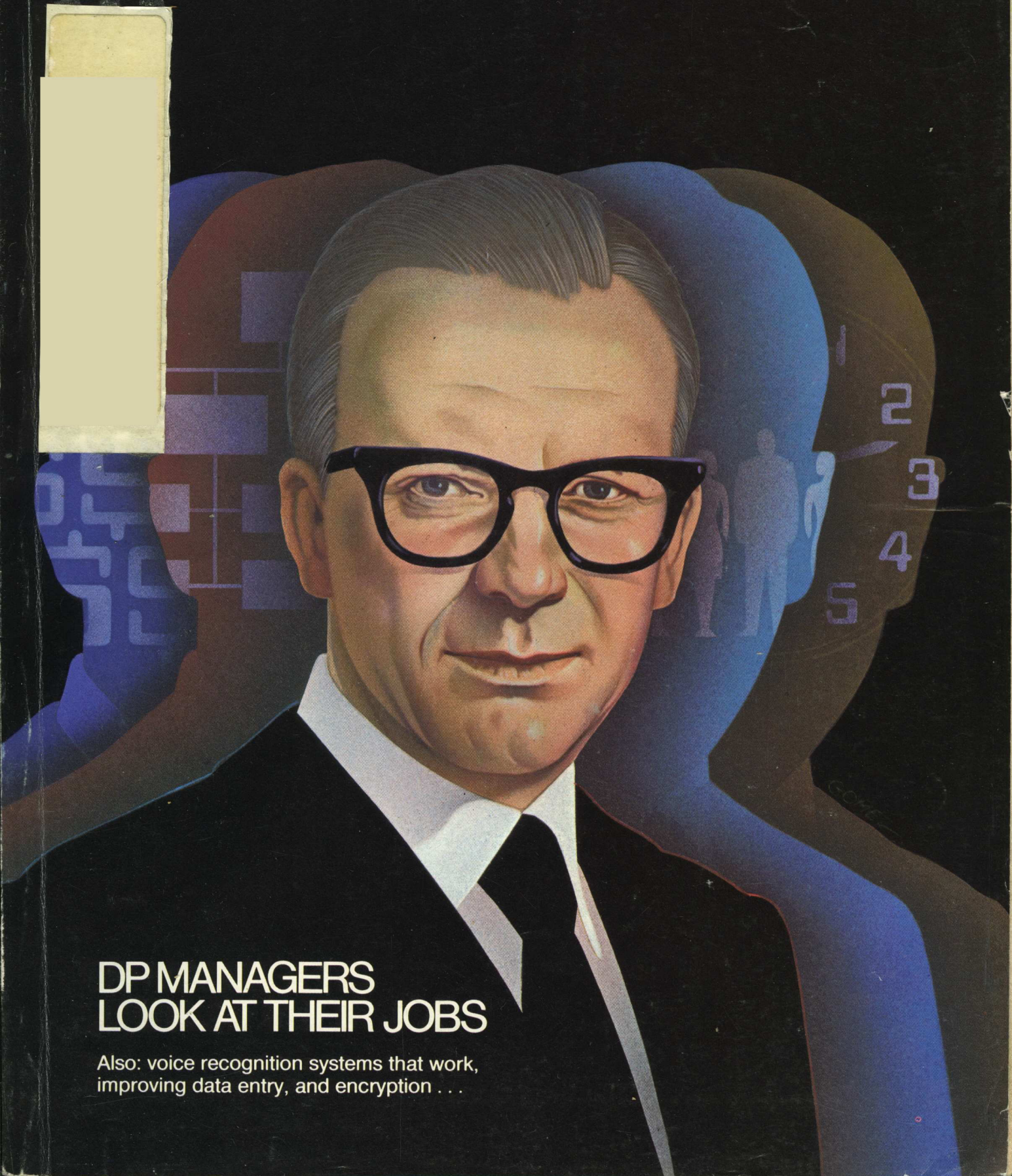
DATAMATION®

76

August



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Quality that's Quick & Quiet

Model 9300 Vacuum Column digital tape transport has characteristics common to all Kennedy recorders — and a few new ones. It's quick (125ips), quiet (noise level of less than 70db), and it has the built-in quality of all Kennedy products.

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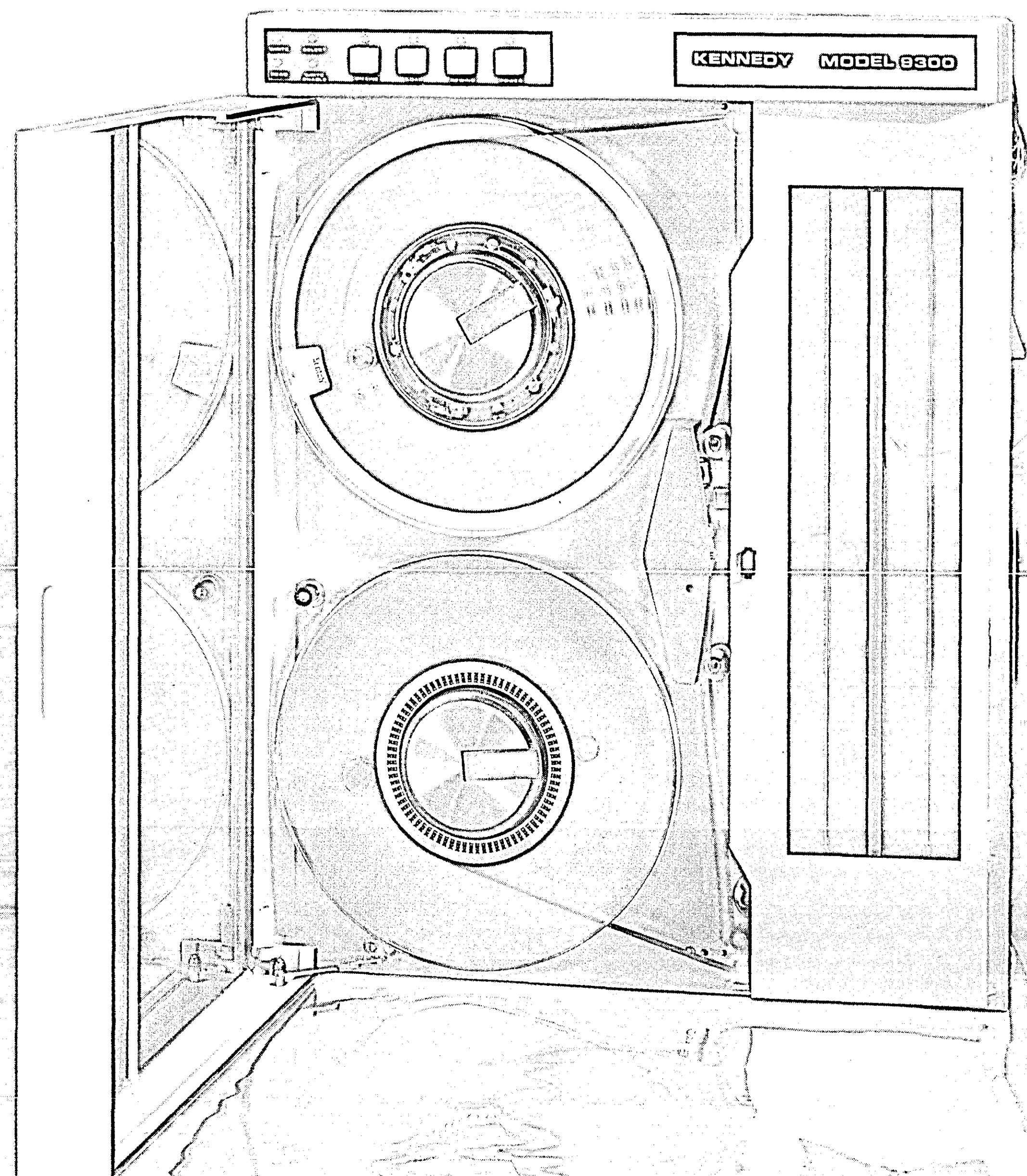

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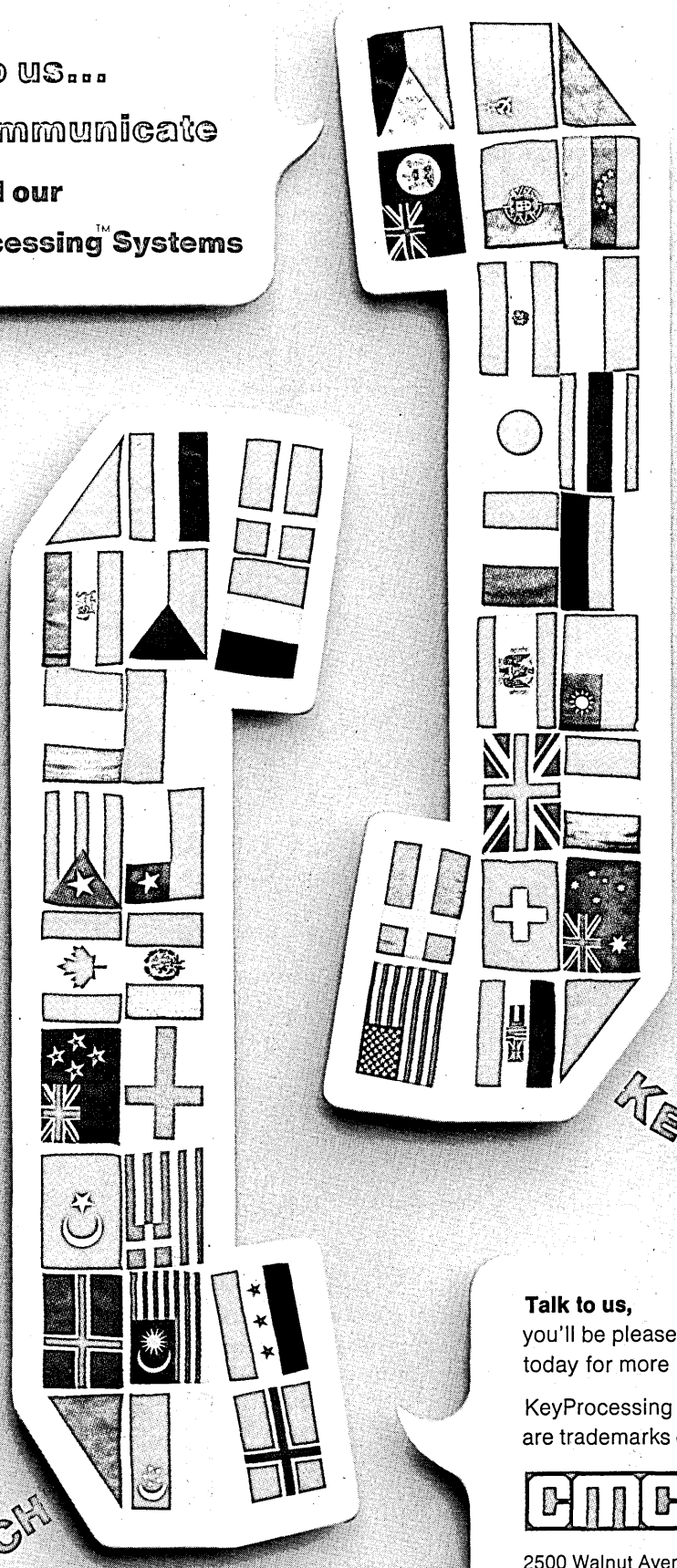

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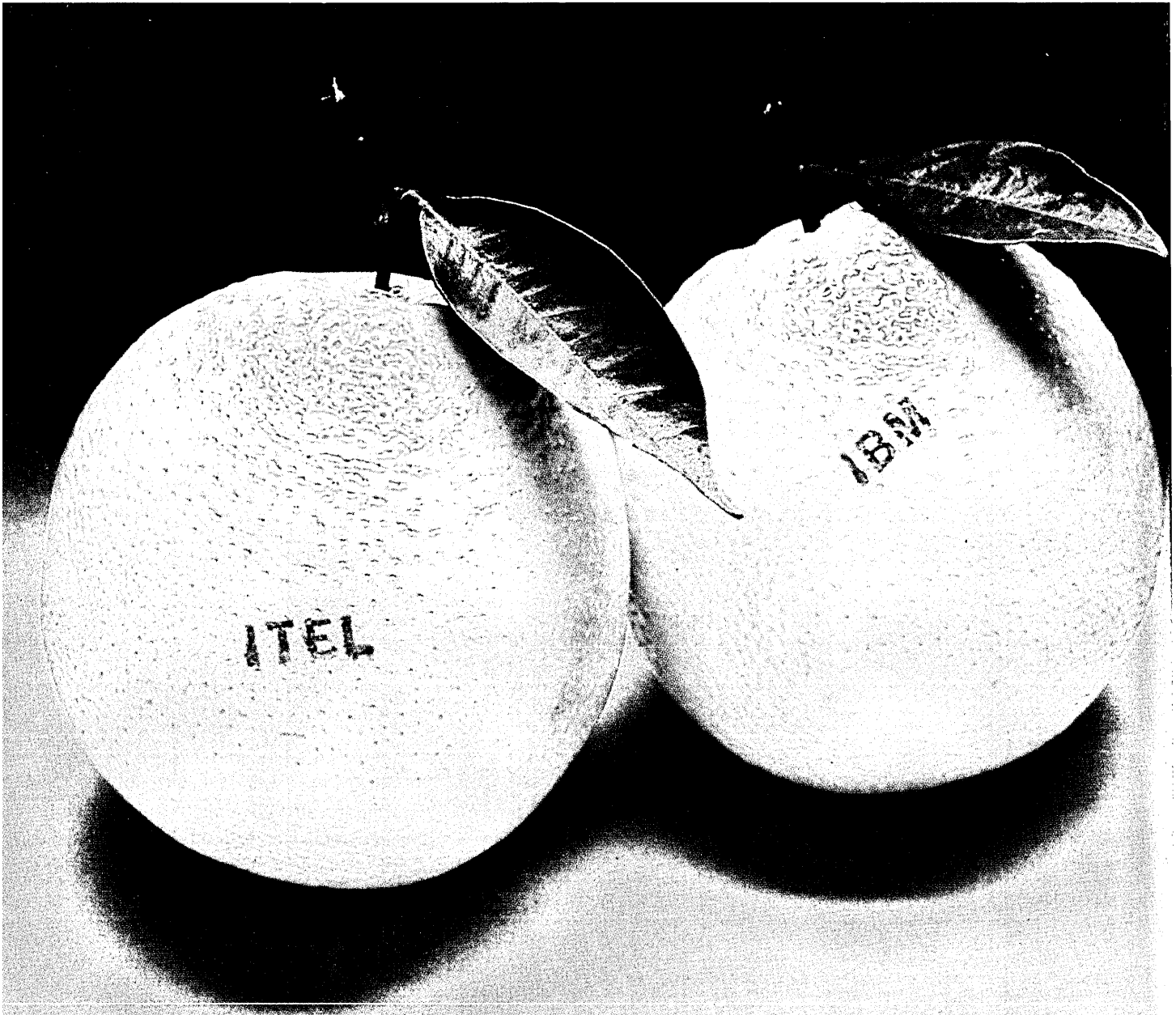

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DATAMATION® 76

VOLUME 22 NUMBER 8 This issue 122,000 copies AUGUST 1976

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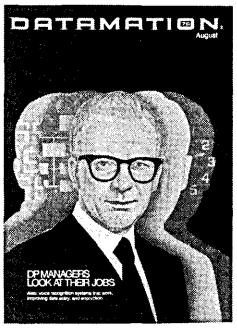

NEWS IN PERSPECTIVE

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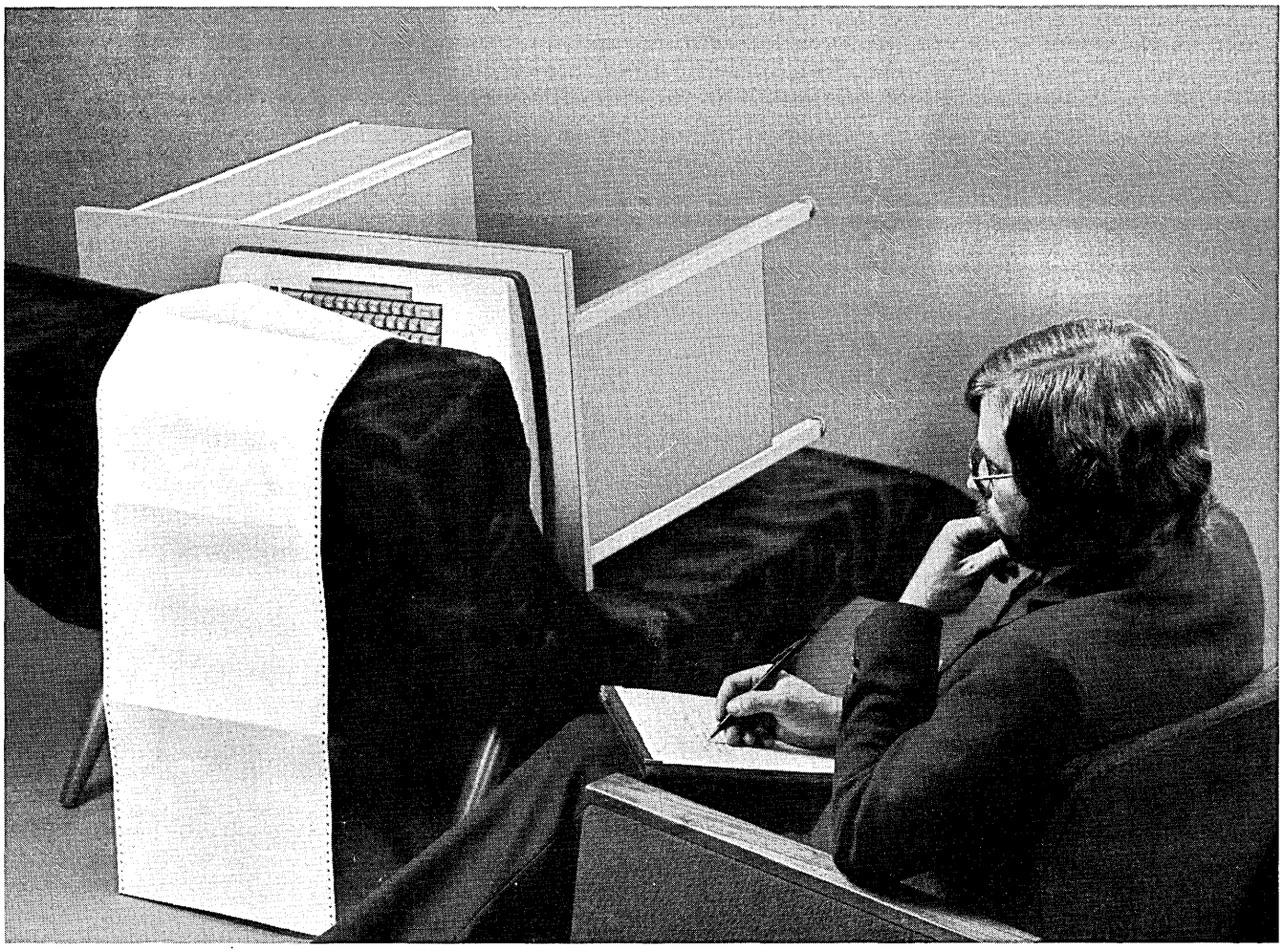

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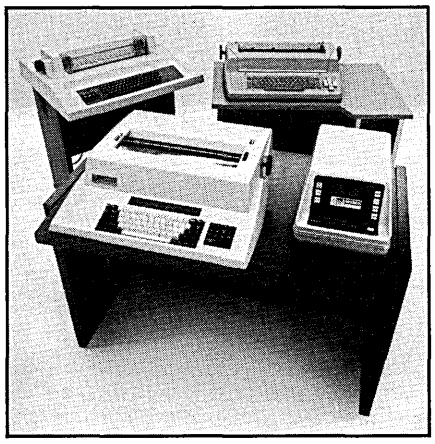

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letters

The right of privacy

The view attributed to Phoenix attorney Ronald Meyer ("Privacy," May, p. 180), that the Supreme Court will uphold the right to privacy, could not be more mistaken. The present Court, shaped by Richard Nixon's conservative appointees, has repeatedly slammed the door shut in the face of civil libertarian interests. In *Paul v. Davis,* the Court upheld by 6 to 3 the Louisville Chief of Police's right to circulate flyers identifying "known and active shoplifters," even when individuals named had never even been brought to trial, much less convicted. In *U.S. v. Miller,* the Court decided by a 7 to 2 margin that a customer had no legitimate expectation of privacy in dealings with his bank!

Take note that these two recent decisions represent a trend in Supreme Court cases. The decisions themselves are simply astounding! Their cumulative effect is disheartening. With ample legal grounds for findings to the contrary (the 4th Amendment protection against illegal search and seizure, the 5th Amendment against self-incrimination, and the 14th Amendment protection of due process), it would become clear that reliance upon the judiciary is inadequate. If we are to protect the right of privacy, it must be by concerted legislative action.

The opinions of several other Honeywell privacy symposium speakers that privacy legislation will pass this year because it's a "motherhood and apple pie" issue are similarly misguided. In spite of momentum created by passage of the Federal Privacy Act of 1974 and by revelations of CIA and FBI surveillance activities, invasion of privacy failed to become an election campaign issue this year and state privacy legislation fared poorly.

It therefore behooves those of us interested in the right of privacy to let our legislators know that we consider privacy legislation a top priority.

PHIL KOLTUN
Assistant Professor
Sangamon State University
Springfield, Illinois

The Datamation 50

Please can Mr. Rothenbuecher (June, p. 48) explain the logic of including the revenue of U.S. companies' non-U.S. subsidiaries, but of excluding all non-U.S. based companies from his article?

Must we look for ulterior motives in your not giving the correct cover title for his article, namely "The Top 50 *U.S.* Companies in the DP Industry"?

In fairness to the rest of the computing world, I suggest you either commission Mr. Rothenbuecher to *complete* his study, or else print this notice across your front page: "The purpose of this magazine is to provide marketing support for the U.S. dp industry against outside competition."

MIKE FLYNN
Hamburg, West Germany

Our purpose is to inform our readers (and sometimes entertain, inspire, or even prod), but definitely not to promote one group of companies in our industry over another. You're quite right that a better title for this year's work would have included the descriptor "U.S." We are considering expanding the feature to non-U.S. firms in the future, in spite of the difficulties stemming from the different ways revenues are reported in various countries.

I've been reading your "top 50" article, and I'm impressed! Greedy as I am, there are other things I'd like to see in your primary table: dollar amounts and ranks for each of your five subindustry groups; net dp income and rank; number of dp employees and rank; dp assets and rank.

Obviously, I subscribe to *Fortune* and a comparison is inevitable. They have the advantage in that, since they deal with corporate totals, more of their figures can be verified. But your list is of more immediate interest. I hope your list will bring some new contenders out of the woodwork (why not a major forms supplier?) and some new information to improve your reliability and accuracy.

And—*of course*—I hope you do it annually!

DOUG PEARSON
NASA
Ames Research Center
Moffett Field, California

Breaking out the industry subgroups **could** be misleading, especially since we do not present the top 50 firms in each subgroup. A company could have high sales in one category, say "software and services," yet lack sufficient cumulative revenues to make the "Top 50." Then the industry subgroup listing would omit that important subgroup member.

This would happen, for instance, with Applied Data Research (1975 total revenues about $12.7 million). ADR would not appear in a subgroup listing taken from our feature, although Datapoint would, with only an estimated $4.7 million in software and services.

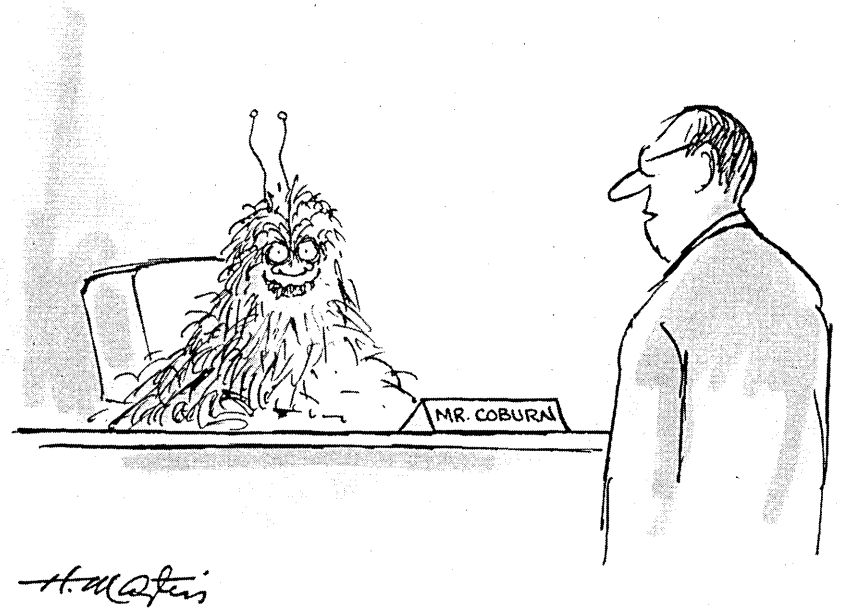
We did supply the information for most of the other breakdowns you suggested; sorry that the exercise had to be "left to the student" this year.

Communications error

Congratulations to J. Burt Totaro on his excellent article ("Communications Processor Survey," May, p. 151) and particularly on his detailed descriptions of the hardware and software functionality required or desired for networking applications today. . . .

Excellent as the article was, there were several errors on the chart in the Honeywell Datanet 6632 column:

1. The maximum number of lines configurable is correctly stated as 380; however, the maximum number of lines active simultaneously is erroneously listed as 56. . . . A more accurate estimate would be about 200 lines with 32K words of memory and should encompass all 380 in the larger (64/-128K) versions.



"I asked to see Mr. Coburn. You're not Mr. Coburn."

letters

2. Not only is the "NO" entry under "assembler" incorrect, but Honeywell also provides as standard (and bundled) a Datanet configuration simulator which executes in the Level 66 host processor.

3. Again, not only is the "NO" next to "console performance monitor" erroneous but, additionally, any and multiple terminals on the network can be configured as network control stations.

DAVID A. LAMBERT
Honeywell Information Systems
Phoenix, Arizona

The information in the Datapro report, on which the article was based, is verified with the companies mentioned. For some reason, errors occurred in this particular case, and Datapro is changing its files to reflect these corrections.

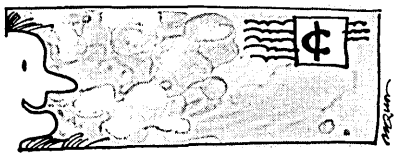
Higher level languages: a costly failure

In "The Second Half of the Computer Age" (May, p. 91), Mr. Frank makes the statement with respect to software productivity that "despite . . . advances, there are no signs of significant jumps in the programmer's implementation productivity."

I agree wholeheartedly, and I think a thorough investigation of the reasons for this lack of progress is long overdue.

In my opinion, socalled "higher level languages" have been a failure. They have failed to reduce significantly implementation time and costs. They have failed to justify the cost of the extra hardware resources they demand. They are not "self-documenting" as, for example, COBOL was advertised to be when it first hit the market. And systems written in higher level languages are not to any great extent easier to maintain than systems written in machine level languages.

It has seemed to me all along that



the greatest contribution higher level languages have made is to the sale of computing equipment and the resultant waste of a portion of every dollar spent on computing.

Now that higher level languages are sifting downward to the minis, the impact of languages on implementation costs are much more visible, and I find my worst fears are true. It is my experience that the cost of implementing, say, a small on-line accounting system increases by a factor of at least 2 when the customer insists on COBOL or FORTRAN rather than assembler. This increase in net cost to the customer is a combination of the extra hardware required to support the language, and the extra money we have to build into the contract to cover time spent coping with buggy and restrictive compilers and operating systems.

This situation is bad enough when the price of a mini installation zooms from $150K to $300K for hardware and software. But considering the size and cost of the thousands of large scale installations in North America and Europe, most of which use higher level languages, the extent to which computerization has undoubtedly contributed to inflation boggles the mind.

HUGH O'ROURKE
Consultant
Special Systems Division
I. P. Sharp Associates Limited
Toronto, Ontario
Canada

A mini tale

Mr. Dorn's comments on minis ("The Trouble with Minis," May, p. 82) may be apt, and are undoubtedly correct and timely, but in no case must be used as advice by a dp manager. He would probably lose his job. Let me tell you a true tale:

I was director of a small computer installation at the Univ. of California at San Diego. The installation was designed with the single minded aim of improving computer science education, in particular, applications programming skills; it was an immediate success. I ruthlessly forbade use of the system for any other task pursuant to the grant proposal that had garnered the money necessary for the project. Using two identical Novas, I was able to achieve 100% availability of the system, which drove 16 terminals. Eight were local, and another eight were placed in dorms and they communicated via phone lines. When one machine needed maintainance the other could be switched in to take up the load.

As an aside, I turned off the noisy fluorescent lighting in the facility and installed incandescent lighting covered with paper Japanese lanterns at a lower level of illumination. All the terminals were crt's, making this beneficial. I rented pillow chairs and low tables. It was a comfortable installation, and the students showed tremendous abilities in learning how to program.

Unlike the other computer "programs" at the university, there were no dropouts. Apparently everybody could learn to program on a system that was always up, gave its top priority to students, never frustrated them with delays or faced them with preemption by some "important" task such as scheduling or payroll.

Now comes the confirmation of Mr. Dorn's article. My classes were a hit. So put more students into them. My computer is always up and ready; so put more hardware into it and give this accessibility to some faculty and staff users (who are frustrated by the usual computer operation just like everybody else). Add cpu's, discs, more of this, and more of that. I said no. If you must, said I, set up another small installation dedicated to what you need. They said, "That's not necessary as you already have the nucleus right here."

I fought it for one year. I fought it for another, and students kept right on learning. The computers kept right on working, and the budget was very low.

When I started, my classes held 20 students and I had time to work with them individually on our one computer. When the classes grew to 40 or so, and two computers and 16 terminals, it still worked. When I finally left, my classes had as many as 150 students (over my objections), and learning had deteriorated to typical university standards. I resigned.

Last I heard, the center I set up still runs. All kinds of applications are run on their disc operating system, and more memory is now used for the system than I had to use for everything. The comfortable furniture and lighting are gone, and students have to wait for the opportunity to test out their programs part of the time. It looks, smells, and sounds like a computer center. I presume the administration is quite happy.

Anybody need a hard-headed mini computer manager?

