1 on a standard format for a merchandise identification code. It will be in OCR, A font, size one, and has been in test since last October in five store locations. Solomon said the NRMA has been urging "the grocery people" to change the OCR B font that is on the bottom of their Universal Product Code (UPC) to look like OCR A "so they will have some compatability with our industry." He said the grocery industry has assured him that the UPC is wandable but hasn't demonstrated this. "We've asked them to make their 10-digit code expandable and they said they would but haven't yet."

It was a long week and it was a short week. Everybody took away some memories but none could match Barry Lubowsky, director of computer services for Rider College, Trenton, N.J. He was the winner of $23,000 worth of free core memory from Ampex Corp.

—Edith Myers

Antitrust

The 700 Documents: A Turning Point?

With some 700 "privileged" IBM documents in its hands, the Justice Dept.'s case against IBM has undoubtedly been strengthened. IBM turned them over to the Justice Dept. immediately after the U.S. Supreme Court turned down IBM's request to review a lower court order on the issue.

The documents were included among the millions that Control Data Corp. received from IBM in its private case against the computer colossus. Essentially, IBM had maintained that it had inadvertently turned over the sensitive documents and that the papers were entitled to remain privileged—and thus not admissible as evidence against the firm—because the papers violated the attorney-client privacy relationship.

The intriguing question now, of course, is what is in the documents? The precise answer to that question probably won't be known until the trial begins—it is scheduled to begin in October—when at least some of them are expected to be introduced as evidence.

Neither IBM nor the Justice Dept. had any comment on the documents' contents. An IBM-inspired gag order forbids both parties in the case from discussing aspects of the case with the press.

A turning point

However, there was comment on the issue from A.G.W. Biddle, executive director of the Computer Industry Assn. "I think the documents," said Biddle, "will once and for all show how IBM controls the market. This could be a major turning point in the case."

Biddle said he wondered whether the so-called "Faw memorandums" were included in the batch of documents IBM turned over to the Justice Dept.

Hilary A. Faw was director of IBM's Office of Business Practices which, according to public documents on file in the case, was established to "bring together a small group of experienced IBM employees who would educate counsel about the electronic data processing industry." The group subsequently worked closely with Cravath, Swaine & Moore, IBM's outside law firm.

One of the Faw memos has been made public with great fanfare. In the memo, Faw wrote, presumably for the education of the Cravath, Swaine attorneys:

" IBM maintains or controls that value (the 'value of data processing usage') by . . . timing of new technology insertion; functional pricing; coordinated management of delivery; . . . refusal to market surplus used equipment, . . . strategic location of function in boxes . . . solution selling . . . refusal to support subsequent use hardware . . .

"Our price control has been sufficiently absolute as to render unnecessary direct management involvement in the means."

With such words, it is no wonder that IBM has been fighting so hard to sequester certain documents. At one point, IBM was fined $150,000 a day by Judge David Edelstein for refusing to turn over documents to the Justice Dept. The fine was stayed, however, until the Supreme Court ruling, and IBM was required to pay nothing because it turned over the documents to the Justice Dept. immediately after the high court action.

Others are privileged

Many thousand additional documents in the case are claimed to be privileged by IBM, and these are being reviewed by special masters appointed by Judge Edelstein. The masters have already said that the documents of IBM's Office of Business Practices, as well as other various IBM task force documents that passed between IBM and its law firm, should be privileged chiefly because they're considered to be attorney work products or communications between attorney and client.

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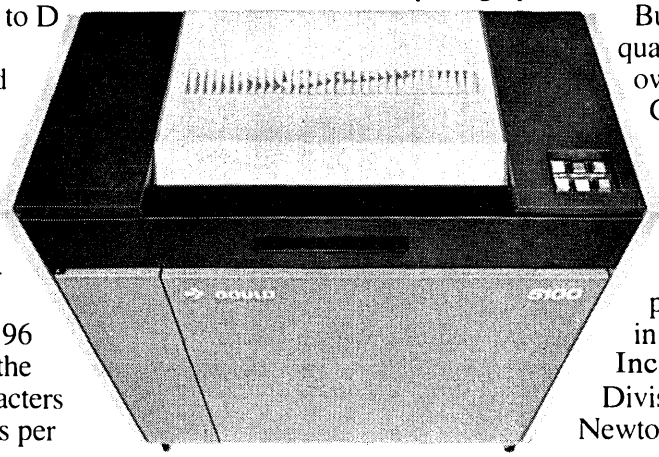

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However, it is possible that the Faw memos turned up in the CDC case and, if that is so, then they will now be weapons for the Justice Dept.

The whole issue of documents in the case has been a staggering problem. The handling alone has been overwhelming. Control Data received some 17 million IBM documents, culled through these, and put thousands on a computerized index. When IBM settled that case with CDC for about $100 million, the index was destroyed as part of the deal.

IBM is known to have a computerized index of documents in the case. Whether the Justice Dept. has one or not is not known; but, given the meager resources of the Justice Dept., that is doubtful.

The whole problem of documents was pointed up early on in the case in a letter from IBM's internal legal counsel Nicholas deB Katzenbach. In the letter, former Atty. Gen. Katzenbach wrote to Assistant Atty. Gen. Richard W. McLaren, who was heading up Justice's antitrust division. In the "Dear Dick" letter of June 14, 1971, Katzenbach wrote:

"Because of the complex nature of the computer industry, preparation for trial of this case will involve many millions of documents as well as extensive deposition. We will require much detailed information from the government concerning its participation in the growth and development of the data processing industry and its use of data processing equipment in all the various agencies as part of our analysis of the structure and definition of the relevant market. IBM has almost 5 billion documents in its own files, many of which the government will undoubtedly wish to examine . . .

Issue of morale

"Not only does the preparation of a case of this magnitude involve great expenditures of time and money by both sides, but it also has other unpleasant effects on the defendant. It unavoidably affects morale, raises questions in the minds of stockholders and induces harassment suits.

"It was for these reasons that I had indicated to you or the attorney general on several occasions over the past year or so that IBM was interested in discussing the possibilities of settlement. Thus, we left your office Wednesday with a strong sense of frustration at your staff's unwillingness to discuss any aspect of a settlement in any way. We cannot accept the explanation that an intense government investigation of five years' duration has not given your staff any idea of what type of relief it is seeking in this case. We also cannot understand why you believe that a massive deposition program—on both sides—will be useful in determining what relief the government seeks."

—W. David Gardner

IBM Is Now an Ex-Customer

Phillip Kronzer looks like the stereotype of a successful IBM computer salesman. At 39, his healthy and cheery look belies the fact that he's been booked and jailed twice in connection with an alleged multimillion-dollar theft of trade secrets from the IBM plant in San Jose, Calif. Kronzer, vp and chief operating officer of K&K Manufacturing Inc. in nearby Campbell, is one of four defendants in the case who have been cleared for lack of evidence. The others are: Wolfgang Arnold, now vp of Athana, a disc pack

news in perspective

manufacturer; Thomas Rauscher; and John F. Sueta. Trial for the remaining six defendants is scheduled for Sept. 16. The 10 were arrested almost a year ago for alleged involvement in the theft of plans for the Winchester and Merlin files.

Kronzer's company, headed by his father who's in semi-retirement, is a machine shop that at the time of the indictment was manufacturing a carriage assembly for the IBM 2314. Being an IBM supplier, K&K also had some IBM drawings, but this was later deemed to be proper possession. Of the search, seizure, and arrest, Kronzer says, "To put it bluntly, they had no grounds . . . It became evident later that they were way off base." The company, which serves the local instrumentation and computer industries as a job shop, at one time did a considerable amount of business with IBM. But that firm is now considered an ex-customer.

A friendly and pleasant person, Kronzer understandably becomes reticent when the subject turns to possible legal actions he will take against IBM. His lawyer says only: "That's a matter that has to be weighed." Kronzer, asked what the experience was like, asks in return, "Have you ever been in jail? Until you've been through it, it's difficult to say what it's like." He shows little bitterness, but mentions the embarrassment to himself and his family.

Companies

Amdahl-Fujitsu Deal Now a Joint Venture

The Amdahl Corp. computer will be produced in Japan after the engineering model and two production models are completed in California. The manufacturing is to be performed by Fujitsu Ltd. for the first two years of the production run, extending into a third year if the mainframes continue to sell, according to Dr. Toshio Ikeda, managing director of Fujitsu's Information Processing Systems Group.

Fujitsu, the largest investor in the American firm founded by Dr. Gene Amdahl of IBM 360 fame, earlier agreed to purchase 10 mainframes from Amdahl Corp., but that deal is off because of the inability of the Sunnyvale, Calif., company to get into the manufacturing business. To do so, says Dr. Ikeda, Amdahl would have required an additional $20-30 million in capital, which it was unable to raise.

He said that interest is centered solely on Amdahl's virtual memory system, the so-called 470V/6, rather than on the originally conceived real system, and that the first delivery by the Calif. company is slated for April 1975. Deliveries by Fujitsu are to follow, allowing them to observe the reaction of the market in the U.S. before adopting a marketing strategy in Japan.

Joint venture

In what has become a joint venture, Fujitsu's role is said to be that of R&D and production, while Amdahl handles R&D and marketing. But manufacturing by Fujitsu could also take place in the U.S., for the company has purchased land for such a plant near the Amdahl facilities in Sunnyvale.

Current plans, however, are to use production facilities for Fujitsu's next family of machines, the M Series, which Fujitsu and Hitachi are developing

DR. TOSHIO IKEDA
Catching up with IBM

jointly. This four-machine family, which is the two companies' answer to IBM's 370, is to consist of: the M-1, being developed by Fujitsu, equivalent to a 370/148; an M-2 from Hitachi, equivalent to a 158; an M-3 from the same company, described as 20% more powerful than the 168; and the M-4 from Fujitsu, with three times the power of the 168. The production line for that latter machine will be used to produce the 470V/6.

The M-4, which will bear a price tag similar to that for the 168, is to be announced this year. The prototype is to be completed late this year, and it's scheduled to be up and running in the first quarter of '75.

The architecture for the M-4 was supplied to Amdahl Corp. about two and a half years ago, according to Dr. Ikeda,

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and led to the American company's vs and multiprocessor designs. In return, Fujitsu received Amdahl's LSI designs, enabling the M Series to use LSI for its logic circuits and MOS for its memories. But it was Fujitsu that advised Dr. Amdahl to develop the 168-equivalent model, Dr. Ikeda said.

Use 168 software?

Unlike the 168, however, the M-4 reportedly will have additional design features, which means it can use 168 software while IBM will be unable to use Fujitsu's software. These extras include a channel relocation feature for the more efficient use of vs architecture, plus several additional instructions. IBM's FS, Dr. Ikeda added, definitely will have this channel relocation function. He said within two years Fujitsu will be able to develop system software that will run on the Amdahl computer.

In talking to mainframe manufacturers, one gets the impression the Japanese are resigned to playing catch-up. Ask them who their biggest competitor is and they all cite IBM. They do not hesitate to express the size or capabilities of their machines in terms of a 360 or 370. And Dr. Ikeda, described by someone outside Fujitsu as the one man on whom the company is banking for its success in the computer business, is no different.

Thinking aloud, he says that if IBM announces its FS in 1977, it couldn't begin shipping until 1978 or '79. That means Fujitsu's successor to the M Series couldn't be shipped until '79 or '80, giving the M Series at least a five-year product life. "It will take about one or two years to catch up again with IBM," he said.

—Edward K. Yasaki

International

Israel Looks Outside For Markets, Expertise

Poor in raw materials, but rich in the skills and intellectual tradition of its people, Israel naturally gravitates to electronics and computing.

Its government has placed the highest priority on these industries, says I. Rom, a director in the Ministry of Commerce and Industry. About half of the nation's limited R&D funds—$10-15 million—go to electronics, along with tax incentives to these industries and subsidies for the goods they export. Electronics embraces computers, components, communications, and instrumentation. The strategy is not to build general purpose computers, but to concentrate on minicomputers and special purpose mini-based systems, and to solicit "foreign partners" to market them outside this tiny, war-torn nation we visited early this spring (see May, p. 96).

Rom listed those firms now established and exporting:

Elbit, a minicomputer manufacturer partly owned by Control Data; Elscint, which makes special purpose systems for the nuclear and medical research fields; Eltam, maker of control and data logging systems for aircraft and ships; Scientific Technology, a manufacturer of production control systems for textile manufacturers; Tadiran, a GTE subsidiary making communications and terminal equipment; Telrad, manufacturer of automatic telephone exchanges; SDSI, producer of disc drives and magnetic heads; and MG Electronics, producer of medical instruments, some of which are minicomputer-based.

"Because it is free enterprise," Rom says, Israel does not have a detailed program for building up this industry. "We are looking for initiative from the outside. This country has something to offer foreign partners because we have standards of professional manpower suitable for well-advanced technologies." While half of the industry's sales are to the defense establishment, "our companies are aware of the danger of a defense dry-up." Prospects of such a happy problem also turn their heads toward commerce and export.

Exports so far in computer-related industry (not all electronics) have been variously noted in Israeli literature, but hover somewhere around the $10-15 million market (1973). Experts see this rising to a maximum $115 million by 1978, with $85 million more likely. And that growth will be limited most by manpower shortages.

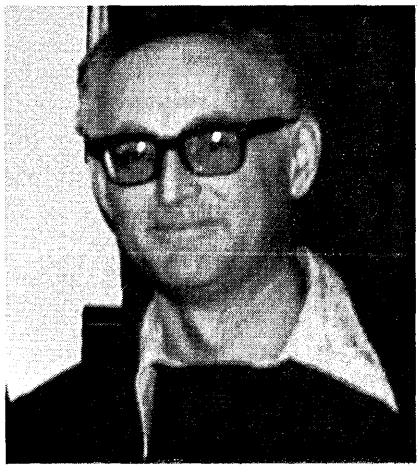
The trials of Elbit

Uzia Galil, entrepreneur and managing director of Elbit Computer, Ltd., exemplified what Rom was explaining, discussing the history and operation of this company located in the impressive Advanced Technology Center outside the Port City of Haifa. In 1962, Galil formed a company called Elron, an electronics and instrumentation firm that was an outgrowth of government development efforts. It subsequently spun off into several companies, one of these being Elbit, formed in 1966. This minicomputer maker immediately came out with a $5,000 system, significant for that day.

But Galil said it was able to sell only about 250 systems between 1967 and 1970. Despite government and banking funding, it did not have the resources to develop strong worldwide marketing. And without these, "we found out the hard way that it was impossible to get a breakthrough, even with a cheap, technically advanced system. We should have sold thousands."

Control Data, already established in Israel, swept in to buy a majority interest and is proving a complementary partner. Almost half of Elbit's $17 million in 1974 revenues will be export, and Galil expects $10 million in exports on $20 million in revenues in 1975. The major export product is the minicomputer for CDC's System 17, which Elbit fashioned to be able to use the CDC 1700 software.

It currently has a backlog of 500 computers, the filling of which was slowed by the Yom Kippur war which drained large chunks of personnel from Israel's manufacturers. A spokesman from Control Data, however, has assured us that Elbit will continue to make the computer, and any manufacture of it outside of Israel will be Elbit's responsibility. Elbit, he said, also will supply the mini-



DR. FRANK MOSER
Customers don't understand overhead

computer for CDC's Cyberdata key-to-disc system, not yet offered in the U.S.

Most of its national market is military systems for the government, although it expects a growing market in industrial control, message switching, and key-to-disc systems. "The key to the minicomputer industry today is software support," acknowledges Galil.

The software industry in general in Israel is fraught with problems and the

same needs of export. It has numerous software firms, and their lists of accomplishments and capabilities are as impressive as those in any country—and the talent comes cheap (about one-fourth the salaries of U.S. counterparts). But each firm is small, with none having more than 30 professionals, "a lot less than the critical mass needed for large projects," says Dr. Frank Moser, general manager of one of the larger houses, NATAM. Moser and other members of the Israeli software association listed their "can't win for losing" problems for us.

Internally, there is the traditional battle with customers over their price per man. Although the software firms think their prices are "too low," the customer constantly compares them with that of their own people, unable to understand "overhead." Then, the government, which is the single biggest customer, is on a jag of developing in-house expertise at the agency level. Moser feels there aren't enough qualified people to fill those jobs, nor are there enough projects to keep development personnel happy. The government, many agree, should strike a balance between permanent staff and outside contracts to experts, but the software firms doubt this will actually happen. (Sounds like the ancient Not Invented Here complex.)

Looking elsewhere

Too, because of the fragmentation of the software industry, some of the big commercial customers that exist "think there is no software industry here and are looking to foreign firms to do their sophisticated systems." And finally, the Israeli market simply is not big enough. "How many cement companies are

DAVID COHEN OF IBM
Shortage of project leaders

there that will buy a project control system?" Moser asks.

To counter the small market size, the software firms need to expand abroad. But they must overcome the stigma of the foreign interloper existent everywhere and the sheer overhead of working abroad. They feel limited to neighboring friendly countries and to projects which can be defined abroad but worked on at home. And they need some kind of partnership with a firm which will subcontract jobs to them. The biggest market, the U.S., is simply too far away.

But that fragmentation of the software industry is a roadblock to growth at home or abroad. It has been proposed that a single national company be formed, combining the 200 or so professionals in these companies. The problem is that most of the small firms are owned by various organizations, and negotiations toward merger would be difficult at best.

There is one group in Israel which is not a likely exporter, but has been suggested as an alternative solution to the

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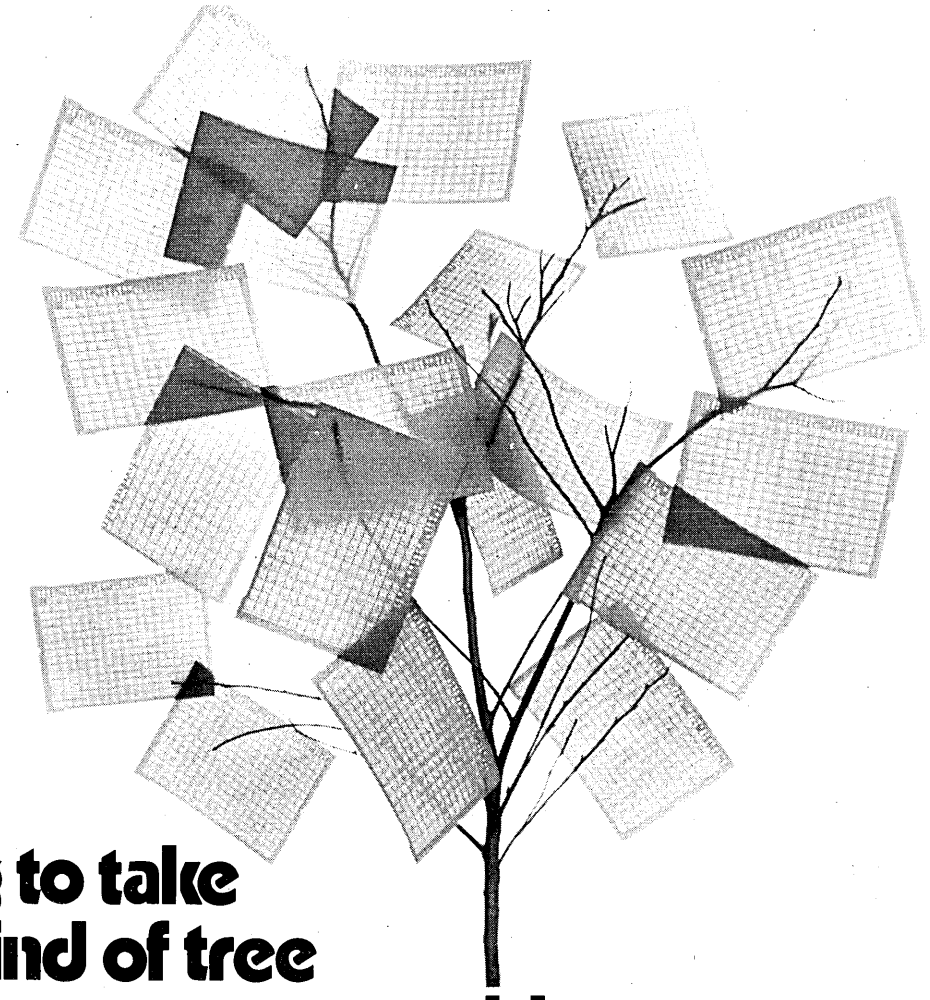

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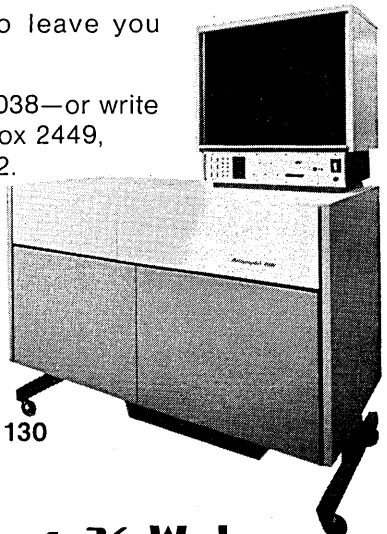

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troubles of the software industry. This is the service bureau industry. While many are linked with software companies, David Cohen, managing director of IBM Israel, and Frank Moser both feel that these partnerships should be increased. Moser noted that software firms in the U.S., in order to survive, are either being bought by large companies or are teaming with service bureaus to counter the ups and downs of a people-oriented software business. Israel must do the same.