JEF RASKIN
Brisbane, California

McCracken on Cobol

Daniel McCracken (The Forum, May, p. 240) makes the point that structured programming is neither for nor against nested IF's. This may be true, but if so, structured programming should only be used in the context of KISS (Keep It Simple, Stupid) since nested IF's tend to negate understand-

(Continued on page 132)

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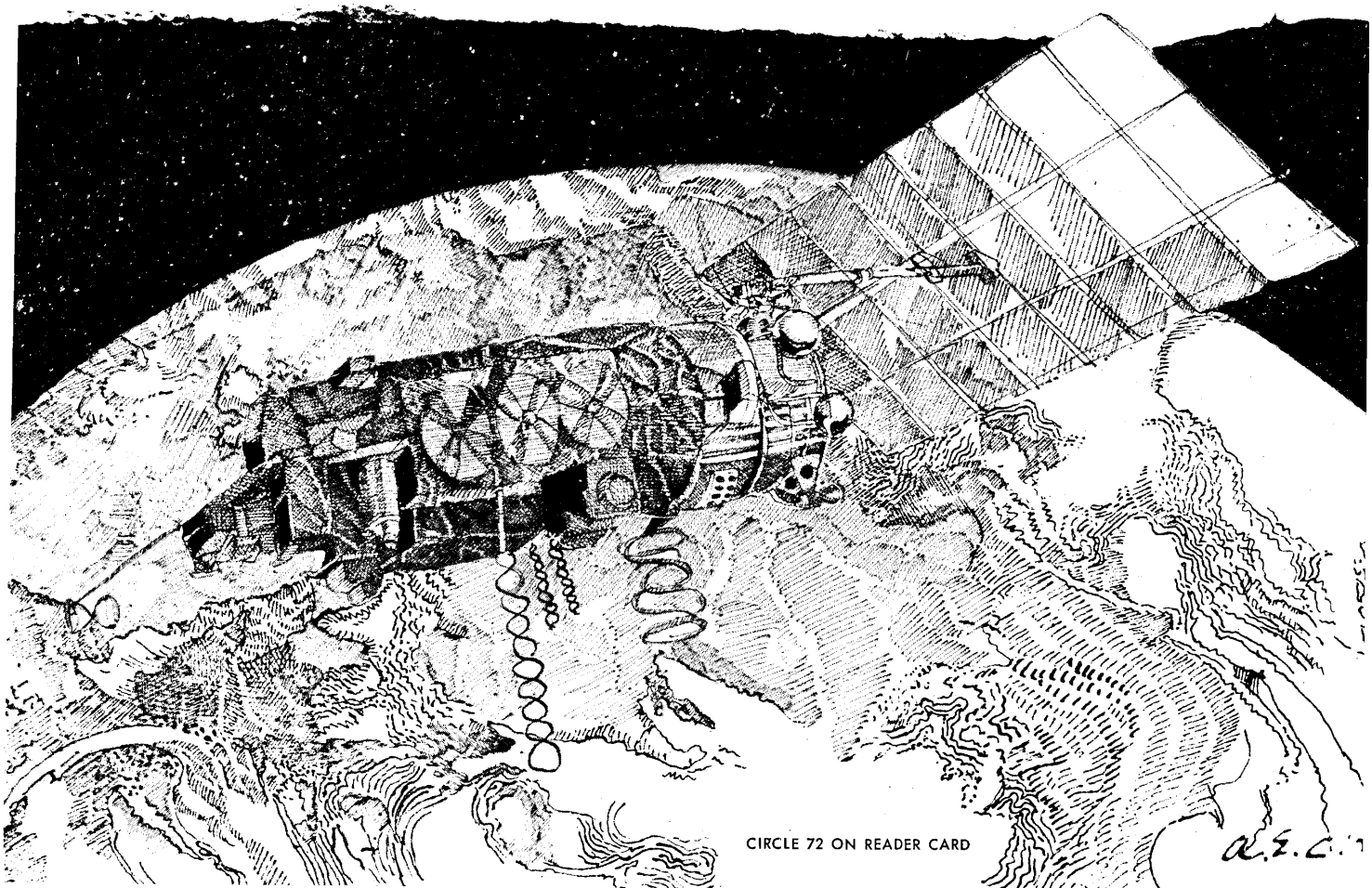

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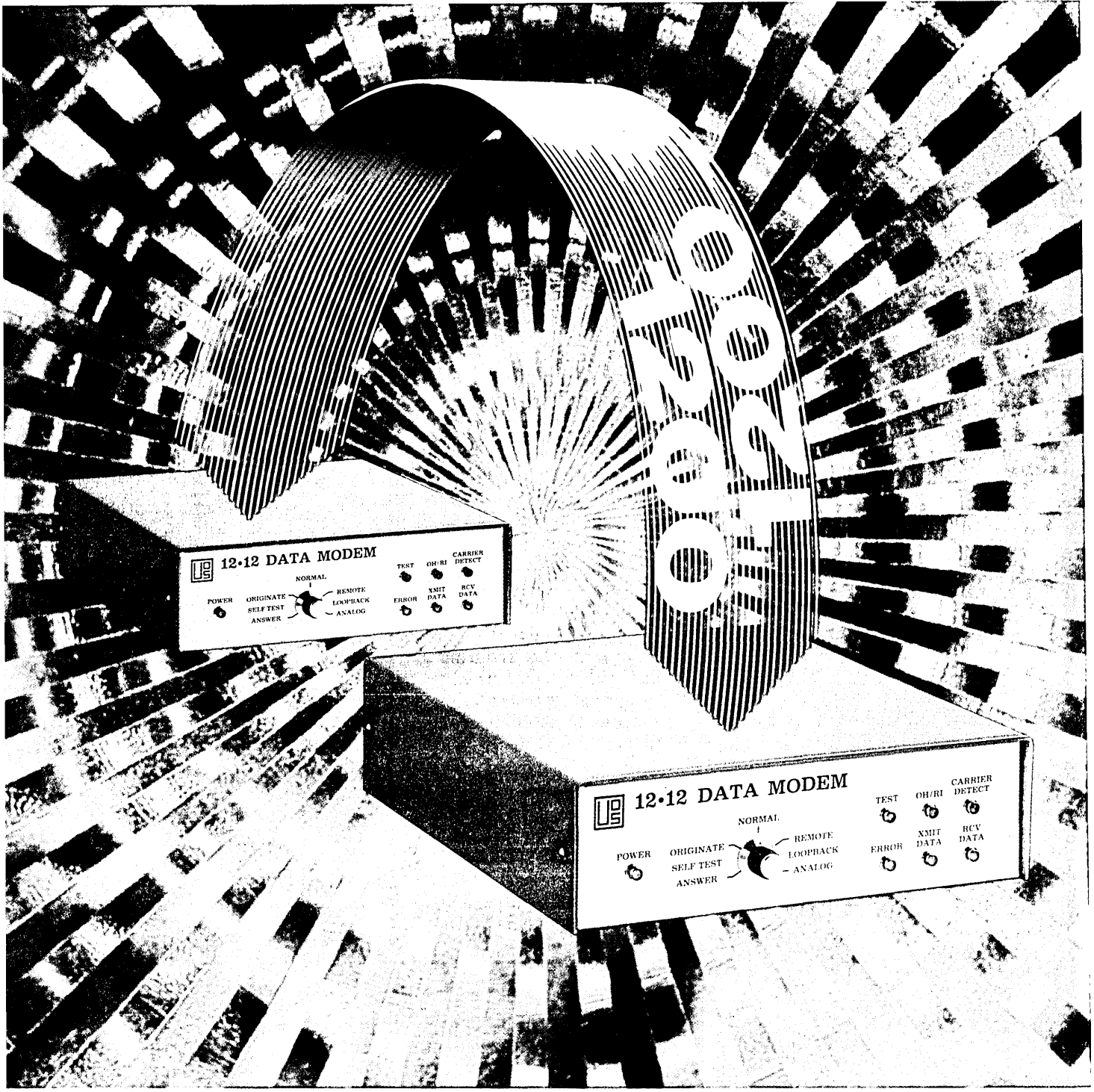

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people

Calm View of Management

In 1974 and '75, Suzette Harold stood for election to Britain's Parliament twice, had two children, and took over as Managing Director of one of Britain's largest software houses, F International, a unique 340-person outfit mainly made up of married women with children.

F International is unique in a number of ways. Formed in 1962 by (Mrs.) Steve Shirley, a highly respected software expert, shortly after the birth of her first child, it has grown to its present size and reputation with virtually no salesmen, no turnkey business or hardware, no packages, and virtually no office quarters. The 340 employees get together only at the annual office staff party.

"We're in the business of providing work for married women," Suzette Harold explains, pointing out that such things as package sales would be a distraction from the tailored software that the company can provide for its clients all the way from feasibility studies through routine maintenance. Scattered throughout Britain and Scandinavia, F International people work in their own homes or at client premises, keeping in touch with the organization through project managers, who live near the client, not the headquarters, and operate accordingly.

Suzette Harold's own career illustrates how F International works. In the early sixties, she worked for various atomic energy establishments, mainly in the Oxford area. Then the Atlas computer was installed at the Chiltern lab. From that time on she was concerned mainly with highly technical information retrieval projects. Like many other women, she left her work to have her first child, in 1966. She missed the sense of involvement in her work.

In 1967, her husband, a nuclear physicist, heard about F International from the wife of a colleague. "He found it a little painful having me at home all the time, exercising my organizing ability," Suzette recalls cheerfully.

Her first project with F International was technical, a critical path program for the Atomic Energy Research Establishment at Harwell, working on 360/65 and /75 computers. Her second, considerably more complex, was automating a British standard with a number of other people from the company. "Toward the end of the project," she remembers, "I was asked to take a management role. Having looked down on management all my life, I found I enjoyed it, especially working with people from the same background. It really was management, too, not just pushing paper. We had very few pre-ordained standards and methods, but we were beginning to think about how to do real project management—measuring the productivity of staff, being able to bid on fixed price contracts, finding the best team size, and developing the best module for a staff like ours."

At first the projects included perhaps a half a dozen people, but as the company developed its project management methods, they were able to take on larger projects, with about 20 people. "That's small these days, but it involved questions of how to delegate such roles as auditor or technical advisor. It's impossible for the manager to be the chief technician too."

SUZETTE HAROLD
"Once you have little Johnny . . ."

By 1968, (when she had her second baby) she was firmly in the manager's role. In 1970, she became "production manager," controlling the growing roster of autonomous project managers.

These are the secrets of F International's success and Suzette Harold views them as the company's greatest achievements. "Industry and government train women technicians and use them pretty widely. But there are very few women as managers, so we have to grow our own. It takes a long time to train a project manager to take full responsibility for finance, personnel, technical quality and everything else a major project entails."

The average experience level at F International is now ten years, and the minimum for entry is five. "We couldn't work this way otherwise," she comments. But project leaders from other companies are not accustomed to the autonomy they must exercise in this firm. The training task has been impressive. Project managers have one or two major projects. They have offices, secretaries, machines, everything necessary to run the projects from their homes. Their homes are near their clients, not near "headquarters," a small office the company maintains near Steve Shirley's home. This is located a few miles outside of London near Buckinghamshire.

A project manager does her own proposals for new work. She keeps track of the productivity of each member of her team—a crucial measurement for F International—and is able to make precise (and profitable) estimates for new work. "It's a tough job," says Suzette.

Harold's own job got tougher in 1974 when she stood as a liberal candidate for Parliament in the February election, had a baby in April, and stood again for Parliament in October. Standing, in Britain, means doing a great deal of walking from door to door because candidates have only a few hundred pounds to cover all their campaign expenses. Without skipping a beat in F International management, she did quite well in her other projects, achieving a respectable vote in a "safe Labour seat" in both elections. Baby Theodora was a happy event too. In 1975, Suzette became Steve Shirley's deputy for a few months and then was officially appointed managing director in November, shortly after the birth of her fourth child.

"Once you have little Johnny," she says, "you want a table job suited to your own schedule. Once you have it with F International, you stick to it. Thus we have very little change in staff, and this continuity turns out to be as valuable a sales asset as the experience our people bring to the job."

The project managers are F International's marketing force, assisted by every employee. "We have a very high volume of repeat business," says the low-key managing director. "This is true of most of the best software houses. I think if you're prepared to undertake the maintenance role, then you're present and people are inclined to think of you when they have new work to do." New business inquiries come in mainly by word of mouth, though the company has a few "system development executives" who pursue a particular line of business, staying in-

volved right through a project and sometimes managing it as well.

F International currently has some 70 to 80 projects in the works and about 40 project managers. "Working the way we do, you use a manager/-technician ratio of about one to five," says Suzette. "After you get about eight people on a project, management increases as a proportion. It's nearly one to two on some of the largest projects."

The central control comes in very precise productivity measurements, and thus precise estimating and constant auditing of results. "We charge as much as other software houses," she says. "We can't compete with the individual freelance on tiny jobs, but when it comes to the 7-8 man team on a five-man-year job, we're very economic. Our proposals are based on a 25-hour week, which is the way most of our people work. Most clients think they get 40 hours worth of work for that. This gives us a very happy market position." ❋

Time-sharing Isn't What It Used to Be

"I do not consider National CSS to be a time-sharing company as it once was defined. The definition is a self-limiting one." These comments by Robert E. Weissman reflect the new direction for the Norwalk, Conn., firm which in recent years has been moving away from being strictly a remote computing services company to one offering continual service and systems marketing.

The firm's 36-year-old president talked recently of the evolution of time-sharing—from its former image as a

ROBERT E. WEISSMAN
Growth without a staff expansion

computer utility, providing big computers in an on-line fashion for engineers to solve problems, to one in which the computers used are somewhat transparent. "Today, we're translating data into information."

National CSS, Inc., one of the larger "independents"—that is, in the remote computing business exclusively, as opposed to General Electric's Information Systems Div., Control Data's Cybernet network or Computer Sciences Corp.'s Infonet—was formed in 1967 as a time-sharing company. Its growth has been quite phenomenal, rising from $7 million in 1971 revenues to $35.6 million last year. It currently is doing about $40 million a year, based on revenues in the first quarter (ended May 31) of $10,154,000, up 8% from the $8,600,000 a year ago. The company also declared a modest dividend—the first in its history—of five cents.

Yet, it claims that it has done all of this without expansion of personnel. In the 1976 fiscal year it had 602 employees (vs. 601 the year previous) and thus raised the annual revenues per employee by 9% to $59,141. It has trimmed the number of software products it sells to 65 today from 150 and still is trimming. And Weissman wonders whether future product development should come out of "discretionary income"—the difference between total revenues and direct operating costs—or through the acquisition route. He leans to a little bit of both. Nomad, a data management system developed internally at a cost of $1.3 million, has been extremely successful in its short life. Some 150 copies had been sold in the nine months following its introduction last October, equaling the investment cost. However, he worries that "internally developed programs and projects may not perform as we expected, either technically or in the marketplace." So the company is on both an internal development program and an active acquisition program as well. It has named its former international head Alan Brigish to direct the firm's acquisition program.

Weissman is a relative newcomer to the computer business, having joined the company three years ago when Richard Orenstein, the former president and now chairman, was looking for a manager who could make some changes in the growing company. Weissman, who had always wanted to be an electrical engineer and had studied the subject at Univ. of Connecticut, was selected—but not because of his penchant for technical subjects. He had a diversified background as a line manager, a top manager and in a variety of industries.

He had been executive vice president of Rediffusion, Inc., which makes communications equipment; a director of corporate development and assistant to the president of Standex International Corp., a diversified company with holdings in consumer products, publishing and industrial products manufacturing; president and chief executive officer of Spencer-Kennedy Laboratories, which makes electronics instrumentation; and president of Dickerman Mfg. Co., which makes automation machinery. The move enabled Orenstein, a technical man, to concentrate on technical subjects and to develop the company's overseas operations, while Weissman, who also has a degree in business administration from Babson College, ran the day-to-day business.

The company serves its 9,000 customers from IBM-based centers in Stamford, Conn., New York and Sunnyvale and Los Angeles, Calif. It recently added an Amdahl 470V/6 IBM-compatible machine to its network, the first installation of a non-IBM time-sharing computer in the firm's history. The company paid $4.25 million for the machine with a loan from a Minneapolis insurance company. ❋

In New Posts

JOHN T. MUNYAN was elected a principal by Cresap, McCormick and Paget Inc. He had been regional director of information systems services in Chicago . . . DAVID CROCOMBE was appointed manager, international accounts, for TRW Datacom International . . . HAROLD L. ERGOTT, JR. is the new vice president, computer products, for the Norden Div. of United Technologies . . . RICHARD PALMER joined Interdata, Inc. as vice president, international operations . . . JAMES P. HEALY was appointed vice president of marketing for Lexitron Corp., Chatsworth, Calif. . . . DR. ROBERT MARCHISOTTO was appointed Director for Scientific Affairs at BioSciences Information Service (BIOSIS) . . . RICHARD J. BALL was named vice president and general manager of Honeywell Information Systems, Canada . . . DONALD F. BROSNAN, formerly vice president of Honeywell Information Systems, Canada, was appointed president and chief operating officer of MSI Data Corp., Costa Mesa, Calif. ❋

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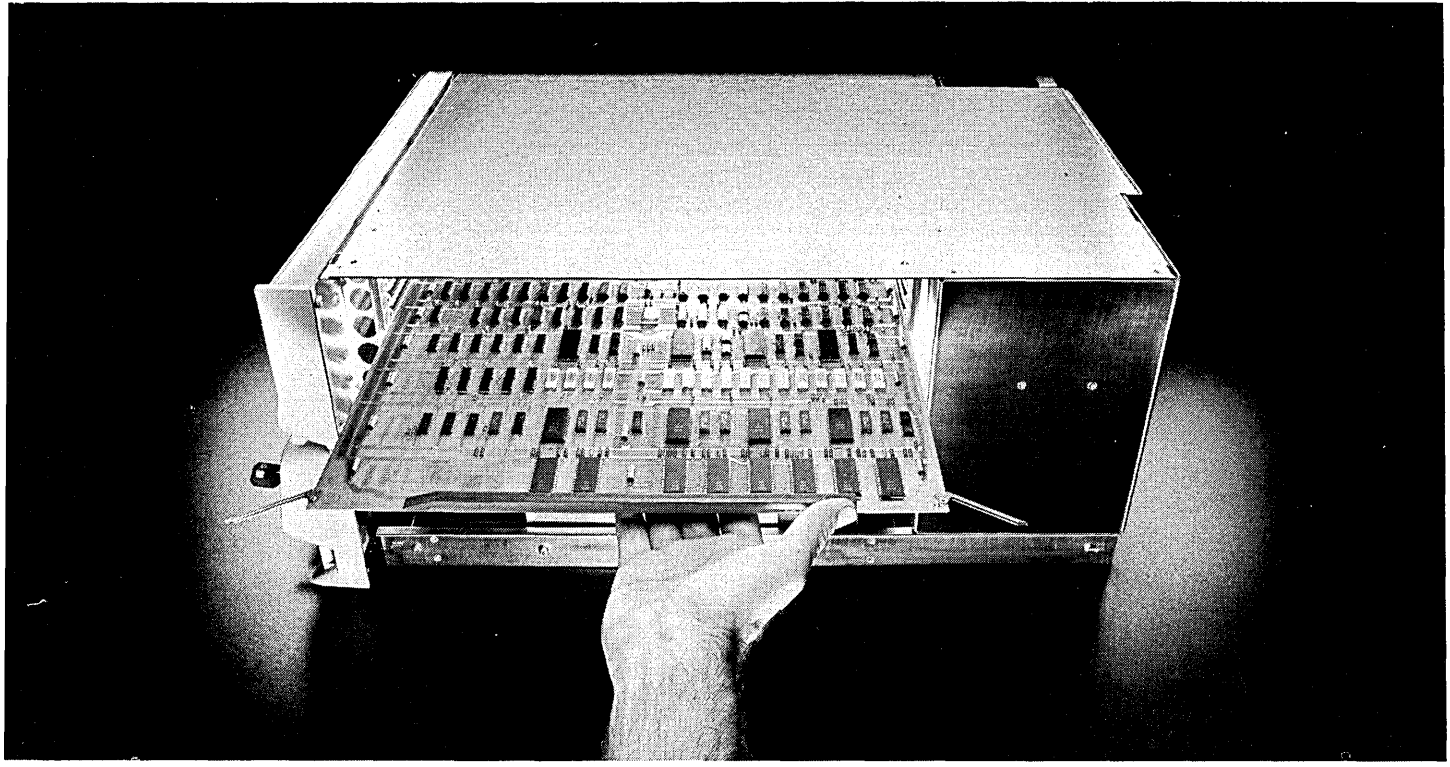

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LOOK AHEAD

COMPETITION FOR IBM--IBM WORLD TRADE

IBM has had competition problems for years in North America marketing against leasing companies and brokers selling IBM equipment. Now there is a sign that IBM World Trade Corp. equipment may enter the U.S. sweepstakes. Continental Information Systems Corp. of Syracuse has imported a 370/165 from London and placed it at Wisconsin Electric, a public utility in Milwaukee.

Previously, large systems IBM equipment has been flowing only in the other direction, but now CIS' president Harry E. Goetzmann Jr., thinks the imported 165 is just a harbinger of things to come, what with the new currency fluctuations and the decline in demand for equipment in Europe.

The IBM 165 is operating fine, says Goetzmann, who noted that the European import has a power converter that enables the 50 cycle machine to operate in 60 cycle North American power mode. There could be even wider ramifications if the importation of large IBM systems to the U.S. becomes a trend: it could have a negative drain on the U.S. balance of payments.

OTHERS AWAIT OUTCOME OF CATAMORE APPEAL

IBM and Catamore Enterprises of Providence, R.I., aren't the only parties sitting on the edge of their chairs, waiting for the final judicial decision in the celebrated Catamore case in which a jury awarded the jeweler $11.4 million against IBM. Users are waiting on the sidelines in great abundance for the final decision from the U.S. Court of Appeals, First Circuit, which is expected to deliver its decision in the fall. The U.S. Supreme Court would be the next stop, but observers doubt the case will go that far, because it lacks the novel constitutional issues the highest court in the land normally requires.

No one knows precisely how many users are waiting to file suits, but there are indications the number is surprisingly high.

DEC-DEFYING STUNT BY DATA GENERAL

If there is anything Data General doesn't like it's the Digital Equipment Corp. and DG has always been particularly galled when its larger configurations end up at users' sites with DECwriters attached. That should stop now with DG's new 30 cps and 60 cps printers and Data General salesmen can even be expected to attempt to sell their new printers to DEC oem customers sooner or later...

DG is also strengthening its position in the burgeoning commercial data processing mini market with its new Nova 3/D. The new products--the printers and the 3/D--give testimony to DG's commitment to vertical manufacturing integration: The 32K-on-a-board memory in the 3/D is made up of 4K rams manufactured at Data General's Sunnyvale semiconductor plant.

DATA GENERAL BUYS SYSTEMS HOUSE

Data General has moved into the commercial systems business by acquiring WSA Systems, Inc. of Los Angeles and renaming it Data General Systems Div. The four-year-old company, formed by Irwin Warshawski, has installed more than 100 minicomputer-based systems for communications, process control and small business clients in the Los Angeles area.

It has used Cincinnati Milacron, Digital Equipment and, lately, mostly Data General minis, including the large Eclipse line. It has written all of the applications programs and in some turnkey operations also developed its own operating systems software.

The acquisition is Data General's first move into the systems field and represents a trend by mini manufacturers to get a larger slice of the systems market. Modular Computer Systems this spring acquired a minicomputer systems house, ECS of Lexington, Mass.

GARBAGE IN -- FARE INCREASES OUT

It wasn't really garbage. At least a spokesman for the Civil Aeronautics Board, which has been charged in the popular press with having fed its computer information which caused it to deny some fare increase requests since 1973, says it wasn't. "It wasn't a computer error and it wasn't a programming error," said the spokesman. "It was an error in methodology."

But the methodology was computerized. The CAB likes to keep its rate making

LOOK AHEAD

methodology consistent. It discovered its error when evaluating a rate proposal from an international carrier and found the methodology it used differed in one area from that used for domestic carriers. "It was a built-in oversight," said the spokesman.

He explained that airlines requesting rate increases have their requests evaluated on a "rate making return on investment" of 12%. "They're not guaranteed this and rarely get it and they're not limited to it either." In evaluating the requests, the CAB eliminates from overall operations overhead, all that is not related to passenger service. It found, in the case of domestic carriers, it was making a double elimination in the case of the costs of "belly cargo," freight carried with luggage in passenger planes. Many of the airlines that have been previously denied a rate increase which might have been due to the error have reapplied for the increases, the spokesman said, but he doesn't attribute it to the error. "It had very little impact," he said. He said the "methodology" has been passed on to airlines seeking rate increases for years and, presumably they used it with their computers. Maybe "methodology error" is the best term. And maybe the flying public should be grateful.

HONEYWELL HARD-PRESSED AGAINST BROKERS

Honeywell's difficulties in selling its used equipment in the marketplace against used computer brokers is dramatically pointed up in a memo introduced in the IBM-Justice Dept. case. The Honeywell memo, written a little over a year ago, notes that one broker quoted a G-400 at 5% of list price while Honeywell was selling the same product at 40% of list price. In the memo a Honeywell executive stated that the firm's biggest exposure in this regard was its "200/2000 equipment."

SUCCESSOR TO THE TELETYPE MODEL 33

Teletype's first 30 character per second terminal is under development in Skokie, Ill., and some models are to be site tested this month or early in September. Called the model 43, it is a replacement for the famed 10 character per second model 33, but quieter and with better styling. However, its price will be in the same ballpark as famed model 33 of which some 600,000 have been produced. It first will be marketed by AT&T and later by Teletype.

TEKTRONIX USERS OFFERED SUMMER REFRESHMENTS

Megatek Corp., a small four-year-old San Diego manufacturer of oem standalone graphics systems, is putting the finishing touches on its new graphics terminal, the model 6014. To be announced next month, it's an end-user product that is software compatible with the PLOT-10 software package that resides in host computer systems supporting the Tektronix 4014 graphics terminals. The company's strategy, says marketing manager Peter Shaw, is to intercept the thousands of 4014 users who might be considering Tektronix' recently-announced 4081 system by offering them something the Tektronix Bi-Stable Storage Tube cannot: full image refresh capability.

The Megatek 6014, priced at $16,000, falls about midway between the $3,000-$4,000 range of the Tektronix 4014 and the $27,000 starting price of the 4081, says Shaw. We understand the first customer is Boeing Co., Seattle.

IBM MAY OFFER DATA BASE PROCESSOR

Some big IBM users who are in a position to know say that IBM is preparing to introduce a processor soon that will execute the colossus' data base management language DL/1. IBM's IMS is generally considered to be inefficient and the new processor would be a welcome and big improvement but--and here's the rub--the processor could wreak havoc with PCMs, independent software firms and plug compatible mainframes like Amdahl.

POLITICAL CONTRIBUTIONS AS USUAL

The relationship between computer companies and politics doesn't surface often, but when it does, it is always interesting. In the IBM-Justice Dept. case in New York, Control Data Executive Council minutes have been introduced in which "political contributions" were discussed by CDC's William Norris.

"Norris," the minutes state, "spoke of the overall need for continuing help by key politicians on Control Data's behalf, particularly with regard to government overall policies re computer procurement, etc. Norris stated he feels everyone in Control

(Continued on page 130)

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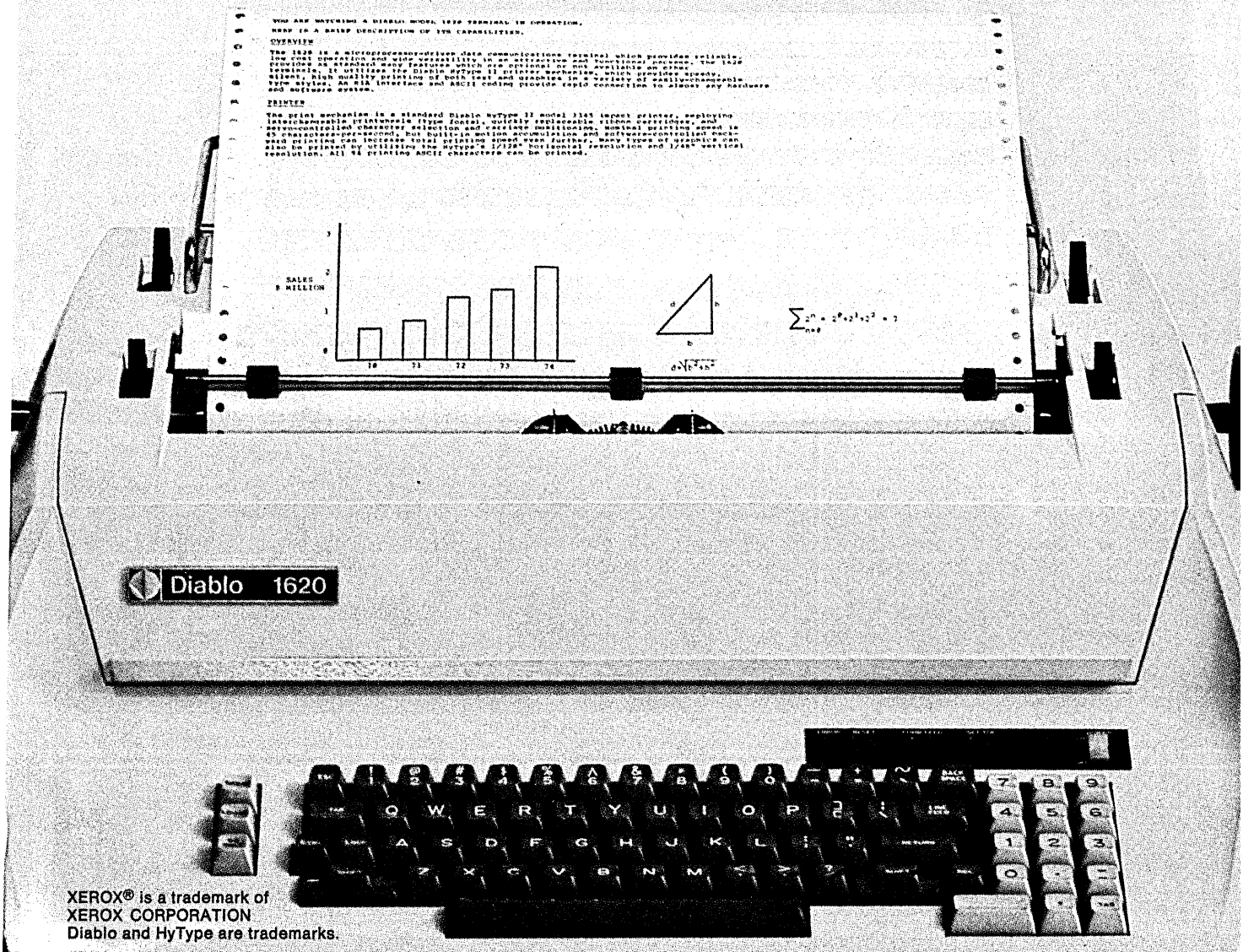

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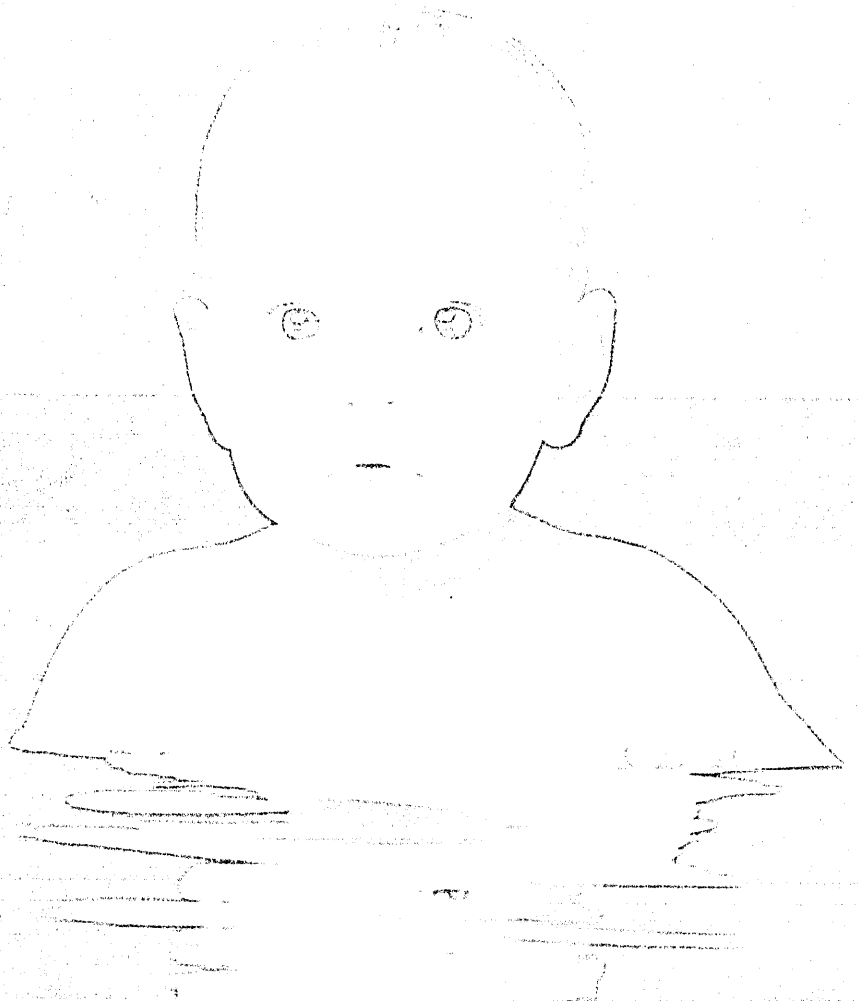

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calendar

SEPTEMBER

Eurocomp, Sept. 14-16, London. Parallel conferences for this year's European Computing Congress will focus on Software Engineering and Performance Evaluation. Delegates, primarily dp management, senior systems and software specialists, and computer scientists, may attend sessions at both conferences. A 32-page brochure listing the full program can be obtained from the sponsors, Online U.S.A., 11007 Old Coach Road, Potomac, Md. 20854.

7th Annual Input/Output Seminar, Sept. 20-22, New York City. An overview of current technological developments will occupy the program this year. Major peripheral manufacturers and end users will participate in sessions on teleprocessing, terminal systems, data entry, key-to-disc and tape, OCR/OMR, minicomputers, microprocessors, voice response, point-of-sale, and electronic funds transfer systems. Fee: $150. Contact: Input/Output Systems Assn., 999 Bedford St., Stamford, Conn. 06905, (203) 323-3143.

APL 76 International Conference, Sept. 22-24, Ottawa, Canada. *"Putting APL To Work"* is the theme, and the congress, sponsored by the ACM, will explore the use of APL in the world of commerce, industry and education. Sessions will also cover language principals, standards, and enhancements. Fees: $70, ACM or CIPS member; $80, nonmember; $25, student. Registration: R. G. Morrison, Suite 600, 265 Carling Ave., Ottawa K1S 2E1, Canada (613) 236-9942.

SICOB, Sept. 23-Oct. 1, Paris. This annual International Data Processing, Communications and Office Organization Trade Fair is expected to attract thousands of visitors. Contact: Mr. Hermieu, 6 Place du Valois, 75001, Paris, France. Convention Informatique will be held during this conference, Sept. 20-24.

Canadian Computer Show and Conference, Sept. 28-30, Montreal. New data processing equipment, including small computers and sophisticated peripheral equipment, will be displayed for an estimated attendance of nearly 9,000 visitors. The seventh annual conference, which alternates between Toronto and Montreal, is organized by the Canadian Information Processing Society. Technical sessions each morning will cover hardware developments and systems capability of minicomputers, word processing, and the impact of economic data on dp. Contact: Ray Argyle, 47 Colborne St., Suite 301, Toronto, Ontario M5E 1E3, (416) 863-1220.

OCTOBER

1st Int'l. Conference and Exhibition, Interactive Computer Graphics, Oct. 5-8, Geneva, Switzerland. ICG '76, to run concurrently with the 3rd European Electro-Optics Conference and Exhibition, will cover all aspects of design, simulation, information retrieval and control, using graphical computer outputs and inputs. Contact: Mack-Brooks Exhibitions Ltd., 62/64 Victoria St., St. Albans, Herts AL1 3XT England.

2nd Int'l. Conference on Software Engineering, Oct. 13-15, San Francisco. Sponsored by the IEEE Computer Society, this meeting will emphasize programming methodology, testing and validation of software systems, data base management, and software for mini or microcomputers. Two pre-conference tutorials will be held Oct. 12, one on Data Base Management, and one on Software Design Techniques. Tutorial fees are $50, IEEE members; $60, nonmembers. Conference fees are: $50, IEEE or ACM members; $65, nonmembers. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, Md. (301) 439-7007.

Mini/Micro Computer Conference and Exposition, Oct. 19-21, San Francisco. A program of 25 sessions, with approximately 90-100 papers, will be presented at this first event for the Minicomputer Industry National Interchange (MINI), a recently formed national organization. An audience of between 8,000 and 10,000 is expected to attend the show and conference. Topics include integrating oem peripherals into computer systems for end use systems; distributed processing with minis; military applications for microcomputers; current developments of memory peripherals for mini and micro computers. Registration, on-site only, is $40. Contact: Robert D. Rankin, 5544 E. La Palma Ave., Anaheim, Calif. 92807, (714) 528-2400.

The Frontiers in Education Symposium '76, Oct. 25-27, Tucson. Sponsored by the Education Group of the IEEE the Educational Research and Methods Div. of the ASEE, and the College of Engineering of the Univ. of Arizona, this conference will discuss new developments and directions in engineering education. Contact: Roy G. Post, Dept. of Nuclear Engrg., Univ. of Arizona, Tucson, Ariz. 85721, (602) 884-3054.

17th Annual Symposium, Foundations of Computer Science, Oct. 25-27, Houston. Papers describing original research will be delivered on topics such as analysis of algorithms, computational complexity, formal languages and semantics, switching and automata theory, and theory of programming and compiling. The meeting is sponsored by the IEEE Computer Society Technical Committee on Mathematical Foundations of Computing, in cooperation with the ACM special interest group on automata and computability theory, Rice Univ., and the Univ. of Houston. Fee: $45, members; $55, nonmembers; $35, student. Add $5 for late registration. Contact: M. M. Blattner, Dept. of Mathematical Science, Rice Univ., Houston, Texas 77001, (713) 527-4094.

ON THE AGENDA

Compcon '76, Sept. 7-10, Washington, D.C. IEEE (301) 439-7007 . . . **DPMA Privacy Legislation Seminar,** Sept. 20-21, Los Angeles. (312) 825-8124 . . . **Minicomputers: The Application Explosion,** Sept. 27-29, New York. AIIE, (213) 826-7572 . . . **8th Annual Conference, Society for Management Information Systems,** Sept. 27-29, Chicago. (312) 567-5119 . . . **INFO 76,** Nov. 8-11, Chicago. Clapp & Poliak, 245 Park Ave., New York, N.Y. 10017.

Conference information submitted to Calendar should include registration fees, phone number and name of contact. Items for consideration should be received by DATAMATION three months prior to the event.

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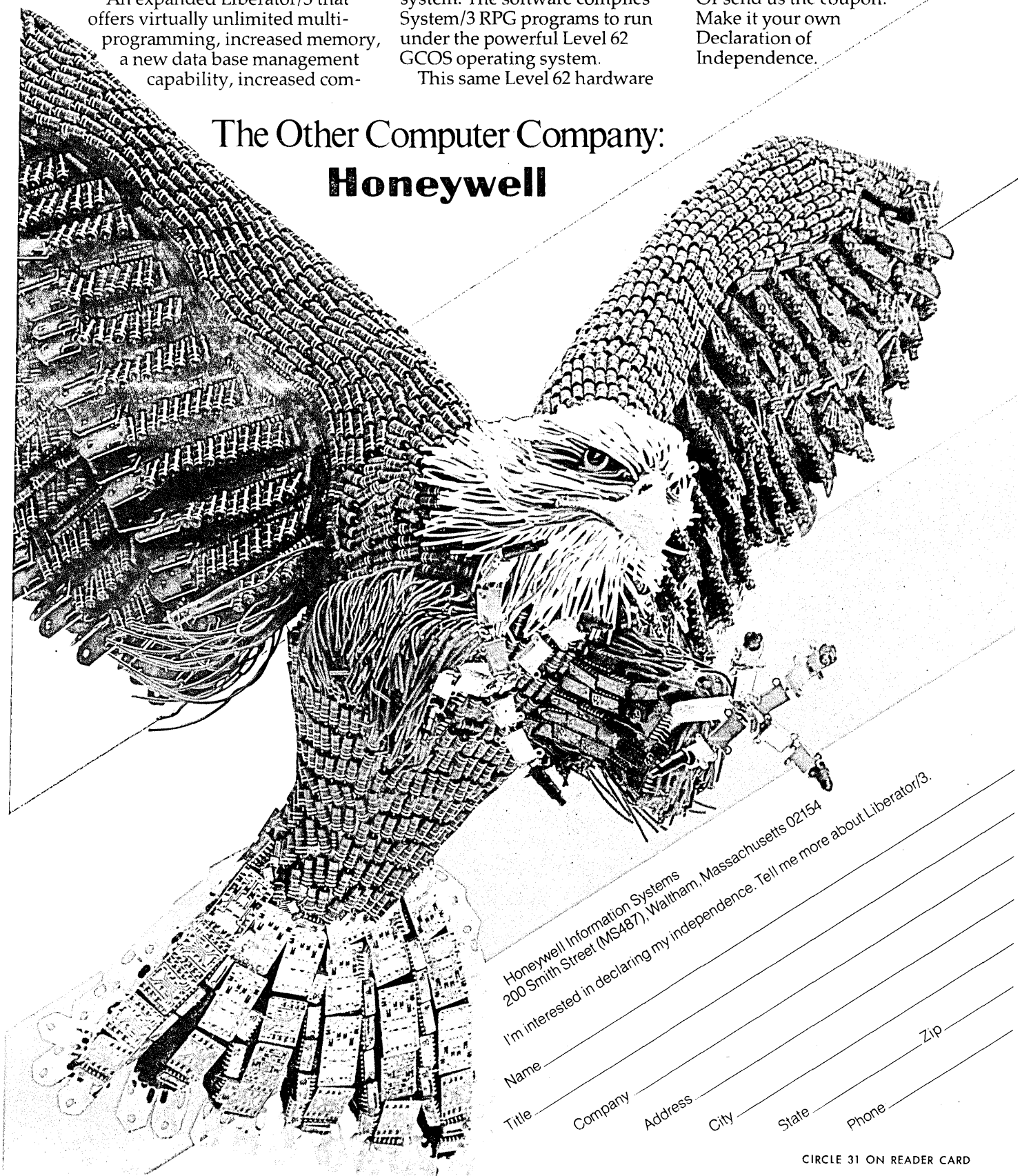

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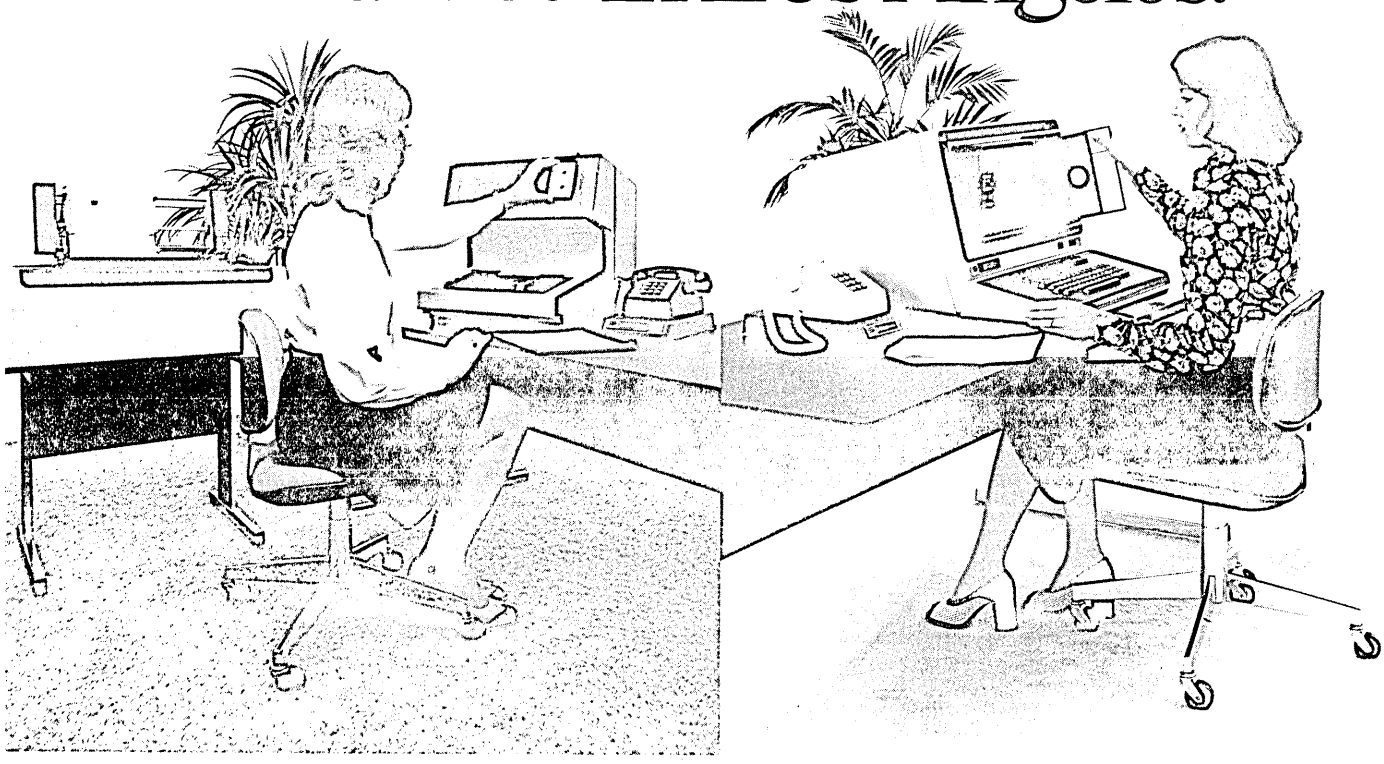

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Our Model 350, for instance, might be just the ticket for your two-man operation in Des Moines. While a larger branch in Los Angeles might require the concurrent background processing capabilities of the Sycor 440.

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Each, for example, can be programmed with our high-level, easy-to-use TAL language. And, they not only talk to your CPU, but to each other.

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For smaller office situations that call for data entry, you'll find our Model 340 the low-cost intelligent answer.

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If you need the advantages of random accessibility, look into the Model 350. The 500,000 "fill-in-the-blanks" characters on its exclusive dual flexible disks let you store customer, product/price and salesman files right at the source.

And, with its 16k bytes of programmable memory, the Model 350 not only retrieves data, but maintains and updates files—and even generates reports.

Just key in a customer number and you get all the pertinent data: name, address and billing information. That means reduced keystrokes, improved accuracy and big savings.

The Sycor 440 System.

When you need more than just data entry, look into our new Sycor 440. With a disk storage capacity of up to 10 million characters and the use of up to eight separate terminals, you can do data entry and inquiry/response concurrent with background processing.

Our 440 system lets you share and access files locally, reducing communication line costs and investments in central CPU resources.

Each display is controlled by the on-site processor and is capable of performing independently. At the same time that you're performing data entry you can make use of our special programs to produce a wide variety of management reports like sales analysis, inventory and billing.

It's a system as flexible as your needs.

Give us a call.

We invite you to take a closer look at our family of distributed data entry and processing systems —the lowest cost answer to your branch office needs.

Call your Sycor representative for details.

SYCOR

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CIRCLE 60 ON READER CARD

IMSAI 8080: THE COMPLETE COMPUTER SYSTEM

- Computer with 16K bytes of memory, 8-level interrupt and interval clock
- 2 floppy disk drives with intelligent interface/controller
- 300 LPM printer
- 24-line by 80-column CRT with keyboard
- Programmer's front panel and software
- All peripherals interfaced

$10,493 UNIT PRICE*

*Quantity discounts available.

IMSAI 8080: THE COMPLETE DEVELOPMENT SYSTEM

- Computer with 16K bytes of memory, 8-level interrupt and interval clock
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The IMSAI 8080 Floppy Disk System. It's more than you'd expect for much less.

The IMSAI 8080 Intelligent Floppy Disk System. For the money, there's no development system like it: it's easier to use, more powerful, modular and versatile than anything on the market. And the tickets prove it.

The IMSAI 8080 computer is powerful, accommodating up to 64K bytes of MOS write-protect memory. It's fast, with 500 nanoseconds total memory access time and 2 microseconds minimum instruction time.

The IMSAI 8080 is modular and highly versatile. It can accommodate up to 22 boards. And there's no restriction on mix of memory and I/O interface boards.

The IMSAI 8080 can be configured for just about any application. We offer a variety of memories (RAM and EPROM), I/O interfaces (parallel, serial asynchronous and synchronous RS232C, TTY), peripherals (disks, printers, tape cassette, CRT's), and multiprocessing capability.

And if you're an OEM, you'll like the way the IMSAI 8080 is put together. Switches are large and rugged, and the front panel, with hexadecimal and octal notation, has an extra eight program controlled LED's.

The intelligent floppy disk interface/controller has its own processor and firmware. It provides sophisticated control of the floppy disk system with DMA and automatic retry. And this economical interface/controller can handle up to four drives. Each disk stores up to 243K bytes using the IBM 3740 format and has an average access time of 330 milliseconds.

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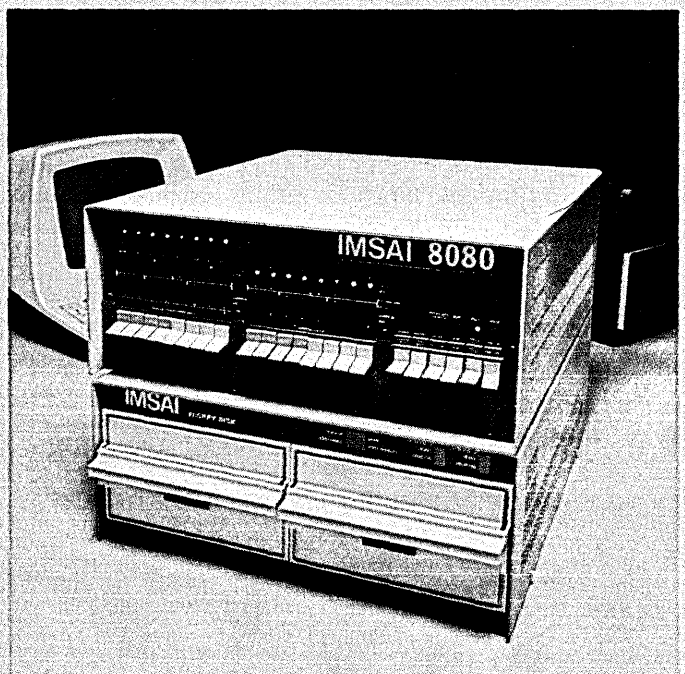

The IMSAI 8080 Intelligent Floppy Disk System. Never before could you get so much for so little. For an IMSAI 8080 catalog describing options, peripherals, software, specifications and prices, write or call IMSAI.

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books

Algorithms + Data Structures = Programs
by Niklaus Wirth
Prentice-Hall, Englewood Cliffs, N.J., 1976
366 pp. $14.95

This book contains a wealth of material that deserves to be read widely and studied thoroughly.

The author had several incentives to write the book. One comes from the observation that the average programming text puts an overemphasis on the structure of the algorithms at the expense of the arrangement of the data (readily explained by the circumstance that the most widely used programming languages have rather poor facilities for expressing data structuring). To redress the balance is one of the author's stated goals.

A second incentive comes from the observed absence of a collection of programs as "literature." When teaching a constructive art that requires as much invention as computer programming, we teach, of course, all the sound rules of composition, all "elements of good style," that we know. But it is equally clear that the subject is so many-sided that the teaching of programming can never be captured in a cook-book with "all the recipes," and for what cannot be taught in terms of explicitly stated principles, we have to resort to the complementary teaching technique, i.e. by example. The absence of a significant collection of programs worth reading and studying has been observed by many; Wirth has had the courage to compose such material.

I use the word "courage" for two reasons. Obviously it needs courage (besides competence, some self-confidence, and the critical assistance of a few kindred spirits) to undertake producing such a collection of high quality programs. In addition, Wirth has had the courage to include in his book many examples that are a few (binary!) orders of magnitude larger than the examples in the usual text. And that requires courage! (He had very good reasons for doing so; besides the observed scarcity of published, larger examples, it is precisely in the larger examples that adequate structuring becomes more and more important.)

He has achieved his two main objectives remarkably well.

The first chapter is devoted to the too often neglected subject of data structuring; it deals in turn with arrays, records, sets, and sequential files. The second chapter is called "Sorting," but although, indeed, only sorting algorithms are discussed, its title is slightly misleading. Wirth uses the sorting problem only as a vehicle for discussing dynamic aspects of program execution, and for demonstrating the profound influence—arrays versus sequential files—that data structures can have on the solution of the problem.

The third chapter deals with recursive algorithms; again his choice of examples is admirable. Instead of showing recursive solutions to problems that are as easily solved in terms of repetition, such as the factorial function, he chooses a set of examples in which the recursive solution indeed presents a great conceptual simplification. The inclusion of a special chapter on recursive algorithms is on the one hand justified by their absence in all programming texts geared to programming languages that do not cater to recursive solutions; on the other hand it is a nice preparation for the last two chapters.

The fourth chapter is devoted to dynamic information structures such as linear lists and trees. In his fifth chapter, Wirth develops a compiler for a sample language—in the preface he calls its choice "a balancing act between a language that is too simple to be considered a valid example at all, and a language whose compiler would clearly exceed the size of programs that can usefully be included in a book that is not directed to the compiler specialist." It takes only 70 pages, and this is a remarkable achievement in view of the fact that, on the one hand, he derives his parser with considerable rigor, while, on the other hand, like a good engineer, he does not shun mundane problems like recovery from detected syntax errors.

The balance between formal and intuitive arguments, the degree of explicitness of the program's justifications, is fairly homogeneous throughout the book. As a result, the book as a whole will perhaps be too formal for some, too informal to the taste of others. He could have tried to please a still broader spectrum of possible readers by varying his degree of formality. He has not done so, and, although I don't remember him stating so explicitly, I think that constancy is carried by his considered opinion that the displayed degree of rigor is indispensable, while a greater degree quickly becomes unnecessarily pompous. (And, when Wirth has a "considered opinion," he is not the man to deviate from it in order to please his public!)

This book is a valuable, novel contribution to the computing science literature, from which the practice of computer programming should benefit greatly.

—Edsger W. Dijkstra

Dr. Dijkstra has been a Burroughs Research Fellow since 1963 and is professor of mathematics at Eindhoven Univ. of Technology in The Netherlands. A review of his new book, "A Discipline of Programming," will appear in an upcoming issue.

Selection and Acquisition of Data Base Management Systems
(A Report of the CODASYL Systems Committee)
Assn. for Computing Machinery, P.O. Box 12105, Church St. Station, New York, N.Y. 10249 (1976)
276 pp. $12 prepaid

With so many organizations assessing the costs, benefits, and selection of a data base management system, the intent and scope of this report cannot be more timely. Even those organizations who have already committed themselves to the use of a particular system may well want to reassess their plan of action based on the material covered. They will certainly find ideas or considerations which may not be part of their current thinking.

The report is organized into six chapters. Chapter one introduces the rationale for data base management systems and attempts to identify the factors within an organization which can impact the benefits and costs of a data base approach. Advantages such as reduced application development cost, improved responsiveness to change, standardization, generality, and increased control over data, are contrasted with the organization's ability to utilize data base considering such factors as personnel turnover, organization size, growth and stability, clarity of user needs, dp organization and staff, hardware, time, and money.

In chapter two, the characteristics of user needs and of the data itself are examined more closely. The general capabilities of data base systems are discussed in chapter three, covering such topics as data base definition, creation, revision, interrogation, integrity, and performance. An important part of this chapter identifies some possible interactions among data base system features. For example, support of a complex data structure may tend to increase inquiry language complexity, and many features are at the expense of performance.

source data

In chapter four, the impact and interaction of data base systems with hardware and other system software are reviewed. The issue of the level at which certain functions should be performed is given considerable attention, while distributed systems are covered only in passing.

Chapters five and six get to the heart of the matter and cover system selection criteria, and the evaluation and selection process respectively. The selection criteria are grouped into user requirements, data characteristics, application programs, and dp facilities. A selection and acquisition methodology is presented including a possible weighting scheme, contract negotiation, and installation, and acceptance.

In evaluating this report, one must be careful to understand its intent which is to "supplement specialized technical knowledge with a structural view of user needs and management perspectives." Thus the report is not a *technical* discussion of what a data base system is or how it works. Rather, it is addressed to the reader who needs to be aware of the impact, pro and con, which such a system can have considering the overall mission of the data processing organization. In this respect, the report *sets the context* for selection and acquisition; it is not a cookbook.

Despite this warning, it is likely many readers will be disappointed. The report is often ambivalent, reaching few hard conclusions or suggestions. A certain feature may be advantageous, or it may not. While data base systems offer flexibility to an organization which changes, the report suggests that a certain degree of organizational stability is required. One should read the report for things to consider, not for answers.

There are two aspects of the report which this reviewer found objectionable. One is the lack of a clear distinction between the data base approach as a philosophy of system development, and a data base management system as a software tool. It is unclear whether certain costs, benefits, or concerns are due to the adoption of a data base approach, or to the use of data base management software.

Equally disturbing is the confusion with respect to how data base affects systems development. For instance, in chapter two we are told "considerable care must be taken to uncover as many user needs as possible, both present and future." We are left to wonder exactly how this very reasonable suggestion varies with the use of a data base management system. Similarly, "care must be taken to distinguish a real need from a convenience." Are the consequences different when using a data base system? The effect of such broad statements is to give the reader the impression that the principles of good system design take on added significance in a data base environment, but we are not told in what way. Perhaps the lesson is that these principles do not go away. This leads to a conclusion which is undoubtedly justified: if an organization cannot develop reasonable systems using traditional approaches, then it will fail using data base as well.

—Robert M. Curtice

Mr. Curtice is a consultant with Arthur D. Little, Inc., specializing in data base systems.

Fundamental Concepts of Programming Systems
by Jeffrey D. Ullman
Addison-Wesley, 1976
328 pp. $15.95

One of the more useful texts of recent years, Dr. Ullman has produced an exceptionally sound book for first year computer science students. Unlike the typically organized book of this type, this volume tries to lead beginning students through a series of subjects which grow increasingly complex and less obvious.

Oriented to students with little more background than an understanding of a single language, usually FORTRAN, this book will pull them past an introduction to such matters as context-free grammars and proving the correctness of programs. Admittedly a fairly heavy set of topics for elementary level students, nevertheless the introduction of this class of material at the early stage of their education is probably appropriate for serious computer science students.

Ullman writes well and not without a certain sense of humor, rare in the academic world. The book is heavily illustrated with examples and diagrams, includes both simplistic and more complex exercises, and has extensive references that appear to be on target. The heavy duty binding means that the volume is likely to hold together during a semester of student abuse.

—Philip H. Dorn

Mr. Dorn is an industry consultant and a contributing editor of Datamation.

BOOK BRIEFS . . .

The Innovation Millionaires
by Gene Bylinsky
Charles Scribner's Sons, 1976
238 pp. $9.95

This fascinating look at modern Horatio Alger success stories profiles the new breed of business geniuses, men whose brains and talent have enabled them to create entirely new industries and make millions in the process. Of special interest in this well-written volume are chapter 7, which examines Robert N. Noyce and Gordon E. Moore and "How Intel Won the Memory Race," and chapter 10, an in-depth report on how Sam Wyly built University Computing Corporation, and the more recent challenges of his newest venture, Datran (Data Transmission Co.), a digital communications network. The author is a writer and editor with *Fortune* magazine.

Applied Data Management
by Charles T. Meadow
Wiley & Sons, 1976
300 pp. $15.95

This volume, part of the publisher's "Information Science Series," offers valuable help to the applications-oriented user for computer handling of large masses of data. Topics include organization of information for storage and computer retrieval; design of computer programs for input, storage, and retrieval; communication between computers within networks; and social implications of modern data processing, especially personal privacy. The only prerequisite is a "modest" knowledge of computer programming using a language such as FORTRAN, COBOL, PL/1, or BASIC. Each chapter includes references and a recommended reading list.

Data Communications Dictionary
by Charles J. Sippl
Van Nostrand Reinhold, 1976
530 pp. $19.95

The alphabet soup terms and jargon words of data processing and data communications will be somewhat more intelligible with this handy reference of 14,500 terms, concepts, acronyms, and abbreviations used in the industry. Extensive cross-indexing and comprehensive definitions make this an extremely useful volume.

1975 Proceedings, IFAC-IFIP Workshop on Real-Time Programming
P. D. Griem, Jr, ed.
Instrument Society of America, 400 Stanwix St., Pittsburgh, Pa. 15222
184 pp. $15 (members, $12) paperback

Proceedings of the workshop held Aug. 21-22, 1975, include 22 papers and additional discussions that cover four sessions on CAMAC, programming, and operating and distribution systems. This is the second workshop sponsored by the Int'l. Federation of Automatic Control and the Int'l. Federation for Information Processing. (The first was held March 1974 in Budapest.)