Israel's service bureaus, which own a total of 45 computers, are primarily engaged in "turnkey services," according to leaders of the Israel association for service bureaus. It contains the 10 "pure" SB's in the country. They seem to thrive on the fact that the country is mostly one of small companies, who need their services. They, too, face internal problems, such as what Levi Ephraim, head of HISH (Office Efficiency and Service Co.), calls unfair competition. "Everyone with a computer is trying to sell hours." Zir Shapira, head of the Electronic Computing Center Ltd., claims that the "overselling of IBM causes it. Here they sell a system by telling the customer he can sell hours and pay it off." They also complained about the competition from the government and the universities, which get their computers duty-free. They pointed to Control Data, which sells services on a system it sold to a university, duty-free, and is hence undercutting them.

If we were amused, it was because the complaints seem to be universal. However, the liaison agency, Iltam, says these "competitive" problems are being policied out of existence.

In any case, the complementary nature of the service and software industries may pose a solution to the problems of size, export, business cycle, competition, and manpower.

Advice from abroad

There are manpower needs in Israel, but how do you measure manpower? Do you note the small population and the needs of breakneck growth? Can you measure by graduates of universities and high schools compared to some projected need? Needs where? In production, in use, in consulting, white collar, blue collar? We don't have the whole picture. We do know that Israel has some very impressive people advising it from among its own ranks and its friends in the worldwide Jewish citizenry. They are organized to serve on computer committees under the Joint Economic Conference, which encourages economic and intellectual infusions from abroad into all its industries.

There are people like Aharon Gertz, director general of the liaison agency Iltam, who came to Israel from Poland in 1928 and has more than 20 years' experience in data processing for the government and in international organizations. There's Dr. Moser, who emigrated from Canada in the 1950s, and has a Ph.D. from the Univ. of Michigan (where Bernie Galler interested him in computing). There is the director of the Hebrew Univ. Computing Center, Naham Oron, who recently spent two years at Temple Univ. and toured other U.S. university centers to learn and compare. There is Dov Chevion, director of the main government center, who is known for his leadership in international organizations. They are joined by dozens of luminaries from abroad: Werner Frank, Bernie Galler, and Philip Dorn of the U.S.; C. C. Gotlieb of Canada; Sergio Beltran of Mexico; Phillippe Dreyfus of France; and many others from Europe, Latin America, and Africa.

There seems to be no shortage of experienced advisors.

IBM's Cohen, who also is chairman of the subcommittee on manpower and education, gave us other measures of manpower. The basic computer professions are quite well-stocked and suffer only temporary shortages quickly filled by the many schools for programmers, operators, and maintenance personnel. (Cohen is not satisfied with the quality of the independent schools there, and the committee is trying to investigate and remedy the situation.)

The main shortage is of project leaders, senior systems analysts, and project analysts. Basically this means they are short of people who can run a project—understanding the user problem, doing scheduling, budgeting. He gave a good example of the kind of person needed. Israel is developing a land registry system. The private plots are variously registered according to the Turkish Ottoman or British system and the government-owned land (which accounts for most of it) is not registered by plots at all. The project leader for this not only must develop a standard system suitable for automating, but also initiate the legislation that will permit its implementation.

Want practical courses

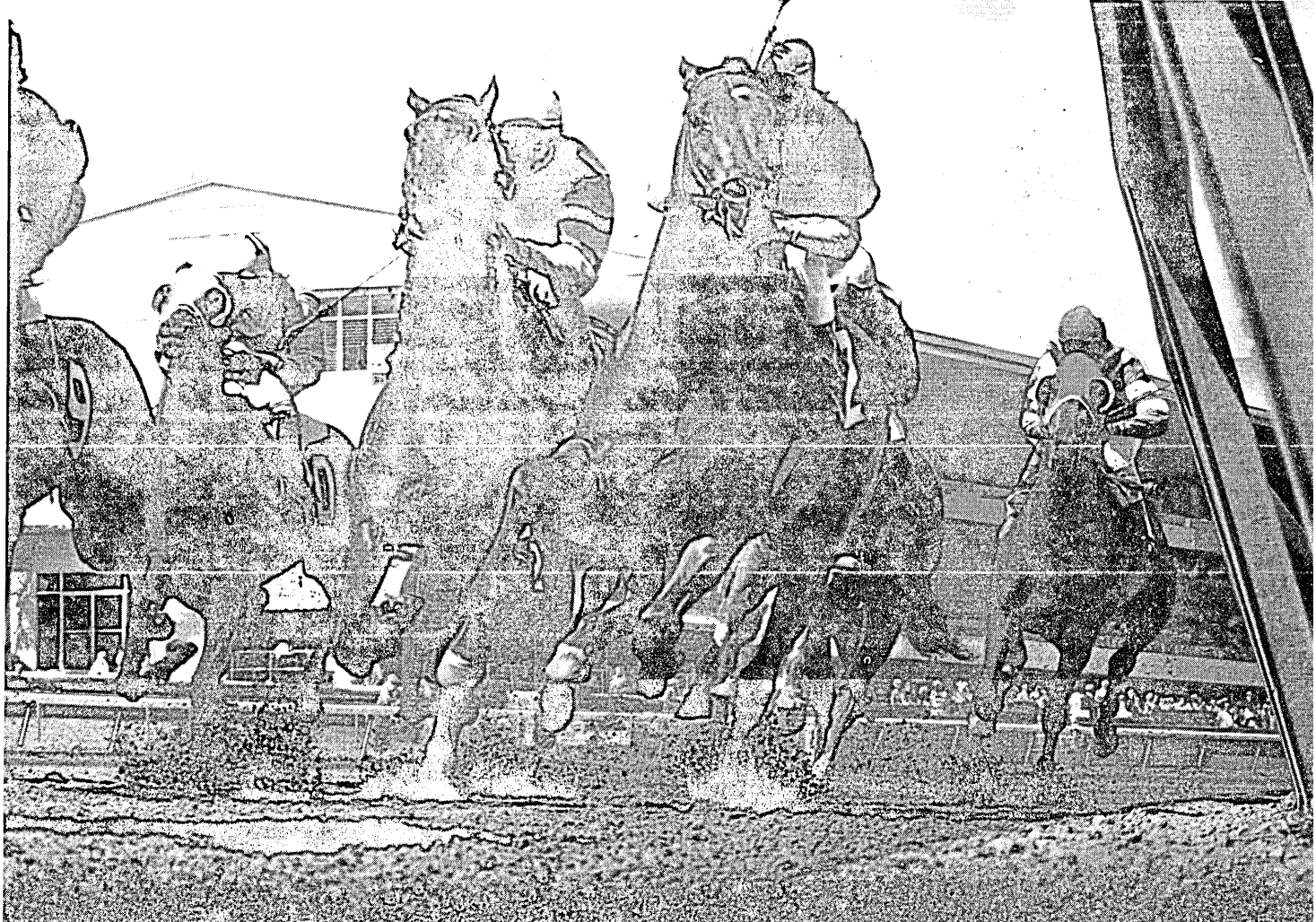
Most of Israel's universities have computer science courses. In fact, by 1975 more than 600 degrees will have been awarded in this field, according to official reports. Aren't they developing the kind of "project leader" Cohen says is in short supply? Cohen echoed a worldwide lament. "They provide experts in automata theory, APL. This is wonderful, but we want to improve our place in the world economy. For this we need people who know how to use computers efficiently and economically. We are trying to encourage the computer departments to provide practical applications courses, make them aware of practical needs. But," he said wistfully, "there is academic freedom."

The real alternative is to go through the university business administration departments, he agreed, and, in fact, funds are being given them to provide the courses needed. The manpower subcommittee is also encouraging management training on the use of computers as a management, rather than a clerical, tool. "Things are changing, as the old guard in management is giving way to younger people who have some edp understanding," he added.

IBM has some small plants in Israel, but none for computer manufacture. The firm has, however, established a research center which should help further the Israeli scientists' study of computing and its application in research in other fields. Not the least of these are both medicine and agriculture, in which Israel already has an outstanding reputation.

When it comes to the specific application of computers in various industries, Cohen criticized one particular situation which exemplifies the nation's overall shortages. Israel brings more than 100,000 Arabs in daily from the West Bank (which starts at a little town called Bethlehem) to work on the thousands of buildings being constructed all over this little country. The construction business is booming, yet computers are not being used in it for scheduling, planning, design, bid reviews, or even material production control. Hence it does not have the efficiency it should have in use of labor or materials.

Finally, if Israel is short of people at top levels to help channel the nation's growth through the efficient use of com-



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puting, it also foresees manpower shortages in computer equipment production. As it enlarges its industry to meet internal and export needs, reports say it will fall short of personnel in administration, marketing, service, and R&D, and in the blue collar jobs in the plants.

Don't start at the top

As in the past, it is continually trying to attract computer professionals from other countries. More than 150 came from the U.S. and Europe between '67 and '70, many of them emigrating during the severe economic downturn in the computer industry in 1970–71. Certainly, there are opportunities, but Israelis warn any prospective emigrant not to plan to assume major responsibilities too quickly. First there are six-month-long immersion courses offered to emigrating families; these involve living at a training center and speaking nothing but Hebrew. While it is optional, IBM, for example, has required this of all its 40 IBMers who have transferred from around the world.

Rami Guzman, director of the government's Automation and System Management team, pointed out that not only must a foreigner learn the language, but also the "ways" of dealing in commerce, government, and industry. The intertwining of state and religion must be understood. As in all countries, the immigrant must "do as the Romans . . . " Guzman related several cases of frustration of Americans who, having held management posts in the states, found it difficult to wait until they were "ready" to assume some leadership in Israel.

The immigrants with the greatest problem in Israel are the Russians. Fifty or so computer professionals have emigrated from Russia in the last few years, and not only is there a language barrier (most Israelis speak English, few speak Russian), but they are basically theoreticians with a mentality and approach entirely different from the West-oriented computing community there.

Surely anyone wanting to live in Israel will find himself welcome, particularly if he understands he is not there to save Israel or its computer industry singlehandedly. In his mind, the nation's enthusiasm for computing shall have to outweigh his low wages, high taxes, inflation. He shall have to be enamored with the beauties of the countryside, the atmosphere of history, and the bustle of modernization. He shall have to be struck by the fervor of a new country, even though it has been mellowed by progress and some materialism. And he shall have to feel on the right side in order to sustain the perpetual outbursts of tragedy.

—Angeline Pantages

Benchmarks

Third Partner: Computer Peripherals, Inc., the joint venture of NCR and Control Data which makes line printers, card readers and punches, and magnetic tape drives for the partners, will gain a new owner—the U.K.'s International Computers Ltd. (ICL). The three firms announced that contracts are now being negotiated under which ICL would invest $20 million for an equal partnership in the Edina, Minn. firm, which would open a research and manufacturing plant in the U.K.

NCR's Scanner: NCR hopes to begin delivering its new Universal Product Code scanning checkout system to supermarkets in mid 1975 and to start con-

Thinking about distributed computing? Lockheed System III gives you RPG II plus a price advantage.

Whether you need a number of in-house systems for distributed computing, or whether you're planning to make your industry expertise available to others in a turnkey system, we've got good news for you.

Lockheed Electronics offers a quantity discount to companies ordering multiple System III business computers.

Sound like a good deal? Well, it is. But what's even better is the system you'll be saving all that money on. In quality and performance it's the equal of anything on the market.

The Lockheed System III has an RPG II compiler in operation with over a year of proven reliability. And it's fully compatible with industry standard RPG II source level programs.

It has a keyboard/console, video display, line printer and disk memory storage. And it's easily configured to your requirements, including 80 and 96 column cards, faster printers, plus expanded disk and core storage. You can have an auxiliary remote video terminal, too. So you get big-system performance at small-system cost.

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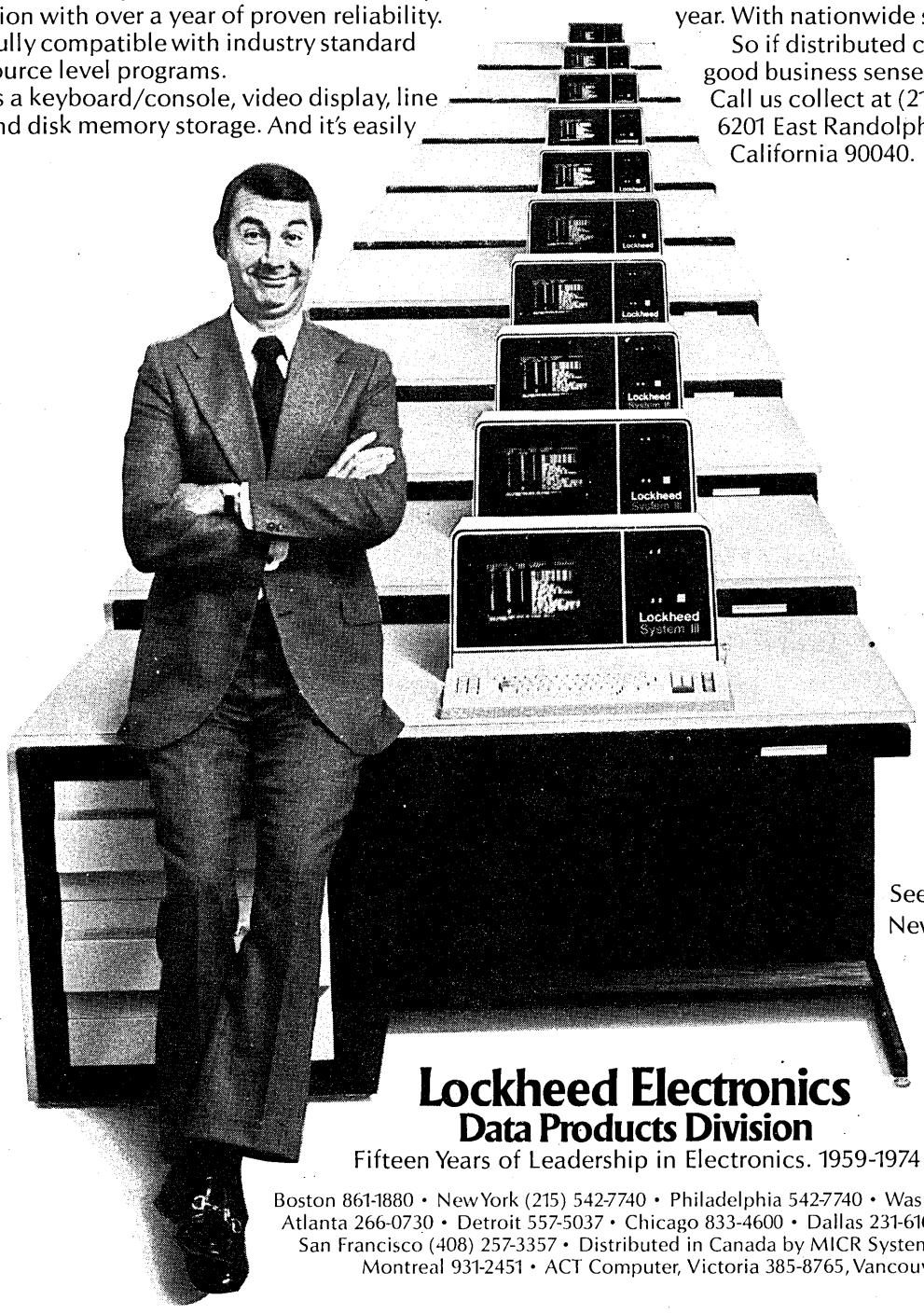
So if distributed computing makes good business sense to you, let's talk. Call us collect at (213) 722-6810. Or write 6201 East Randolph Street, Los Angeles, California 90040.



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news in perspective

ducting field tests this month at a Marsh supermarket in Troy, Ohio. The $4,995 scanning system, which uses a laser light source, is housed in a checkout stand and operates with the company's model 255 checkout terminals and an in-store computer, the model 726. It will read symbols printed on grocery items by the manufacturers of the items and trigger a price look-up. NCR said this year it will install "several thousand" model 255 terminals without the scanning feature.

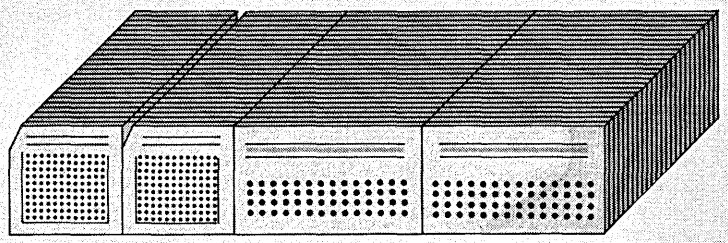
POS and Cpu's: The proliferation of electronic point-of-sale systems will have a major impact on sales of central computer systems over the next 10 years, says Frost & Sullivan, Inc., the New York market research organization. In a new Reference Report (#261), the company said that over the next 10 years some $700 million in computer revenues will be attributed to the upgrading of computer installations to meet the needs of POS and credit terminal systems. It thinks that by 1979 annual sales of POS equipment will exceed $1 billion. The survey also disclosed that NCR's popularity has "increased substantially" over front-runner Singer, and that IBM is in third place among general retailers and second among the supermarkets.

The company also issued a Reference Report (#230) on the computer performance evaluation business, predicting that hardware and software products will grow from a $17 million sales base last year to $140 million in 1983. It bases its forecast on a survey in which 50% of computer installations responding planned to purchase hardware monitors, and another 25% were in the process of developing their own software for this purpose.

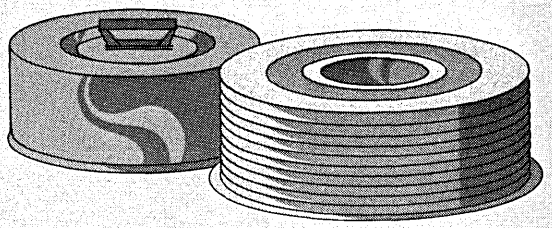
Metric Delay: The House of Representatives thinks more thought should be given to the economic impact of converting the U.S. to the metric system of measurement. (See related article on p.77.) Legislation to push the Metric Conversion bill (HR 11035) through without considering subsidies to small businesses and individuals financially affected by conversion was defeated in a 240-153 vote by the House last month. The bill itself is still alive and can be brought to the floor again; however, it will be subject to amendments such as those by Rep. Spark M. Matsunaga (D-Hawaii) to extend the conversion period to 15 years from 10, and to provide loans to small businesses financially affected by conversion and assistance to persons laid off their jobs or required to purchase new tools as a result of conversion.

Milestones: Orbis Systems, Inc., the Costa Mesa, Calif. floppy disc drive manufacturer, ended its first year of business in April with sales of $365,000, and predicted sales in its second year will soar to $1.4 million . . . A neighbor, Computer Automation, Inc., of Irvine, Calif., also passed a milestone, delivering the 1,000th LSI-Type 2 minicomputer, announced last fall, to a British bank . . . Basic/Four Corp., Santa Ana, Calif. subsidiary of Management Assistance, Inc., delivered its 1,000th small computer system to Lee Pharmaceuticals bearing a silver medallion with the inscription, "1000th System" . . . And the minicomputer firm Microdata Corp. began doubling the size of its 48,000 sq. ft. plant in Irvine to meet a big backlog. The company has some 6,000 minis installed. □

Tab makes one storage cabinet for cards,



one for disks,



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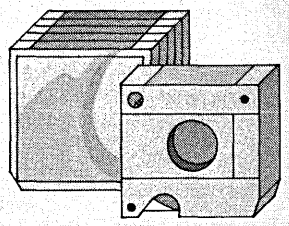
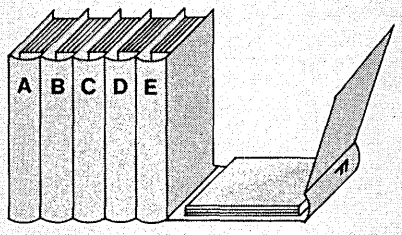
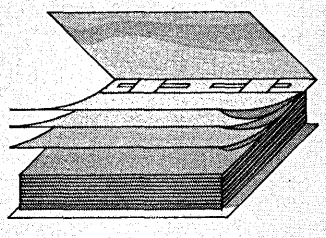


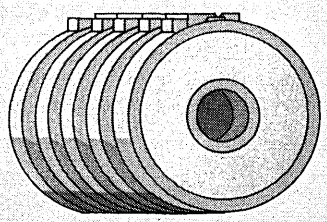
one for binders,

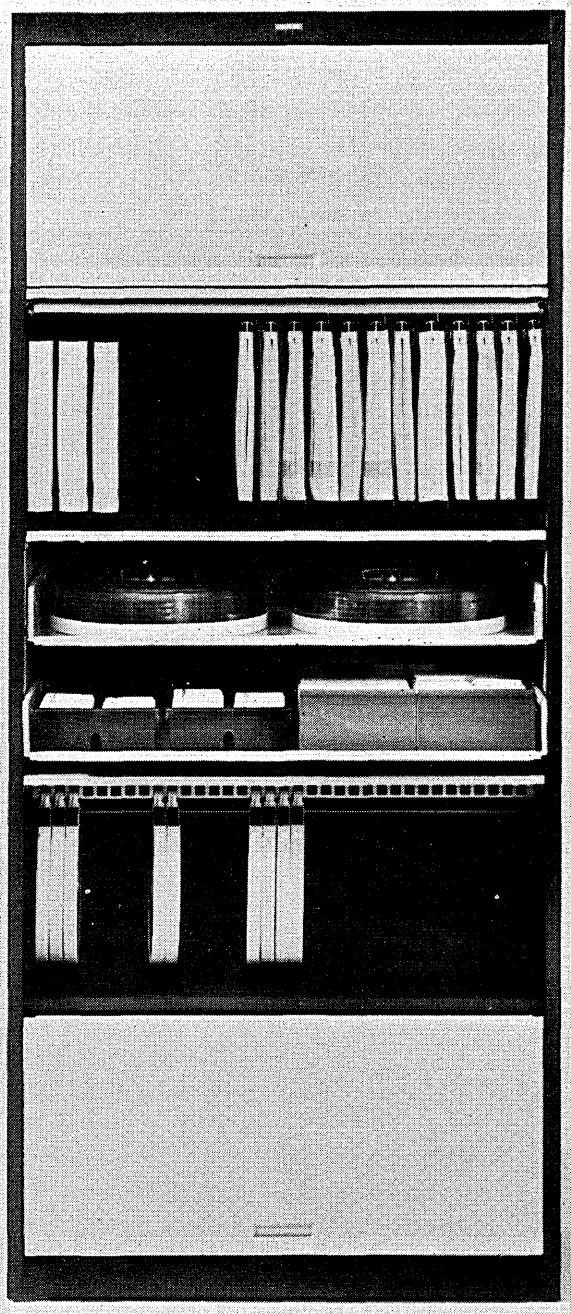


one for printouts,



and one for tapes.





This one.

The Data Media Cabinet. Since 1956 when Tab introduced it, this revolutionary cabinet has quietly become a computer room word in media storage. With its broad selection of shelves, inserts, racks and rollout trays, it has readily and easily adapted to provide safe storage for 80 and 96 column cards, microfilm rolls and cartridges, fiche, mag tapes, disc packs (2315, 1316, 2316, 3336, 5440), printouts, manuals, binders, forms in cartons; even the department coffee pot. Others have tried to improve on it. But the two-, three-, four- and five-compartment Tab Data Media Cabinet has proven unbeatable over the years. Unbeatable still. One of its many configurations will meet your precise storage requirements, even as one of its many colors will complement your office landscape or computer room environment. Contact your local Tab representative, or write Tab Products Co., 2690 Hanover Street, Palo Alto, Calif. 94304.

Data Media Cabinet
"Make Of It What You Will"

TAB
PRODUCTS CO

CIRCLE 49 ON READER CARD

LOOK AHEAD

(Continued from page 18)

socialist candidate talked of plans to nationalize some French companies, including Bull, and Bull would have had to decide whether to abandon its facilities and hightail it for another country. We hear that the powers urging a national company were considering three candidates to head it: Mitterand's brother, a Univac executive; current Honeywell Bull leader Jean Pierre Brule; and none other than IBM's Jacques Maisonrouge.

RYAD MARKET TEST

First commercial service bureau in the West to use the new Ryad series machines has been set up in Helsinki, Finland, by the Russians. Some reports say that this is the first of the Eastern Bloc's tests to determine the exportability of the Ryad family. There are those who observe, though, that it will be a long time before production of Ryad will be sufficient to meet Russia's internal needs.

MITI TAKES OVER JAPANESE HEADCOUNT

Annual statistics on Japanese computer installations, until now, had been coming from the Japan Electronic Computer Co., the leasing firm owned by the six major mainframe manufacturers. But that function has been transferred to the Ministry of International Trade & Industry (MITI), which controls imports. We hear the change stems from complaints of importers who, in view of the upcoming liberalization of that country's import laws on computers, wanted the controlling ministry to also be the keeper of those installation census records. The latest MITI figures, as of September '73, show a total of 20,089 computers installed, including minis. Domestic manufacturers account for 60% by number, about 52% by value.

RUMORS AND RAW RANDOM DATA

A 370/165 with DAT box has been offered to a customer for $50K a month by a used equipment broker. That's a nice buy, as our source compares it to an equivalent 168 at $110K a month from IBM and $80K from a leasing company...Funny that nobody owning a 155 or 165 ever uttered a legal peep about IBM violating "prior practice" by obsoleting them so quickly. Apparently those firms, most of which are among the Fortune 500, don't have the daring of little Catamore Enterprises of Providence, R.I., that is suing, among other things, for such a violation through unbundling...Storage Technology Corp., which has huge installations of tape drives (e.g., 140 at Aetna Life), assumes that any maintenance problem in a mixed system is theirs until they find out differently. Thus there is no time wasted on finger-pointing...Storage Technology tape drives for Univac gear now are being installed and we hear that even Univac is considering buying some...Mostek looks like the next firm to join the microprocessor sweepstakes. The company has been selling "an important new product" to Olivetti and we bet it's a microprocessor. The Texas-based semiconductor company is using P-channel MOS in its cpu...Ever since it was founded six years ago, the Los Angeles calculator manufacturer, Computer Design Corp., has wanted to call itself Compucorp, the trade name it uses on its products, but was turned down by California's Secretary of State because too many other firms were using the "Compu" prefix. When the state finally relented this spring, the company quickly got shareholder approval in May to realize its long-standing desire for the new name.

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Digidata. The TRW OEM series 9000 is a universal digital terminal for any system requiring rapid, reliable communication of numeric data. It's versatile, small and field proven.

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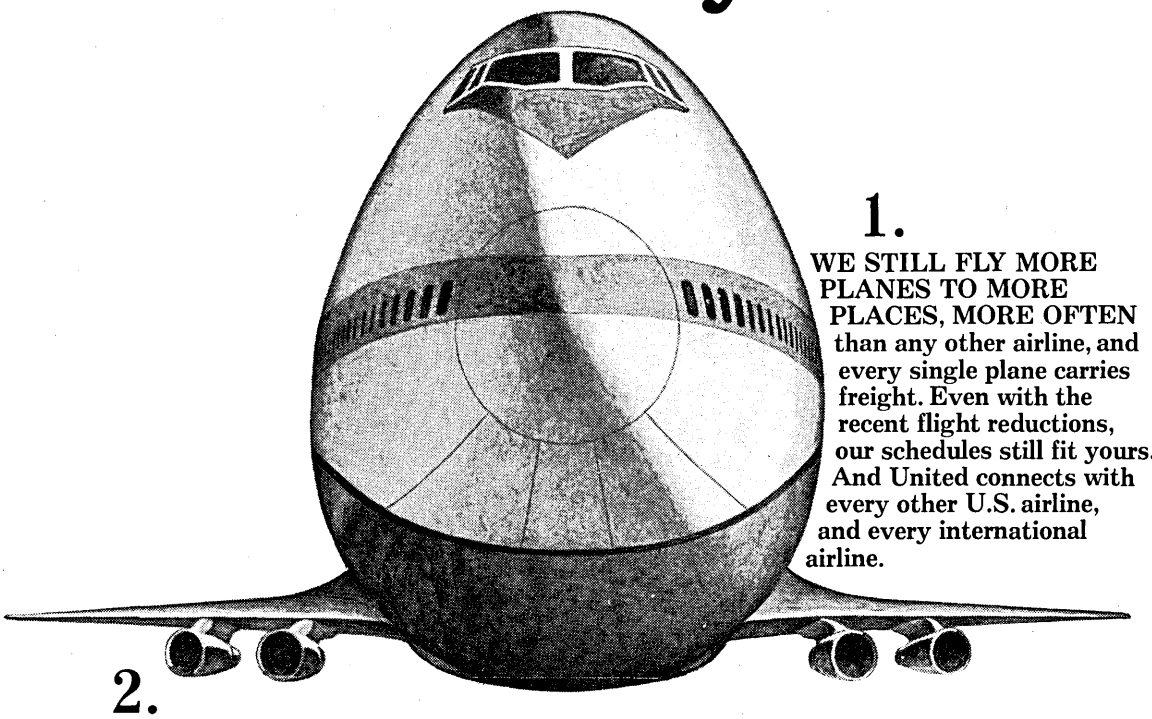
3 nitty-gritty reasons why shipping on United makes more sense than ever, these days.



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WE STILL FLY MORE PLANES TO MORE PLACES, MORE OFTEN than any other airline, and every single plane carries freight. Even with the recent flight reductions, our schedules still fit yours. And United connects with every other U.S. airline, and every international airline.

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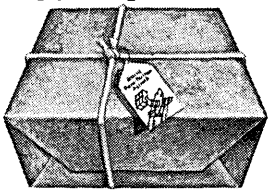
This dependable, same-day way to rush important small shipments to 113 cities can be a lifesaver, today. And it's surprisingly inexpensive.



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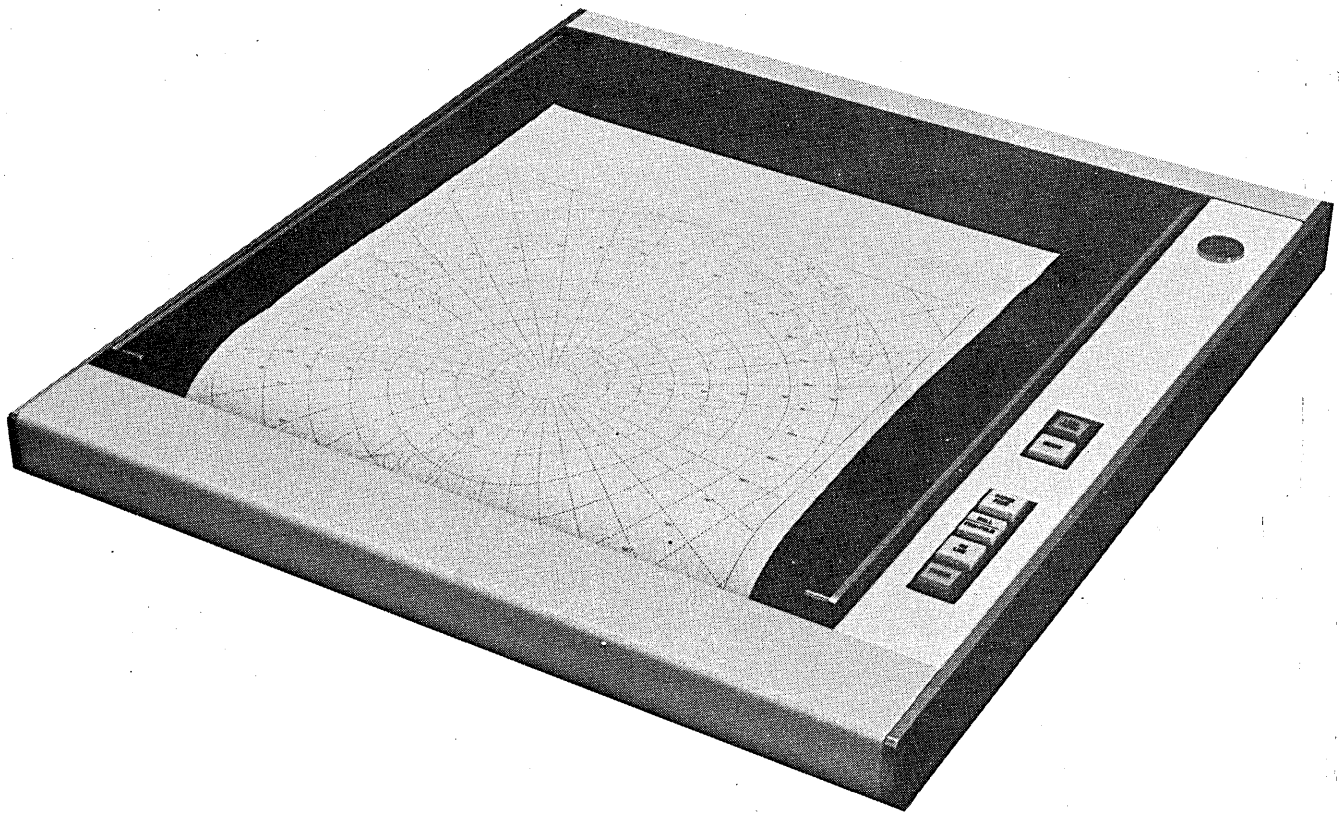

The new Bi-Scan™ writing head in Statos 33 family of printer/plotters gives you sharper hard copy output than any standard electrostatic computer peripheral in the business.

In fact, a 250% improvement in contrast. It does this with a simple but unique staggered-styli design. Each stylus is 60% larger in diameter so that the dots actually touch to produce extremely clear printing or plotting.

But Bi-Scan is just one of the exclusive features that makes the Statos 33 family of printer/plotters the best cost/performance buy around.

Other features you'll like include automatic control electronics to simplify interfacing, make programming easy, and take a big load off the computer. A dynamic toning system to guarantee even toning at all operating speeds. And a choice of four widths: 8-1/2 inch, 11 inch, 15 inch, and the super wide 22 inch (ideal for weather maps, seismic charts, or D-size drawings).

Whatever your requirements – alphanumerics in any language (even Chinese), graphics, or graphics interspersed with words – there's a Statos printer/plotter for you. And they're priced right.

For details on how Statos 33 units relate to your application, call Dave Sloan (415) 493-4000. Or write Varian Data Machines, 611 Hansen Way, Palo Alto, CA 94303.

varian data machines

*Bi-Scan Patent Pending

There is a better way to meet the paper crisis.

Paper costs are on the rise. Pending paper shortages are making matters worse. Postal rates are up adding to the crisis. The paper explosion occurring in American business is causing inflationary havoc with company operating budgets. There's no end in sight.

It's time for a better system. 3M has that better system — 3M Microfilm Systems. An efficient tool for better paper management. An efficient tool that in some cases can substitute for paper. Example: **Computer data** transferred to COM (computer output microfilm) can completely eliminate the need for computer printouts. Large, bulky **engineering drawings** can be transferred to a 3¼″ x 7⅜″ aperture card — eliminating costly reproduction — giving way to easy handling and economic postal rates. Also consider **micropublishing**. Now costly catalogs, price sheets and spec. sheets can be transferred to 4⅛″ x 5¾″ microfiche saving paper costs, printing costs and shipping costs.

Another effective way to cut operating costs is the efficient management of paperwork. And once your documents are safely locked on microfilm, there is no paperwork to mishandle. That's efficient. You deal with manageable size microfilm cartridges, aperture cards or microfiche. All at your convenient disposal for record retrieval in a matter of seconds. And 3M Microfilm is effective as a storage medium too. Cutting document storage space up to 90%.

Efficient, effective, essential to today's business world — 3M Microfilm Systems. Take a look at your paper explosion — isn't it time for a better system.

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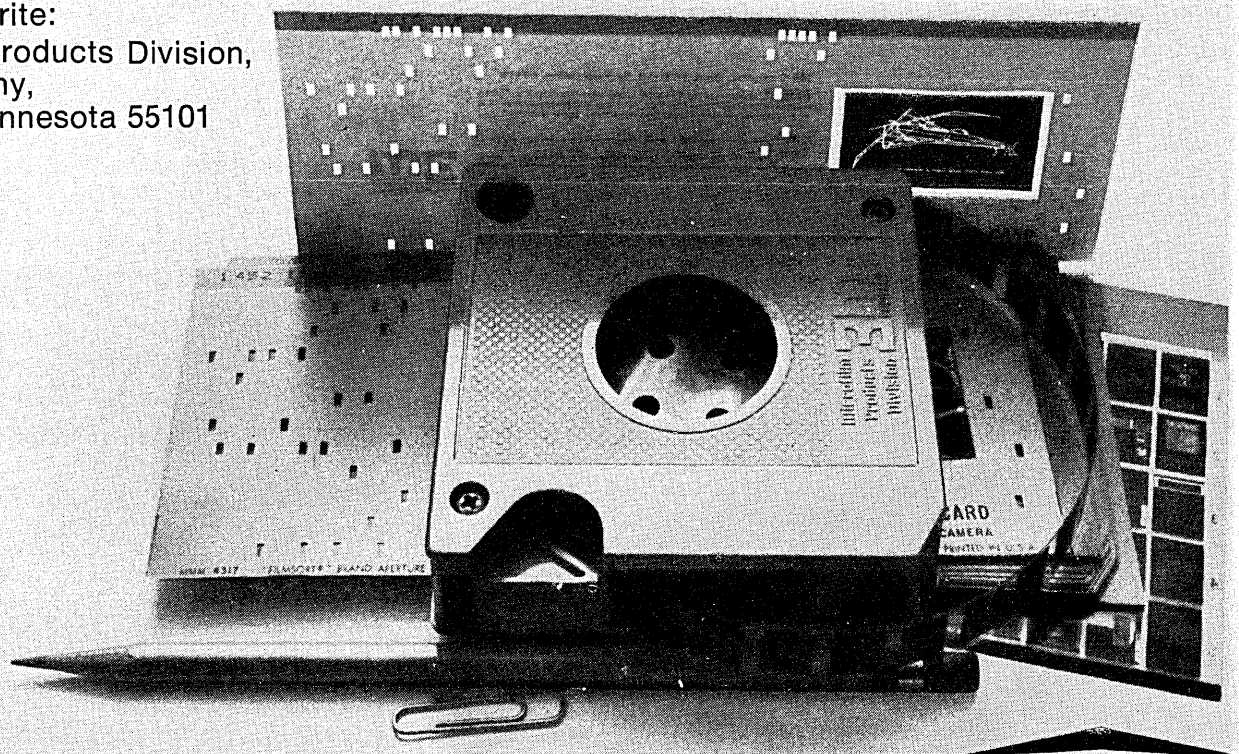
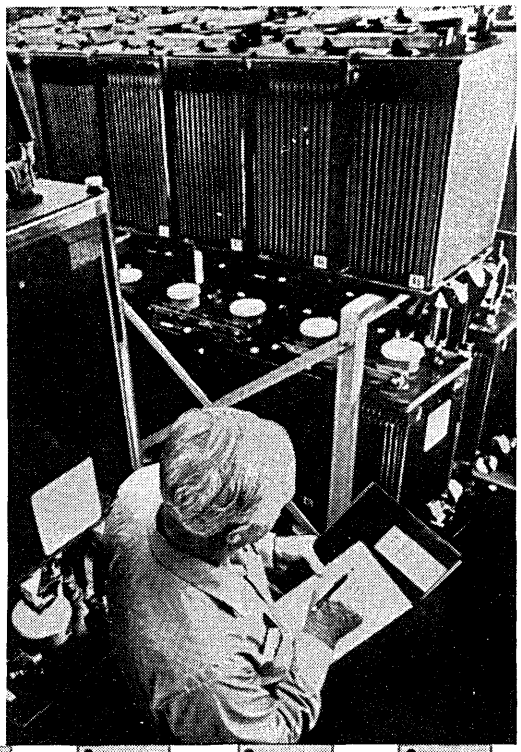


The age of microfilm is here...