How to Use Pocket Calculators
by Pierre R. Schwob
Petrocelli/Charter Publ., 1976
156 pp. $9.95

This well-illustrated, easy to understand handbook offers problem-solving

(Continued on page 37)

INNOVATIONS FROM

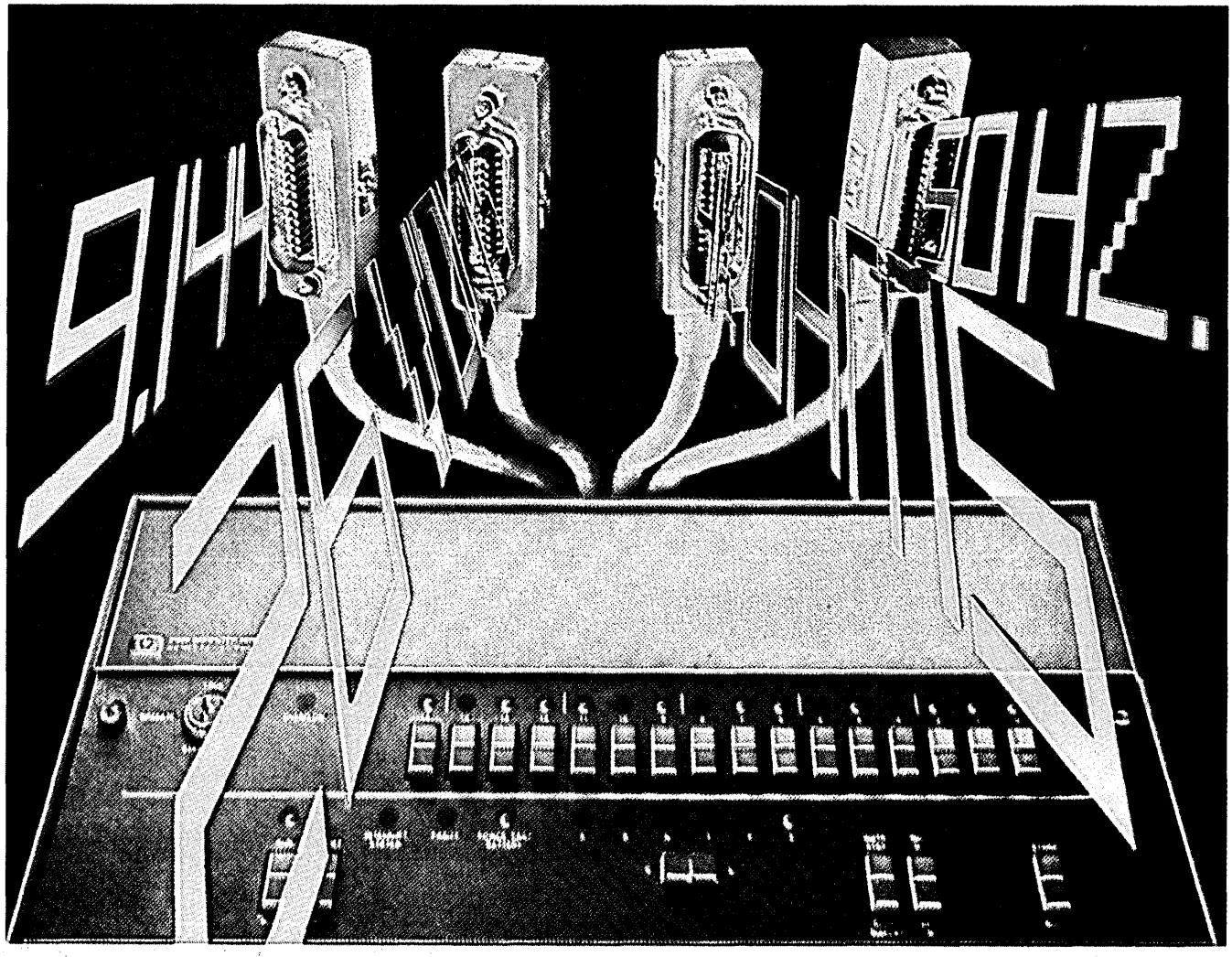
HEWLETT-PACKARD

COMPUTER ADVANCES

DATA BUS STANDARD SIMPLIFIES INTERFACING.

An essential "missing link" which will help the measurement and computation industries achieve their combined growth potential is a new standardized, digital, data bus interface. Today, non-standard interface links are costly and complex. The movement toward distributed processing with minicomputers, and distributed intelligence in peripherals and instruments, is being accelerated by new LSI and microprocessor technology. These trends compound the interface problem and demand a digital data bus standard for interfacing computers, calculators, instruments, and peripherals. The new IEEE-488 standard meets this demand simply and effectively.

Standards are important as technology evolves. Think how standard lightbulb sockets have allowed the electrical industry to lower costs and provide inexpensive lighting to millions. Think how standardizing highway traffic flow has encouraged entire new



HEWLETT-PACKARD'S HP-IB/21MX MINICOMPUTER. SIMPLICITY AND POWER FOR AUTOMATIC TESTING.

vehicle industries and has made satellite communities practical. Think how standard telephone addressing and electronics has stimulated worldwide communication.

These elements of mechanical connections, traffic paths and message protocols are the same elements key to standardizing the three main categories of digital data communications interfaces. It is encouraging to see new standards in some of these categories beginning to emerge.

First is the digital data path between computers and local terminals. It is low speed (up to 2 Kilobytes/sec) and today the industry generally favors EIA RS232C as the mechanical and electrical standard with ASCII characters for data formats.

Slightly higher speed data transmission (up to 6 Kilobytes/sec) and longer distance transmission such as phone lines require modems and message communication protocols. Today EIA RS232C/RS422/RS423 are the emerging mechanical and electrical standards; also the synchronous, bit oriented protocols (e.g., SDLC/HDLC/ADCCP) are growing in acceptance.

The most recent important standard to emerge, IEEE 488, is in response to a need for medium speed (up to 1 megabyte/sec), local interfacing of instruments, controllers and peripherals.

This IEEE-488 interface bus standardizes several characteristics. The mechanical interface is standardized much like the light bulb socket, i.e., cables and metric connectors are specified. It includes electrical characteristics, and traffic path standards analogous to highway flow regulations. And there the functional message protocol standards such as those which enable direct telephone dialing. The result is an interface bus that allows interconnected system components to communicate effectively and in an orderly, unambiguous manner.

By standardizing on the IEEE-488, industry users are free to focus their creative energies on higher level problems. Training and explanation becomes easier, and users benefit through multiple vendor availability and mass production. Cooperation on such standards can provide the catalyst for increased synergism between computers, calculators measurement instruments and peripherals and can help stimulate the explosive growth and efficiencies seen in other industries that profited from standardization.

EVOLUTION OF A STANDARD

Often at Hewlett-Packard, the definition of a new product results from an engineer's frustration at not having the right instrument to solve his problem. The solution, i.e., the design of a new instrument, comes either from that engineer or one at the next bench. This historically is known as the "next bench" phenomenon. Many HP products have resulted from an engineer solving his specific need, only to discover that he has designed a solution to a industry wide problem.

Such was the case several years ago. Hewlett-Packard engineers observed that other HP divisions were producing instruments that were difficult to interface together. The interface problem these engineers experienced was exactly the same problem encountered by engineers at nearby benches. Engineers in several divisions worked together to solve this local device interface problem. Their work in turn helped create the original interface concepts which served as the basis for discussion at national and international standard activities. European and American manufacturers and users were aware of the problems and worked toward common solutions. Their four years of joint efforts resulted in a medium speed digital interface standard. This was adopted as IEEE Standard 488-1975. It was subsequently adopted by the American National Standards Institute as ANSI Standard MC1.1. There is the possibility that the interface system concept will soon be internationally accepted by the IEC to serve manufacturers and users regardless of national origin. HP has implemented this standard as the HP-IB "Hewlett-Packard Interface Bus."

PUTTING THE HP-IB* TO WORK

New HP-IB/21MX Minicomputer Controls Multiple Instrument Clusters, Accesses Data and Develops New Programs—All at the same time.

In the past, interfacing instrumentation systems for measurement and test applications has been complex and costly. Not any more. With the HP-IB/21MX Minicomputer, automatic test systems for production, and laboratory research; and automatic data acquisition systems can be implemented more easily and simply. HP offers for the first time a minicomputer with a multi-programming operating system as a controller for instruments which conform to the IEEE-488 standard.

Take the simplicity of HP-IB interfacing. Add HP's 21MX Minicomputer and Real-Time Executive (RTE) software for the power and control. Choose from over 100 HP and non-HP IEEE-488 compatible instruments, calculators and peripherals to handle test and measurement. Within hours, flexible and powerful measurement and test systems can be up and running. OEM's, freed from device interface problems, can focus their resources on the customer interface.

Controls multiple instrument clusters. Because the Real-Time HP-IB Minicomputer supports multi-programming, it can simultaneously control several HP-IB clusters of up to 14 instruments each. Test/measurement equipment can be organized into multiple physical or functional groups—each connected to the HP-IB/21MX Minicomputer by its own HP-IB interface bus.

New instrument clusters can be added or reconfigured without downtime or affect on existing clusters.

Systems can grow as needs grow. And, because of the new Real-Time HP-IB Minicomputer's speed as an HP-IB controller, throughput is increased in high volume or production testing.

Consolidates test measurement data. The Real-Time HP-IB Minicomputer's multi-priority program scheduling allows highest priority and alarm tasks to run immediately and devotes "idle" time to other chores such as correlating and analyzing data, or producing timely management reports.

HP's new IMAGE/1000 data base management software adds a complete set of "software tools" for consolidating files into a single data base. Once the data base is established, IMAGE/1000's English-like QUERY language lets users interactively find any stored information by searching under multiple "key values" such as a part number, vendor code or failure type. IMAGE/1000 permits easy report generation with automatic sorting, summation, pagination and averaging.

Allows concurrent program development in multiple languages. While the Real-Time HP-IB/21MX Minicomputer is busy controlling instruments and consolidating data, it can also be used for program development.

For the first time engineers can readily access instruments and devices

*HP-IB is Hewlett-Packard's implementation of IEEE Standard 488 and identical ANSI Standard MC1.1—Digital Interface for Programmable Instrumentation.

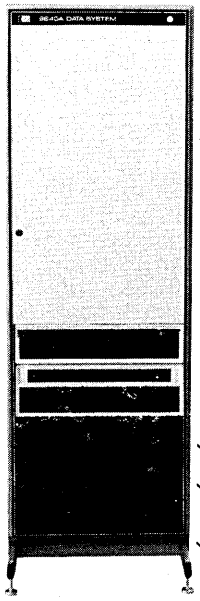
via the IEEE-488 and with the popular scientific language FORTRAN IV. HP's Multi-User Real-Time BASIC, which can be learned in a few hours, and HP's assembly language are available. This Multi-lingual approach brings the utilization of HP-IB to a wider cross section of users.

Supports Multiple Terminals. The Real-Time HP-IB Minicomputer also offers multi-terminal accessiblity. Several people can use the system immediately and simultaneously—for program development, data entry or system control. As a result, testing and production data such as quality assurance information is available when needed for decisions.

Augments data networks. Finally, the Real-Time HP-IB/21MX Minicomputer extends the data gathering capabilities of today's computer networks. Off-the-shelf hardware/software data communications packages make it easy to connect the HP-IB/21MX Minicomputer to other HP 21MX computers or to link it upwards to a central HP 3000 or IBM 360/370.

Simple HP-IB interfacing plus 21MX power: That's the Real-Time HP-IB/21MX Minicomputer story. For more information on how these systems can help you gain management control over your automated testing, circle A on the attached reply card.

HP-IB/21MX JUST MADE AUTOMATED TESTING EASIER AND FASTER



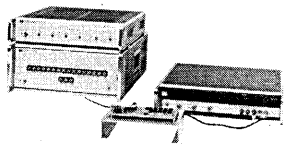
Multiple Instrument Clusters
Each independent cluster of up to 14 instruments is connected to the 21MX Minicomputer via a separate HP-IB interface cable.

Add New Clusters Easily
With on-line configuration capability, new independent instrument clusters can be added or changed without downtime or affect on existing clusters. Programming test procedures are simple BASIC "PRINT/READ" FORTRAN "WRITE/READ" statements.

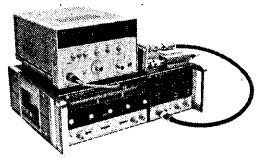
HP-IB

HP-IB

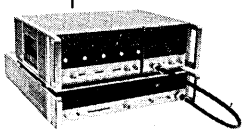
HP-IB



Component Test Clusters
A monolithic DAC is tested with an HP multiprogrammer and digital volt meter.

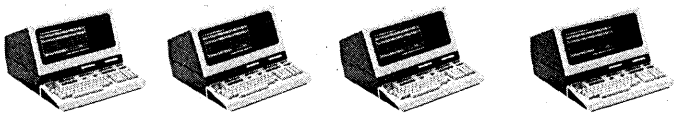


Subassembly Test Cluster
At the same time C-band microwave amplifiers can be tested with a sweep oscillator and an RF power meter.



Instrument Test Cluster
And, at the same time, a sweep oscillator can be tested with a frequency counter.

BASIC FORTRAN IV QUERY HP ASSEMBLY



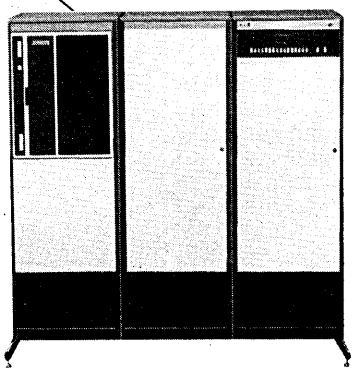
Multiple Terminals for Concurrent Program Development or Data Base Access
The Real-Time HP-IB/21MX Minicomputer permits fast multi-lingual program development or data access with new IMAGE/1000 by several users simultaneously.

New Real-Time HP-IB/21MX Minicomputer
The HP-IB/21MX Minicomputer which automates test/measurement procedures, and permits concurrent program development and data retrieval consists of a 21MX Minicomputer and cartridge disc memory, managed by HP's RTE-II or RTE-III Real-Time Executive software. Prices are $19,000 for non-disc and $34,000 for disc based systems. Each HP-IB interface can be added to a 21MX Minicomputer for $1,000 U.S.*

For a demonstration of the Real-Time HP-IB/21MX Minicomputer, check A on the reply card.

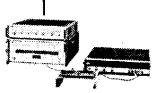
*Domestic Prices FOB California.

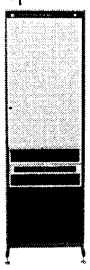
Computer Network Connections



Central EDP
HP supported hardware and software connect the HP-IB/21MX Minicomputer to other 21MX Minicomputers or to an HP 3000 or IBM 360/370 in a distributed management information network.

HP-IB





Incoming Inspection Satellite
A remote HP-IB/21MX Minicomputer in the nearby incoming components inspection department consolidates test data via the network connection system.

IMPROVING THE TESTING OF COMPLEX PRINTED CIRCUIT BOARDS...

Due to the astronomical numbers of circuit elements and interconnections on today's PCB's, the production of perfect boards is rare. Therefore, automated fault finding methods that are comprehensive and fast are of central importance to economy-minded production managers. Low quality boards that leave the company mean high warranty costs.

In just a few years, the digital printed circuit board has exploded in size and complexity so dramatically that boards with 200 integrated circuits or 10,000 logic gates are not uncommon. Testing boards can make life difficult for designers, production managers and customer service managers alike.

The design engineer needs to be totally sure that the design on the drawing board is testable, and to what extent.

The production manager's role in life is to produce quantities of good boards, faster and economically. But the common practice of testing only a typical 50 percent of a board's functions falls far short of a rigorous production test.

An industry rule of thumb is that each IC on a board will account for a 1 percent failure rate. A 100-IC board, would average one failure per board. If only 50 percent of a board is tested, a large percentage of passed boards will still have faults. The use of manual or semi-manual fault locating techniques costs precious troubleshooting hours.

Then, there is the customer service department! Here, the pressure especially builds to have faster and more accurate testing methods.

And ultimately, this deteriorating situation is an anathema to company executives who are aware that fully 30 to 40 percent of production costs for today's digital PCB's is attributable to testing them and assuring their quality.

Some good news . . . While the complexity of printed circuit boards has exponentially increased, the price of powerful minicomputers has sharply decreased. Consider the advantages of testing PCB's with a computerized system.

At the earliest design stages, the board's component connections are entered into the system by a simple and standard format. The minicomputer's stored memory incorporates a comprehensive library of commercially available IC's and other circuit components and how they work. With this data, and employing built-in pattern generating procedures, the minicomputer "simulates" the board.

Is the board testable? The computer indicates to the test engineer the quality of the test, that is, the percentage of all possible faults on the board that can be detected as presently designed.

Knowing quantitatively how testable the new design is, is extremely valuable. It indicates to the designer whether a need exists to add test points and test paths to increase the testability. The judicious placement of a single test point can sometimes lead to a dramatic increase in board testability. With the design still only on paper, the cost of the change is only slightly more than the cost of a pencil equipped with an eraser.

At the same time that the computer software programs check the design, the test program is produced. This will be used in the production stage and later for customer service. The board is now ready for production.

Using a minicomputer-based dedicated system, the production managers test tools can be the same software programs generated by the computer automatically from the design stage circuit descriptions.

The board is placed in an easy-to-operate fixture adaptable to most PCB's without expensive or time consuming construction of special fixtures.

Throughput is key to economy. A board tester should be designed for throughput. Testing the board's logic takes place in a matter of seconds. Then the tester directs the operator to move a probe to areas that are not testable from the edge connectors, to precisely diagnose faults. Simple English language commands enable operators with little technical training to perform the job.

The customer service manager can use the same test programs so software costs, amortized over three departments, are minimized. There may be hundreds of different PCB's handled by the service department, so testing software must allow for efficient on-line recall of the board testing programs.

The prime cost of running the customer service department is troubleshooting. The system must find faults and find them fast. Tests must be thorough so that faulty boards are not returned to the field. The "no trouble found cycle," where faulty boards cycle between customer and service center, will then be broken. Engineers in the lab, production areas and customer service centers benefit from this PC Board testing approach.

THE DTS-70 DIGITAL TEST SYSTEM THROUGHPUT, RELIABILITY AND SIMPLICITY

Hewlett-Packard builds thousands of complex PC boards for use in instruments, calculators and computer systems. Each HP division run as a small company itself, is naturally concerned with the design and manufacture of fault free boards. Frequently, problems encountered at one HP manufacturing factory are the same as the next. The familiar "next bench" phenomenon has evolved to a grander scale to the "next factory" phenomenon. Engineers in the Automatic Measurement Division knew that a system designed to solve their own and other HP Divisions PC board test problems would be a solution for other companies as well. The system they designed—the new DTS-70 Digital Test System—represents a new dimension in digital PC board testing.

The DTS-70 system permits up to three test stations to operate with a single 21MX Minicomputer equipped with disc memory. This lowers the cost of production testing significantly. Concurrent with one test station, a preparation station can be used by designers to enter new circuits for initial design analysis. Optional test generation software called TESTAID-III simplifies and speeds PC board test preparation.

The DTS-70 system will test large circuit boards in a few seconds. If a fault is present, the operator is given information necessary to locate it in about one to two minutes. A "guided probe" is used for diagnoses. The minicomputer provides information as to

where and how the probe should be placed by the operator.

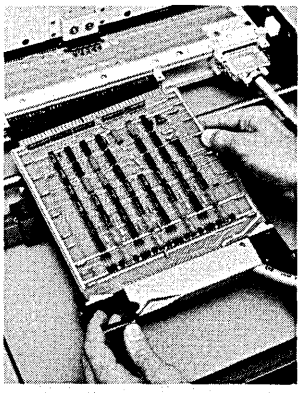
For efficient system design the HP-IB interface bus is used as the DTS-70 interface bus. For example the HP-IB interfaces the DTS-70 to the repair-ticket printer which produces hardcopy fault isolation information that can be conveniently attached to fault boards sent for repair.

The DTS-70 system was designed with production problems in mind and it can be used by unskilled operators. Dialogue instructions are easily and quickly communicated by the system through an HP-2640 keyboard-video terminal.

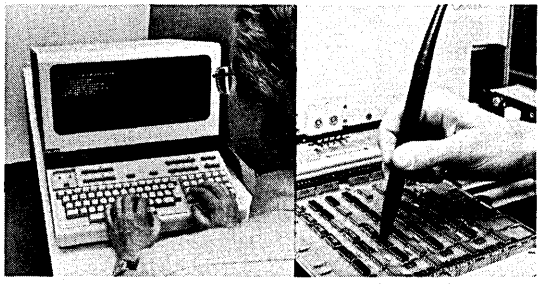
When not being used for testing, the powerful minicomputer system can perform tasks such as production scheduling, inventory control, shop-loading and materials requirements planning analyses.

For more information on the DTS-70 circle B on the reply card.

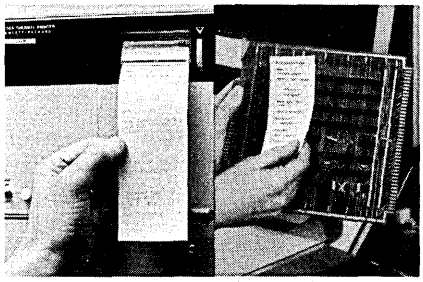
HP 21MX BASED DTS-70 SPEEDS PC BOARD TESTING



The board under test rides smoothly on guides and is secured in position with lever action designed to minimize operator fatigue.



Fault isolation is made easy for operators with a minimum of training. Instruction messages appear on the display indicating precisely where the probe should be placed to isolate the faulty circuit.



Simply worded repair instructions are produced on a hardcopy ticket. This ticket is attached to the faulty board for use at the repair station.

FAST, ACCURATE FAULT LOCATION

Determining if a PC board is good or not, is only a first step. The really important next step is to actually locate the fault so the board can be repaired. DTS-70's FASTRACE software searches for these faults using two techniques. When used in conjunction with each other, **Fault Signature Search and Guided Probing work much the same as do the famous sleuth team of Sherlock Holmes and Dr. Watson.**

When a crime occurs, Sherlock, with his keen power of deduction, evaluates people even remotely associated with the crime. He then obtains a "criminal profile" and comes up with a list of prime suspects who match this profile. If there is only one prime suspect matching the profile then the crime has been solved. More likely, there are several prime suspects remaining after Sherlock's initial investigation.

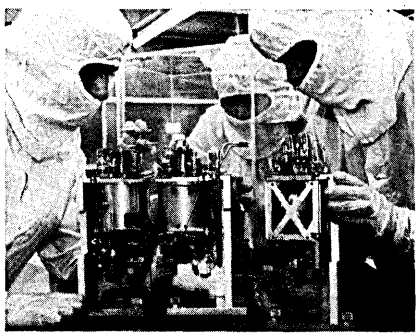
DTS-70 first uses an Automatic Fault Dictionary Look Up technique which consists of searching through a list of faulty output patterns generated by the TESTAID Simulator for a match with the output pattern measured from the board being tested. If a match is found, then a list of "fault candidates" associated with the measured faulty output pattern is noted. This is analogous to Sherlock Holmes' contribution to solving the mystery. Then Dr. Watson questions each prime suspect and in turn goes through an exhaustive evaluation of every clue. Dr. Watson leaves no stone unturned in his pursuit of the criminal and when he is convinced of the culprit's identity, he is always right!

Then a technique takes over which guides the operator to probe for additional information. When a bad signal is measured, its driving signals are also measured in a logic "backtrace" sequence. Final isolation of the fault occurs by actually measuring the point at which the failure exists. Using the Fault Signature/Guided Probe approach, the DTS-70 locates faults with unprecedented speed, typically less than a minute and, with Sherlock Holmes accuracy.

For more information on fast, accurate fault location circle C on the reply card.

USER TESTED PERFORMANCE

HP-IB improves testing efficiency for TRW
Computer testing debugs new model cars for Ford



TRW's advanced technology will be applied this summer when a computer life detection instrument package they designed will probe for life on Mars.

At TRW, the design of a computerized life detection instrument package that will probe for biological signs of life on Mars this summer, is an example of the technology applied by this designer and manufacturer of scientific, military and commercial space craft systems. Precise measurement and testing is a critical aspect of activities at their Space Pack facility in Redondo Beach, California. There the company's Defense and Space Systems Group relies on 25 HP 2100/21-MX computer based Scientific and Measurement Systems for engineering and manufacturing testing.

Don Broutt, who manages TRW's automatic test systems department, adopted the HP Interface Bus to link numerous test instruments to his HP computers and to numerous HP calculators.

"Many of our programs involve extremely limited production runs . . . some products, for example, are one of a kind. Before adopting the interface bus, our efforts to reestablish test stations for each program was like reinventing the wheel. Now when setting up a new test station with the HP-IB, we can easily add or reconfigure instruments in a computerized network with minimal set up time," explains Broutt.

With improved flexibility comes improved cost, according to Broutt. Pre HP-IB testing required specially engineered printed circuit board interfaces for each unique test device. If a device served as both a "listener" and "talker" it required two boards. Now one board within a computer allows interfacing with up to 14 devices meeting the IEEE-488 standard. Similarly a single standard cable now replaces specially-engineered cables formerly required for each unique test instrument.

"In our pre-HP-IB testing, we wrote special driver software for each unique device. This consumed excessive amounts of computer memory. Now our engineers simply use a subroutine for each device to access an HP-IB standard driver. Gone is time consuming reference to hand books for device translation. Once a subroutine is written, the device interface is transparent to our engineers," relates Broutt.

Now, with the growing availability of test devices using IEEE-488 and the expanding use of the HP Interface Bus, TRW, is able to reduce the cost of interface design. The manpower and resources formerly allocated to this function, can now be applied to other priority projects.

A Hewlett-Packard Minicomputer monitors Ford's Shaker System which simulates the stress and strains of normal and extreme driving conditions.

Ford Motor Company's debugging of prototype cars increases in complexity from one year's model to the next. Electrical and mechanical systems are enhanced to help control product cost, more stringent emission control and safety standards are mandated yearly, and an extremely competitive market places emphasis on product innovation and reliability.

At Ford Motor Company, a comprehensive computerized testing program enables the Car Engineering and Product Development Groups to meet these challenges.

Key to the testing programs are six HP 2100 based Scientific and Measurement Systems computers, combined with an innovative mix of analog measuring devices, torture chambers, testing apparatus and high speed minicomputer data acquisition stations.

With computerization, test results are now available four times faster than previously, and in some tests, data is processed as it is captured.

Prior to Ford's marriage of HP computers with measuring devices, constant operator intervention was required to set calibrations and adjust measuring instruments. Tests were not nearly as comprehensive as with its computerized system.

One test called the Shaker System involves computer testing of model cars that simulates driving upon a variety of surface conditions – from normal driving to extremes such as speeding a car down a tortuous pair of railroad tracks.

When tested under the Shaker System, each wheel of the car is placed on a hydraulic ram. The front wheels are excited in phase and 180 degrees out of phase. Vibrations sensed from accelerometers attached to critical points, like the steering column, are converted digitally for the computer's analysis. The HP minicomputer controls the programmable generator and the two-channel digital to analog converter. Resulting signals activate the ram's servo control mechanisms.

Each discrete point monitored contains a natural or built-in frequency. As the exercised frequency implanted by the HP 9600 approaches the natural frequency, a resonance effect appears, in effect magnifying the vibration.

Computerized statistics and plots enable Ford engineers to design automobiles with natural frequencies attenuated to an accepted level or moved out of the driving range of normal operations to preclude the resonance effect.

When asked to compare the preciseness of his company's computerized testing to prior methods, a Ford engineer replied: "Like measuring something with a micrometer instead of a ruler."

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source data

(Continued from page 28)

techniques for calculators with four functions (+, −, ×, ÷), floating decimal point, automatic constant, and algebraic logic. Some of the "how to's" include solving banking problems involving simple and compound interest, discount to yield, annuities; problems involving percentages and rates; solving equations involving direct and indirect variations; use of scientific notation to simplify equations containing large numbers, and performing chain calculations in one step.

Microprocessor/Microprogramming Handbook
by Brice Ward
Tab Books, Blue Ridge Summit, Pa. 17214 (1976)
294 pp. $9.95 ($6.95 paperback)

Everything you always wanted to know about microprocessor construction, operation, programming, and applications seems to be contained in this guide. The chapters are packed with illustrations and examples for the designer who wants to develop a unique program — a microprogram — for the microprocessor system. In addition to a list of abbreviations and a glossary, appendixes include a list of microprocessor manufacturers, product comparisons, and details of the MCS-80 support family.

reports & references

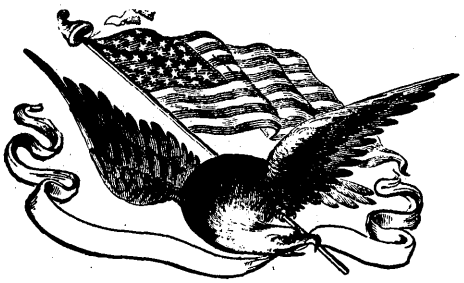
Brand Preferences

The fourth annual *Datamation Brand Preference Study of the Data Processing Industry* again studies the oem and end user markets. The 169-page report presents the first, second, and third choices of products and services of 1,479 end user and 983 oem respondents from across the U.S. and Canada. Results of the last two studies (1974 and 1975) have been incorporated to permit comparisons of changes in preference over this period. The study has been expanded to measure 93 types of dp products, services, and software. Among new categories are forms handling equipment, minicomputer software packages, independent maintenance services, keyboard data entry, facsimile transceivers, computer room furniture, and more. Price: $45. Marketing Research Dept., DATAMATION, 35 Mason St., Greenwich, Ct. 06830.

Data Base Info Service

To aid administrators in the management of data base installations, a new information service, *Auerbach Data Base Management,* supplies information on planning and design considerations, basic components of a data base environment, evaluation and selection of a DBMS, and profiles of current offerings. The single loose-leaf volume contains sections on the data base administration function, the user system interface, the data model and DBMS architecture, analyses of current trends, and case histories of operational systems in various industries.

The service includes an initial issue of 20 reports, with bimonthly supplements of 4-6 reports. Annual subscription: $175; a 30-day trial is available. AUERBACH PUBLISHERS INC., 6560 N. Park Drive, Pennsauken, N.J. 08109.



Microprocessors and Microcomputers

Prices of typical microprocessors are expected to drop to around $15 (in quantities of 100) during the coming year, and to about $5 in two years. Microprocessors with greatly enhanced capabilities will be available at current price levels. So finds *All About Microprocessors,* a 20-page report with detailed characteristics of 55 current models from 27 vendors. A discussion of trends and explanations of types and terminology are included.

The 34-page *All About Microcomputers* surveys the principal characteristics of 125 microcomputers from 65 vendors, considerably increased from last year's 33 microcomputers from 20 vendors. Trends and developments, detailed explanations, and the comparison charts are the main features.

Price: $10 each. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Bank Terminals in Europe

European banks will spend $175 million a year for the next ten years on terminals and automatic tellers, and still save $500 million a year net. That's because today 70% of 18 billion transactions are handled each year by physically moving paper, for a $5 billion annual operating cost. This volume is expected to double by 1985, demonstrating a definite need for online systems. An in-depth analysis and ten-year forecast in units and sales volume, by country, for branch terminals and automated terminals are supplied in the 216-page report, *On-Line Banking Equipment & Services in Europe.* Price: $675. FROST & SULLIVAN, INC., 160 Fulton St., New York, N.Y. 10038.

COM Standard

The American National Standards Inst. has approved the revision of the ANSI Standard, *Format and Coding Standards for Computer Output Microfilm,* ANSI PH5.18-1976. The 28-page Standard covers COM in 16mm and 35mm roll film and microfiche, both camera originals and distribution copies. Character sizes and spacings for effective reductions are described. Price: $5.50 ($4 NMA members). Publication Sales, NATIONAL MICROGRAPHICS ASSN., 8728 Colesville Rd., Silver Spring, Md. 20910.