3M BUSINESS PRODUCTS CENTERS

CIRCLE 53 ON READER CARD

Lead-calcium back-up batteries. The difference between outage and outrage.



An abrupt shut off of power, and an equally abrupt start up with generators, can damage electronic equipment and the data it contains.

That's why IBM's Advanced Administrative System in White Plains, N.Y. uses lead-calcium batteries to smooth over the rough spots. Short-term power outages up to 30 minutes are straddled without a hitch. In longer outages, the batteries allow the computer installation to be shut down in a series of timed, predetermined sequences, thus avoiding harm to the equipment.

This uninterruptible power system (UPS) uses 531 lead-calcium batteries, chosen for the long life and minimum maintenance they offer. A simple and economical means of protecting a highly intricate communications network.

Back-up batteries are one of the ways lead helps protect us all. Asarco is a leading producer of lead. Headquarters at 120 Broadway, New York, N.Y. 10005.

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hardware

Tape Protector

Regular file protect rings do not really protect a tape from an operator error; it's very easy to put a ring in a tape that was supposed to be saved. But this cannot happen with the Fileguard "real" file protect ring.

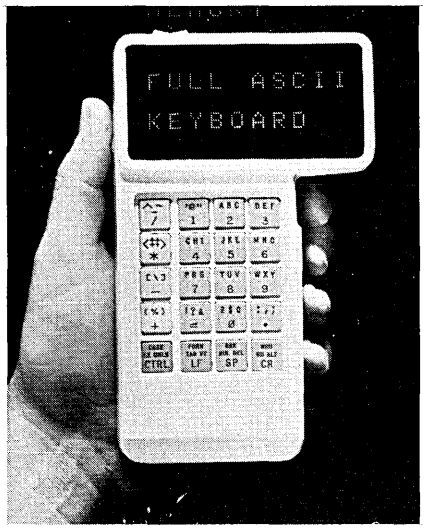
The Fileguard ring is inserted in a tape reel with a special tool. It blocks any attempt to put the other kind of file protect ring into the reel, but is not thick enough to push against the "write enable" switch in the drive. That means the tape cannot be written when the ring is in—a kind of twist in looking at write protect rings.

At any rate, the device is simple enough to be nearly foolproof, and is priced at $185 per thousand. The special tools necessary for installing and removing the rings run an extra $15. FILEGUARD SYSTEMS, Tequesta, Fla.

FOR DATA CIRCLE 284 ON READER CARD

Hand-held Teletypewriter

The Termiflex hand-held interactive terminal looks too big to be a pocket calculator, and much too small to be a terminal. It comes with its own acoustic coupler, power supply, 20-key pad, and 1,000-character scrolling memory —all in a five-pound package. Full of



surprises, the terminal can generate all 128 ASCII characters (by using three shift keys), can display upper- and lowercase letters, has switches for selecting communications speeds (10, 15, 30, or 120 cps) and parity and transmission mode (full- or half-duplex), and can even pad display lines so they are justified.

The only thing not miniature about the unit is its price, which is $1,570 for a two-line display model with the full memory, or $1,190 for a single-line display with 500 characters of scrolling memory. The acoustic coupler, power supply, and carrying case raise the price another $480. That's a lot of money, but for some applications, a Teletype is just too heavy. TERMIFLEX CORP., Nashua, N.H.

FOR DATA CIRCLE 285 ON READER CARD

Character Printer

The Diablo printer, the one with the plastic "daisy petal" element for its characters, has a competitor in the Q-Series character printer. The Q printers are impact devices that are supposedly capable of hammering out 12 copies at a time at speeds of 30 cps or 45 cps, depending on the model chosen. At the faster speed, the units can take unbuffered input from 300 baud lines. Stepping motors for ribbon and paper positioning couple with servo-control for carriage and character wheel movement, allowing character placement in 120 horizontal positions per inch and 48 vertical positions per inch; these features should make the device a plotter too.

The units are being built for oem applications. In quantities of 100, the 30 cps model sells for $1,425 and the 45 cps model for $1,600. Shipments take 60 to 90 days.

The Diablo printer looked attractive enough for Xerox to buy its maker. Maybe something good will happen for this new firm, too. QUME, Hayward, Calif.

FOR DATA CIRCLE 286 ON READER CARD

Minicomputer Card Gear

It took a couple of generations of hardware evolution for the peripherals on large-scale systems to begin to account for half the hardware cost. With minis, it is difficult to keep the peripheral costs down to half the total cost. This is especially true when an application requires card equipment.

This firm is trying to keep prices in line by offering an interface for attaching a Decision Data data recorder to a mini. The result is a card reader, printing card punch, and keyboard which run $12K with interface and cables. Using 80-col cards, the peripheral reads at 200 cpm and punches at 45 to 75 cpm. With 96-col cards, it reads at 300 cpm and punches at 60 cpm. There is a 400-character buffer, a 2K-bit program area, two input hoppers, and two output hoppers.

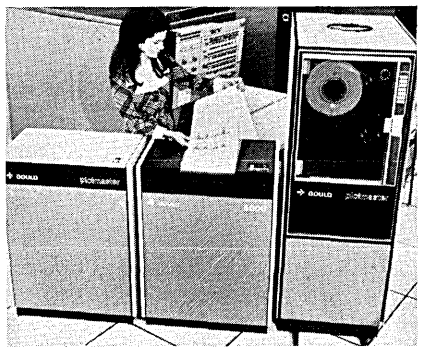
Given a printer, the system could substitute for an EAM department. As it stands, it offers three peripherals in one for users of Digital Equipment Corp. PDP-8s and PDP-11s. Interfaces for Nova and Varian machines, as well as for RS232B communication lines, will soon be offered. MNTL LOGIC LABORATORIES, Hampton, Conn.

FOR DATA CIRCLE 287 ON READER CARD

Electrostatic Plotter

There is a switch on Gould printer/plotters that allows an operator to select on-line or off-line operation for the unit. In the on-line mode, the units use a Plotmaster controller which connects to a selector, byte multiplexor, or block multiplexor channel on an IBM 360 or 370. The controller can accept data in either byte or burst mode. The same controller is used in off-line operation, but of course the unit is augmented by a tape drive for those applications.

Software includes applications pack-



ages, written in assembly language, which are callable as FORTRAN subroutines. DOS, OS, or VS operating systems can be used.

Series 4820, 5000, or 5100 printer/plotters can be plugged into the controller to yield speeds claimed to be up to 400 times faster than those of pen plotters. Prices start at $20,400 and go as high as $39,700 for controller, plotter, and tape drive. GOULD INC., Newton, Mass.

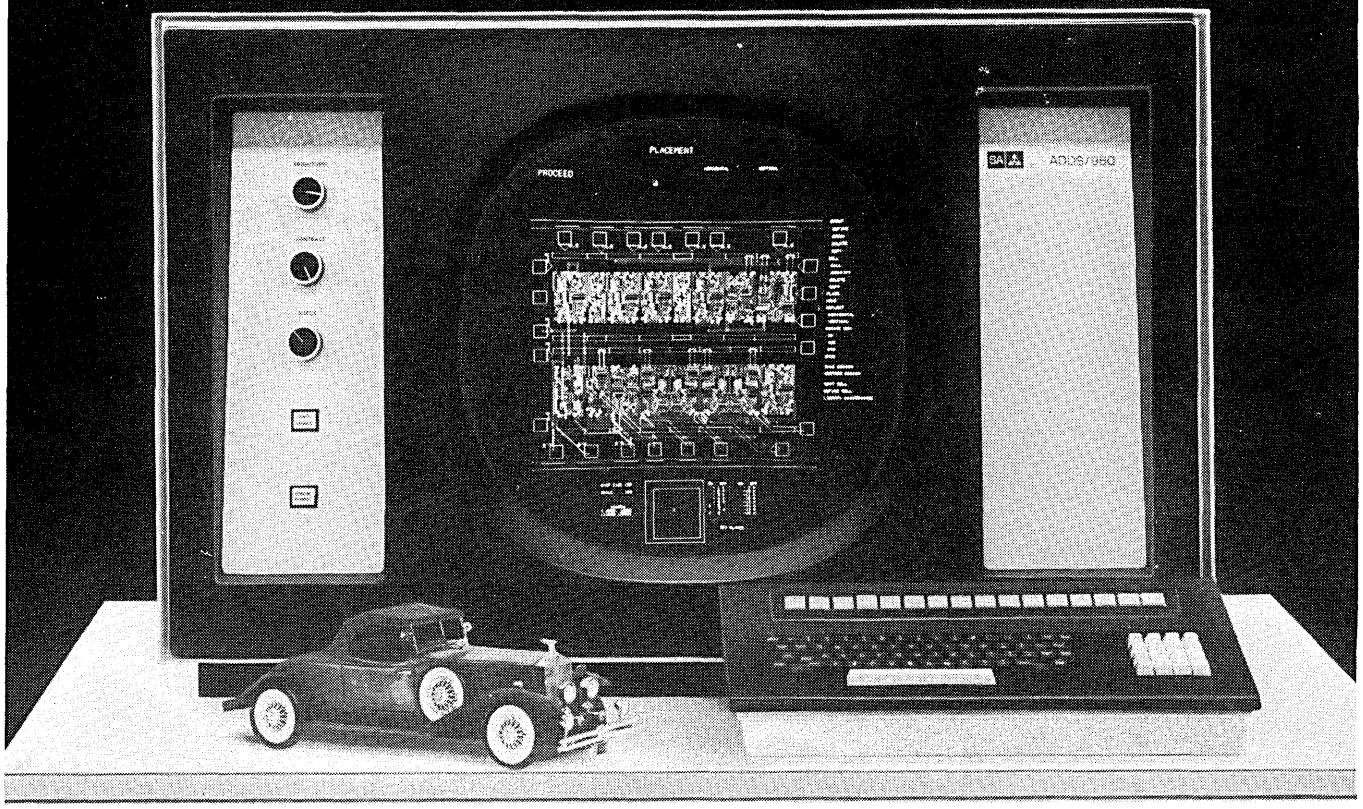
FOR DATA CIRCLE 288 ON READER CARD

IBM Channel Interface

Peripherals which are not IBM plug-compatible can be interfaced to an IBM selector, multiplexor, or block multiplexor channel through an IBMINT. The device is a single circuit board which emulates an IBM peripheral interface and can be used for transfer rates to one megabyte. A second ver-

(Continued on page 140)

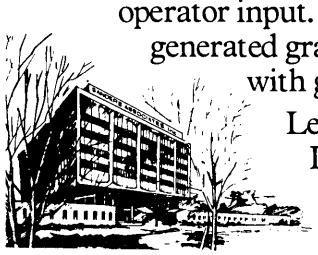
ADDS/900® graphics. Because you want to go first class.



Looking for the most advanced technology in graphic display systems—with cost-effective performance and maximum flexibility?

You've found it. Sanders' ADDS/900 system does it all—on-line to a CPU or in a stand-alone, remote environment. Composed of off-the-shelf modular components, it can be tailored to your special needs for applications including: land-use management, command and control, data reduction, IBM 2250 firmware emulation, training and simulation, and computer-aided design.

The programmable Advanced Data Display System interacts with digital, analog and operator input. It can present composites of television video and computer-generated graphics, utilizing up to 12 display terminals. And it's compatible with general-purpose digital computers.



Learn more about going first-class. Contact Sanders Data Systems, Inc., Graphic Systems Marketing, Daniel Webster Highway South, Nashua, N.H. 03060. Call (603) 885-5280.

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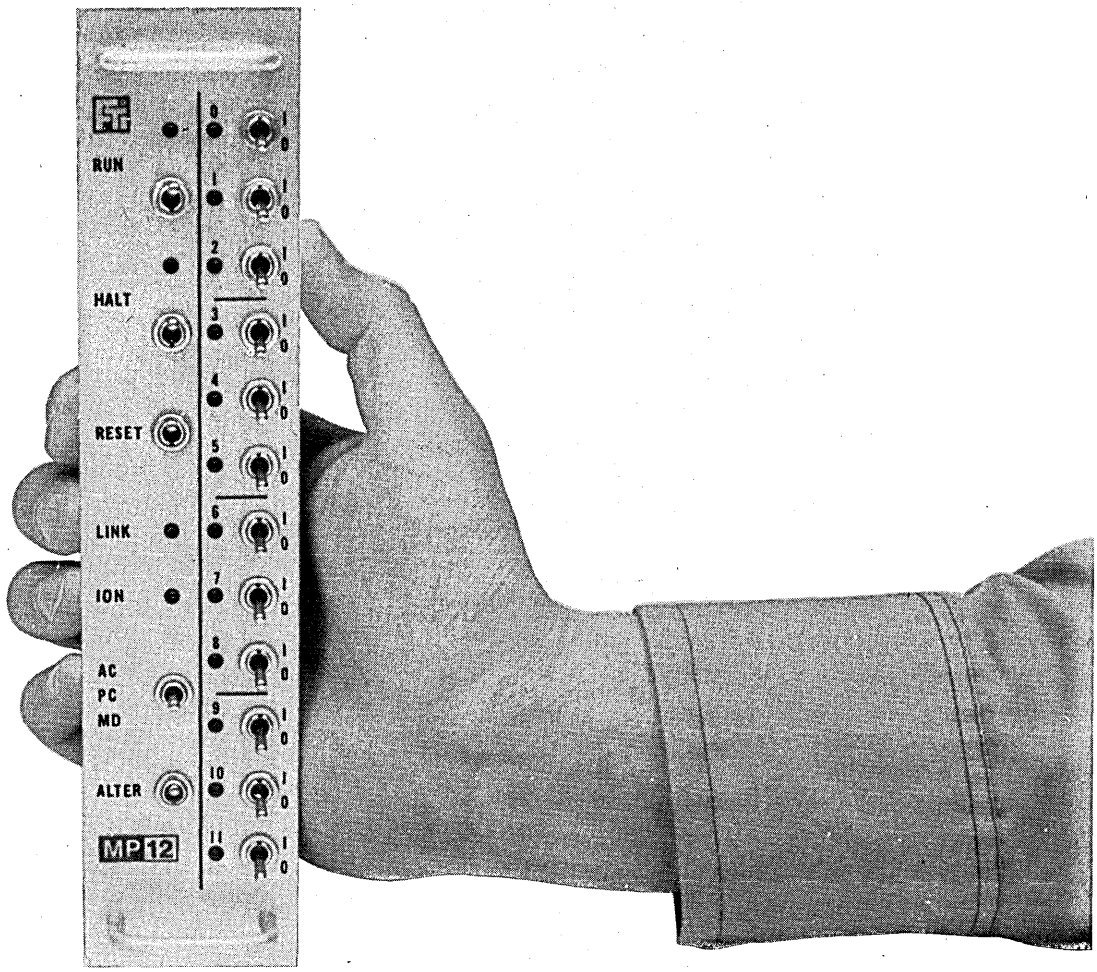
European Sales Offices: Sanders Data Systems, Ltd., 51/53 Brick Street, London W1Y 7DU, England; Sanders Data Systems, GmbH, 6000 Frankfurt/Main, Rennbahnstrasse 72/74, West Germany.



ANNOUNCING AN EXCITING NEW OEM SYSTEM COMPONENT.

It's the MP12 . . . Fabri-Tek's new microprocessor that performs like a minicomputer. The MP12 helps you get your application system up and running faster, easier and with more capability than ever before. No MOS microprocessor can match its performance in data acquisition, automated assembly, point-of-sale and other dedicated digital control applications.

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Quick Delivery, Low Price—There's a lot more you'll like about Fabri-Tek's MP12. Delivery and price, for instance. It's available for off-the-shelf delivery for as little as $990 in quantities of 100. It can actually help you cut your overall manufacturing costs.

The MP12 could be the most useful component you've ever seen. For complete specifications and option information just write to MP12 at the address below.

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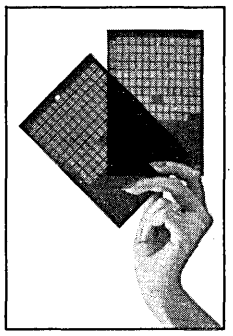
CIRCLE 35 ON READER CARD



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sion enables hooking up a minicomputer to an IBM channel. Either device can connect multiple peripherals, theoretically up to 256 units. Prices are $2,200 and up for the peripheral connector, $2,450 and up for the mini interface. COMPUTER INFORMATION SYSTEMS, INC., Logan, Utah.

FOR DATA CIRCLE 289 ON READER CARD

Honeywell's New Line

When Stephen F. Keating, president and chief executive officer of Honeywell, described his firm's new Series 60 computer line as being based on "the most advanced technology and futuristic thinking," some IBM designers must have blushed, for the Series 60 sounds something like seven new models in the IBM stables. Some of the 60s use EBCDIC as their internal code, have JCL, integrated file adapters, and conversion aids for IBM 360s, plus offer System/3 language compatibility. Their software is unbundled. Some even have cache memory and virtual storage DAT boxes, and of course they are byte-oriented.

That is not to say that HIS has done something unwise. It is extremely smart to be as compatible as possible with any firm which holds 70% or so of the market (we will leave it to the courts to decide whether the 70% figure is right). On top of that, Honeywell has produced machines that are compatible with earlier HIS and GE lines, too, providing "bridges" for its existing customer base to use in upgrading. Ironically, the bridges move its customers closer to IBM compatibility too, but that's a risk Honeywell had to take to get a shot at number one.

In the big machine side of the lineup, HIS is not really copying IBM at all. The new top of the line Model 68/80 is actually a take-off on the Multics system, which traces its heritage back to Project MAC, one of the real pioneers in time-sharing and interactive processing (put together by GE and NIT designers). The 68/80 (shown here) is intended for users with requirements for large-scale memories (up to six billion virtual bytes) and for file security. The 68/80 can be had in single- or multiple-cpu configurations with real memory of up to 8MB for each processor. The MOS main memory uses 9-bits plus parity, and has a cycle time of 750 nsec/8 bytes. The backing store is disc, up to 134MB. And the Multics operating system makes it possible for a single user to run a single program as large as the total disc capacity of the system.

The Multics operating system provides a GCOS environment for batch jobs to maintain compatibility with the

HIS 6000 (nee GE 600) series while performing its t-s functions itself.

The machine has a 31-channel I/O multiplexor rated at 4.5MB; two can be operated simultaneously while a third is attached as a spare. Datanet 6600 front-end network processors handle up to 380 lines each; two can be attached but one is a spare. The system has a standard cache memory of 512 16-byte blocks, plus an "append unit" which provides the addressing for the virtual memory.

A "small" version of this machine with one processor, 1MB of main memory, 4MB of bulk store, 160MB of disc, one Datanet 6600, three tapes, card equipment, and a single printer would run $3.5 million-plus. It would lease for $75,275 on five-year terms, plus $6,128 for maintenance and software. It will be available early next year.

One step down from the 68/80 is the 66 level, which is composed of models 20, 40, 60, and 80. The series is compatible with Series 6000/600 computers, and conversion aids are provided for Series 400, G200, RCA Spectra, and IBM 360 users. The two bigger models of the 66 level can be configured with cache memory and up to 4MB of real 750 nsec/4 byte memory. The smaller versions have 1.4 usec memory. All use 9-bits plus parity bytes.

Peripheral processors are offered for mass storage, unit record equipment, mag tapes, and the document handler. The multiplexor, memory controllers, mass storage and unit record processors may be integrated on some of the models.

The level 66 machines operate under GCOS and have two kinds of operator

consoles, both with crt's. Prices range from about $1.2 million up to four times that amount ($23K/month to $95K/month plus maintenance) on configurations HIS calls "typical." There seems to be a big overlap with the 68 level machine; presumably the application will determine the model.

The next-to-smallest machine is the 64/20, an 8-bit plus parity machine with a 4-byte data path and a 1-usec memory cycle time. It can have as little as 64K of main memory or as much as 128K. It comes with integrated processors for mass storage, for mag tapes, for communications lines and for unit record gear. EBCDIC is its native language, and it knows 195 instructions. It will be first available early next year with Series 2000/200 compatibility mode, later in a native GCOS version. A 64/20 with 98K, three discs, a printer, three tapes, and card gear will run about $367,000 on purchases or $7,371/month plus maintenance.

The smallest machine announced by HIS for this family is the 62/60. It is a step above a System/3 at $4K-plus per month, and has conversion aids for the IBM 360/20, and for HIS 2000/200 and Series 100 equipment. It's a multiprogramming machine with an integrated communications subsystem, integrated controllers for printers and card stuff, and memory sizes ranging from 64K to 128K. An 8-bit plus parity EBCDIC machine, it knows 140 instructions. Purchase price for a system with 80K, two discs, a printer, card reader, one communications line, and some software will be approximately $193K. It too will be available in the first quarter of 1975.

So it appears that HIS has actually announced three kinds of machines and provided bridges between them as well as bridges to other products. It has merged some IBM-like features, some GE-like features, some H'S-like features, and even some Project MAC features to produce a line to compete with IBM through the rest of the 1970s. In some ways the machines seem related only by model number, so the final success of the company's computer line may be determined by the strength of its bridges. HONEYWELL INC., Billerica, Mass.

FOR DATA CIRCLE 281 ON READER CARD

CDC's New Line

Control Data has come in from the cold. After years of proving that discrete component circuitry can operate as quickly as integrated circuitry, the firm has stopped fighting and switched to the new system. In making the change, CDC found that they could squeeze twice the speed out of mainframes half the size of earlier Cyber 70 and 6000 lines—which comes as no surprise to others.

The new series of machines comprises four models, the 172, 173, 174, and 175. The first three are much alike, being distinguished from each other mostly by the number of pieces. In configuring a version of the 172, 173 or 174, a customer can choose one or two memory storage units plus one or two peripheral processor subsystems. The memory is MOS, has a cycle time of 400 nsec, comes with eight independent banks in each unit, and can degrade gracefully with operator help. The maximum memory size is 256K words, which would be delivered in two identical systems of 128K each.

The 170's word size, like that of other CDC hardware since 1964, is 60 bits long. That makes the maximum memory size equivalent to about 1.75MB, for those who think in IBM units.

The cpu for the three smaller models has a 50-nsec clock and two arithmetic sections (one for 60-bit words and another for 18-bit words). The processor has character manipulation instructions, 24 registers, plus fixed- and floating-point arithmetic.

The 175 is a different animal altogether. It's a dual-processor with nine independent functional arithmetic units in each cpu (for boolean, shift, normalize, floating add, long add, floating multiply, floating divide, population count, and increment functions). Also, it has a clock time of 25 nsec and uses an eight-word instruction stack. In effect, it is an 18-unit parallel processor.

Both kinds of machines, the kind represented by the 172/173/174 and the other, the 175, are supplemented

product spotlight

Page Printer

Like the Xerox 1200 page printer, this HIS page printing system is a whole reproduction department in a box. An off-line system, the printer prints, cuts, stacks, and collates reports. It preprints forms, reduces the image size from 11" x 14⅞" to 8½" x 11", and can put out up to 210 pages per minute.

A non-impact machine, the page printer comes with its own tape drive and built-in mini. It can print tapes created on HIS Series 2000, Series 6000, Level 66 (part of the new line), IBM 360, or IBM 370 computers.

It prints 132-character lines, 85 to a page, and stacks them in eight output pockets (or a single reject bin). Actually, up to three optional 8-pocket stackers can be added, presumably allowing for collating 32 reports at a time.

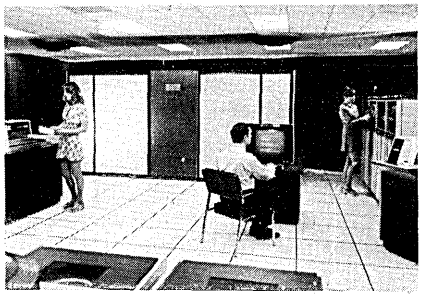
Not counting the various tape drives available, two basic models are offered, one which prints at 12,000 lpm or 140 pages per minute, and one which produces at 18,000 lpm or 210 pages per minute. The stock character font has 96 symbols, but larger sets with up to 512 characters are offered. Characters can be produced in various styles and sizes also.

The 140 page/min system is priced at $162,210; the 210 page/min unit goes for $193,620. Maintenance and lease prices are figured on the number of *feet* of paper used. (This is something like the way IBM used to charge for card equipment based on the number of cards used.) The minimum rentals are $3,667 and $4,380; these prices correspond to something like $5 to $10 per thousand feet. Electrographic paper and toner are billed separately. The replaceable cylinders which are used to print fixed information like forms headings run $330 each. HONEYWELL INC., Wellesley Hills, Mass.

FOR DATA CIRCLE 280 ON READER CARD

hardware

by peripheral processor subsystems in the finest CDC tradition. The basic peripheral processor system has 10 functionally independent computers, each with 4K 12-bit plus parity words. The 10 smaller processors share hardware for arithmetic, logical, and I/O operations; together they share the main memory with the central cpu. A second peripheral processor system can be



added to the 173, 174, and 175, and it can have either four, seven, or 10 processing units. Additionally, the nominal 1-usec speed of the peripheral processors can be jumped to 500 nsec.

All the models of the new series are bit-compatible with the Cyber 70 and Series 6000 machines, so switching applications programs over should be no problem. All function under the same operating system, the Network Operating System, which is said to be a melding of KRONOS and SCOPE, and all can be networked with each other—one of the special advantages of NOS.

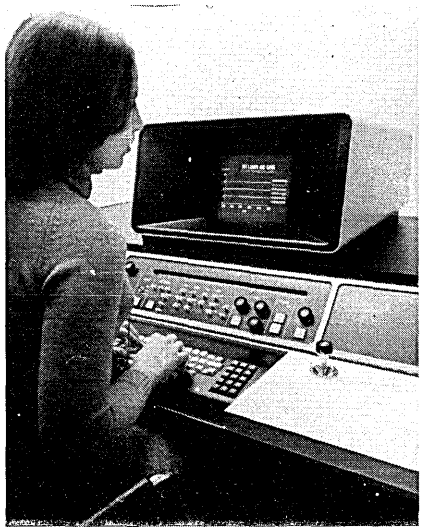
Software is all unbundled, and is expected to run 20-25% of the total system cost, which in turn can range from $18,000 to $75,000/month on a three-year basis, or $1-4 million on purchase. Deliveries begin in January. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 282 ON READER CARD

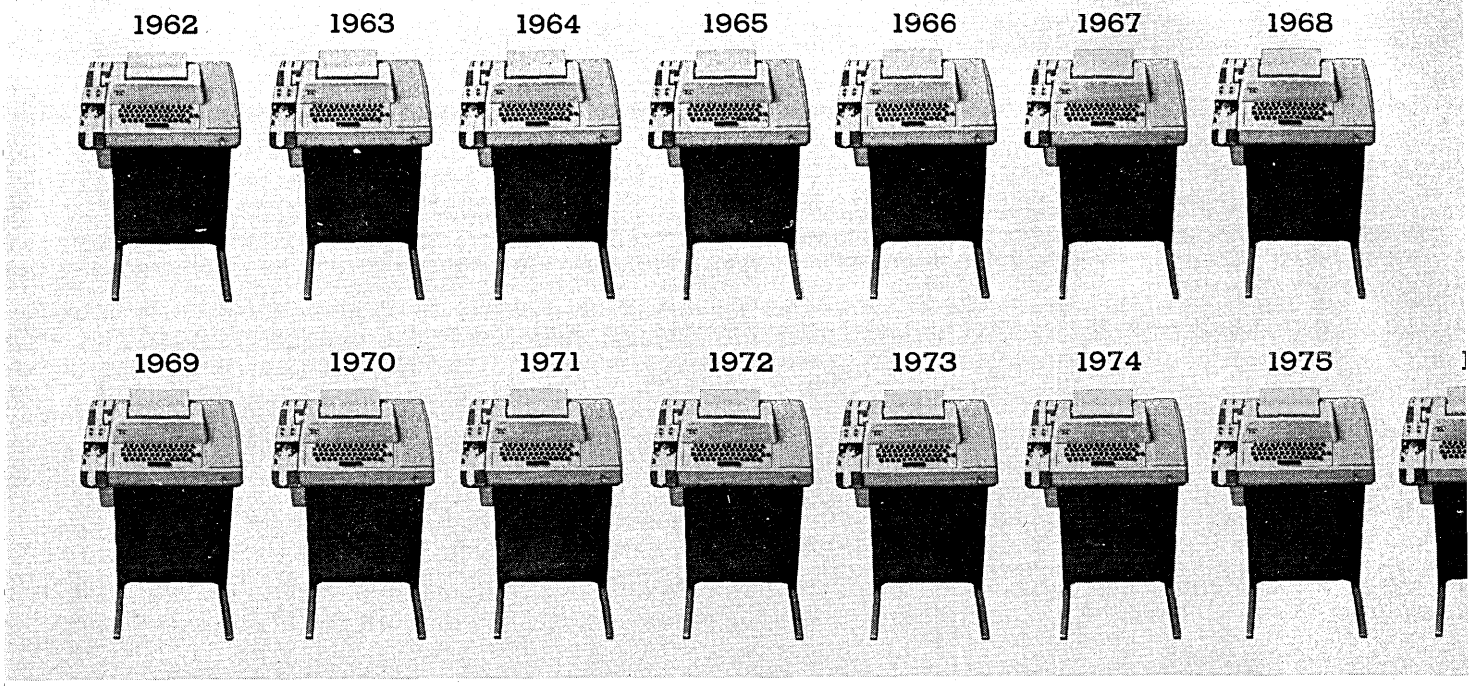
Mechanicalangelo

GE's image processing system, called Genigraphics, is a spin-off of the company's flight simulation work done for pilots and astronauts. The image-producing technology has been brought down to earth for such commercial art purposes as creating bar charts and graphs for business reports. A little expensive ($320,000 for a typical system) for adoption by most dp departments, sales are expected to be to firms specializing in graphics. Still, the system could find its way into some large dp shops.

Genigraphics hardware includes a Digital Equipment Corp. PDP-11, a display console, and digital image reproduction pieces. Output is in the form of 35mm color slides, which can



be used to produce hard copy indirectly. Input is either from a library of stored symbols (which can be altered in shape, size, position, or color using joysticks and switches on the console) or from connect-the-dot descriptions entered through a keyboard. Images



Just how much longer will the model 33 be around?

The moment economy, reliability and versatility in data communications go out of date, the model 33 will become obsolete. But the more we look at today's business and economic environment, the more it seems the model 33 will live forever.

Because where else can you get so much for so little?

When the model 33 was first introduced, it was a bargain. Today, it's still a bargain. But it's hardly the same machine.

We've got a team of engineers assigned to the model 33 and their job is to keep making it better. Every year, they come up with a number of new features and improvements. Some improvements make the 33 more dependable and versatile. Others make it easier and more economical to manufacture.

Because of these changes, the model 33s we're building today are standard-duty terminals instead of light-duty units. And our manufacturing changes have enabled us to stay ahead of rising costs.

Since we feel the model 33 is going to be around for a long, long time to come, our parts support, quality service and continued product improvement programs are as strong as ever.

It takes more than manufacturing facilities to build the terminals Teletype® Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.

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cutting telephone line costs is just the beginning!

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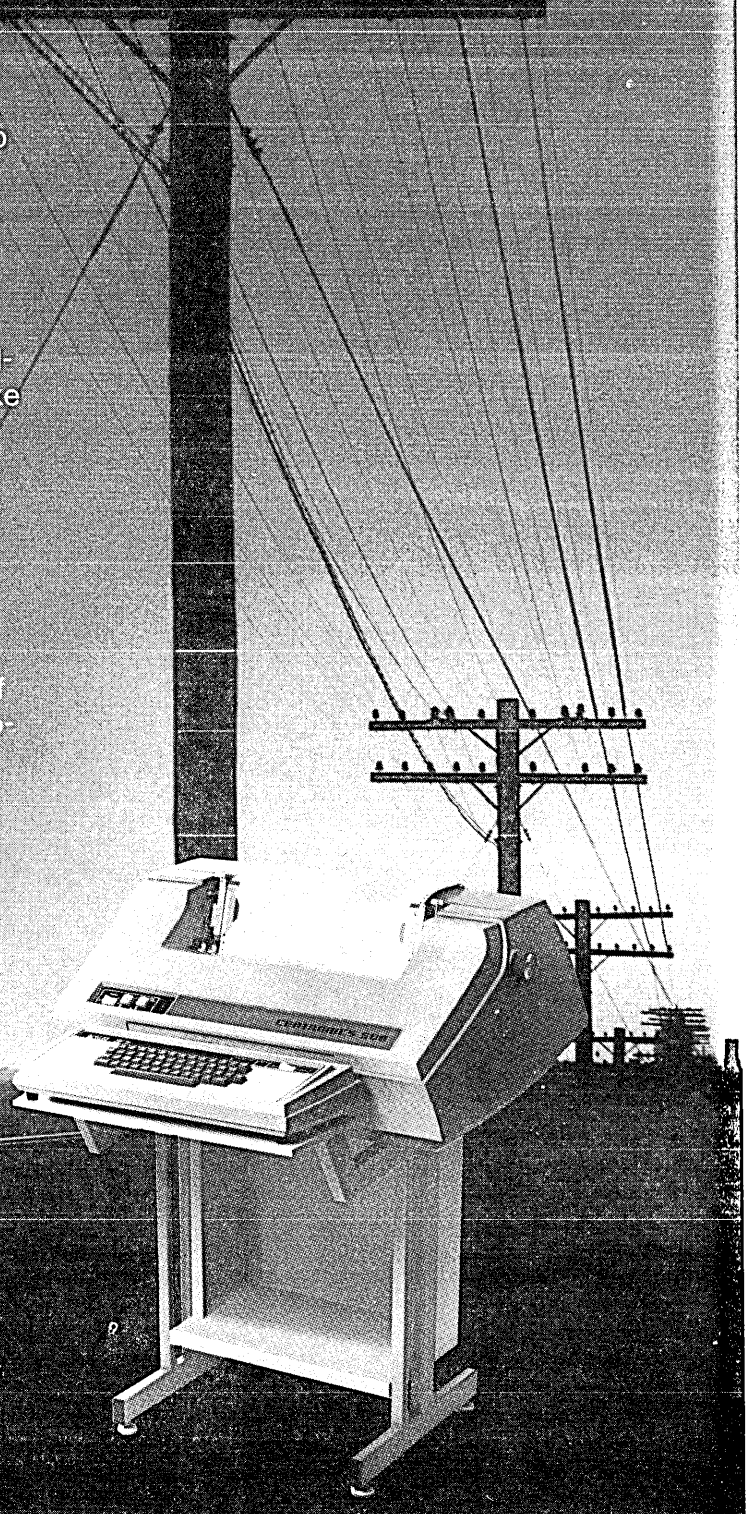
Price/performance—Centronics' calling card. Reduce telephone line costs by printing 4 to 12 times faster. Now Centronics' low priced 132 column incremental keyboard printer is ready to take on a world of exciting applications. From simple teleprinter duties to sophisticated message switching and timesharing systems. As an input/output device, the 508 is also a natural for the demanding needs of small business systems. Indeed, the applications for the 508 are limited only by the imagination of its users.

First cousin to the popular 308. Every feature of the versatile new 508 is also available in our popular 80 column teleprinter, the Centronics 308. And whether you purchase or lease, prompt service is available nationwide from over 40 locations.

The 308 or the new 508? It depends on how wide you want to save!



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CIRCLE 88 ON READER CARD

stored on mag tape can be retrieved, altered, and restored; when working from stored symbols, the machine's operator can produce as many as 18 pieces of "new" art per hour.

Third-party service centers in major cities will be providing the graphics for firms which cannot find the $320K expenditure in their budget for peripherals. GENERAL ELECTRIC CO., Albany, N.Y.

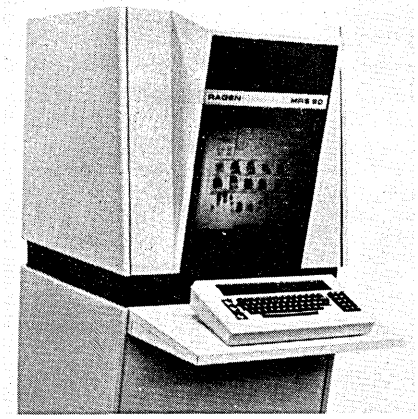
FOR DATA CIRCLE 283 ON READER CARD

Image Retrieval

The MRS 90 is claimed to be the only microfilm image storage and retrieval system that can automatically deliver any one of a million pages of 16mm roll microfilm. That seems like a big claim for this age, and some competing vendors may wish to object. But the 90 can search a film file using name, number, subject code, or other parameters entered through its keyboard; can base its search on Boolean parameters; and does reportedly average 10 seconds per page for retrieval. The retrieved documents appear on a screen, and can be hardcopied at will.

The base system includes the photocopier, screen, and keyboard, and 29MB of disc memory for the controller. Four more discs can be attached without beefing up the controller, and up to 15 more keyboards.

Because of its size and storage capability (equivalent to 250 conventional four-drawer file cabinets, according to the vendor's arithmetic), and since all the necessary components seem to be built in, the 90 does make a convenient filing system for documents that need not be removed from storage often. RAGEN PRECISION INDUSTRIES, INC., North Arlington, N.J.