Word Processing

Guidelines for equipment selection, comparative analyses of equipment price, specifications and performance data, and special reports on industry trends are featured in the 139-page *Auerbach Guide to Word Processing.* Comparison charts of equipment capabilities, performance characteristics, and compatibility for over 60 devices are included. Detailed reports on 25 major devices, a suppliers directory, and a discussion of the advantages and disadvantages of different types of word processing systems are also included. Price: $24.95. AUERBACH PUBLISHERS INC., 6560 N. Park Drive, Pennsauken, N.J. 08109.

Automated DP

The proceedings of the Interagency Automated Data Processing Planning Conference, held in Warrenton, Va., on Feb. 22-24, 1976, presents discussions and conclusions of management needs for ADP, both present and future. Sponsored by the Automated Data and Telecommunications Service (ADTS) of the General Services Administration, the conference held parallel sessions on the centralization of ADP management, executive/legislative relationships, personnel management, MIS, public/-private sector responsibilities, and sharing among agencies. The 280-page proceedings include a summary of the conference highlights, reports of the parallel sessions, and individual presentations. Price: $9 ($2.25 for microfiche); ask for accession number PB252943. NATIONAL TECHNICAL INFORMATION SERVICE, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, Va. 22161.

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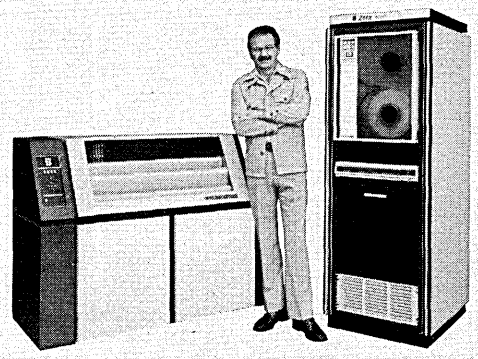
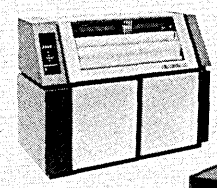
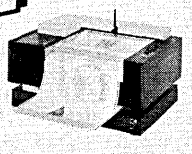
Ideal for unattended operations calling for multiple copies of one or more plots, the 6000 operates at speeds up to 4,000 steps per second (14.14 ips diagonal)—and features a special speed selector for optimum speed/quality output.

Key features of the control electronics include: unattended plotting from 1 to 159 files per tape, unlimited multiple plots, searching out desired files, storing and editing of plotting sequences.





If you're in engineering, highway or city planning, structural design, map making, management reporting or electronic data processing, the 6000 Series is your plotting system. It grows on you.



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source data

vendor literature

Latest Buzz Words
If you thought "line hit" was a baseball term, think again. This and other data communications terms are collected in the expanded edition of *Sherry's Guide to Data Communications Buzz Words,* a 24-page pocket-sized booklet with 44 new definitions added. (For the not yet initiated, a line hit is "an electrical interference causing the introduction of spurious signals on a circuit.") INTERNATIONAL COMMUNICATIONS CORPORATION, Miami, Fla.
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Laser OCR
Laser technology makes possible a high degree of accuracy in this company's OCR-ONE optical character recognition system, according to an illustrated brochure. The highly controllable, high quality light source enables the system to read documents not scanable by most other systems, it is claimed. The system is programmed with a simple form, and is especially designed for general business applications. OPTICAL BUSINESS MACHINES, INC., Melbourne, Fla.
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Statistics on HP Calculators
Two application summaries describe statistical software libraries for the HP 9815 and HP 9825 desktop programmable computing systems. Three volumes of applied statistical programs, ranging from determination of the mean to calculation of an 11-variable multiple regression, are available for each programmable calculator. Vol. 1 contains commonly used statistical routines; vol. 2 includes key programs for the analysis of variance and regression; and vol. 3 concentrates on nonparametric (distribution-free) statistics. HEWLETT-PACKARD CO., Palo Alto, Calif.

4400 System Case Studies
Two case studies show the scanning and key entry flexibility of this vendor's dispersed processing system. One describes an insurance company's use of the 4400 KeyScan System to process premium payments automatically. The second shows how a bank automatically processes 20,000 to 30,000 "hold-over items" in its check processing operation, enabling it to obtain same day availability on over 99% of the funds represented by the items. CUMMINS-ALLISON CORP., Data Systems Div., Glenview, Ill.
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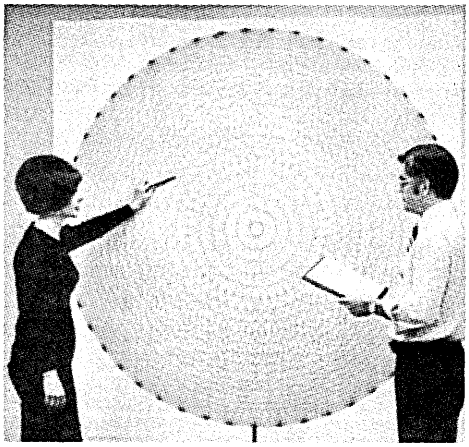
Wide Plotter
A 6-page illustrated brochure describes 10 "super-wide" electrostatic plotters which handle paper widths of 22, 24, 36, 42, and 72 inches. They operate at 30 sq. ft. per minute, independent of plot complexity and using no mechanical arms or pens. Application in geophysics, mapping, planning and control, computer-aided design, production control, research and development, and printing and publishing are discussed. Detailed specifications are given, and also described are on-line operation with the IBM 360/370, use of optional character generator, simultaneous print/plot option, and the basic electrostatic operating principle used. VERSATEC, Santa Clara, Calif.



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Microfilm Primer
The Management of Information, a 12-page revised and expanded booklet, presents basic information on microfilm systems, microfilm techniques and equipment. Simple small office installations to sophisticated operations involving computer generated microimages and electronic retrieval are covered. Business Systems Markets Div., EASTMAN KODAK CO., Rochester, N.Y.
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Core Memory Systems
A 4-page illustrated brochure describes this vendor's core memory systems. Model 696 is a 16K word by 18-bit system, compatible with Model 698, a 32K word by 18-bit system. Both systems have a full cycle time of 650nsec with an access time of 250nsec. Each is contained on a single module 11.75 by 15.4 inches. FABRI-TEK INC., Minneapolis, Minn.
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Plotter Chart Paper
An 8-page mini-catalog of the full line of this vendor's plotter chart paper is available. The company claims it can supply "virtually any grid pattern or form design," and lists charts manufactured to fit most plotters. GRAPHICS CONTROL CORP., Recording Chart Div., Buffalo, N.Y.
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Data Entry
The 1300 Series data entry systems, applications-oriented key-to-disc systems, are described in an illustrated brochure. Five systems for high and low volume operations and easy conversions are defined. INFOREX, INC., Burlington, Mass.
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Graphical Reports
A completely automated graphics system, EZPert, provides comprehensive management reports concerning status, cost, and resources throughout the planning, scheduling, and control phases of a project, according to a 12-page illustrated company brochure. The system capabilities and options are described, as well as the models available, modes of operation, and the operating environment. SYSTONETICS, INC., Anaheim, Calif.
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courses

DP Feasibility Study
Which factors determine the success or failure of a computer installation? Why do some companies earn good returns on their dp investments while others do not? How can you contribute to the effectiveness of your company's dp system? These and other in-depth questions are tackled in the 20-hour home study course, *The EDP Feasibility Study*. Designed for managers, the course uses the case method of study, and the final exam is the student's own analysis of an actual case, evaluated by an expert instructor. Price: $55 ($50 to AMA members). AMERICAN MANAGEMENT ASSNS. EXTENSION INST., 135 W. 50th St., New York, N.Y. 10020.

Audit and Controls
A five-day course, *Auditing and Controls in Data Processing,* is intended for internal audit staff members with responsibility for, but minimal experience in, dp auditing. Topics include auditing in the dp environment, dp systems and controls, and computer-based audit. To be held in Denver (Aug. 23-27) and Chicago (Sept. 20-24). Price: $609. Contact your local DPD representative, IBM DATA PROCESSING DIV.

(Continued on page 133)

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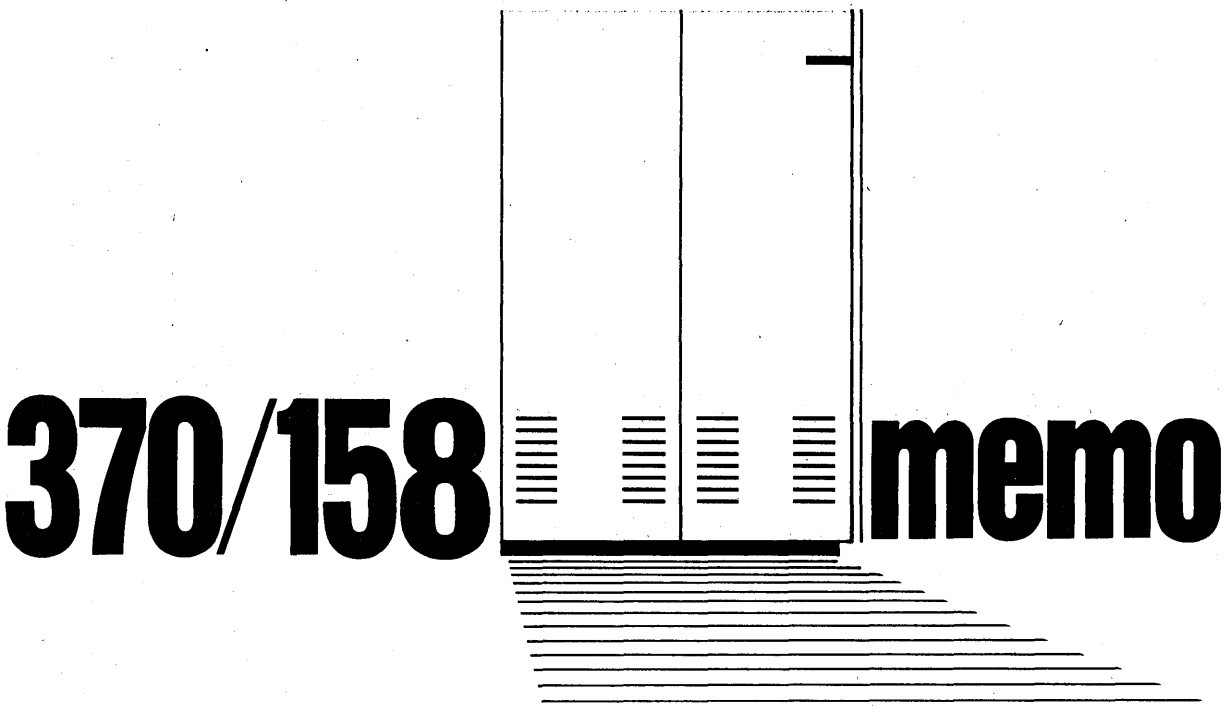


370/158 memory

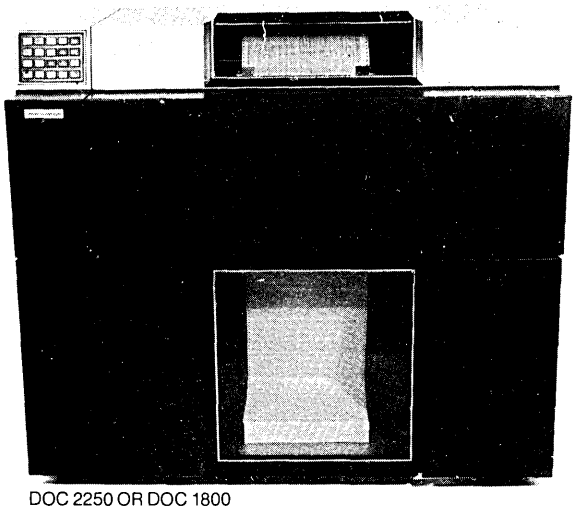
DOCUMATION'S PRINTER/READER/PUNCH: YOUR IBM 360/370 WILL THINK IT'S IBM. THE PRICE PERFORMANCE RATIO WILL TELL YOU IT'S DOCUMATION.

Documation just introduced a new Printer/Reader/Punch Subsystem you should introduce to your IBM System 360 (Models 22 through 85 and 195) or 370 (Models 115 through 195).

When you replace your IBM 2540 Reader Punch and IBM 3211 or 1403 Printer with Documation's new Printer/Reader/Punch Subsystem, your main frame won't notice the difference.

But there are some very significant differences *you* will notice. Starting with the fact that Documation's Subsystem can be tailored to give you as much function as you need.

You can take your choice of two printer models — our DOC 2250 (printing 2250 lpm with a 48 character set) or our



DOC 2250 OR DOC 1800

DOC 1800 (printing 1800 lpm). Either model can appear to your system as either an IBM 3211 or 1403. With some extra advantages thrown in.

Operating in the 3211 mode, the DOC 2250 prints 10% faster than the 3211. That's advantage #1. Advantage #2 is price. The DOC 2250 costs less than half as much as the 3211. Advantage #3 is space. The DOC 2250's integrated microprocessor controller eliminates the need for a separate controller. And because the DOC 2250 has built-in, comprehensive microdiagnostics, maintenance can be done off-line without tying up the host system.

The DOC 2250 also offers: buffered vertical format control including indexing and line spacing; fully-buffered print line; operator-changeable character arrays; a 432-position Universal Character Set Buffer (UCSB) that allows any character set to be used; up to 6-part forms; high-speed paper slew up to 100 inches per second; power cover; power stacker.

The DOC 1800 offers all the features of the DOC 2250, but at a reduced printing speed. And a reduced price.

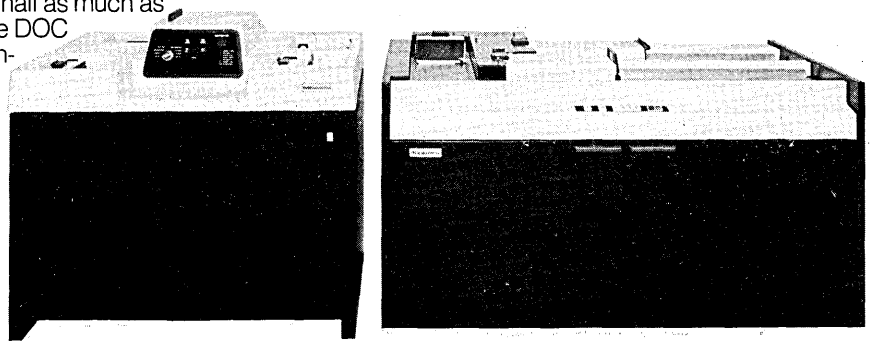
The 1403 compatibility feature allows both models to operate in the 1403 mode. This feature includes: paper tape loop; operator selection of line spacing (6-8 lines per inch); dualing; manual indexing with rotary dial; use of 1403 UCSB feature or other standard non-UCSB character arrays. Your CPU will think it's working with a 1403. You'll know you're getting a 2250 or 1800 lpm printer for just about the cost of an 1100 lpm printer.

The read/punch side of the Subsystem (the PC 6000 Reader and the PC 50 Punch) recognizes the same command set as the IBM 2540. All data and control signals transferred between the host and the PC 50 and PC 6000 pass through a subsystem microprocessor controller built into the PC 6000. Utilizing Documation's own patented riffle-air pick and stack system, the PC 6000 reads 1000 cards per minute and stacks them in one of two stackers. The input hopper holds 6000 cards and can be loaded on the fly. Stacker 1 card capacity is 5500; Stacker 2 holds 3500 cards. PC 6000 options include 51 Column Card Read, Optical Mark Read and Read Column Eliminate.

The PC 50 Punch Model 3 punches a minimum of 50 cards per minute; Model 4 punches 100 cpm. The PC 50's microprocessor controller enables it to detect and correct punch errors automatically without operator or host system intervention. With the Pre-Read feature Model 3 reads 300 cards per minute, Model 4 reads 400 cards per minute. Other PC 50 options include a 51 Column Card read/punch feature, an interpret feature, a second input hopper to enable off-line reproduction of card decks; a Read Column Eliminate feature and Optical Mark Read. Off-line, the PC 50 will gang-punch, gang-punch and interpret, reproduce, reproduce and interpret, or just interpret — eliminating the need for extra pieces of equipment to perform these off-line functions.

The ruggedness and reliability of Documation equipment in the field is legendary. What that means to you is less downtime. Documation equipment has proven itself so reliable in fact, that card-handling equipment users ranked Documation their #1 preference in 1975 media surveys. The reason? All Documation products are designed in-house. Then all parts and machines are fabricated in our own sophisticated precision manufacturing facility, giving Documation a unique control over product quality and reliability.

Documation provides sales and service in major metropolitan areas. Documation's service is as reliable as Documation's equipment. When your Documation equipment needs maintenance, we don't want you to have to wait for us. So



PC 50 PC 6000

we have a service team of Documation-trained field engineers waiting for your call. Documation's maintenance contract provides maintenance and parts 24 hours a day, 7 days a week.

You have an IBM 360 or 370. We have the Printer/Reader/Punch that offers the most cost-efficient subsystem available. Let's get together. For more details, call or write Mr. Roy Ostrander, Vice President, Box 1240, Melbourne, Florida 32901. Phone (305) 724-1111.

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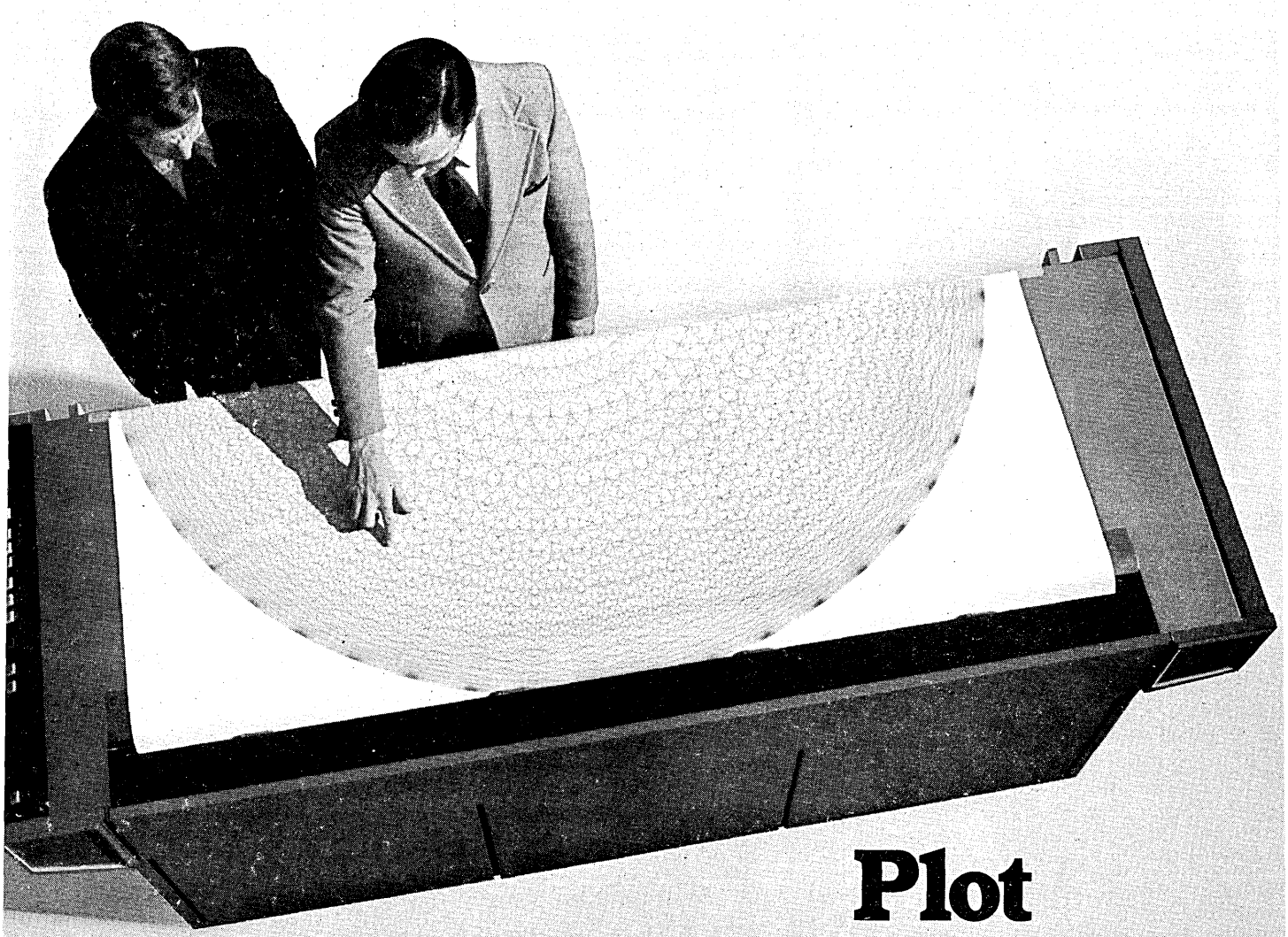

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CIRCLE 19 ON READER CARD

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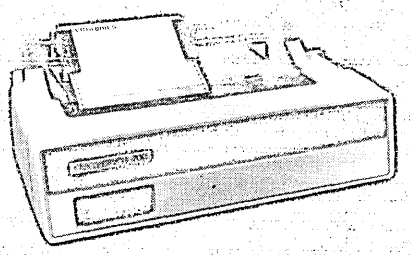
Bob Howard, President, Centronics



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Timbuktu, Tallahassee and Topeka all need intelligent terminals that make data entry a breeze. ADDS System 70 is the answer.

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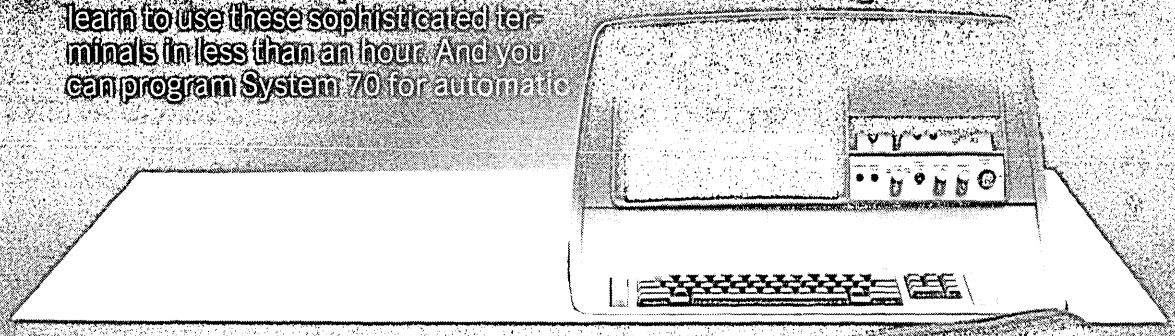

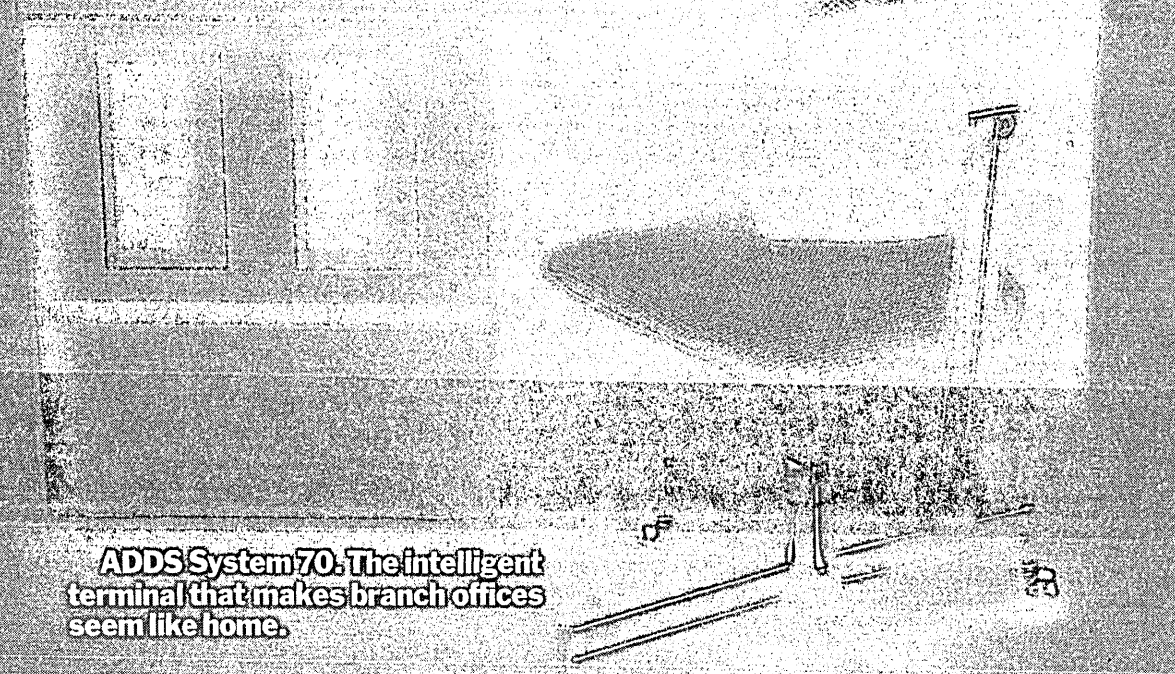

ADDS System 70. The intelligent terminal that makes branch offices seem like home.

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CIRCLE 11 ON READER CARD

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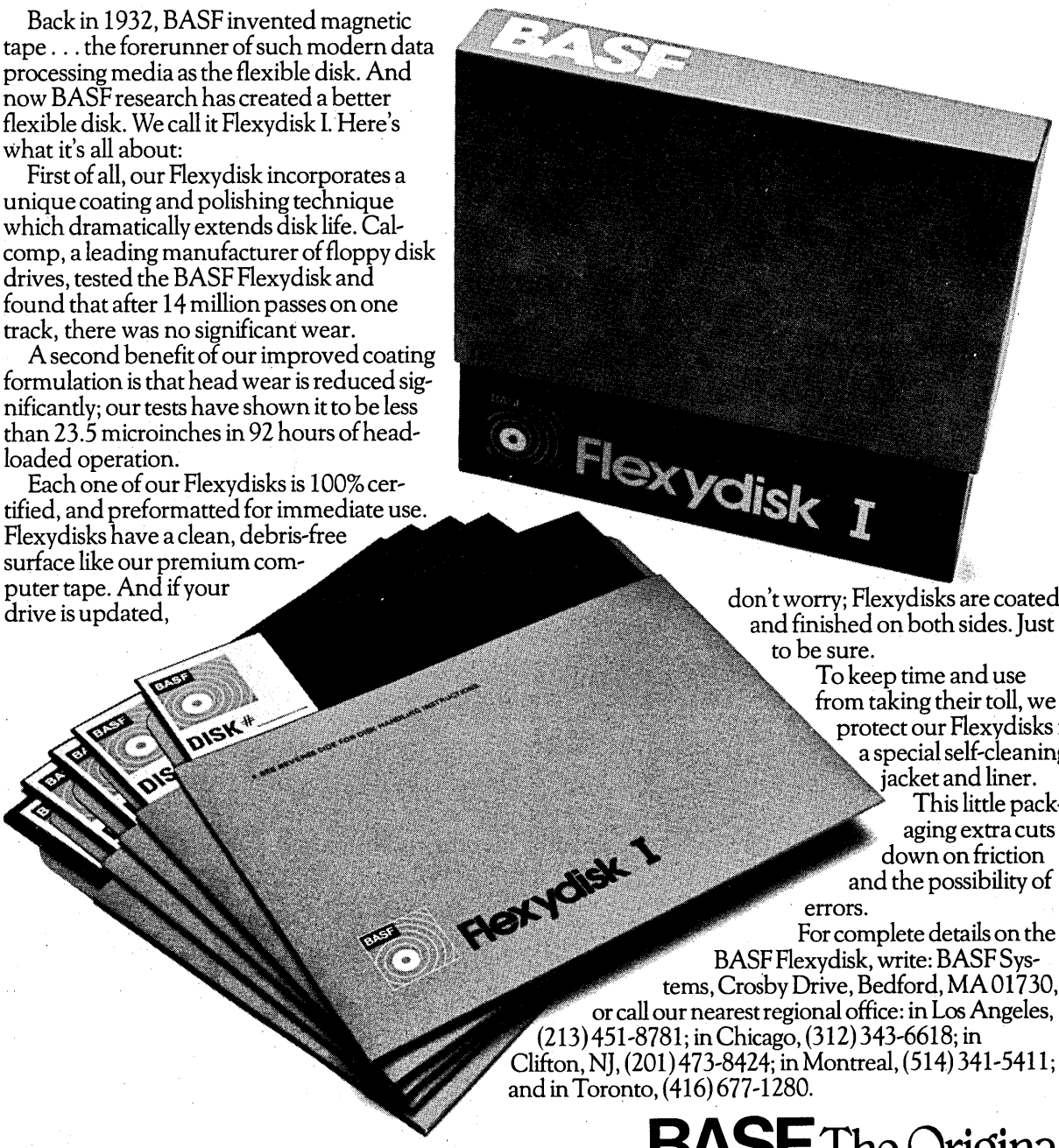

To keep time and use from taking their toll, we protect our Flexydisks in a special self-cleaning jacket and liner. This little packaging extra cuts down on friction and the possibility of errors.

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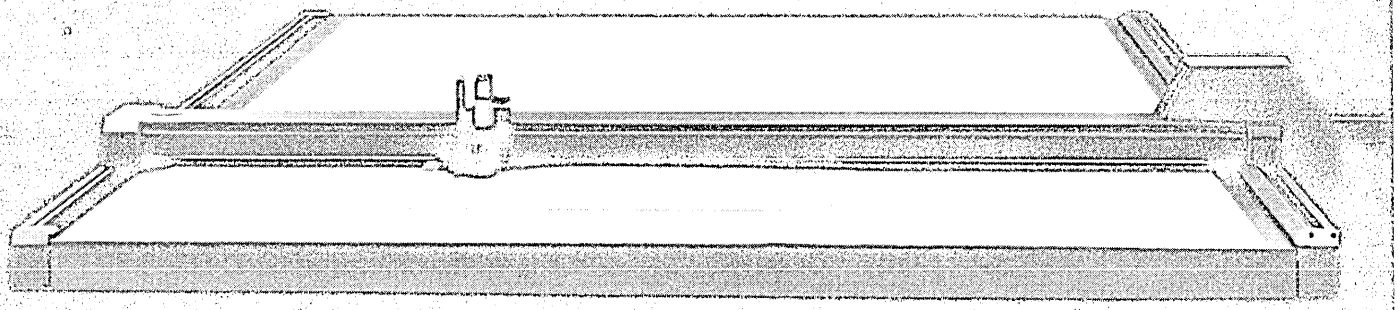
DRUM BEATER!



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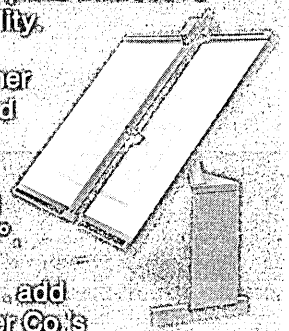

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IBM 370 users: An Intel add-on memory system can save you up to 50%.

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You can add to or replace the IBM supplied memory. Either way you'll save up to 50%. As an example, you can get 4.0 megabytes of Intel 370/158 memory for less than you'd pay for 2.0 megabytes of IBM. That's like getting 2.0 megabytes free and with money left over. Money to use in other ways. We can expand your 370/135 to one megabyte in a single frame, or your 370/158 to 8 megabytes in a single frame. In either case that's twice the capacity offered by IBM.

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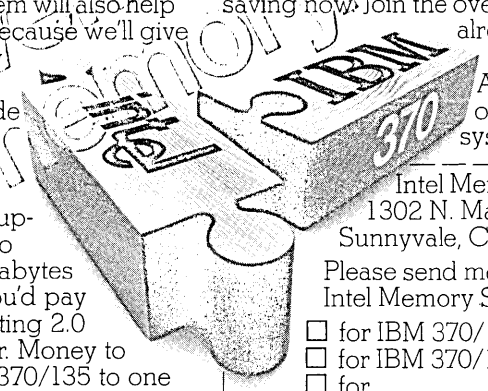

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CIRCLE 67 ON READER CARD

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CIRCLE 95 ON READER CARD

Editor's Readout

Richard A. McLaughlin, Sr. Associate Editor

Who is William Farr?

DATAMATION readers are accustomed to finding information on data processing within its pages, even on this page. But DATAMATION is also in the business of publishing, and it's important to talk about that second business this time.

Public celebrations have just marked the fact that our unique engine of self government has been kept operating for two centuries. From time to time parts of that engine need looking after, and one of those parts is due for inspection.

Article I of the operator's manual for the machine has recently been doubly challenged. That article, which we refer to as the First Amendment to the Constitution of the United States, among many other things guarantees us that "Congress shall make no law . . . abridging the freedom of speech, or of the press . . ."

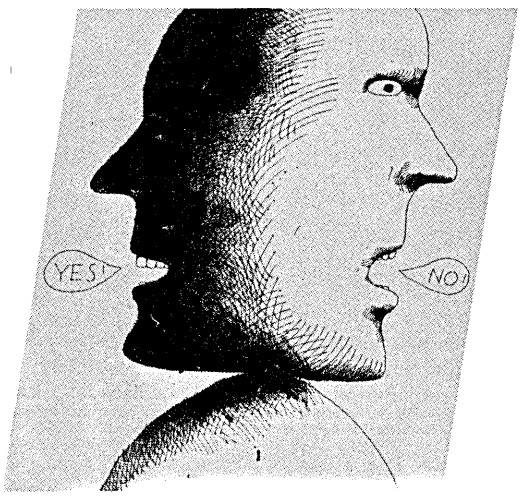
There have been two recent Supreme Court tests of that Article. The first was to determine whether the courts could closet their operation from the public by denying the press its right to publish information about a case to be considered. At issue was a Nebraska court's gag order restraining the press from reporting an alleged murder confession. On June 30, the Supreme Court struck down this *particular* Nebraska court's order regarding this *particular* case. The high court, however, chose not to expand its decision to strike down all gag orders, leaving the press only partially protected against them.

The outcome of the second test is even more in doubt. That Supreme Court has denied—by refusing even to consider—our press' right to keep secret its sources of information. The case in question involves William T. Farr, a reporter found guilty of contempt of court for not identifying the sources for a story he wrote in 1970 for the *Los Angeles Herald-Examiner* regarding one Charles Manson, later convicted of murder. The issue in this case is the confidentiality of sources.

Both of these challenges to press freedom affect DATAMATION and hundreds of other trade publications as well as the popular press. Our reporting to you has been blocked before (for several years our coverage of the antitrust action against IBM was restricted by a court order against talking to the press); and our sources of news are not going to share their inside information if we cannot protect them from exposure. This publication, like all the others, needs the court's thinking to be turned around, and that is going to be difficult to do.

The court is faced with the clash of two very important principles, the right of a free press and the right to a fair trial. Do our traditions guarantee, as some would claim, the right of the accused to a jury selected from a public unaware of the circumstances of the accusation? Or do they favor more strongly the right of the public to know the circumstances?

We believe that the press' right to publish information about court cases, and its right to protect its sources are both vital; that without protection against recrimination for those who reveal what the public has a right to know, many things will not be known to the public; that a press stripped of its ability to decide what to print is not a free press at all.



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Which has the greater right, press or court? It's impossible to say. The press cannot guarantee never to publish misinformation rather than information or never to cause damage with its words; but it can nearly guarantee that without the freedom to do its job, much the public ought to know will never be published. And the former is the lesser wrong.

Congress can help the courts to see that. Congressional action, however, almost certainly will come too late to help Farr. On the anniversary of our country's founding, during the flag waving and patriotic speech making, William Farr was waiting to be told *when* to go back to jail.

Is he a martyr? For some of us he is. Will he be snatched from jail only to be put before another court asking again about his sources? There's not even a Constitutional guarantee against that. Will the courts have their way with the press this time? Next time? Next Watergate? If they do, you may not hear about it.

We ask no more than the removal of prohibitions against publishing and the same kind of confidentiality of sources enjoyed by clergy and lawyers. Please exercise another of your rights by writing to those folks on Capitol Hill. That's all it will take to jog the machine again. ❋

The View From the Manager's Office

by Jackson W. Granholm

Is it more fun to program than to manage? Does the excitement of being in the industry wear off after 20 years? Would they do it again?

What do computer people think of their work? Do they, in fact, work? Is it exciting? Drudgery?

How does the work compare with other careers they might have chosen? Is it a career with above average rewards? Does it command any respect in the world? Are they a part of making the world a better place in which to live?

We decided to ask such questions, to try to figure out what motivates people in our industry. There are enough people in enough diverse careers related to computing to provide material for many volumes on the subject. So we limited this particular query to the ranks of the inmates of operating management. In other words, the person we talked to may head an allegedly "integrated" computing capability, or head a group of programmers, but, in each instance he has certain authority over other people or equipment, and the responsibility to match.

To entice the maximum of frankness, and to avoid problems of "company policy" or of "public statements by authorized spokesmen" and all similar corporate idiocy, we promised them anonymity. We have numbered our people so that you can tell John$_1$ from John$_2$, but we are prepared to go no further.

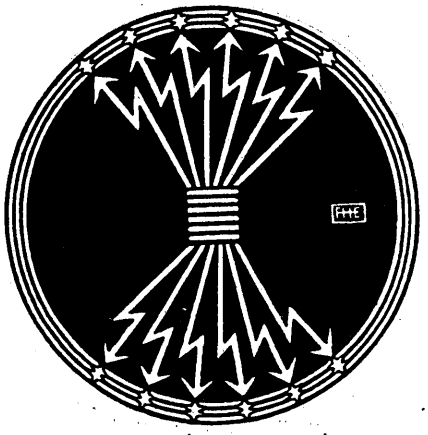
One of my friends threw it all in, sold it out, and bought a gas station in Idaho.

These people all work for users. No manufacturer of computers or peripherals is represented. While this may seem like callous discrimination on our part, we are of the opinion that manufacturers, no matter how impressive their in-house applications, have an automatic bias we wish to avoid.

Within these constraints, all else is as real as we could make it. These are real people with real jobs in the everyday world of work:

The Utility

John$_1$ is Manager of Computing with a large public utility. He is appreciated and recognized for his skill and experience. His responsibilities include



computer operations, operating systems, planning, and direction of engineering computing.

John$_1$ has a long background of solid experience in computing. He went to UCLA, *majoring in statistics and math analysis, with the help of the G.I. bill, rights to which he had earned by his service in World War II.*

When he graduated in 1949, a few corporate recruiters came around to talk to math graduates. John$_1$ remembers the occasion:

"I decided to take the offer that Douglas Aircraft made. Their representative was enthusiastic, knowledgeable, and convincing, a very exciting guy. But the real reason I took their offer was that it was for $5 a month more than the only other offer I got.

At Douglas I got to work on the IBM CPC [Card Programmed Calculator, a 1950 vintage machine]. This was wonderful experience for anybody who wanted to learn all about computing, from card punching on up."

John$_1$ went on to be a salesman for a company later absorbed into one of the industry giants. Then he became, for six years, director of computing for a division of a diversified company. He founded the division installation which did both business and engineering work.

After another stint as a salesman, for ten years he was Director of Computing for a division of an aerospace company, working with different and new equipment, introducing neophytes into the trade.

John$_1$ brings almost 27 years of solid experience to his present job. He tells about how it's been:

"The early days were exciting. When you have just gotten out of school something like the CPC is almost beyond belief. I mean, I was just looking for a job—something a math graduate could do. We were all pretty green but the way things were then you had to be pretty self sufficient because with every problem you really invented and built your own system all over again just for that problem. That's the way it was at places like Douglas. And the vendors, the IBM people, they didn't know any more about what we were doing, or what their machine could do than we did. In fact, we usually had to show them.

"I guess I was happy when I went to be a salesman the first time. At least, I did all right. But somehow I just didn't feel comfortable. Looking back I guess I never did feel comfortable working for a company that made and sold computers. I was more comfortable working for a user.

"It seems like when I first got to be a manager there was no drama in what we did. We had a lot of start-ups and a lot of start-overs. But the company management there had no appreciation or understanding of computers. You'd think, with a company supposed to be in a technological business, they'd have some appreciation. But no. To them we were a pain in the corporate butt, and we were just there to eat money

and make the government happy according to a good deal of top management opinion. We tried to explain everything to them over and over again, but they still wouldn't understand it.

"Later on, though, in other jobs, I got to take part in some very interesting developments. I mean things like beginnings of data base management, and centralization of work loads which was most successful. It's been interesting, and some of it has been exciting, and I have had a feeling of accomplishment pretty often."

"Looking back on your career, suppose you had chosen some other line of endeavor? Pick anything you might have done as an alternative, as a new graduate in math, that is. You might have become an insurance actuary, for instance. Do you think the way you have gone, the career you have had, compares favorably or unfavorably with the possible alternatives?"

"There's no doubt in my mind that it's been a very good career. It's work that is respected, admired even, by lots of people. The financial rewards have certainly been commensurate, probably better than I could have done working in some other line. Yes, it was a good choice. Not a choice, really. It was sort of by accident to start. But I wouldn't go back and change the general direction.

"I've been in companies with both good and bad management, from my point of view. The management here is enlightened. You might think that, compared to an aerospace company for example, the management of a utility would be kind of uninformed. But not here. Our work is appreciated and we get a lot of support. For example, the Manager of Data Processing, my boss, is on the Management Committee. You don't find that in too many companies.

> I guess sometimes I think about it, and I think I have spent 27 years doing the same thing over again.

"I think back to my first management job. The top people there had no appreciation of the worth of the computing facility. But here there are new challenges—harder work all the time. Yet I guess sometimes I think about it, and I think I have spent 27 years of doing the same thing over again."

"Have we progressed in computing?"

"Oh, sure we have progressed. We're still progressing. Of course software is still lagging hardware. We've got to improve our ability to develop new applications systems without the big amounts of time and money that go into them.

"I think back and remember that I was one of those people who used to get into the learned discussions about whether we should have open shop or closed shop—closed shop so only the professionals could get at the computer and no one else could louse it up. It all seems silly now. Clearly the way to go, and the way we are going here, is to give every person hands-on access, through terminals, of course. Terminals are great and getting greater. We're finally recognizing the value of interaction of the guy who actually has the problem with the computer. We should have seen it long ago."

"Your background is mostly with engineering applications, but you have business applications here too?"

"Heck, yes. The most exciting new thing we are doing is to give access to the customer master file from 110 field offices. We now make history runs of the accounts of over three million customers, and we put it on microfiche, and we send it out to the branches. When Mrs. Smith calls up in West Boondock to ask about her utility billing, somebody has got to search through the microfiche to find the answer, and then he usually can't tell her much. But we're going to have a terminal in each office, and everybody will be on-line to the whole customer base, not just the part we can put on microfiche. The local man will have the whole story, and he can go through it in detail with Mrs. Smith.

"It's interesting, but true, that we can't come up with an economic justification for doing this. Yet management supports it fully because things have gotten so big that, otherwise, we just can't operate the company any more. We expect a lot more customer good will and understanding besides.

"This is a part of what I'm trying to tell you, that here, at long last, the business of computing is finally recognized as a benefit rather than an evil. This is not due to our efforts. Management has done it. In general, computer people are just lousy at in-house public relations.

"I'm no good at being a philosopher. It took me a long time to decide that I'm a manager and not a salesman. But the day is really at hand when the computer is a household word, and we're all going to have terminal access to it. Oh, it may take a few years before there is terminal access in the home for things like grocery shopping, but it won't be too long before there is terminal access in the home, or the equivalent of it, for things like communications with banks, and for billing queries, and for access to selected services."

"What do you think about the computer manufacturers?"

"Like I said, I've decided I'm at home in the user's world. I don't know about the manufacturers. Some of the current new ones show promise, but I don't think they're going to make it. Yet I think it's regrettable that the supplier ranks are so thinned. New ideas are always good."

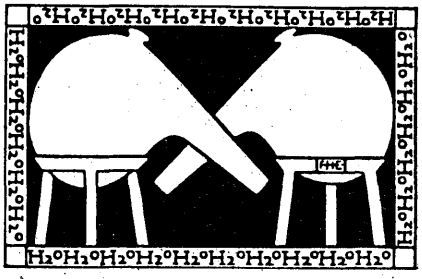
"How is it really, now, compared with your first days at Douglas? Do you still have the same verve?"

"Well, I think so. But really not. It gets a little harder to get up and come to work every day. One of my friends threw it all in, sold it out, and bought a gas station in Idaho. I think maybe I'd like to do something like that. But not yet."

The Research Laboratory

One of the more fascinating jobs in the world is surely to be the one and only Computerman, with a capital C, in an entire facility. This is the position of John$_2$. He does everything required in computing by a research laboratory of a large corporation. The lab is full of scientists at the Ph.D. level. John$_2$ does all their computing work, assisted by one employee who is a combination keypunch and machine operator.

John$_2$'s two-man department does all the accounting, financial, and contract monitoring work of the laboratory. It also does the computing on every research problem posed by a lab researcher.



John$_2$ uses some of the biggest computing power in the world. His terminal talks to a CDC *6600 in Los Angeles and to* CDC *7600s in Berkeley and in Minneapolis. It talks to the eight* CDC *6400s in Bethesda which comprise the Kronos system. His 1100 lpm printer readily handles all the work load of the research lab.*

> I had to drive across town every day, and take my cards with me. Of course, I punched the cards myself.

But it was not always thus for John$_2$. His field of study at U.C. Berkeley was mathematical statistics. After graduating he taught successively at two large West Coast universities.

He first got on a computer after he

took a job in aerospace:

"We used the IBM CPC machines, but they were across town. I had to drive across town every day, and take my cards with me. Of course, I punched the cards myself.

"When the company started a new division, I got asked to go with it. We had our own computers. I became the Manager of Mathematical Analysis and

> I love what I'm doing. I hate to take vacations.

Programming. I guess I got in on the development of just about every big new application."

But after 17 years of heading up one of the country's top programming crews, $John_2$ was summarily laid off, along with some 1,700 of his fellow employees. For five long, black months he looked for work, but, of course, he was overqualified.

Then, in a remarkable instance of the triumph of justice, someone in his former company remembered him, and noted that the corporate research laboratory could use a qualified computerman. $John_2$ was called back to work.

Today he spends 90% of his time programming, and he is adept in just about every available language. The

> I can't think of any other place where I'd be interested all the time.

rest of the time he spends helping with keypunching or with operations.

We asked $John_2$'s view of the contrast between what he does now, and what he used to do:

"When I left my other job, before I was laid off, I had about 22 programmers working for me. We had access on-site to five IBM 360/65s. It was a different world."

"Which world is better?"

"This one, by far. There is no comparison. When you work alone, without interruption, you can really enjoy your work. The researchers here never use computers in person. I am in on every problem that we run. It's fascinating. This is just about as close as I can imagine to getting a perfect job."

"How are your relations with management?"

"Management appreciates the capability we have here. It's well-suited to the work that goes on. This is primarily a studious place."

"What goes on here, then, is really pure research, and no particular practical results are expected from it then. Is that right?"

"Well, it used to be that way. But it's changed to be more industry dependent. A greater portion of our funding comes from in-house whereas it used to be mostly government."

"So then would you say that the lab is expected to produce engineering things more than scientific things, in the sense that an engineer is sometimes expected to produce something that works, while a scientist may not necessarily be expected to achieve a practical result?"

"Yes."

"What if you had chosen another career? Suppose you were in a different line. Would things be better for you?"

"Well, the only comparison I can really make is with teaching. I was in teaching. This is surely better than teaching. In fact, I'm sure it's better than other things I can think of. I'm interested all the time here. I can't think of any other place where I'd be interested all the time."

"Does it get any more difficult for you to come to work? Do you find that you don't have all the starch you used to?"

"No way. Work is no more difficult —not at all. I love what I'm doing. I hate to take vacations.

"Morale is a lot better here than it used to be in my other job. Things are really just great."

"Do you have any comments on the world at large—the great scene in which we all make our little contributions, hopefully?"

"I don't know who I am to comment on the state of things. I get pretty disgusted sometimes, though, with the stupid leadership, or apparent lack of leadership we seem to enjoy. We should be preparing to go to Mars right now. We should keep advancing and make use of our technology. But we're not. We are sitting around with our thumb in our ear. I guess I really don't know what I can do about it. At any rate, I'm happy here, and I have a wonderful job."

Aerospace

For some time $John_3$ has been corporate Director of Computing for a large aerospace firm. One of his charges in this modern-day world has been to centralize data processing in

> I don't believe it is in IBM's best interest to solve my problems—or maybe any user's problems.

the company. Recently he turned his chair over to a former associate to become an in-house staff consultant.

$John_3$ has a somewhat atypical background in computing, and his management experience has been heavy. He has supervised large groups of people.

He attended Harvard and Brown, graduating in physics. His first work was with missile guidance systems from which he moved into analog computers. He got turned on to digital computers first by being assigned to a group to evaluate their use in dynamics problems.

$John_3$ joined the development lab of a large computer manufacturer where

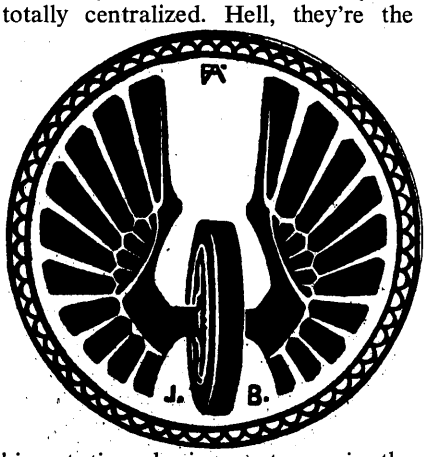
> This whole idea of centralization is a crock.

he had charge of system software for a new product line. His next stop was as an executive of a systems and software company, whence he graduated to his present spot.

He talks volubly about his place in the world:

"Life is pretty easy this year. I'm not doing anything.

"Look at those folks down the street. Now they tell the world that they are totally centralized. Hell, they're the



biggest time-sharing customer in the world.

"Business around here is level. Things aren't increasing or decreasing. There are no big upheavals. We aren't in the middle of any damn equipment changes. We have enough capacity. Nobody is making waves.

"You ask me what I think about the state of the world. I'm a project leader, not a philosopher.

"Things are level here, and there's no sense changing them. Every month our reliability improves. Every month the throughput goes up. That's what can happen if you just let it run and don't diddle with it.

"That's why I decided to change chairs. If you're not in trouble, people don't need you. Hell, the place can run itself this way.

"This whole idea of centralization is a crock. It's got to be. What we've got to do is move out to the periphery of the organization, let the guy with the real problem have hands-on capability, with terminals if necessary. But prob-

ably the little machines are going to do it. Do you realize that the cost per bit of storage these days is less in the IBM 5100 than it is in one of the big mothers? The mini's are going to win out. Look at these new little machines. They've got all the capability, from the user's standpoint, of some giant machine, and they cost less, overall, per operation.

"Our top talent is rested these days. It's time for them to take a good look at the world, because the old ways are crumbling.

"We've done something that would have been unthinkable five years ago. We have totally ignored the latest release of the operating system. This is damn close to heresy. But I say forget staying current. The aggravation is not worth the miniscule benefits, if any.

"But we don't have enough smart people. It's too easy just to follow along. When we get smart we'll have big machines for big problems and forget all this other crap. I don't see the exercise of spending $14 million getting centralized to find out it doesn't work that well.

"We keep getting told that each new system breakthrough is just wonderful, and I don't believe it.

"Sometimes I think I don't believe anything anymore.

"I don't believe it is in IBM's best interest to solve my problems—or maybe any user's problems.

"I've gotten convinced that IBM has a monopoly position, and they use it to prevent technology from getting to the customer. They're going to fight to perpetuate the myth of centralized data processing. They think they have too much at stake. This kind of a misguided fight can damage them greatly.

"Meanwhile, we take what we can get that's any good.

"Some of our current system design is idiotic. We've got these records which originate about 35 miles from the computer center. We truck them off 30 miles to another facility to be keypunched. Then we truck the cards another 30 miles to the center to be processed. Then we truck the results back to origin. This takes about two and a half days. It make no damn sense. But, of course, the data processing people can't see that it makes no sense.

"In some ways this is an unsettling time. We can't see anything significant happening in IBMland. About the most anybody can promise to offer you is 5% improvement in anything. Maybe it's the lull before the storm."

"Do you have any specific thoughts about computing in the world at large?"

"Well, I've learned that the way to go is first of all, do what you want to do, and the rest takes care of itself. That's one reason I've decided to turn myself into a sort of professor. We could use a few more experienced professors.

"Computing is going to be a part of everybody's life, not just a specialty. The specialists better get used to that, whether they like it or not."

"Has your work been rewarding, compared to other things you might have done?"

"I've got the best of all possible worlds. Computing is unique in the sense of achievement you can get. I found out some time ago that I'm no entrepreneur, but this is where the action is. I've never been able to understand doing something just for money.

"The rewards are great in computing. Of course, when I started out I didn't know what I wanted to do. I've had a great time programming. Software is more fun than hardware.

"But then, on the other hand, you always get to the point where there is nothing new and different. You end up running a bunch of plumbers. Then you've got to look for the next place that hasn't become a plumbing shop."

You always get to the point where there is nothing new and different. You end up running a bunch of plumbers.

Education

John4 has 16 programmers and 7 analysts reporting to him. They all work in the office of the County Superintendent of Schools of a large county.

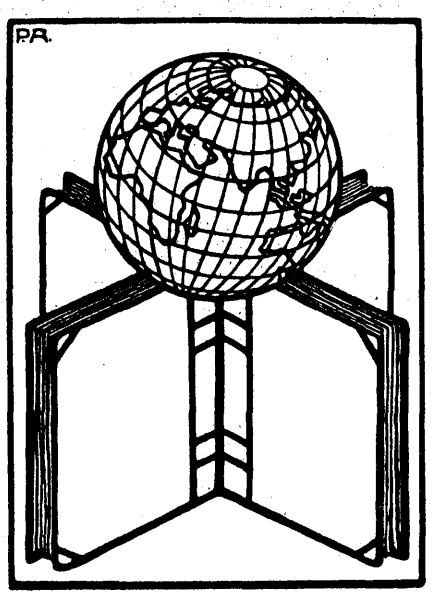
The Superintendent's office reports to an appointed county school board whose members, in turn, report to the elected governing board of the county. There are 95 school districts in the county, all independent. Services are provided to all of them, at no direct cost. Thus John4 and his people provide the software which structures the programs for 93 school districts. The other two, in big cities, have their own capability. Some smaller districts have partial capability.

John4 graduated from the Univ. of Illinois in math, and went to work for the State of Illinois in the conversion of unemployment records from EAM to DP. When his draft board called, he went off to spend time with the U.S. Army as a programmer at NORAD Hq. and later in Alaska. Before he returned to civilian life he had become a programming instructor.

He then went to work in a big aerospace company as a project leader heading a team of seven programmers. He worked in engineering record keeping and data base management, and, in his spare time, taught at night at Control Data Institute.

John4 has been with the school superintendent's office for five years now. It is his opinion that the things he knows how to do could have wider use in education:

"We seldom get down to the things in the real world that affect kids. I may be confused, but it seems to me that pupils are the reason we have schools.



But there is big teacher resistance to letting anyone offer assistance to classroom instruction. It seems to be partly that they don't know anything about computers, they have no insight into what computer-aided instruction or testing might be, and they are afraid. They are afraid to find out, and afraid that someone else will find out what they really do.

This place is fantastic, technologically, but the politics make it frustrating.

"I can envision that we should have lots of terminals out in every school district, and a few minicomputers strategically placed around. We are too geographically spread to run everything into and out of central like some cities do, or try to.

"But our analysts have to tailor our products to each district. No two ever want quite the same thing, and local school boards and administrators are very jealous of their home rule rights. We have a continual stream of requests to enhance and modify programs, and some of the requesters have no inkling of the costs or time spent to do what they demand, and no understanding of computer systems whatever."

"How does your work here compare with what you did in aerospace or the

military?"

"Well, I've had a better than average career wherever I've been. I like working with computers. When I was in school I thought about a career in flying. Maybe that would have been better. It still fascinates me. But I got in at an early age for EDP. The field was new. It still has plenty of room for growth.

"This is still a good field for people to get into."

"The world of computing, you mean?"

"Yes. There are going to be lots of additional uses. I can see that we could be using computing here for simulation and prediction. We used to do things like that in aerospace—inventory prediction, costing, pricing, need and quantity prediction and things like that.

"We could do that here and give administration the information on which to make a decision. But they'd just go make it based on hunch or superstition anyway. They have no reliance on a computer.

"There are a lot more problems to

> My staff has low motivation. We live in this civil service type environment, and nobody really has to do anything . . .

be solved in the educational environment. But there is this complete caste system. Those people and teachers and administrators who are known as certified employees have their own little world. They automatically class all other employees as lower rank. If you aren't a certified employee, you are low man on the totem pole. Some of my people have teaching certificates, and they are as well or better educated than a lot of people who think they are teachers because they have the rank. Because we've got an oversupply of teachers, or because of preference, or whatever, they work in computing. This automatically classifies them as second class, and not worth listening to.

"And if you aren't a graduate of you-know-where, at least if you didn't go through their education mill over there, you don't get a job in school administration. Not in this part of the world. It's a closed club, buddy, and if you don't have the membership card, forget it. And they do all this with public tax money.

"We could be of big help in career guidance, vocational guidance, many useful things. The software is available to do many things. The state universities know where it's at, but the public schools—forget it.

"About 20 of our districts have some EDP capabilities. They do some work. The two big ones, of course, do all their own work. But these other 20—would you believe it?—they look on us as a bad threat. Even though everything we do for them doesn't cost a nickel—to them—they'd prefer to have the public pay for duplicating everything all over the world so they can feel safe in their cushy little empires.

"Educators are the last people in the world who really want any innovation. This place is fantastic, technologically, but the politics make it frustrating. We

> We could give them the information on which to make a decision. But they'd just go make it based on hunch or superstition anyway.

come up with proposals which are sound, economically viable, will clearly save money, and all those things. They never even get a good hearing because of the political climate—among educators, that is. Whenever anybody wants to go to the bathroom around here, he better first consider the potential effect on each of 95 school districts.

"The last thing they want is some method to measure achievement. Forget it. They can blow up smoke ad infinitum. A trained educational administrator can change the subject forever—he can even sound almost like he's saying something—if anybody dares to suggest a method to measure what the hell he really does, or what the results are. They have got more issues to confuse the issue than you ever heard of.

"It seems to me we could have more accountability in the schools. People ought to be able to find out what schools do. Maybe it's better that they don't find out. The governor has asked for more accountability to the public from the public schools. He'd like to be able to measure results. I think that's a good sign that the elected officials are thinking about it. Of course, it will be a cold day in hell when he gets it.

"No business would operate this way. They'd be down the tubes.

"Take, for example, an absent teacher. Say he's got a year's leave of absence. They hire a substitute. Of course, the substitute, not being a full member of the club, doesn't get paid as much. Say he gets paid half. The absent teacher gets paid the other half. He gets paid with public money for sitting on his duff in Italy, or in the hospital, or wherever he is.

"The educators have all these societies they belong to. They accomplish nothing.

"There's a state committee of teachers that meets on data processing matters. For three years in a row the annual progress report has been the same thing—nothing. Of course, the real requirements change every day.

"If public schools were related to the private sector they might do something that looked more like progress. They are a long way behind even the universities.

"Data processing needs more acceptance from educators. Everywhere you look it's under control of the business function, and has really nothing to do with education.

"My staff has low motivation. We live in this civil service type environment, and nobody really has to do anything in particular because they won't get fired. Neither do they quit and go someplace else, so the turnover is essentially zero."

"Do you intend to fill out the rest of your career here?"

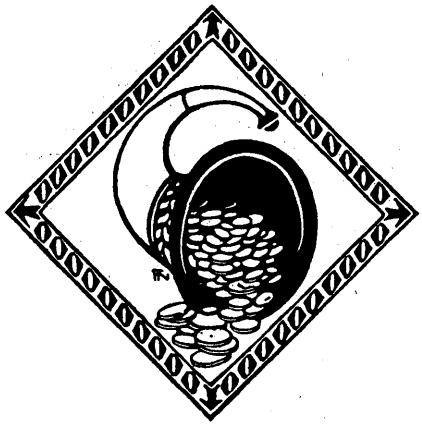
"I hope not. I'm going to try about two more years of it because it really is a place where I can learn a good deal, and not all of it is about computers.

"Then I'll go back to the private sector when I can have a real and fulfilled sense of accomplishment.

"Of course, to be fair, I've had a sense of accomplishment here. The real reason I have is because all of my predecessors did nothing."

Banking

The typical bank in the United States is a small one. Some states do not franchise branch banks, and many



old banks do not grow large. Then too, new banks are always forming, backed by local businessmen.

Because for every Bank of America or Chase Manhattan there are hundreds of small banks, John5 has the kind of job he has. He manages a service bureau, resident in a small bank. His operation serves seven out of the ten independent banks in three sparsely-populated counties.

John$_5$ has a lot of background in banking applications. He graduated from Georgia Tech in math and industrial management, and IBM *hired him out of the master's program in data processing at Wayne State Univ. to become a system analyst helping Detroit banks.*

He went through the ranks at IBM *up to marketing in a district office, then joined a service bureau company which served banks.*

He is now with the second such company, one that, through its various service bureaus, does all the computing for over 400 small banks.

John$_5$ is enthusiastic about the work he does:

"We provide all customer accounting. We also do the in-house accounting. We keep the bank's ledger, and we prepare all the financial reports."

> Data processing is an excellent career. There isn't anything else I could have picked that could compare to it.

"What equipment do you use?"

"We use a 360/40. The machine is twice as big now as when we took it over. We keep adding to it. We rent our space from the bank here in the headquarters building. To them we are a paying tenant as well as a supplier."

"Is your machine on lease, or do you own it?"

"The initial configuration was owned by the bank, so we lease from them. We also lease from IBM, and we lease from the independent suppliers whose equipment we use.