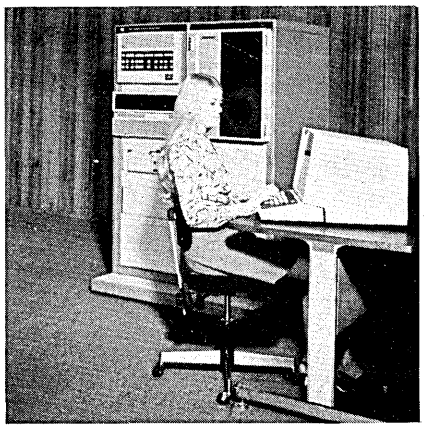


FOR DATA CIRCLE 290 ON READER CARD

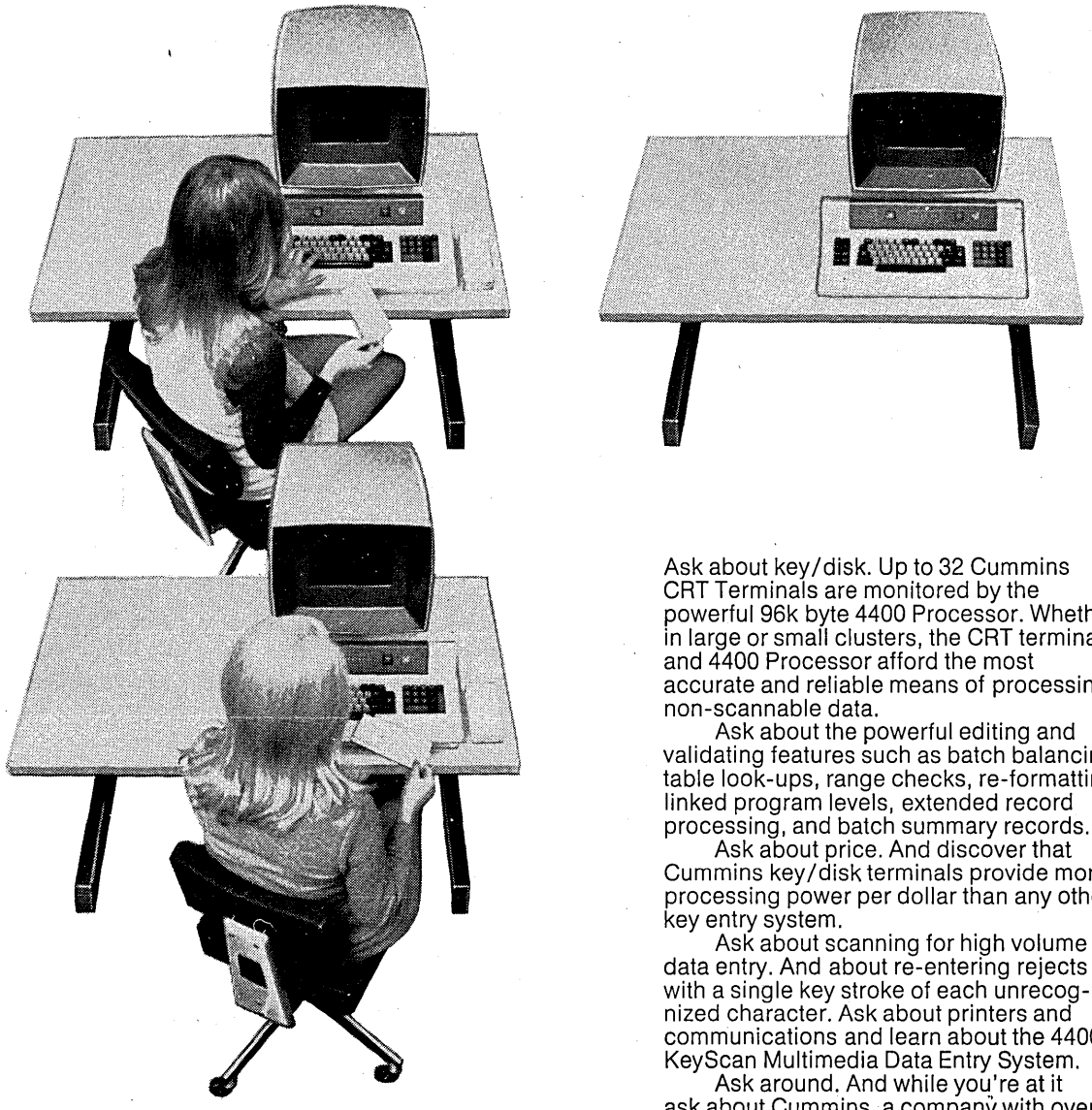
Data Base Manager

Reality has competition. Hewlett-Packard apparently agrees that one good way to market a mini is to package it as a data base management system, so the firm is offering the Management/230 Information Management System. Although the product lacks a snappy name like Microdata's "Reality," it will service the same number of user terminals (32), also has an English-like language, and is based on a 16-bit mini.

The H-P machine comes standard with 24K words, 5MB disc, a 1600-bpi tape, a 30-cps impact printing terminal, a disc operating system, and a data base management software package called



When you consider key/disk... ask about the Cummins KeyScan™ Data Entry System.



Ask about key/disk. Up to 32 Cummins CRT Terminals are monitored by the powerful 96k byte 4400 Processor. Whether in large or small clusters, the CRT terminals and 4400 Processor afford the most accurate and reliable means of processing non-scannable data.

Ask about the powerful editing and validating features such as batch balancing, table look-ups, range checks, re-formatting, linked program levels, extended record processing, and batch summary records.

Ask about price. And discover that Cummins key/disk terminals provide more processing power per dollar than any other key entry system.

Ask about scanning for high volume data entry. And about re-entering rejects with a single key stroke of each unrecognized character. Ask about printers and communications and learn about the 4400 KeyScan Multimedia Data Entry System.

Ask around. And while you're at it ask about Cummins, a company with over 45 branch sales and service offices located across the country. Send for the 4400 KeyScan System brochure. Write: 836 Waukegan Rd., Glenview, IL 60025. Or ask the operator to dial 312/724-8000 and make an appointment to visit our demonstration facilities.

Ask about the KeyScan Data Entry System. Then ask about other systems and you decide which is best.

4400

KeyScan Multimedia Data Entry System

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hardware

IMAGE/2000. According to its vendor, Management/260 allows data structures to be independent of physical devices. The user is required to establish the relationships between his data; this establishes a "schema" which is put in a dictionary file. After that has been done, the software reportedly automatically opens files, reads input, enters, modifies, or deletes data which terminal operators enter in raw form.

The system is base priced at $53,950, including the disc, tape, one terminal, and the software. HEWLETT-PACKARD, Palo Alto, Calif.

FOR DATA CIRCLE 291 ON READER CARD

Microcomputer

Here is another source for microcomputer products based on the Intel 8008 chip set. The MPS-803 is a complete microcomputer, including the 8008 chip, that is assembled by selecting from this manufacturer's line of 4½ x 6½-inch pc card sets. These include ROM/RAM memory (1K and 2K by eight bits), a 28-line I/O card, a 32-line input card, a 32-line output card, a 2K by eight-bit ROM, a 4K by eight-bit RAM, and an eight-level priority interrupt card. Prices start at $920 in single quantity, but with all the configurations possible, oem's should check with the firm for specific requirements. PROLOG CORP., Monterey, Calif.

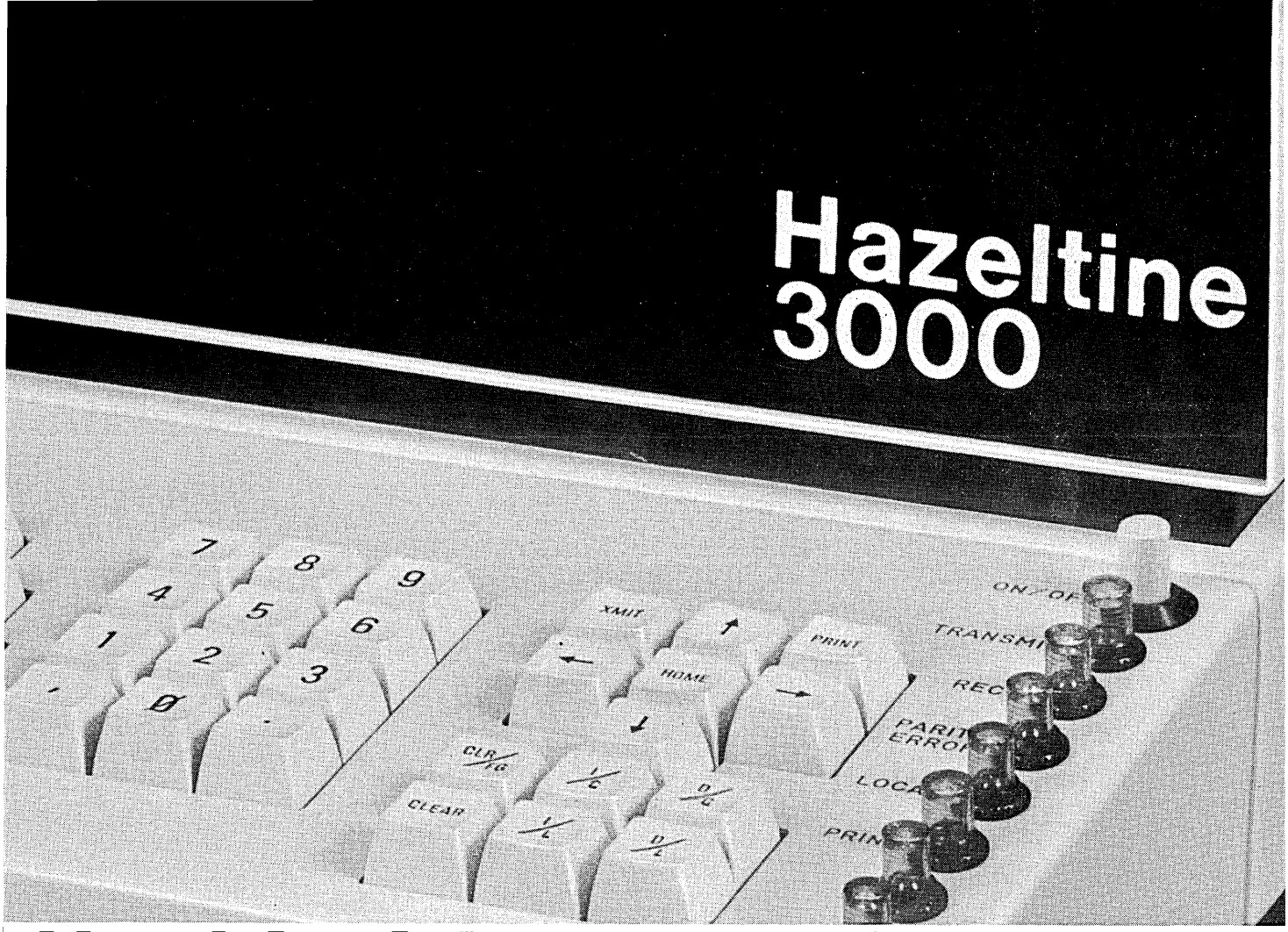
FOR DATA CIRCLE 292 ON READER CARD

Printer Interfaces

Printer Technology Corp. has developed a number of interface kits that should make it easier for sophisticated end users and systems designers to use Printec serial impact printers. The kits are for the Digital Equipment PDP-8 and PDP-11, the Data General Nova mini family, and Digital Computer Controls' "duplicates" for those machines. The kits include the 100-cps printer, a plug-in interface board, a 25-foot interconnecting cable, paper tape diagnostic programs, and an instruction manual explaining how to write software for the printer.

The PDP-8 and Nova kits are priced at $3,995, while the PDP-11 package is set for $4,895. Printers are available with either 64- or 96-character (upper/lower case) sets and optionally with character buffers for 2,400 baud operation. The printer kits are scheduled for first deliveries this month. PRINTER TECHNOLOGY, INC., Woburn, Mass.

FOR DATA CIRCLE 293 ON READER CARD □



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The Hazeltine 3000 is a *custom* video display terminal at a standard *off-the-shelf* price: $125 per month (12 month rental, maintenance included). The Hazeltine 3000 terminal offers you:

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Plus the features that made the Hazeltine 2000 terminal the world leader in teletypewriter-compatible video terminals:

- 1998-character display.
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- Split screen/protected data.
- Optional printers at speeds up to 1200 baud.
- Variable field transmission.
- Powerful editing capability.
- Tabulation.
- Optional "dual" Tape Cassette.

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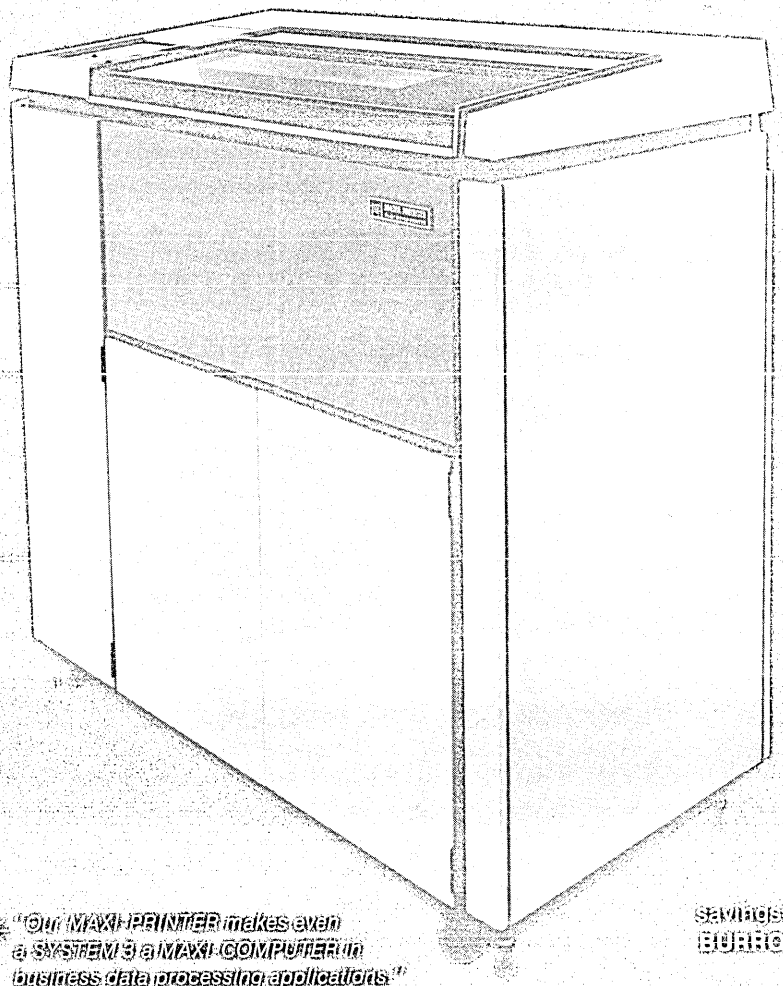
MACRO PRODUCTS is the only source for completely plug-compatible high speed Maxi-Printers for Maxi-Computers!!!



Regardless of the make of your MAINFRAME — BURROUGHS — All major systems, UNIVAC 1100 Series, HONEYWELL 200 and 2000 Series, XEROX Sigma Series, or the IBM System 3; Our 3rd generation Line Printer, the MACRO M/70 Series, is fully hardware and software compatible.

The MACRO M/70 Series of high-speed 1000 LPM Line Printers can save you more than $20,000 per printer and increase your throughput by as much as 50%, in most installations!

The MACRO M/70 Series uses the unique Data Products Mark V Print Hammer to provide unsurpassed print clarity and character alignment and provides high-speed impact printing in a low-cost, trouble-free machine that is totally suited for high volume EDP installations. 1000 LPM is obtained using 96 consecutive characters on the print drum; a full 64 character set yields more than 1200 LPM and both will deliver a full 132 column format and handle multi-part forms. In addition to its many standard features, a full complement of options are available. A typical outright purchase price of $80,500 for the BURROUGHS Models includes the basic printer, electronics, control logic and complete interface electronics and represents a savings of more than $20,000 per printer over comparable BURROUGHS equipment. Similar savings can be realized on other MAXI's ... lease or purchase!

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CIRCLE 26 ON READER CARD

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Which adds up to another dimension. As specialists in **business communications,** we offer a pretty impressive range of standard and custom services. For example, maybe you don't need a full-time tie line. Then try our metered service, and pay only for the time you use — with minimums as low as eighteen hours per month. Or suppose you need a voice tie line and a teleprinter circuit. We'll give you both for the price of the voice line. We can even install a low-cost Videovoice terminal that works on an ordinary telephone line. It's guaranteed to add a couple of dimensions to your communications.

Or maybe you need a communications package nobody else has asked for. Whether it's to the next town or across the country, we'll put it together. We'll even write a new tariff if necessary.

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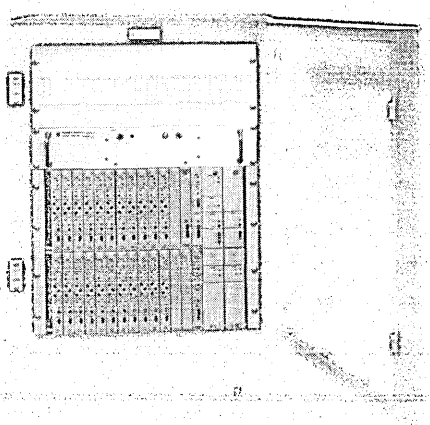


General DataComm's Model 1251
High-Speed Digital Synchronous Time-Division Multiplexer

The TDM designed for compatability with the new digital communications networks. General DataComm's Model 1251 is available for sale and delivery now.

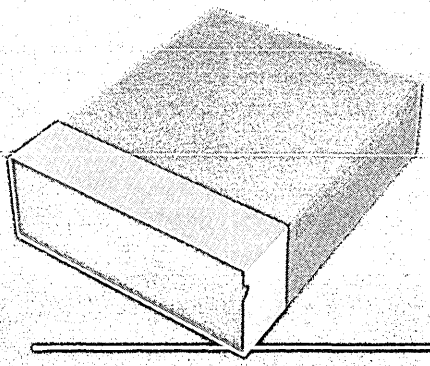
Model 1251 gives you the ability to multiplex as many as 62 channels of synchronous data having mixed rates ranging from 1200 to 19,200 bits per second and to transmit the composite output at any rate up to 256 Kbps.

But speed alone does not tell the whole story. The 1251 is superior to outmoded multiplexers in its

Flexibility — permits maximum combinations of modem and terminal equipment in the same system.

Superior Diagnostics — on-line monitoring of each data channel, remote channel testing, automatic fault alarm.

Plug-in Maintainability — no need to interrupt operation of all channels to replace one card.



And the 2400 bps Modem with all the diagnostics — General DataComm's Model 201

At first glance, General DataComm's new Model 201 might seem like anybody else's Bell-compatible 2000/2400 bps modem. That's where the similarity ends. Nobody else has synchronous 201 modems with the complete remote and local diagnostics offered by General DataComm.

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CIRCLE 6 ON READER CARD

software & services

XMAS in June

There are 26 sets of programs offered separately under the XMAS Managerial Accounting System. All are related to business controls, including financial control, planning, and budgeting, among others. Written in PL/1, they operate under OS, DOS, and virtual storage operating systems on 360s and 370s.

The largest module requires 24KB. Some sample prices are: direct order purchasing control ($2,000); cash flow projection ($1,500); production labor reporting ($3,000); and personnel administration ($3,000). Interactive versions are slightly higher. XONICS, INC., Arlington, Va.

FOR DATA CIRCLE 251 ON READER CARD

Free Data Retrieval

MIRADS is a "free" information retrieval program for the 1108. It works with DCT-500 or Uniscope 300 terminals to search, sort, manipulate, update, print, or display data from any number of files. The system was written at Marshall Spaceflight Center using FORTRAN, COBOL, and assembly language.

The "vendor" is in the business of disseminating programs written under contract for NASA. So the $750 price for listings and documentation of the 23,500-card program is actually a giveaway. COSMIC, Univ. of Georgia, Athens, Ga.

FOR DATA CIRCLE 252 ON READER CARD

Virtual Spooling

POWER/VS is IBM's updated version of the popular POWER spooling program that has been around for some time. It runs under the DOS/VS monitor. The system program permits tasks to be processed while input jobs are being read and stored, simultaneously printing completed jobs. Additionally, it allows jobs from remote locations to be handled more efficiently through its remote job entry facility. Other advantages of POWER/VS include a full range of operator commands that allow greater control over tasks, and job accounting data collection to simplify preparation of billing reports. Up to 25 communication lines can be supported by the package. Any 370 DOS/VS user with at least 96K of memory can have the program in September without charge. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 253 ON READER CARD

Nova Business Language

IBOL (Interactive Business Oriented Language) is available to better equip the Data General Nova computer line for duty in business data processing applications. It is a core resident, interactive, multiprogramming system and language that features program overlay capability, program protection, free-form statements, program chaining, and much more. It differs completely from Data General's RDOS monitor in the handling of data files, but it's claimed that "a tolerable degree" of compatibility can be achieved if two accommodations are made: the common data file must be contiguous, and applicable RDOS programs must take into account that IBOL programs do not process the first six words of a disc sector when reading and writing data files.

The minimum system requirements for IBOL include a 16K Nova mini and a tty. The system takes advantage of the power monitor option if it's present. The real-time clock is not required, since program switching is triggered on a procedure completion basis rather than at fixed-time intervals. A three- to four-partition system requires 32K of memory. The price of $800, or $1,200 with a disc source file option, is approximately one-tenth the price we've seen competitive products priced at. CALL CO., Longwood, Fla.

FOR DATA CIRCLE 254 ON READER CARD

software spotlight

Honeywell Software

This software house has staked out the Honeywell series 200 and 2000 systems base and, together with a number of users, developed some alternative software packages for it. They provide an alternative for users content to stay with the old Honeywell gear despite the 60 Series product announcement covered elsewhere in this issue. The packages are on-line oriented which will, to some extent, allow these users to upgrade their dp operation modes.