"We have 33 employees at present of whom 5 are analyst/programmers, one customer service man, two administrative people, and the balance are operators."

"Is your work pretty cut and dried. I mean, do you just get in the checks and deposit slips and crank them through every day?"

"Heck no. This is exciting and interesting. Banks are on the threshold of some vast changes and exciting developments.

"For example, we're working on electronic funds transfer. In fact, it's already with us in a few places. With the use of terminals we're going to have access to accounts by customers on-line—merchants—even in the home. We'll have the tellers on line. Any branch will be able to communicate with any other.

"As you probably know, this bank has Docutellers out on location. The person with a card can make a transaction at them at any hour of any day. Of course, they aren't on-line. They are serviced on a schedule. But we have plans to put them on-line.

"Actually the savings and loans are ahead of the banks in some respects. You can do a point-of-sale transfer at the big supermarket across town. They have an arrangement with the S&L, and, if you have your account there, you can buy your groceries from your savings account."

"It had never occurred to me to do that. But I notice that it takes me longer to buy with a check in a supermarket than it does to pay cash."

"There are two banks right now working on an on-line check guarantee service. The terminal right in the store will verify your check. Of course, for this to work, all the banks will have to agree on a common computer switching network.

"The savings and loans are ahead of us here. too. They have already formed an association to develop a computer switching network. The banks will do it. I don't know what the final configuration will be, or who will operate it, but it will come."

"How do you view your career. Are you happy here? You seem to have built your own job, in a very real sense."

"Data processing is an excellent career. There isn't anything else I could have picked that could compare to it.

"There is an excellent opportunity to learn a lot here. Our customer banks don't make any policy decision without us. We confer with them all the time—at their invitation. We're real members of the team, and it's an impressive team."

> I'm encouraged to see that the computing public understands what a bad scene the 370 is.

"What do you think about the industry as a whole?"

"I wish you hadn't brought that up. I've just notified IBM that we are changing our maintenance vendors because we're pretty unhappy. It's been bad with them lately.

"They came around here, ingratiating themselves, and offering to be a part of our study group—at their expense, of course. They offer assistance, or so it's called. But the relationship has been very poor lately. We don't want them in our study group.

"You see, we don't sell software as such. Any bank with whom we are affiliated can make use of any program we have, and there is no additional charge for this. We do buy software, though. And we buy it from banks, frequently. We even buy it from banks with whom we don't work. Or we'll buy it from vendors such as Burroughs.

"It's too bad. IBM has turned in some really great performances, but I think they are a monopoly and should be busted up. Others cannot really compete with them.

"I'm encouraged to see that apparently the computing public understands what a bad scene the 370 is. It sure is. It just has not proven to be the improvement over the 360 that it was claimed to be. And, surprisingly, the users see this.

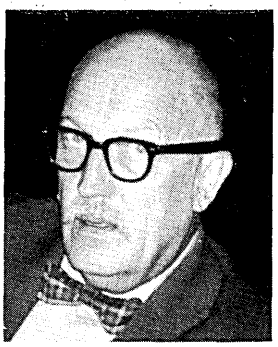
"I'm glad I came here. I would never learn about business at IBM. I couldn't get the broad scope of understanding that I get here, and live in the midst of, really. That's not a fault. It's just the way IBM is. Big and departmentalized, you know. I could only see a tiny corner of the real world there. Here I see it all."

And so we finished our conversations with our various John$_i$, thanking each of them. While we had heard some discouraging words, we were in an overall uplifted mood.

Certainly the world of computing is not, as some dire pundits had yesteryear proclaimed, populated with robots. We had not talked to a group of followers. Excitement with innovation was a common thread of much of our discourse. Apparently computing still offers challenge and opportunity, and its practitioners get caught up in it.

Nor is there undue satisfaction with the status quo. Our various John$_i$ are movers and doers. They are going to form their own opinions and move in their own directions.

We are left with having met some vital and interesting people. Our prognosis for the future is a hopeful one, seasoned lightly with caution. ✲

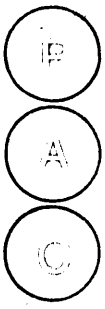


Mr. Granholm's dp experience began when he programmed dynamics problems on the IBM 602A and 605 for Boeing. His background includes both hardware and software apprenticeships, as well as consulting for various electronics firms. He has been a rather regular contributor to Datamation for over 15 years.

You're OK But I'm Still the Boss

by John L. Kirkley, Editor

Drivers in your head? Crossed transactions? Transactional Analysis is shaking up some of those old, cherished management concepts.



Being a manager in business data processing isn't getting any easier.

Not only are you expected to keep up with the latest products, but you should be familiar with your company's objectives and the ins and outs of your industry as well. And to cap it all you must be a master of the black art of management.

At times it's like wading through a sea of managerial alphabet soup. There's M.B.O. (management by objective), O.D. (organizational development), and J.P.G.s (job performance guides). And, if you're metaphysically inclined, you might even consider on-the-job T.M. (transcendental meditation) to bring tranquility to your staff.

O.J.T. meditation may be a passing fad. But another set of initials, TA (for Transactional Analysis) is an approach to human behavior which seems to be spreading through the business world like an underground messianic movement. Brought to national prominence through such books as *Games People Play*, by Eric Berne; *I'm OK, You're OK*, by Thomas Harris, and *Born To Win*, by Muriel James and Dorothy Jongeward, TA promises an approach to getting a handle on that perplexing, often frustrating process known as human interaction—the most difficult aspect of the manager's role. Using simple, often colloquial language, TA emphasizes practicality and avoids abstruse theorizing; for example, TA identifies three major parts of the personality and labels them simply "Parent," "Adult" and "Child."

Why the interest in these concepts? From a purely bottom-line perspective, people represent a growing corporate financial commitment. In the not too distant future fully 90% of corporate dollars could be allocated to "people costs," according to William Rothamel, Univ. of Illinois, a panelist at this year's National Computer Conference. Today's dp manager is already spending more than half his budget on personnel related expenses (see "1976 DP Budgets," February, p. 51).

Job satisfaction

More than money is involved. The old work ethic is under attack; employees are reaching out for an intangible something called "job satisfaction." The day of the autocratic manager is dying. And the pressure is on management.

Pat Coleman, a management consultant who heads Resource Development Associates in St. Paul, is one of a growing number of consultants who have adapted TA teachings to the corporate environment. He's spread the word to dp personnel in firms like Control Data and the First Computer Corp. (dp arm of St. Paul's First Bank Corp.) and to managers at industry giants like General Motors.

According to Coleman, the Parent, Adult, and Child behavior states, or ego states, reflect the three parts of our personality. He says, "Every time we interact with others we are operating out of one of these three ego states." A healthy, developing personality supposedly operates out of all three ego states at the appropriate times—no one ego state is "better" than the others.

Our Parent state is sometimes nurturing, helpful, protective, kind, but it can also be judgmental, domineering, and blindly opinionated. The Child state is equally multi-faceted: sometimes free, spontaneous, playful, sensual; at other times sullen, fearful, angry and selfish. Borrowing from our industry, TA practitioners characterize the Adult as our "data processing facility," the objective, unemotional, fact-finding part of our personality.

When the egos mesh

Like any other soft discipline, TA finds scientific solace in formulating laws. A fundamental TA rule is that when transactions between two people are parallel, they are complementary and can go on forever. Witness two happy Child ego states at play (forget the chronological age). Or those interminable conversations when two critical Parents join in complaining about the government, taxes, and the general stupidity of those in power. The two ego states mesh, and the action is underway.

But when the conversation breaks down, when one or the other becomes hurt, angry, puzzled, it's likely that a crossed transaction has occurred; that is, an unexpected response has been given, as when a hurt Child tries to contact a nurturing Parent and confronts instead a dispassionate Adult.

Conflict with the boss

At the time of our interview, Coleman had just been talking to an ex-workshop participant, a manager from General Motors he referred to as John. Seems that John had a major conflict with his boss, Coleman explained. The man was never available for a one-on-one conversation; he was, it seemed to John, deliberately avoiding any kind of confrontation. Coleman said that John had been in a meeting that morning where his boss had said some very negative things about John's department—"hooking John's scared Child." John told Coleman that without the TA training he would have gone to lunch, had several stiff belts, and then returned to work either to blow his stack or sulk in his office. This, he said, had been his pattern *for 30 years.*

Instead he had an alcohol-free lunch, entered his boss' office and said, "This door is going to stay closed until I've expressed my feelings about what's going on and you have expressed yours." Both men, using their newly learned TA orientation, talked for over an hour. Turns out the manager felt threatened by John's superior job performance, fearful that his own job might be in jeopardy. According to Coleman, John was afterwards "on a real high . . . he felt that he and his boss had come to significant understanding."

Another happy TA user is Ernie Costello, vice president of personnel at the First Computer Company. Over the past several years, the company's management, systems analysts, program-

mers and customer service people have all been exposed to Coleman's brand of TA for business.

"Not a fad"

"Everyone who has been involved feels that he has a better understanding of himself and others," says Costello. "Our managers like it and have given it widespread support. TA is not a fad—it's a basic approach to understanding human behavior. And it's practical; you can use it."

Is there an ego state relationship that is characteristic of the business environment? Yes, said Viola Callaghan of the San Francisco TA Institute. "The relationship between the supervisor and the employee in most organizations is that of Parent-Child," she said. Coleman agrees, warning that the disadvantages of this situation far outweigh the advantages. Without giving up his decision-making prerogatives, the manager should strive for Adult-Adult relationships whenever possible even though there will be many times when his Parent or Child ego state are appropriate.

Coleman has adapted a new TA concept to his message to managers, a concept that he says has "TA standing on its ear."

Locked inside our heads since childhood are a set of insidious commands known as "The Drivers," according to this latest TA theory. Although all of the commands influence our behavior, one is usually dominant at any one time. They are:

1. Be perfect . . . never make mistakes, be critical of other people's imperfections.

2. Be strong, show no emotion, be macho, be tough.

3. Hurry up.

4. Please others, be nice.

5. And, of course, try harder.

The corporation often demands the first three drivers: "be perfect, be strong, hurry up." Unable to meet these demands (which, in reality can never be satisfied) the hapless employee falls back on his "please others" and "try harder" drivers. The results are predictable and often disastrous.

Off and running

TA is relatively new. Developed by psychologist Eric Berne, TA moved from a theoretical idea to an institutional reality with the founding of the International Transactional Analysis Institute in February 1958, in San Francisco. When Berne's book, *Games People Play*, made the *New York Times* best seller list in 1964, TA was off and running. Today the Institute has a full-time staff of 25 and over 10,000 members in this country and abroad.

Despite the bureaucracy implied by the founding of an institute, TA seems to remain a loosely structured, grassroots movement. The word is spread by students who in turn become teachers—a psychological "chain letter" that is bringing TA's slangy, easy to understand analysis of complex human behavior to even that bastion of conservatism, the corporation.

Dr. Dorothy Jongeward, a pioneer in the application of TA to management, is a case in point. She shuttles from coast to coast, giving workshops entitled "TA in the Working World" at such idyllic retreats as Cape Cod and Carmel. President of her own company, the TA Management Institute, in Orinda, California, Jongeward has trained a dozen disciples around the country to handle TAMI's overflow or companies who cannot meet the considerable fees she can now demand.

She's not alone. The International Institute couldn't tell us how many consultants are bringing the TA message to business but, with quiet fervor, they commented, "we're really growing."

Unfortunately TA is not like a long-lasting vaccine—one shot and you're set for life. According to Coleman and others we talked to, there is a fairly rapid fall-off period after the first enthusiastic response to a TA seminar or workshop. Regular reinforcement through refresher workshops and advanced classes in TA concepts are necessary, claim the consultants.

Basic simplicity

TA originally began as a psychotherapeutic method, a technique to be used only by specialists. The fact that it has been moving successfully into the business environment for use by "lay-persons" testifies to its basic simplicity and practicality.

It also testifies—to use more TA slang—to an immediate and worthwhile payoff. And not just in bottom-line dollars. All of us, whether we're fulfilling the role of manager or subordinate, or both, spend a great deal of our lives working. More and more, management is hearing demands for "job satisfaction," for an environment that provides more than just homage to the work ethic plus a weekly paycheck.

In the introduction to *Working*, author Studs Terkel describes what his landmark book is about: "It's about a search . . . for daily meaning as well as daily bread, for recognition as well as cash, for astonishment rather than torpor; in short, for a sort of life rather than a Monday through Friday sort of dying."

TA, claim its supporters, can help in that search.

Some recommended reading:

Berne, Eric. *What Do You Say After You Say Hello?* Grove Press, 1972.

Bernie, Eric. *Games People Play*. Grove Press, 1964.

Harris, Thomas A. *I'm OK, You're OK*. Harper & Row, 1969.

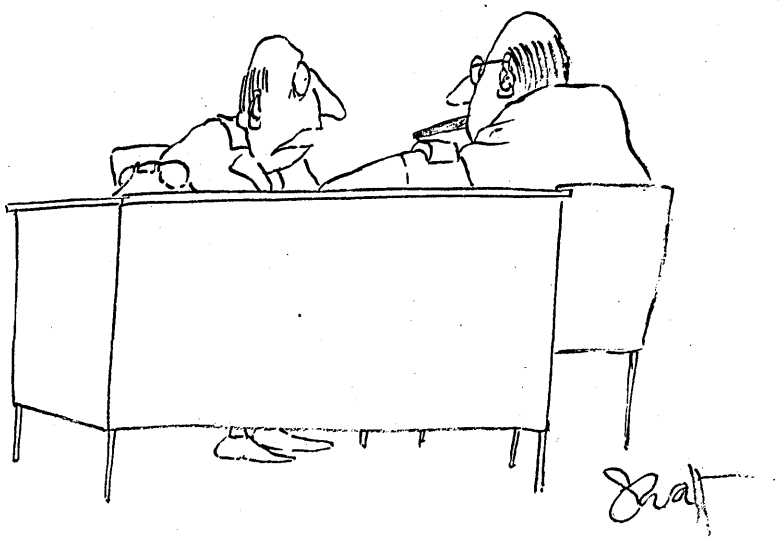
James, Muriel, *The OK Boss*. Addison-Wesley, 1975.

Jongeward, Dorothy. *Everybody Wins: Transactional Analysis Applied to Organizations*. Addison-Wesley, 1973.

James and Jongeward. *Born to Win*. Addison-Wesley, 1971

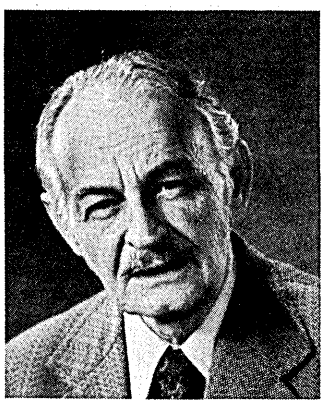
Steiner, Claude, *Scripts People Live*. Grove Press, 1974.

Terkel, Studs. *Working*. Avon Books, 1972. ❋



"But I don't want to go with you to your management seminar as an example of an organizational problem."

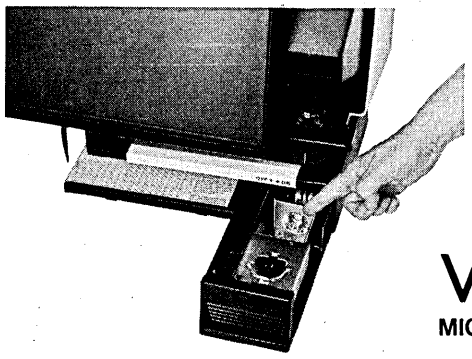
"We looked at the best COM readers on the market. And they weren't good enough."



Ned Graef, Chief Engineer
Research and Development
Microform Products Div.
Realist, Inc.

"So we built a reader that's brighter than anything you've seen before. The Vantage COM IV. In fact, it's 250% brighter than our previous model, and that was one of the brightest on the market."

"We achieved this brightness without sacrificing lamp life. Our tests confirm 1000 hours of operation with high intensity viewing, and up to 2500 hours with low intensity. That's the longest lasting lamp on the market."



"Of course, we didn't change everything about our award-winning design. We still have the only true drop-in lens system, so you can change lenses without dismantling the machine. The COM IV offers dual lens and dual carrier options, along with a complete range of lenses from 20x to 85x, for unexcelled versatility. And our Vari-Optic zoom control gives you 25% more picture from any lens. We designed same-way scan, too, so that the image travels in the same direction as you move the carrier.

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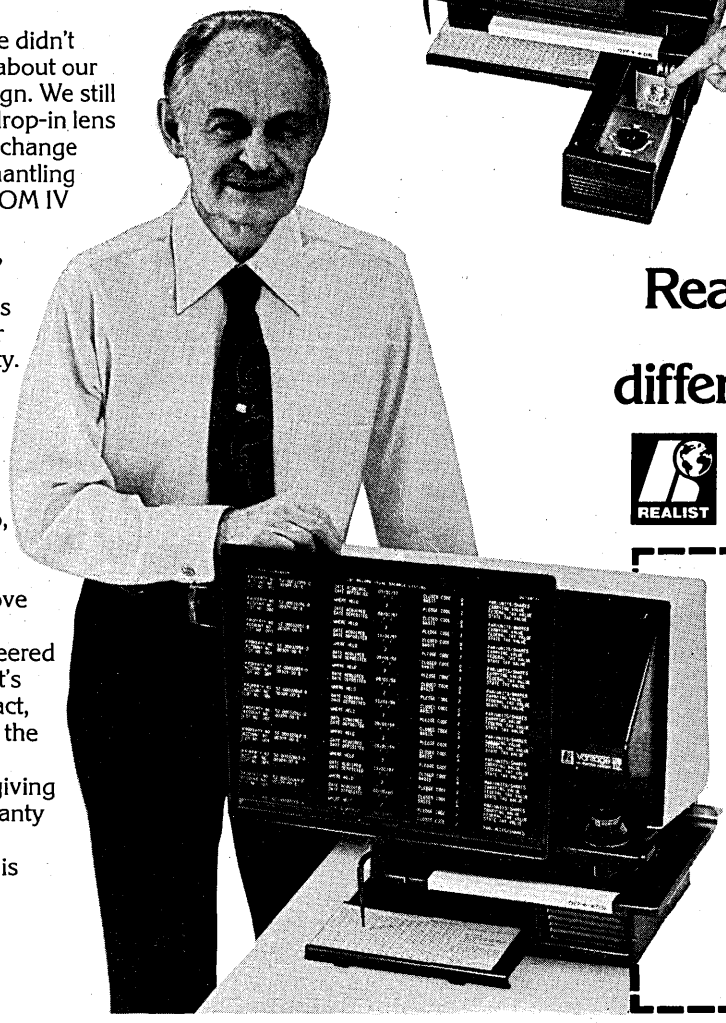

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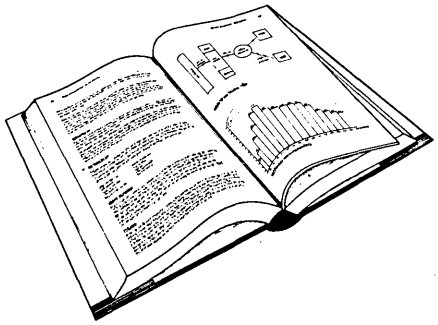
CIRCLE 62 ON READER CARD

Eurocomp

Eurocomp – The European Computing Congress – is Europe's major annual computing event. Attracting participants from all over the world, it runs every Fall in London and each year focuses on topics of specific concern to computing professionals.



Delegates

Eurocomp 76 comprises two international conferences:

Computer Performance Evaluation

Software Systems Engineering

The two conferences will run in parallel at the Heathrow Hotel, London Airport on 14-16 September 1976.

The Computer Performance Evaluation Conference will be chaired by Philip Kiviat, Technical Director of FEDSIM in Washington DC and a wide range of theoretical and case study sessions will examine:

Systems modelling & simulation
Workload definition
Systems performance measurement
Performance evaluation & management

The Software Systems Engineering Conference will be chaired by Professor Brian Randell of Newcastle University, UK and session topics include:
Software management
Systems reliability & portability
Design tools, testing & validation
Systems structuring
Languages & operating systems

A 32-page brochure listing the full conference programmes and including registration forms is available on request.

Speakers

Eurocomp 77 will have as its theme:

Information Dynamics

The conference, which will be held in London on the 19-22 September 1977, will investigate the worldwide status of on-line information systems – both their design and application.
Sessions will specifically examine both the transportation of computer stored information over networks and also its subsequent handling so as to serve user requirements.

If you are working in any of the fields listed below and would like to submit a paper for presentation at Eurocomp (or publication only), please write for a Call for Papers leaflet.

Networks – both public and private
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Communications software
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Regulation, standardisation & tariffs
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Proceedings

The Proceedings of Eurocomp constitute an up-to-date, permanent record of the international status of the particular topic area investigated.

Eurocomp 74 covered the whole field of computing–however it focused on:

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All the people who bought our DUMB TERMINAL (the ADM-3) because of its low $995* unit price didn't really expect a lot. But they hadn't counted on the 32 switches. Switches that let you turn the DUMB TERMINAL into a pretty clever animal.

Take the 20 switches under the LSI name plate, for example. Among them, 11 communication rate positive action switches that let you select bauds from 19200 to 75. Also an RS232 interface extension port switch. It allows you to connect the DUMB TERMINAL to all kinds of clever devices — to recorders, printers and smarter terminals. And switches for odd-even parity. Optional upper and lower case (the complete set of 128 USASCII characters) — plus a lot more.

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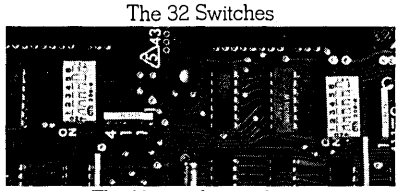
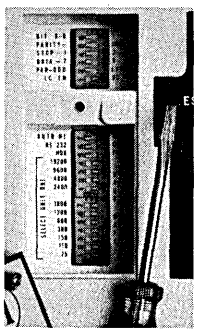
The 32 Switches



The 12 switches in the rear, on the PC board.



The 20 switches under the front name plate.

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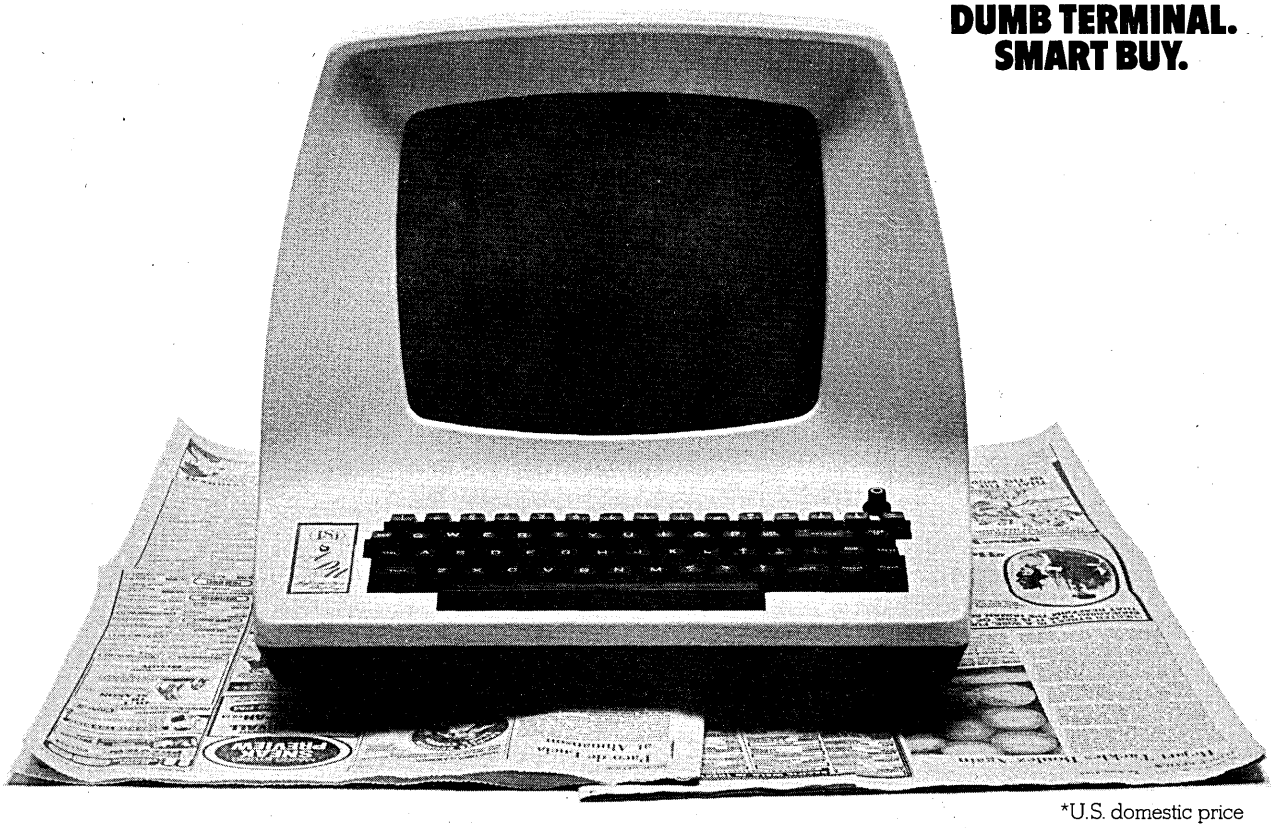

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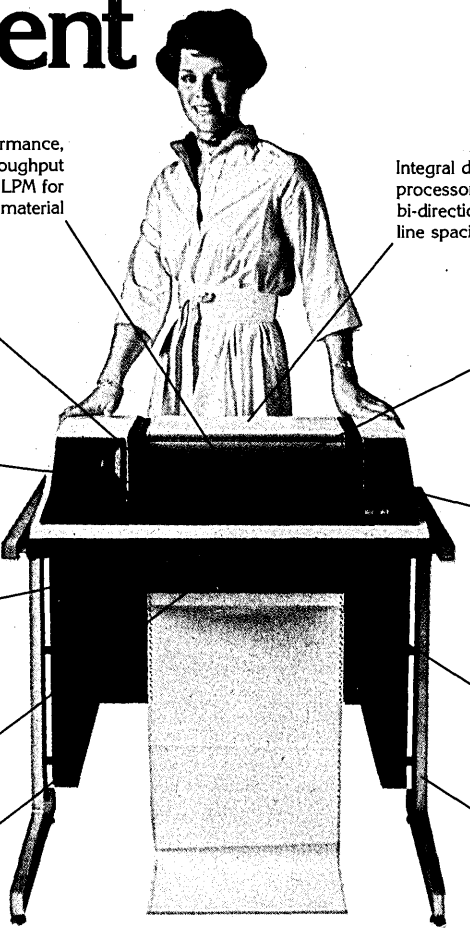

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Voice Recognition Comes of Age

by Edward K. Yasaki, Sr. Associate Editor

No longer laboratory toys, voice recognition systems are beginning to do real work in data entry and control applications. The results, especially for data collection, are increased productivity and decreased error rates.

The Monsanto Company in Missouri has to contend with 25,000 pieces of mail that arrive each day and the need to find the correct mail zones for each. To make the job easier, letter-size mail is handled by an electronic mail sorter; anything larger than that must be handled manually.

They streamlined the sorting task by using voice input. An operator wearing a microphone headset reads aloud the initial of the first name of the addressee and the first four letters of the surname. On a small crt in front of her, the employee's name and mail zone appear. If the five alpha characters she has input can apply to a number of employees, they are all listed for her to select from. According to a Monsanto spokesman, the system has doubled the speed of mail processing at the facility.

The operator, of course, could accomplish the same thing merely by keying in the five characters. But she has both hands busy handling the mail, which is anything but standard in size or shape. Thus the voice recognition system frees her hands for the job she must perform. In other applications, it frees hands and eyes and enables the operator to move about. It gets around the difficulty and awkwardness of having to pause and write down or to key the data being collected.

While there continues to be a place for the traditional methods of getting data into computer-readable form, it is also clear that voice data entry is appropriate and even ideal for a growing number and variety of applications. Where a voluminous amount of numeric data is to be entered, for example, keyboarding or optical reading may still be the route to take. But when words and alphanumerics are to be entered, users are finding voice input to be cost-effective.

A natural for data collection

In the data collection process, the advantages are evident. With the ability to speak data into a computer, one bypasses the writing of that data and keying of data to get it into machine readable form. The time saved alone can often justify going to voice input, not to mention the cost associated with the writing, keypunching and error-correcting activities.

Another example of the hands-busy application is in the warranty management program of a Midwestern manufacturer. Compressors returned for service must first be examined by a technician in the service department. He notes the type of compressor, its serial number, customer's name, and other pertinent data that formerly had to be keypunched. No longer must he memorize a serial number long enough to write it down on a form. In addition to allowing him to read aloud the number, thereby capturing the data, the system will also catch some errors. In the serial number BJ1076C, for example, the system will notice that the motor designation B and the year 76 are incompatible combinations, and thus alert the operator to the discrepancy.

In both of these examples, the system being used was made by Threshold Technology Inc., Delran, N.J., which claims more than a hundred input terminals installed. Threshold's systems, as with all the systems discussed here, are "discrete" or "isolated" word recognition systems. That is, the speaker must pause briefly between each word. The envelope of silence surrounding each word uttered must be at least a tenth of a second, a quarter of a second for some devices.

The user, initially, must "train" the system to recognize his enunciation of the words in the vocabulary. This is done through repetitive utterances of those words to produce a reference pattern that can be stored in core, or on a disc or cassette. After this training, the system will respond to the user's spoken command with an appropriate action. This action might be as simple, in effect, as depressing a key; it could be as complex as executing an entire computer program.

One system, designed by Scope Electronics Inc. of Reston, Va. for programmers who are severely disabled, will store some 50 COBOL statements so that the user doesn't have to spell out each word. The user will say *dimension,* for example, and the system will output the ASCII characters for DIMENSION—plus probably a space at the end, since that's always there. In a similar system for the blind, the action also includes a voice response for verification purposes.

In operation, Scope's voice recogni-

tion system accepts an audio signal that comes from either a microphone or telephone. This signal is passed through a spectrum analyzer that consists of a number of bandpass filters covering the audio spectrum from roughly 200Hz to 5,000Hz. The screened input from these filters is fed through a multiplexor to an analog-to-digital converter, so that the energy values are converted to an 8-bit code. From there on, everything is processed digitally.

Scope stores its vocabulary of reference patterns in a Data General Nova minicomputer, while Threshold Technology requires no ancillary mini.

Basic systems today seem to handle a vocabulary of 20-40 words, expandable by adding memory size. For example, Scope's Voice Data Entry Terminal System (VDETS), a multi-user programmable system, uses an 8K Nova, which is good for a 40-word vocabulary. For 400 words, they might go to a 16K model. These figures are approximate, for it depends also on the actions that must be taken by the system with each spoken command. And in this system the executive software takes up 5K of core.