EASYCOMM is a roll-in/roll-out monitor that permits on-line operations to run simultaneously with Mod 1 MSR batch programs in the background. The principal feature of the system is that no existing programs or files need be modified to bring the communications systems on-line. The communications programs can be written in any standard Honeywell language. A second version of this monitor will allow on-line communications to operate in a partition of OS/2000, in parallel with other job streams, again without the need to change existing programs or files. A fully paid license for either the Mod 1 MSR or OS/2000 monitor version is $15K. An annual fee of $500 includes maintenance and enhancements to the system.

•

COMMBASE and COMMTALK are a data-base management system combined with an inquiry language that allows the user to build files, interrogate them, and display data in a variety of report formats on either a crt or hardcopy terminal—or both. COMMBASE and COMMTALK can be implemented on a dedicated on-line model 2020 system, or on a model 2030 system with Mod 1 MSR batch programs running in the background. Optionally, COMMBASE and COMMTALK may be run in a partition of OS/2000. A fully paid license for both COMMBASE and COMMTALK is also $15K, with an annual maintenance charge of $500.

•

OTIS-I (On-line Terminal Information System) comprises an array of on-line applications systems and software for order entry, invoicing, cash receipts posting, purchase order writing, inventory maintenance, and all associated file maintenance programs. There is also a full range of batch programs provided for such application areas as customer and product sales analysis, lost sales reports, open orders, commissions, and many other items. OTIS-I is coded and documented and will operate as a dedicated system, or with Mod 1 MSR batch running in the background, or as a partition of OS/2000. The system can be implemented on any 2030 system with at least 49K bytes of memory, or in a 49K partition of OS/2000. The fully paid license is $38K with an annual maintenance fee of $1,200. It can be rented for $1,520/month. COMMLINE, INC., Los Angeles, Calif.

FOR DATA CIRCLE 250 ON READER CARD

software & services

PDP-11 File/Data Management

The PDP-11 file system and data management package is intended for real-time on-line data base applications on Digital Equipment's most popular minicomputer. It provides direct (relative), chained sequential, index sequential, and multi-list (IMS) access methods. Also featured are virtual disc storage techniques and pointer-shared records for increased performance. The package runs under DEC's DOS, RSX11A-C, RSX11D-M, etc. A FORTRAN interface and file loaders are included. The price is $6,700 plus field installation and modifications. ENTRY LEVEL SYSTEMS, East Cleveland, Ohio.

FOR DATA CIRCLE 255 ON READER CARD

FORTRAN IV Access Method

ISAM70 is a general purpose keyed access method that runs on a variety of computers that include the IBM 360, 370, 1130, and System/3; DEC's PDP-11; the Data General Nova line; and General Automation's 1830 and SPC-16. It provides the user with the ability to read and write disc records based on alphanumeric or binary keys (of any length) instead of record numbers. This makes it possible to construct files using names, part numbers, locations, or other identifications as the "hook" for a particular record in a file. Additionally, ISAM70 supports as many keyed files as required—with no increase in program size.

In addition to adding, updating, or deleting keyed records on the file, ISAM70 also optionally provides identification of keys on the file, statistics on the keyed file (such as number of active keys, available records on file, file saturation, etc.), the ability to read the file sequentially without regard to the key, and the ability to copy the keyed file onto a new keyed file which could optionally be larger or smaller.

ISAM70 is written in FORTRAN IV as callable subroutines averaging about 2K in size (depending on the computer being used). The price of $195 includes the source deck and supporting documentation. SOFTWARE '70, Anaheim, Calif.

FOR DATA CIRCLE 256 ON READER CARD

Extended FORTRAN IV

Digital Equipment has announced an extended version of FORTRAN IV, based on the RT-11 operating system, that enhances both compiler and run-time performance on the PDP-11 minicomputer. The new system features an optimizing compiler designed to execute user programs without redundant operations. Typical users of FORTRAN/RT-11 would include physical and life scientists, engineers, architects, and college and university faculty and students. Applications include scientific calculation, statistical data reduction, laboratory instrument analysis, and the teaching of computer science and technology. Recent benchmarks for FORTRAN/RT-11 show that it performed a series of matrix inversions faster than an IBM 360/30, it's claimed.

The system is an extension of ANSI FORTRAN X 3.9-1966. It is compatible with all programs written in this language, and can achieve local optimization of programs beyond level 1. The programming is said to be efficient enough to allow the storage of 200 to 300 lines of FORTRAN code in a minimum 8K system, while a 28K PDP-11 could hold two thousand lines.

The program is separately priced at $700, and packages started going to the field last month. DIGITAL EQUIPMENT CORP., Maynard, Mass.

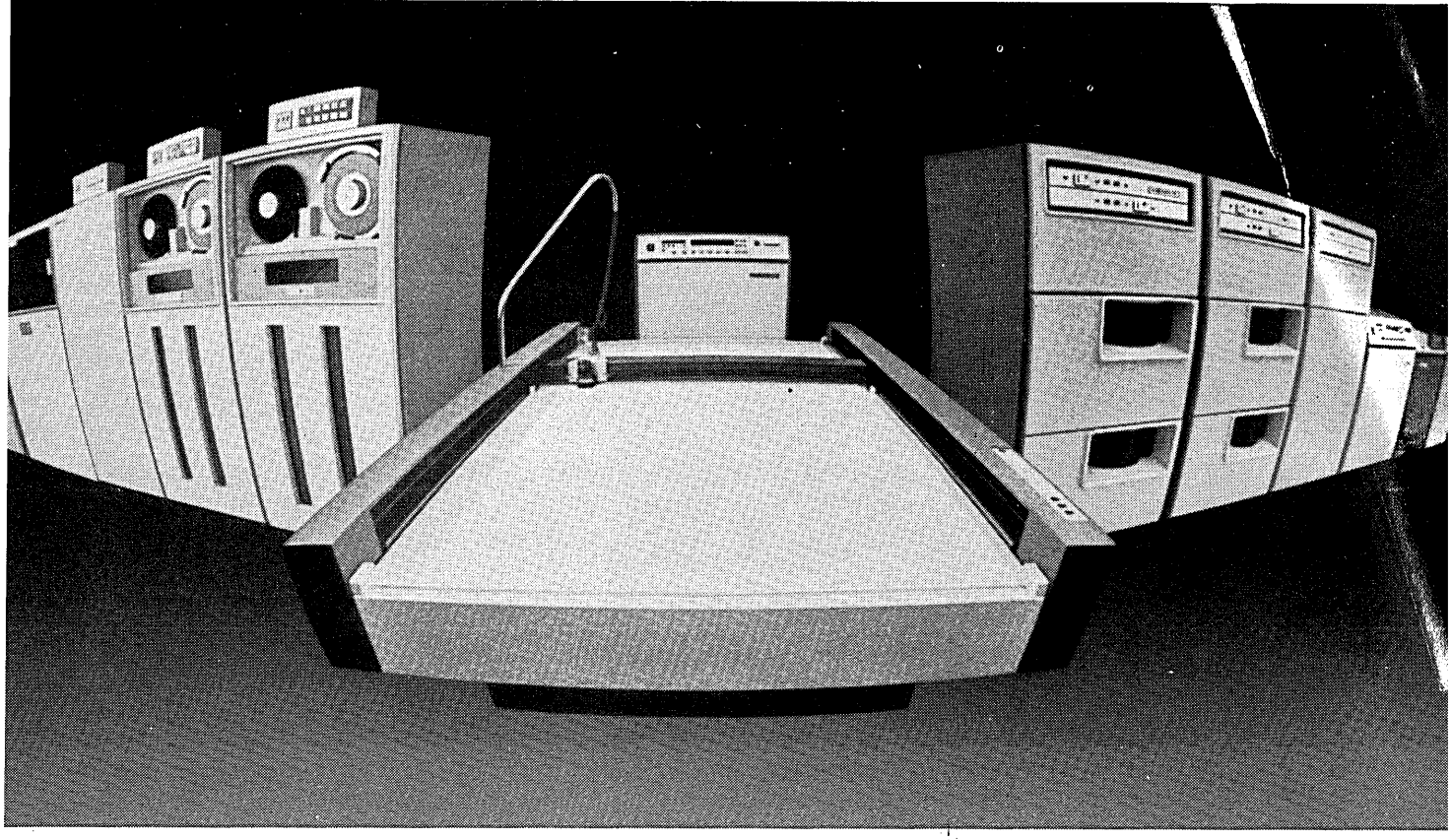
FOR DATA CIRCLE 257 ON READER CARD

Nova Operating System

Some major enhancements have been made to this supplier's Data General Nova operating system called cvs/72 —at no increase to its $2,950 price. The changes will qualify it to handle business applications more efficiently.

Indexed sequential disc files are now supported, in addition to direct access files. A novel feature allows fields to be added to, or deleted from, records in an existing disc file at any time, without having to modify the program that reads the file. Output spooling is now available to provide better printer utilization. Job control commands may also be spooled, improving system utilization and allowing unattended operation. Finally, a trace feature has been added to assist in program debugging. The monitor is a single user, conversational system that supports an extended subset of BASIC, accommodating programs up to 64K. The minimum system requires 8K, a disc drive, and a tty or crt with keyboard. The system will support additional core memory, multiple disc files, and other ASCII I/O devices. COMPUTER SYSTEMS DESIGN, INC., Manhattan, Kans.

FOR DATA CIRCLE 258 ON READER CARD □



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Disk memory equipment. This was our second area of concentration. In a remarkably short time, we have become the leading independent supplier.

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The point is we have not grown by accident. Thirteen years after our beginning, we have become a leader in computer peripherals.

For information on peripheral products, call your local CalComp office, or contact California Computer Products, Inc., DM-M6-74, 2411 West La Palma Avenue, Anaheim, California 92801 (714) 821-2011

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MODEL 155 with 370/STOR			MODEL 158 from IBM	
YES	NO		YES	NO
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☑	☐	3. Up to 30% more CPU cycles than Model 155	☑	☐
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☑	☐	7. Virtually no conversion or installation costs	☐	☑
☑	☐	8. No additional storage adapter required for expansion	☐	☑
☑	☐	9. Ability to reconfigure main memory	☐	☑
☑	☐	10. 35% less costly than a Model 155 with all – IBM hardware	☐	☑

That's what 370/STOR 155 can do for your installed Model 155 processor. We almost turn it into a 158 – and then some – for about one-third less than it will cost from IBM.

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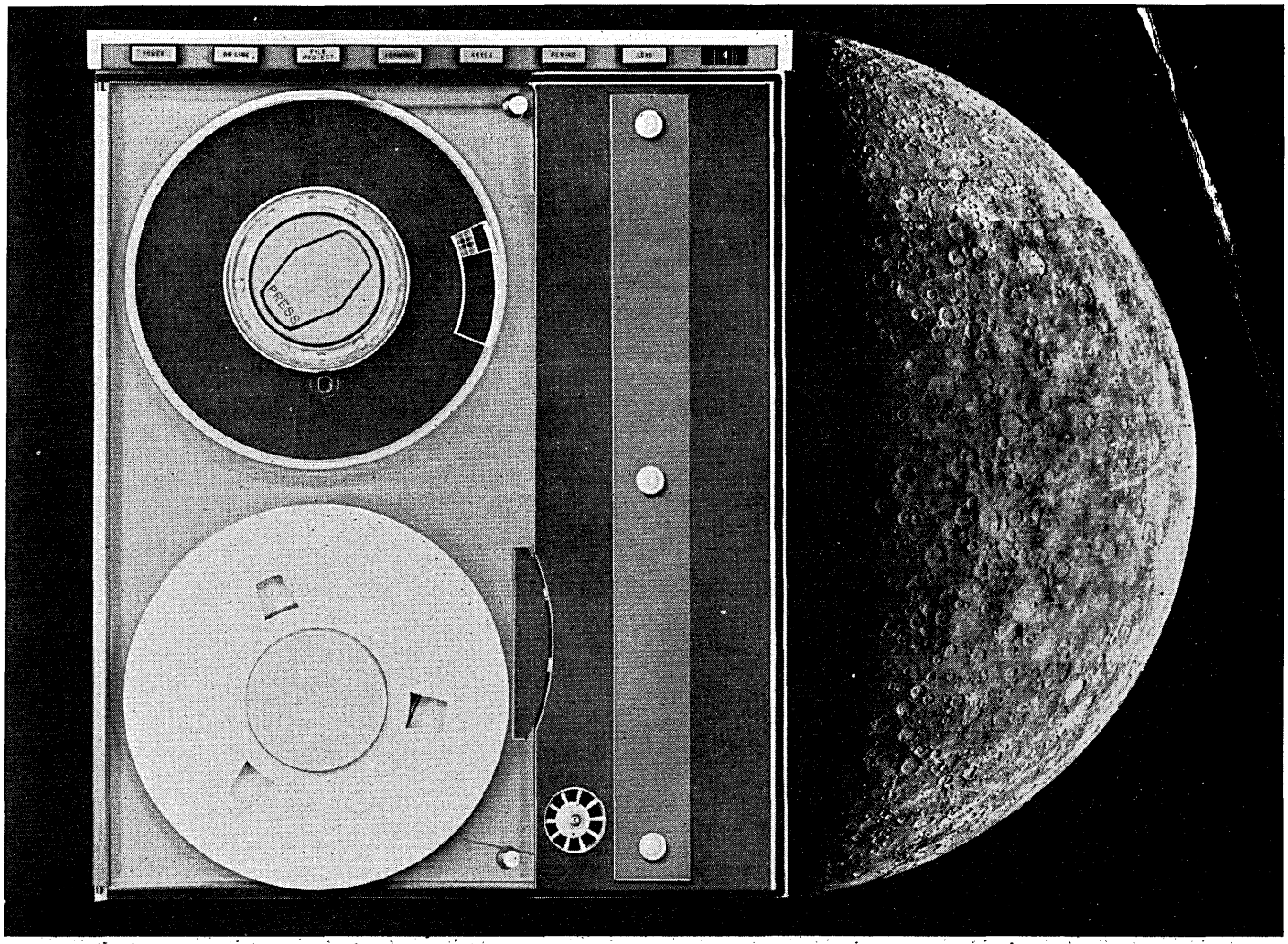

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CIRCEL 106 ON READER CARD

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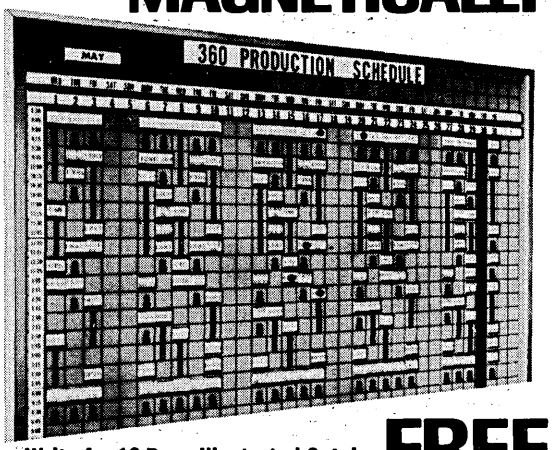

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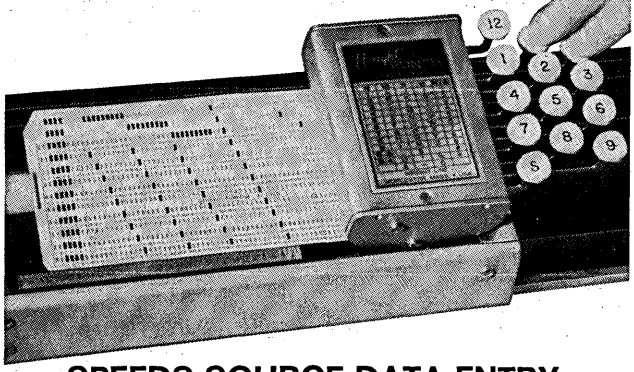

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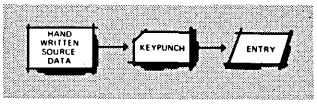
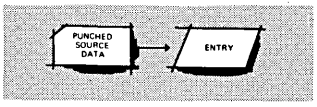
Instead of using hand written source data which must go to keypunching before entry, you can punch source data at any location using the Wright Punch. These cards then go directly to data entry.





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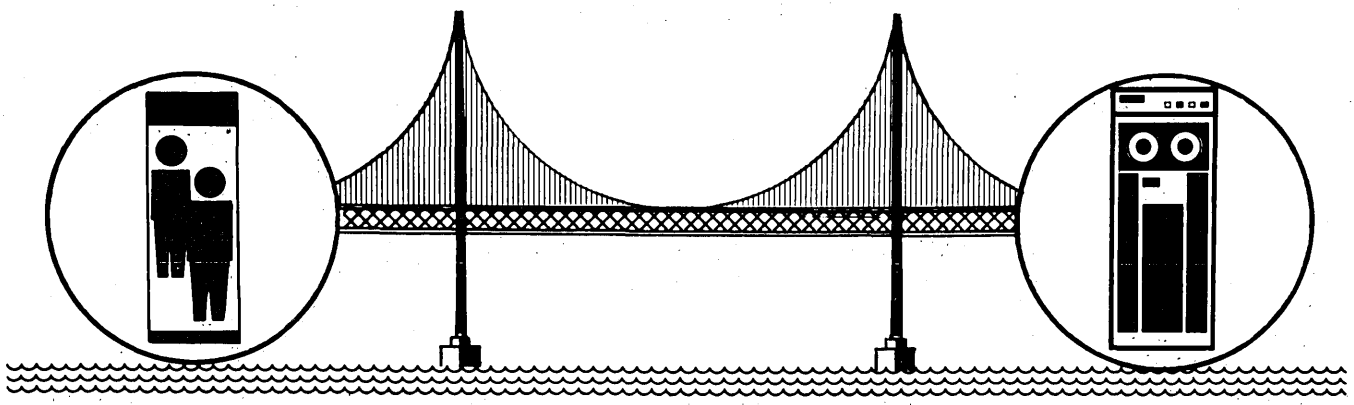

6th. ANNUAL CONFERENCE
THE SOCIETY FOR MANAGEMENT INFORMATION SYSTEMS
FAIRMONT HOTEL
SAN FRANCISCO CALIFORNIA
SEPTEMBER 11-13, 1974

Building upon past Conference topics, the 1974 SMIS Annual Conference will further explore the ever-changing and evolving art of management information systems. Of particular interest is the increasing convergence of computer and communications at a pace that often makes these terms synonymous. Perhaps in no other scientifically-based discipline *has the technology advanced faster than man's ability to apply it fully and effectively.*

In this context, one of the nation's leading scientist/managers stated almost two decades ago that, "The pacing factor in research and development is not technology, but management." The Conference theme paraphrases that idea by suggesting that *the pacing factor in MIS is not technology, but man.*

The objective of the Conference, therefore, is to bring members and guests face-to-face with the cultural and communications gaps in MIS design. Three broad subject areas will be addressed:

- **Psychological considerations in MIS design**
- **The influence of communications on MIS design, including both the psychology of communicating data to management and the impact of teleprocessing on MIS design**
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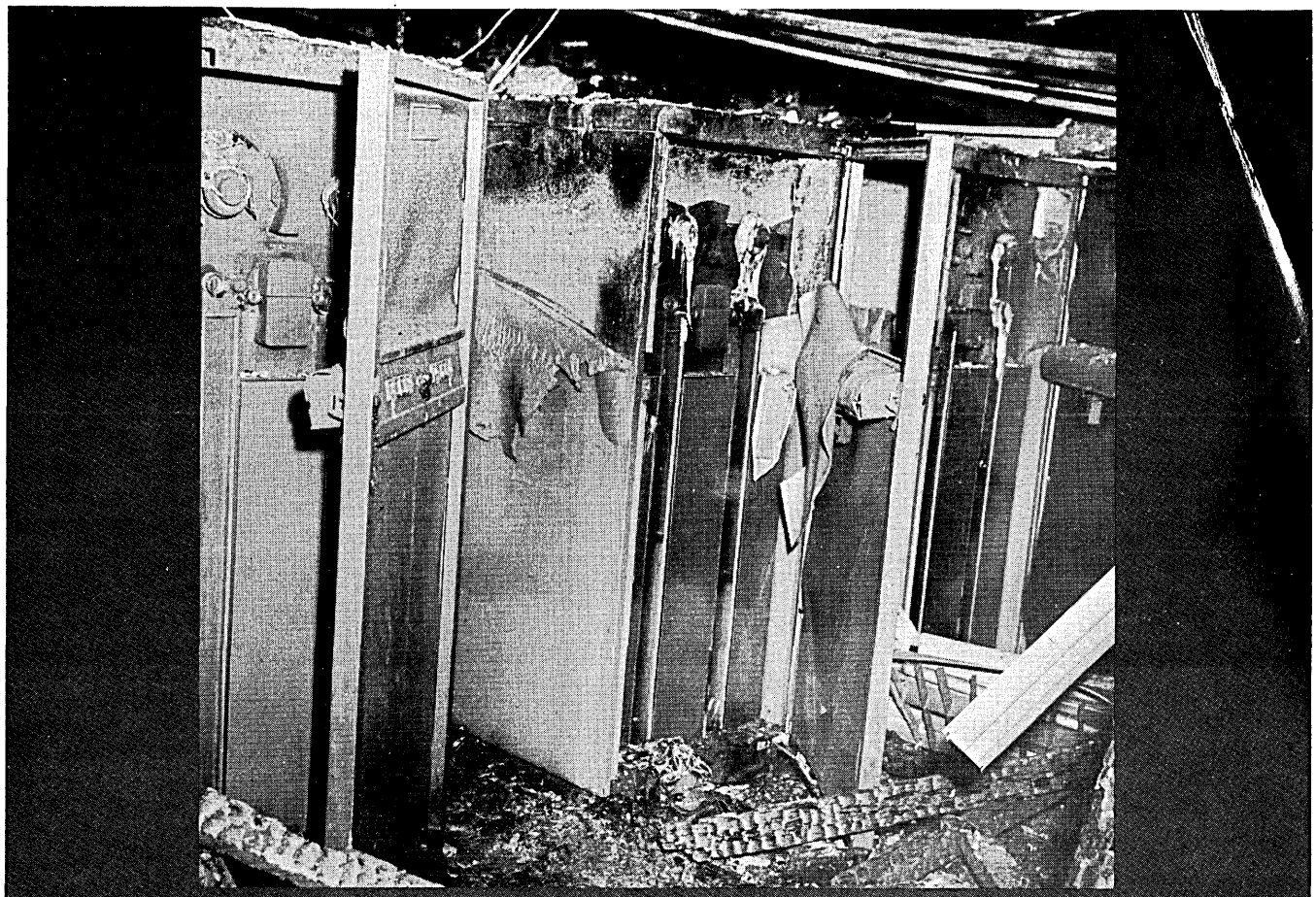

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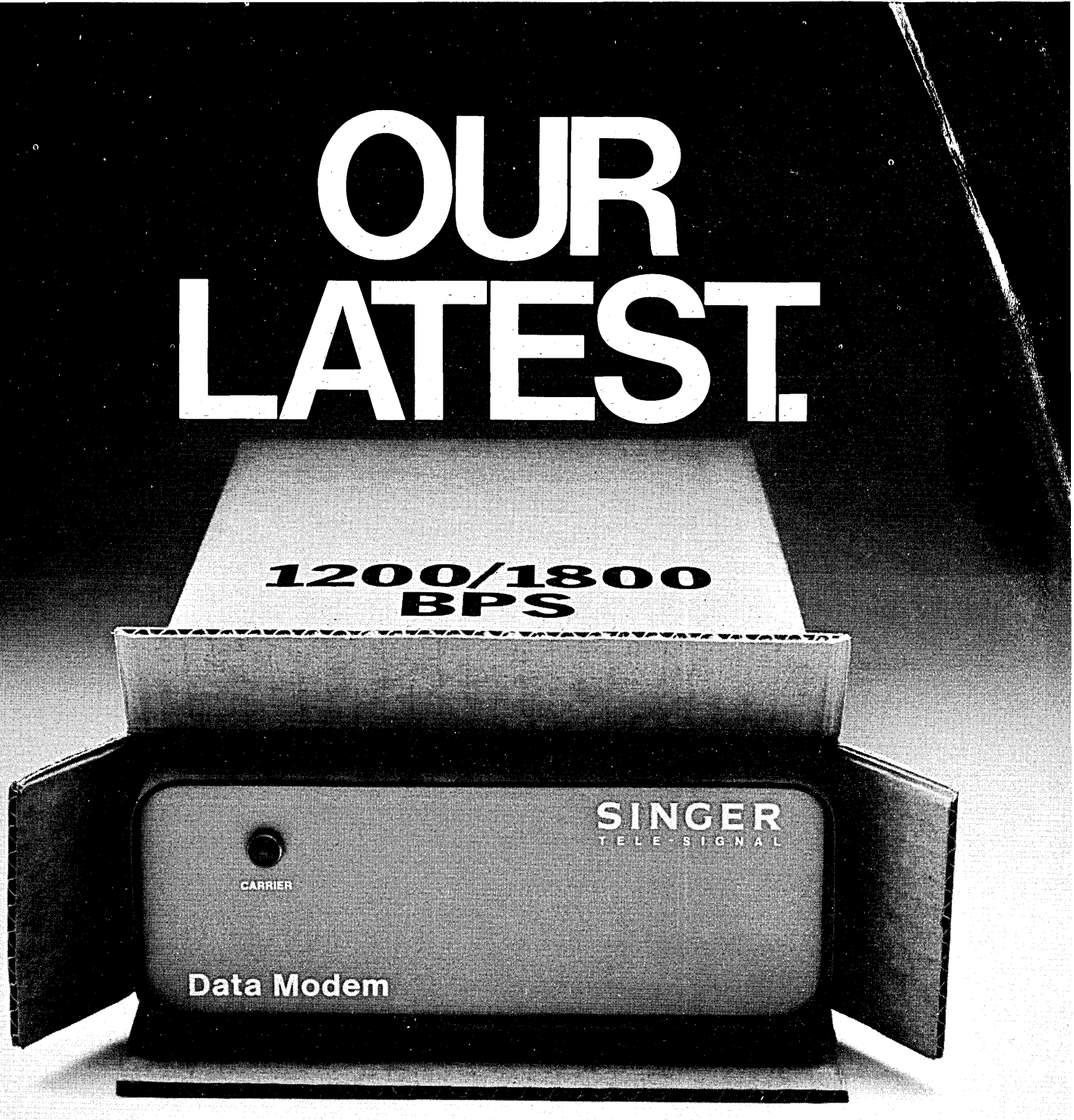

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WHAT IT TAKES TO MAKE MAC, MIS

It has been argued that the problem environment surrounding systems like MIT's Project MAC, MIS, and ABM changes too fast for a complex system to keep pace. The environment and the problem requirements change on a daily basis, whereas the large, complex system constructed to solve the problem is capable of change only on a monthly or yearly basis. Hence the solution never catches up with the problem.

I believe that this is a correct analysis of the difficulties of building systems like Project MAC, MIS and ABM, but I would like to propose a more positive view of the future. I do not believe that it is fair to say that these systems will never fly. On the contrary, I believe that systems like Project MAC, MIS, and ABM will fly when the software community learns how to build systems that can adapt to changing problem requirements.

The reason that most systems cannot adapt to a changing environment is that they are made up of a large number of highly interrelated, interlocked parts. Whenever a small change is made it triggers a chain reaction that "ripples" throughout the system. This effect is not disastrous when a system contains only ten or so subsystems. If the probability of interaction (change) between any two subsystems is .01, then one small change results in an average of 1.111 . . . changes including all "ripple." But if 100 such modules are combined into a single system, each change can be expected to cause one additional change, and the system blows up; it can never be stabilized.

The real question facing the designers of large systems is: "How can we learn to manage change in a complex system?" How can we minimize the impact of change, so that we can build systems like Project MAC and MIS and keep them up to date with the problems they are intended to solve? The answer is that system designers must gradually develop a culture of system architecture similar to the one that exists today for the construction of houses and large buildings. It would be impossible to build houses if contractors always had to work with materials as primitive as machine language instructions. These instructions are the sand, gravel, uncut trees, and hand-carved tools of systems design. The reason that architects and contractors can construct satisfactory buildings is that their art has evolved to the point where most of the major subsystems are prefabricated, and they are able to focus their attention on the development of appropriate structures; i.e., on structures that adapt to their environment.

The trouble with system development today is that the problems are sublime and the solutions are ridiculous. The problems are stated in highly abstract forms, and the solutions are represented by zeroes and ones. The gulf between problem and solution makes it impossible for designers to

AND ABM FLY

predict system behavior or for users to imagine how the system will work in order to specify meaningful requirements. Moreover, the designers spend most of their effort at the zero-one level and the result is invariably a hodge-podge structure that is incapable of adaptation.

What the field of system development needs is more attention to structures and less attention to bits. A science of structures, or a formal study of architecture, is evolving in the fields of engineering, architecture, and design automation; and it can be the basis for future improvements in system development methodology. An original proponent of the new view of architecture is Christopher Alexander, whose book, *Notes on the Synthesis of Form*, describes the nature of interactions between the requirements of a problem and the importance of discovering the structure determined by the interactions. Alexander even describes a computer program, HIDECS, that organizes requirements into natural structures. Hence Alexander not only argues the importance of structure, he also describes a method for determining it.

As the science of structure matures, the gulf between system problems and solutions will narrow, and systems will become more adaptable. At the sublime end of the spectrum, designers will become more aware of the crucial importance of subsystem interactions and appropriate structures. At the ridiculous end, languages for expressing solutions will "rise" in level until entire systems can be specified in terms of prefabricated subsystems. At this point, the interactions will be clearly visible and much more manageable, and systems will be capable of changing on a daily or weekly basis.

There are already visible trends in this direction. The disciples of structured programming are preaching the importance of minimizing the managing interactions between subsystems. Concepts like virtual memory and virtual machines are freeing programmers of many of the traditional constraints, thereby improving system structures and reducing resistance to system changes. Finally, the level of languages continues to rise. Higher level languages are used widely, and it is now possible to represent complex systems in the precise, compact notation of various "meta-languages." It is entirely conceivable that these techniques will result in systems that can meet the demands of changing environment.

MAC, MIS, and ABM may not fly today, but the propeller and the piston engine are on the drawing boards and someday someone may get it all together.

—Frederick M. Haney

Dr. Haney is a member of the Advanced Systems staff of Xerox Corp.; his major responsibility is the marketing and technical evaluation of new system concepts.

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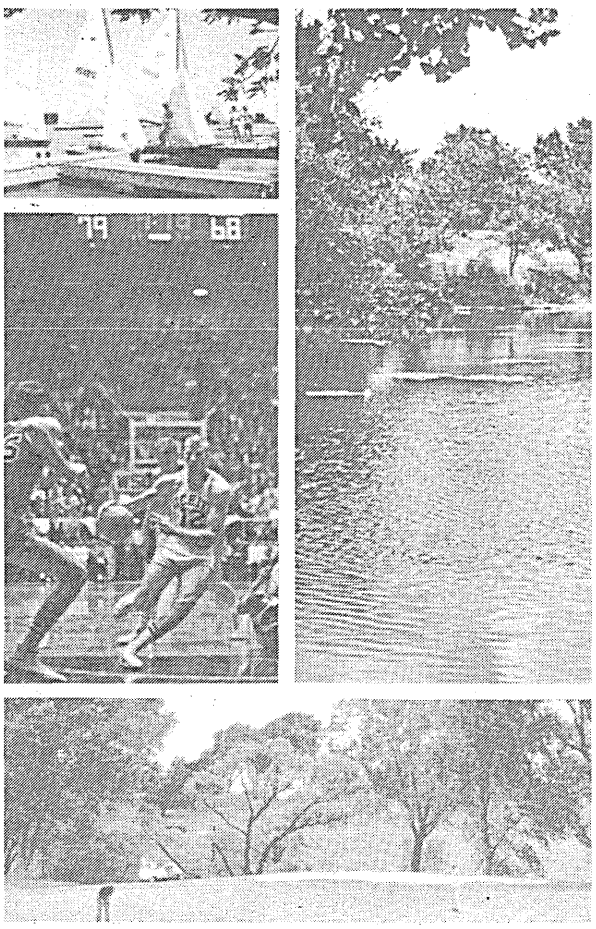

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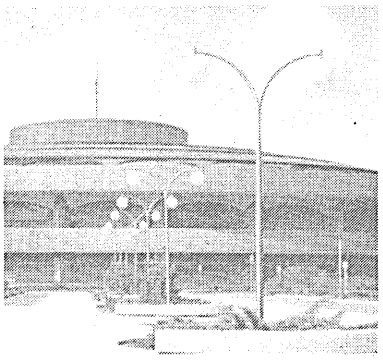

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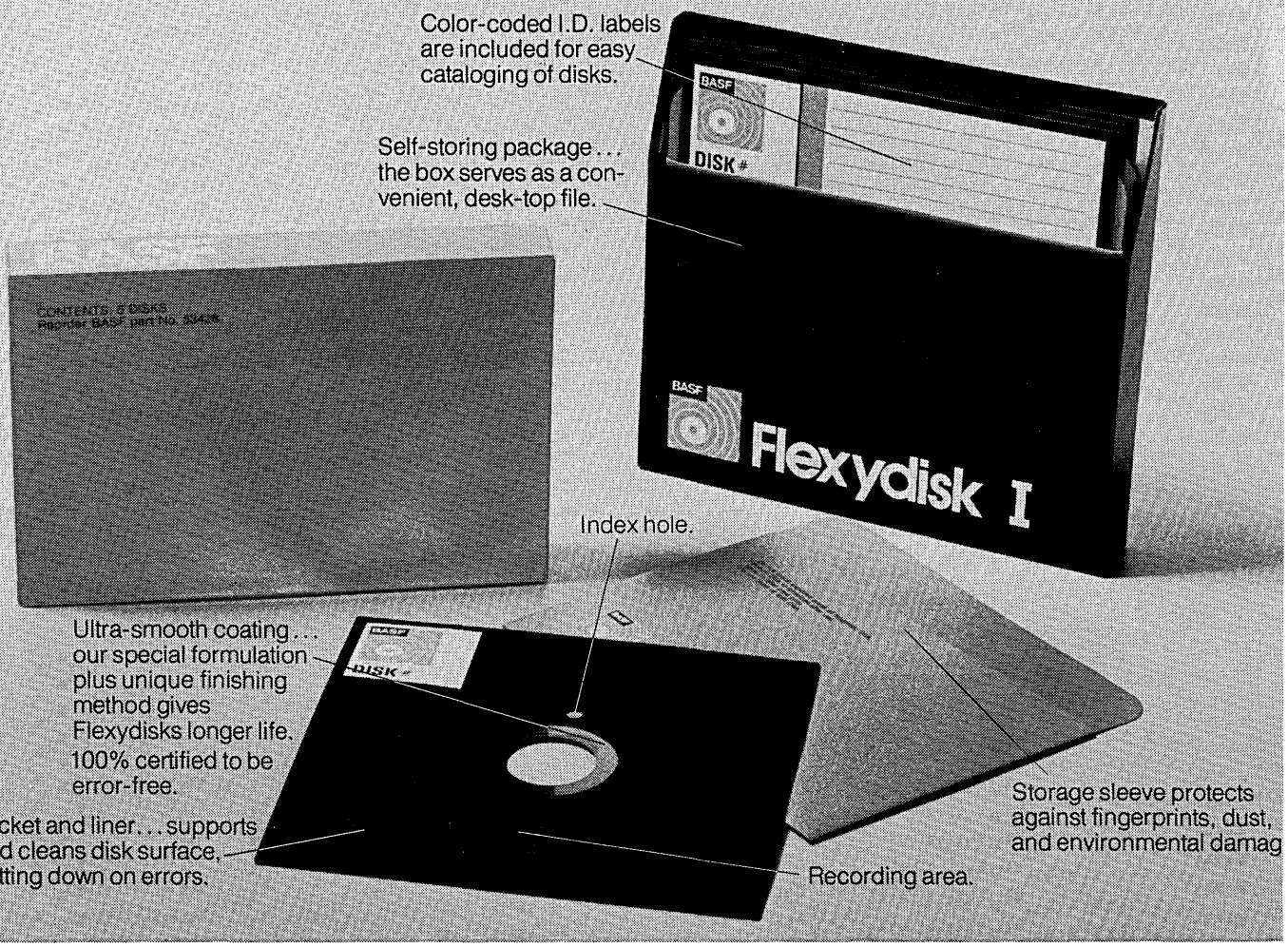

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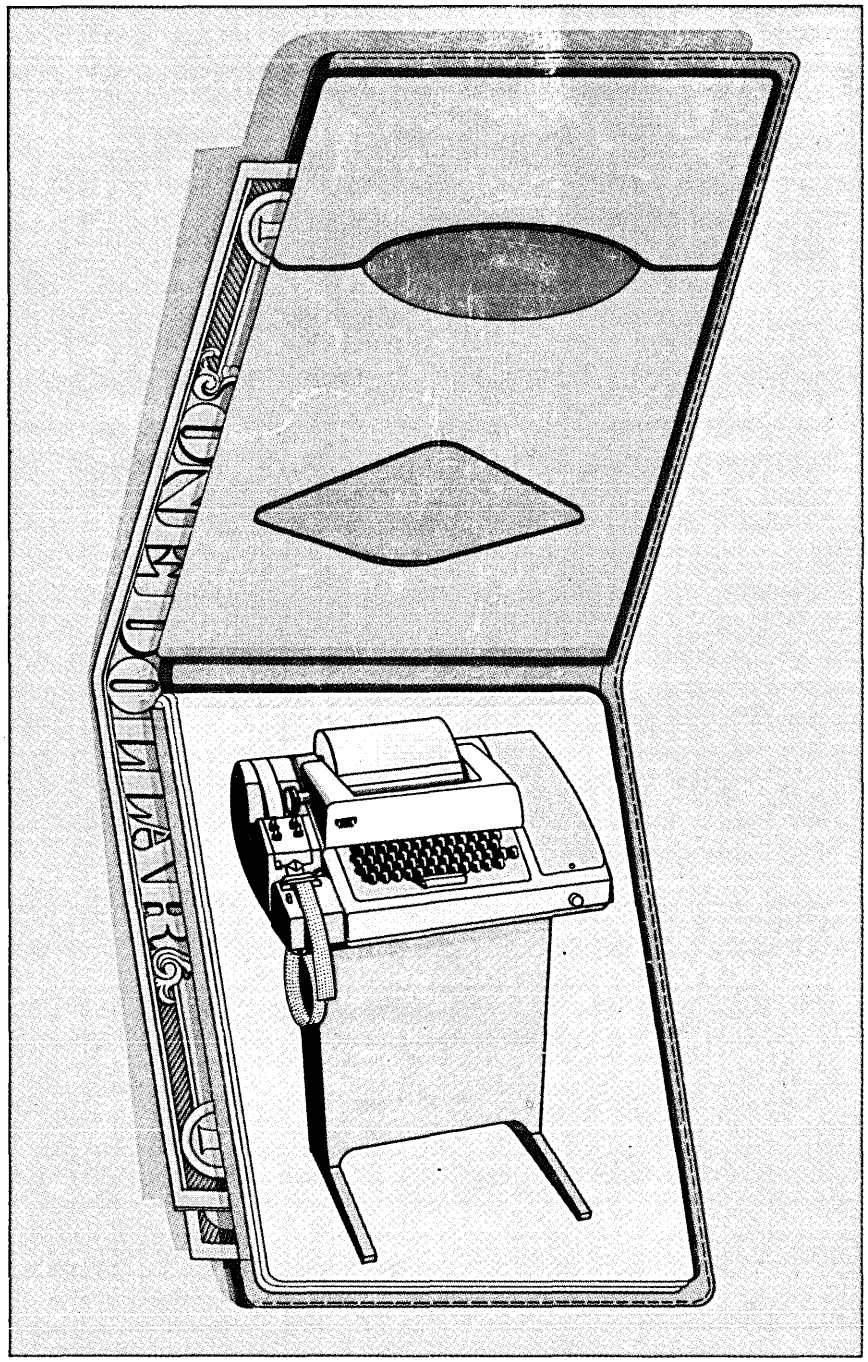

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