Really language-independent

According to Threshold's Arnold J. Popky, a Naval group recently made a test of Threshold's system, using a 17-word vocabulary that included the 10 digits, plus such commands as *code*, *height*, *clear*, *erase*, and *enter*. The words were spoken by men and women in these languages: German, Polish, Tagalog, Russian, Armenian, French, Czechoslovakian, Japanese, and Swahili. And it showed that the system couldn't care whether the user chose to say *one*, *uno*, or *ein*. "So it's really vocabulary- and language-independent."

This reporter tried one of these systems, training the Threshold device to understand two phrases after three repetitions each. It worked. I then said some of the numeric digits that are in the vocabulary, and although the system had not been trained to recognize my voice, it scored perfectly on the digits. Stretching my luck, I went on to some of the other phrases in the vocabulary, but this time scored poorly.

A system will handle a number of simultaneous users, in time-shared fashion. Of course each must train the system. For each on-line user, there would be a user station with an audio amplifier which could be set to match the user's speaking level. There's also a display, which provides feedback for visual verification, making it possible to achieve nearly a 100% throughput accuracy rate. The display can also be used to provide prompting messages that will lead the user through an input process from start to finish.

Hardware vendors say a system's recognition rate is approximately 97% or so on the first try, once the training process has been completed. Those are minimum numbers that appear to depend less on the user's educational level and more on his level of confidence. What's required during the training phase is that the user enunciate his words in a normal manner, the way he would be speaking while he performs his job. If he does that, it will not be unusual to achieve a near-perfect recognition rate to begin with, if not soon thereafter. In any case, the user speaks his data, looks for visual verification, then says *enter* or *go*, before that data can be input.

Prices for speech recognition systems range from $10,000 to $20,000 —and up, as they say. Users at a number of organizations are said to be interested not in one or two systems, but rather in having a large number. For them, apparently, it becomes economical to think in terms of specialized microcomputer-based systems.

"We can use the VDETS as a sort of development tool [for tailored products]" says James W. Glenn, research scientist at Scope Electronics. Noting that it is a programmable system, he adds, "And when you get something you think you want to reproduce in quantity, we can do that in a microprocessor without rewriting the software." He says the current system can be transferred to the microprocessor version of the Nova mini, but was unable to predict the extent of the price reduction that would result.

A technology in search of applications

Scope is currently developing a system for the U.S. Army Electronics Command that will store a structured vocabulary of 304 words and support 64 speakers, up to three users being accommodated simultaneously. It will have a voice response capability as well, allowing two-way voice communications over radio links and field telephone lines. The log-on procedure for users is to include a speaker verification check.

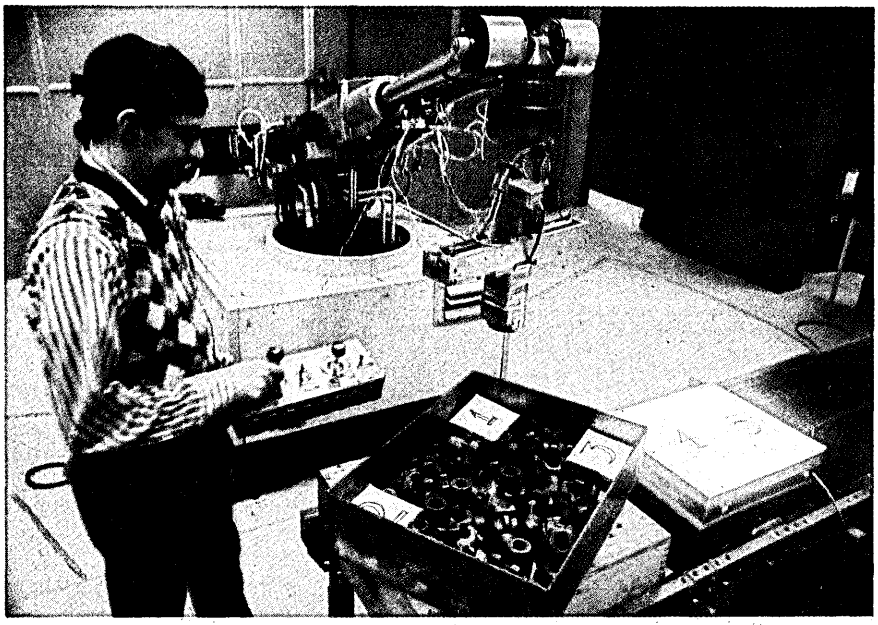
Interest in this technology has also been shown by the Air Force. At the Rome Air Development Center, working with Threshold Technology, they've developed a Voice Input Code Identifier that they see has application in mapmaking. A cartographer, instead of looking up from his map to manually enter annotative data while performing the digitizing, would be able to verbalize the data. "This new technology can free an individual's hands, which is important if he's handling radioactive material or just driving a truck and needs to enter a restricted area," says Richard Vonusa of Rome's Intelligence and Reconnaissance Div.

They want to take this a step further, however, with something called the Automated Speaker Verification system. This system will identify a speaker by his voice characteristics and provide entry to controlled areas. "The

Speaking data into a computer not only frees an operator's hands, but also eliminates the need for writing or coding data and then keyboarding it. Productivity increases and error reductions are both claimed. The device shown is from Threshold Technology, Inc.

goal of the combined code identifier and speaker recognition systems," says Vonusa, "is to allow a person to be identified by speaking his code numbers without ever having spoken to the system before."

In the manufacturing environment, Threshold's system is being used for the preparation of numerical control tapes. In a South San Francisco firm, the parts programmer, again with his hands free to handle blueprints or perform calculations, voices the programming functions to the system. There's interactive prompting through the programming steps, as well as visual verification. He can say *arc*, and the display will read ARC angle 1 =. He says *six, zero*. The display reads ARC angle 1 = 60. He says *okay*. The display automatically goes to the next step: ARC angle 2 =. He says *one, three, five*. Looking at the display, he responds with *okay*, and the next prompt appears. The output is a paper tape ready for N/C machine use.



This experimental system at Stanford Research Inc. demonstrates how an operator can control a mechanical arm using a joystick and, since both his hands are busy, voice commands. After the robot is trained, a spoken command will cause it to retrace its sequence of learned actions. Control applications based on voice input are seen as important not only for exotica like robots, but also for giving the disabled greater independence.

These systems also have applications in the office setting. Citibank, in New York, has been looking at a Threshold Technology system for its stock transfer operations. The application consists essentially of accepting a bundle of stock certificates brought to a window by, say, a messenger from a brokerage house. A window clerk must unfold and unstaple this stack of paper, verify that they're the correct certificates, and then begin capturing the pertinent data. She would read off the number of the brokerage house, the Cusip number, which is a uniform code identifier for stock certificates, and the quantity of shares.

A minicomputer would take that information, combine it with stored data, and produce a receipt. One copy would go to the messenger and another be attached to the certificates. The system also could tell the clerk in what bin to place certificates for subsequent processing. The receipt would be used to reclaim the stocks. A 10-digit control number, printed on the receipt when it was first produced, would then be read into the system, causing the computer to respond with the rack number where the freshly produced stock certificates were being kept. Finally, it would log the stocks out of the house.

The appeal of the voice input system, says Citibank's Neil Faulkner, is the mobility it provides to the clerk, who must move from the window to a bin or to a rack and back again, as well as the freedom she must have to handle the stacks of certificates. It is both a hands- and eyes-busy operation. A fast typist "beats the hell out of it," says Faulkner of the voice input process, but in this application other factors seem to make voice more fitting. The stock transfer operation requires the inputting of only numeric data. Faulkner says that with bonds, which represent about 9% of input, there are two alphabetic characters that can also appear in the Cusip number.

On the floor of a commodities exchange, too, voice input is being used by floor reporters who speak into wireless microphones, reporting the latest transactions and the prices. The reporter, on the exchange floor where a sale is being executed between two brokers, would merely say *July silver four-four-four*. Getting his visual confirmation, he then says, *go*. The data is captured.

In Canada, there's a group looking at voice input combined with voice response. Ottawa based Bell-Northern Research currently has a few applications that run with Touchtone input and voice response, but since the start of this year has been evaluating Scope's system for its ability to replace Touchtone. "We will be implementing a telephone directory, which we hope will be used internally here," says the organization's Tony Walker. It initially will use Touchtone, but the feasibility of using voice input instead is to be studied. They are also looking at a data base inquiry capability for transaction-based systems.

"One of the things we're doing is developing a bootstrap mechanism whereby the system will recognize, with a minimum amount of input, who you are," says Walker. "And then it will bring back up your prestored vocabularly from a disc. As far as is possible, we're going to make it speaker-independent." They think they will be able to accommodate several hundred users. The main problem will be storing their vocabulary, which is to go into a Digital Equipment PDP-11/40 that, in turn, is on-line to an IBM 370/168.

In other applications, the idea is not so much to capture data as it is to control a device, or a number of them, with voice commands. At an S. S. Kresge distribution center, for example, cartons are being sorted in this manner. A warehouseman reads the label on a carton, says *number four go*, and thereby sets up the designated conveyor routing for that package. It serves to keep unauthorized personnel from moving goods, but also records each employee's work volume, an important consideration where piece-count affects compensation.

At the Stanford Research Institute, artificial intelligence researchers have mated a Threshold Technology system to a Unimate industrial robot. These mechanical arms are designed for discrete product manufacturing operations where, once trained, the robot does the same things over and over. The voice recognition device is being used experimentally for that training phase, but in conjunction with a joystick that can manipulate the arm through the required motions much more quickly. The system has been given a vocabulary of 42 phrases, including control commands, motion commands, and quantifiers—such as the 10 digits, inches, and degrees. The arm can therefore be commanded to twist its wrist 45 degrees, raise up six

inches, or retract or extend 36 inches, all by voice command.

The rain in Spain

Still another company, Dialog Systems Inc. of Cambridge, Mass., is awaiting a contract for a system that recognizes a thousand words. It obviously would be highly inconvenient for each user to have to repeat each of those thousand words in order to train the system. But all of Dialog's systems do away with that requirement, within limitations. Instead the vocabulary of its system is made up of the renditions of each word as spoken by 50 or 100 people, each with his or her accent, dialect, or pitch. It's based on the theory that if 50 people spoke a word in unison, you'd be able to understand it—what they call the Greek chorus effect. These, then, are put together in the model of one word.

According to Thomas P. Cutler Jr., vice president at Dialog, the machine will recognize the 10 digits as voiced by a first-time user with 97% accuracy. After one pass through those 10 digits, however, the accuracy with that user rises to 99.9%. Over time, he continues, the machine improves its ability to recognize a given voice. No one always pronounces the same word in the same way each time; a user might even get tired toward the end of the day and begin slurring his words. "The machine is continually training to your voice," explains Cutler. "If you say a word and the machine repeats back and you don't correct it . . . it will narrow toward the way you said it the last time."

There can be a problem, of course, in shipping machines that purport to require no training. One could load core with something that might be called the common American dialect, only to find that the majority of users speak with a Southern drawl or a New England twang. But they get around this by making up a data base with a lot of samples of that accent.

These are all discrete word recognition systems, of which the first model of any kind was scheduled for shipment by Dialog in June. More significantly, the company also has a continuous speech system slated for installation this month. That one requires no pause between each word.

Cutler says that the continuous speech machine can process a series of words or digits in which the sounds overlap each other. It is limited to a five or ten second continuous stream, or to an indefinite continuous stream with only a limited number of words in the vocabulary. Cutler says that will be about 35 words. Currently that's the tradeoff, either in the duration of a spurt of words or in the vocabulary size.

But Cutler notes that one seldom needs a continuous speech system capable of handling an incessant flow of words strung together. Instead, most applications have a built-in phase, during which the processor can go back and make sense out of a 10-second-long utterance. He mentions a hypothetical inspector who is examining incoming packages and reading the numbers off some purchase orders. Perhaps it's a 12-digit number.

"If he had to do it with a discrete word machine," he says, "it would take an inordinately long time and wouldn't really make the machine worthwhile. If he can string the digits together, then he'd take only two seconds, instead of maybe 15 or so. It's a big difference. Those people are working on a time basis." But the application has a built-in pause while the inspector gets to the next parcel and aligns it so he can read off the number. "With a very large memory and some parallelism, you can get a hundred words of complete, continuous speech, but we don't make that machine right now."

Dialog's systems, all of which can operate over phone lines, use the DEC PDP-11/04 mini and a high-speed array processor developed in-house. The speed of this system, says Cutler, was developed for the continuous speech application. Thus for the discrete word job, "our computer is fast enough so that it can handle eight simultaneous conversations." Prices are a bit higher, in the $35,000 to $45,000 range.

Gaining his independence from a keyboard, a quadriplegic programmer can now input COBOL statements by merely saying them. Scope Electronic's 16-character display here provides visual verification, but in other applications could be used to step the operator through an input process.

It can mean more than convenience

The idea of simply feeding voice data to a computer doesn't impress industry analyst Frederic G. Withington of Arthur D. Little Inc. (who is also one of DATAMATION's contributing editors). He notes that "the microprocessor and inexpensive electronics make simple voice recognition very cheap." And these devices may find broader application for simple control applications than for data entry uses, he adds. For example, a microcomputer-based voice recognition device might be produced for only $500. It would not be suitable for computer input, he explains, but could recognize commands like *stop*, *right*, *left*. It could control a wheelchair, turn lights and appliances on or off, even raise the bed of a disabled patient. Such a cheap control device may be the more significant development, he suggests. "For computer input, you have to get sophisticated. And sophistication is where the software art runs out of gas."

In terms of the proliferation of this technology and its role in the everyday lives of people, Withington is probably correct. But this should not detract from its effectiveness in any class of applications. Provide something cheap enough and we'll all want one. One of these days the garage door opener will transmit the voice of the driver, who will merely say *open sesame*.

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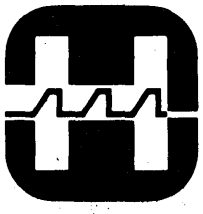

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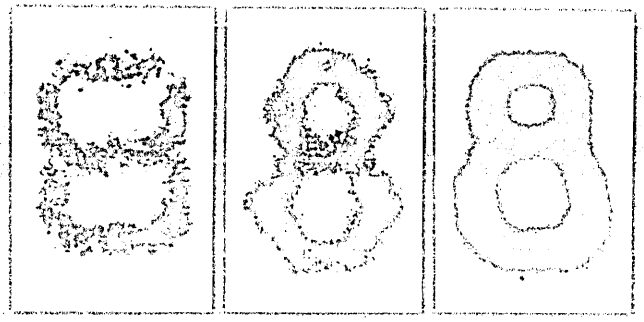

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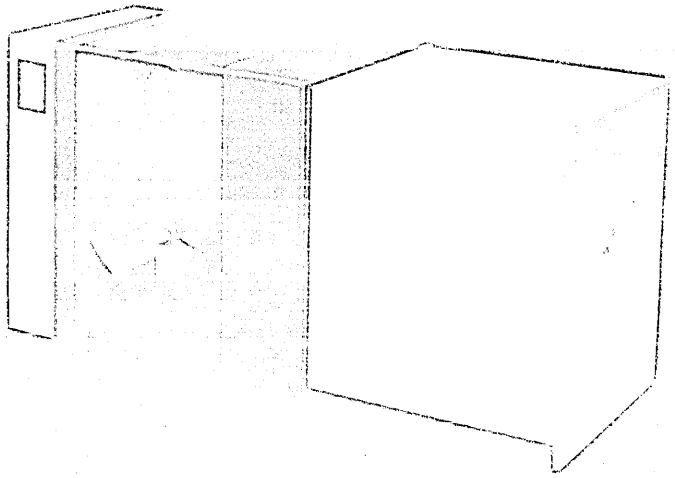


Siemens combines excellance with performance

Humanizing Data Entry by Default

by Tom Gilb and Gerald Weinberg

Nearly 90 years after Hollerith, we still use data entry operators as eye/finger machines. Little changes to improve their lot can lead to big improvements in efficiency. Defaults alone can cut keystrokes by half.

Although computer technology has changed rapidly in the past two decades, much input design has remained in the slough of punch card thinking. What is needed is to stimulate the thinking of systems designers and system users to bring input design up to the level of current hardware and software—and perhaps a bit beyond.

One major consequence of sterile input design is the persistence of "keypunch girl" problems. Great masses of people—almost always young women, for they are willing to work in poor conditions, at stultifying tasks, at low pay—pass large portions of their lives keying information that could be sent to the computer in ways that are more accurate, more interesting, easier, and cheaper.

Literally hundreds of millions of dollars are spent annually on this often dehumanizing activity. Only the persistence of cheap labor—available because of depressed economic conditions and the general suppression of certain groups—lets poor input design persist as its companion.

To most systems designers, this cheap labor force is essentially invisible. Of the many books now on the market concerned with "computers and society," not one even mentions this frightening waste of humanity. And in spite of hundreds of articles on such fancy technology as interactive graphics, the vast, vast majority of computer input today is still supplied by key-driven alphanumeric devices.

Let's take an example of the kind of design thinking—or rather, thoughtlessness—that goes into key driven input. How many of our conventional design concepts are built around the assumption that message validity checking must be possible through "verification?"

This kind of "verification" is a euphemism for 100% repetitious keying by poor young women—keying which the designer will never see, let alone experience. We certainly don't mean to imply that systems designers have anything particular against young women. Quite likely, many of them are *for* young women. No, the verifiers are victims of a failure to move design ahead as our understanding and experience moved ahead—not to speak of our hardware and software.

> In many shops, twenty years and four generations of hardware and ten generations of designers have come and gone without making a ripple in the keypunch room.

Consider some other "advanced" design features supposedly directed at the same question—validity checking. Check digits, control sums, and limit checks are the most common techniques "beyond" repetitious keying. All these techniques come to us from an era when checking had to be carried out without reference to the file records to which their message relates.

Twenty years behind the art

Even though such limitations are no longer necessary, validation systems based upon them live on and on. In many shops, 20 years and four generations of hardware and ten generations of designers have come and gone without making a ripple in the keypunch room—except in the sense that faster machines need more and more cards crammed in their bellies to keep them silent.

What we must begin to consciously include in our message design is that:

- *direct access to related records is the norm;*
- *keypunch operators are human beings who will respond to design, both good and bad, in appropriate manners;*
- *program execution speed is thousands of times faster than it was in 1955;*
- *memories, both main and secondary, are thousands of times bigger;*
- *the data entry process is frequently interactive;*
- *the people who are at the source of data often understand the real world behind the data, and can be counted upon to recognize and correct many erroneous situations not accessible to the keypunch operator;*
- *savings in the keypunch room can cause horrendous expenses in other parts of an operation—expenses that can only be eradicated by taking a broader view of the meaning of "input."*

One aspect of input design where new techniques can be very advantageously applied is in the use of defaults. The default technique can ordinarily be expected to reduce input errors based on the simple idea that *what you don't do you can't do wrong.*

In natural language, defaults are so

The authors have extracted this article from their new book, *Humanized Input: The Design of Reliable Keyed Input Systems* (Winthrop, 1976).

natural we hardly notice them at all. Consider the set of English sentences:

1. *John drove to the grocery store and John bought a loaf of bread.*
2. *John drove to the store and John bought a loaf of bread.*
3. *John drove to the store and bought a loaf of bread.*
4. *John drove to the store and bought bread.*
5. *John drove and bought bread.*
6. *John bought bread.*
7. *John*
8. *(pause)*
9. *(nothing at all)*

The first sentence expresses the full message explicitly. Sentence (2) takes advantage of the fact that either:

We *know* that bread is bought at the *grocery* store.

We *don't care* precisely what store was involved.

In either case, the message can be shortened because of *information available to the recipient.*

Sometimes the recipient's information is *internal.* In passing from sentence (2) to sentence (3), we eliminate the repetition of "John" because of the internal structuring of defaults in English, which the recipient presumably knows. Passing from (3) to (4), we eliminate "a loaf of" on the basis of a *standard default quantity.* From (4) to (5) we can eliminate "to the store" by using a standard default *location of purchase;* while from (5) to (6) we make use of a standard default *means of transportation.* Each of these defaults would be appropriate in a commercial environment, as we shall see.

In passing from (6) to (7), we may employ the idea of a *standard question,* to which only one variable element—the name of the person who drove to the grocery store and bought a loaf of bread—needs to be added. From (7) to (8), we need only signify by a pause (or a carriage return or end of record) that the standard action was taken, by the standard person. And, finally, in passing from (8) to (9), we eliminate even the need for a control character or a pause by simply not asking the question—under the assumption that if there were some deviation from the default pattern, we would certainly be informed.

Notice, incidentally, that when we *fail* to use such defaults in ordinary discourse, it seems queer to others. Suppose you ask the question:

Did John drive to the grocery store and buy a loaf of bread?

and your listener responds:

John drove to the grocery store and John bought a loaf of bread.

instead of a simple *"yes"* or nod of the head. A few responses of this type and you would become convinced that your listener wasn't quite well, and indeed this kind of response pattern is often a sign of certain mental afflictions. Therefore, it is not surprising that computer input systems that fail to make use of *natural* defaults often force their users to feel ill at ease, for they must behave in a manner that would, among humans, indicate social awkwardness, if not actual mental problems.

Local defaults

Imagine an order entry system which receives the following two order messages:

	CUSTOMER I.D.	SHIP VIA	QTY	PRODUCT CODE
(1)	CHWY	SURFACE	234	XP197
			313	ZT39
(2)	JONCO		6	JG4889
				JG338

Some of the defaults in these messages are quite obvious, such as carrying the customer identification through all elements of the order. Indeed, this is so natural an interpretation that we ordinarily fail to notice it at all, which may lead to some troubles in our system design.

The shipping method may similarly be carried through into each line, but

> To improve their number of keystrokes, the operators never used the tabulator key, and rather frequently spaced out, one stroke at a time, to the right-hand margin.

an even further default can be seen. In order (1), there is a message indicating that the order is to be sent by *surface* mail, but order (2) also contains a message about shipping. It is to be sent by *AIR MAIL.*

We avoided writing *AIR MAIL* explicitly to save the effort and eliminate chances for error. In this case, 98% of our electronic reserve parts are automatically sent by the fastest method, though it is possible to indicate other modes of shipment when desired. *AIR MAIL* is the default option for this type of part, which everybody working with the system normally knows through training, common sense, experience, or feedback from the system.

Alternatively, the operator may *not* know that *AIR MAIL* is the default. Determining the most economical or fastest method of shipment may be a calculation involving a variety of factors, and best left to the computer unless explicitly overridden. There simply may be no reason for the operator to know the method of shipment on all orders.

The use of defaults in such an order entry system might lead to a great reduction in the estimates of keystrokes—2 to 1, 3 to 1, and more. Why, then, aren't defaults used more often? The answer lies in design thinking frozen in an ancient time when memory and processing power were not available. Using defaults, we require memory and processing power. Because we didn't have them 20 years ago, designers act as if they didn't have them now.

In any design, we make a number of assumptions. The worst assumptions are those that prevent us from even considering viable alternatives. Other assumptions creep into the designs we do consider. When the design is implemented, these assumptions—when inaccurate—will lead to discrepancies between the design calculations and the achieved figures. The designer is responsible not only for the design, but for unearthing the assumptions that may prove critical to its success or failure.

Assumptions that prove wrong don't necessarily prove bad. The design might just as well perform *better* than expected, because of something we overlooked. In general, however, because of the sales-oriented environment in which most input designs are made, assumptions do tend to be optimistic rather than pessimistic. Therefore, designers who bury their assumptions are more likely to get a nasty surprise than a pleasant one.

The Composition Fallacy

One of the most commonly wrong design assumptions is what is called the *Composition Fallacy.* The Composition Fallacy assumes that the whole is exactly equal to the sum of its parts. A common example of this fallacy is the assumption that a team's performance will be determined strictly by the skills of the individual members, which is rarely true.

In data entry, the Composition Fallacy states, for one thing, that actual keying rates for the whole application will equal the sum of the rates for all individual fields. In reality, overall rates are rarely determinable with precision from the individual rates.

Certain keys or combinations are faster than others. The order of fields in the input relative to their order on source documents, or relative to their "natural" order, will affect the total keying rate. These and a myriad of other factors combine to make it foolish to rely on more than order-of-magnitude estimates of keying rates.

Even more important in most applications is the effect that defaults have

on *error* rates. The initial assumption is that all keystrokes have the same error probability. Though this approximation is certainly crude, it leads to the estimate that errors will be reduced in the same proportion as keystrokes are reduced. This is a reasonable assumption in many situations, and a 3 to 1 reduction in errors entering the first stage of the system is bound to have a salutary effect on costs and operating conditions.

Even so, the error reduction could be even greater if the new procedure is more "comfortable" for the operators. Or, to look at the dark side, an "uncomfortable" procedure may increase errors. And, since any *new* procedure is bound to be a bit uncomfortable, the designer had better be prepared for the error rate to be somewhat higher than estimates at the onset.

As the operators become familiar with the new procedure, we can expect the error rate to diminish—eventually converging to something *close* to our estimate, hopefully.

One other assumption that cannot be left unmentioned is the motivation of the operators. Even before keypunches, typewriters were sometimes affixed with counters to measure the "productivity" of typists—the number of keystrokes. When motivated by this measurement, the operators increased the number of keystrokes per day. The industrial engineers proudly watched the "productivity" rise, as they knew, by force of scientific law—it must. Their pride in their "achievement" blinded them all the longer to the actual facts of the matter. Operators *never* used the tabulator key, and rather frequently spaced out, one stroke at a time, to the right-hand margin. Depending on how the counters were rigged, they adopted other stratagems, such as backspace-space combinations to bring them up to their quota of "productivity."

In our default example, we shall not realize the potential of the "skip" key if the operators are motivated to produce as many keystrokes as possible. Indeed, we may find them ignoring the default possibilities altogether. Only by improving our concept of "productivity" will we achieve the full potential improvement of our design. Counting *finished* work—with appropriate adjustment for the value of reliable work—will be more likely to give the kind of motivation we need for our design to succeed. And, of course, any environmental improvement that makes the operators identify their interests with the organization's interests will only add to that success.

Feedback

One common reason for poor motivation is lack of operator understanding of the overall system. For instance, if the operator doesn't know that defaults are being taken, "stupid" errors can result. In our order entry example, the system specification could call for the program to display—on a suitable device—a feedback message such as:

AIR SHIPMENT ASSUMED SINCE NO OTHER INDICATED

The advantage of feedback is in making the operator aware of the consequences of default actions. While this may be done purely for training, it will ordinarily safeguard against unintentional defaults. Therefore, the feedback system will normally provide the operator an opportunity for self-correction before continuing, after having seen that the intended message was not communicated.

> Using defaults, we require memory and processing power. Because we didn't have them 20 years ago, designers act as if they didn't have them now.

For instance, we might see the following message protocol:

JONC 6 JG4889 JG338
AIR SHIPMENT SINCE NO OTHER INDICATED
SURFACE
SHIPMENT OPTION CHANGED TO SURFACE FOR JONC ORDER

This example illustrates another variation of a default input. In an ordering system where the quantity "one" occurs on a large percentage of all order lines, the message design may allow the system to assume the quantity "one," just as we saw it could do with the quantity 12. In other applications, the *same* quantity may not prevail for each item, but each item might have its *own* characteristic ordering quantity—a *loaf* of bread, a *dozen* eggs, a *ream* (500 sheets) of paper, and so forth. In the days when internal storage was limited and direct access devices were only a gleam in their inventor's eye, a separate default for each item would have been uneconomical. Today, it may prove an efficient solution.

In such instances, it would certainly be good practice to use feedback to train the operators, not only to show what defaults have been taken, but to show when they *might* have taken a default, but didn't. For instance, we can imagine the following protocol:

JONC 6 JG4889 JG338
AIR SHIPMENT ASSUMED
ONE JG338 ASSUMED
NOTE: SIX IS THE DEFAULT ORDER FOR JG4889 AND NEED NOT BE GIVEN

If the word NOTE is made sufficiently conspicuous to the operator, subsequent entries for JG4889 might be made using the default quantity of 6. Since 6 is a rather unusual default in this application (most of the items are packed 4, 10, or 12 to a box, or kept singly), it is unlikely that most operators will learn to use it without some sort of operational feedback. Through such feedback, the experienced operator gradually, painlessley, and without cost, learns to enter information

". . . God bless you . . ."

more speedily, more accurately, and in a manner that is more comfortable and satisfying.

As the preceding example implies, it should normally be possible to express default options explicitly if the operator so desires. The operator might be unsure, initially, of what each default option is. Sometimes we have operators who do not use the system often enough to learn the defaults. Psychologically, it may be easier to enter the quantity desired than to take the "risk" of guessing wrong, even though the system has (hopefully) been designed to protect against error either way.

Zipf's Law

We may reasonably assume that with feedback, the operator will learn to take advantage of the efficiencies offered by the default options. Most people will act in such a way as to shorten messages they must use repeatedly. An empirical observation in linguistics, Zipf's Law, indicates that the most commonly used words and grammatical forms in a language come, over time, to be the shortest. We can quite accurately predict that a word such as "I" is rather frequently used in English, and that "necessitarianism" is not—or rather, "isn't."

This shortening process will generally prove rewarding to the operator, but we must never make the mistake of assuming that all operators will perform according to some statistical law, or some other assumption by the system designer. As we have seen, there may be reasons (good and evil) why the operator doesn't *want* to work more efficiently, and these may have to be overcome through external motivation rather than system design.

Alternatively, we may simply have to or want to accept the operator's decision about how efficiently to operate. Consider a hospital information system in which doctors enter dosage quantities for various drugs. While we may provide default dosages, we will probably not want to make any great effort to force the doctors to change their habits in writing prescriptions—though we may want to provide feedback which they may use at *their* option.

In the cases of doctors, total usage of the system may not justify attempting to gain efficiency, though other operators of the same system may be justified in striving for speed of entry. Even then, however, we simply cannot know what will be most efficient for each and every *individual* person.

For instance, in one system with default quantities for each line item, some of the operators simply would not use default quantities at all. Others would use them, but only for quantities of "one." Since some of these operators were actually faster overall than some who used defaults consistently, it was decided that there was no need to try to make people break their own "rhythm." We don't know, of course, whether or not these operators could indeed have gone faster by taking fuller advantage of defaults, but chances are they knew themselves fairly well.

Because people are different, and situations are different, it is wise to allow for differences rather than fight them. Feedback, for instance, allows people to learn at their own rate and in their own manner, unlike classroom instruction where all must cover the same material at the same speed, whether they learn it or not.

Automatic default setting

With the operators setting defaults for each other, we come close to a more flexible method of establishing defaults. The system itself could tabulate patterns of input—for each product, or each customer, or for some other category. For example if one customer generally orders one category of item, such as "SCREWS," the system can "announce" that default as soon as the customer information has been keyed and confirmed.

Automatic adaptive setting of defaults can have several advantages:

- *Defaults may be used in situations where the raw frequency was not sufficiently high.*
- *No great initial expense is needed to establish defaults, for they establish themselves automatically.*
- *When patterns change, defaults will gradually change to meet those new patterns, without explicit intervention.*
- *Pattern information obtained in this system may prove useful for understanding system behavior such as buying patterns of customers.*

In deciding when to use defaults, and what default values to use, we must consider the consequences of inadvertently getting the default option because of an input error. Although proper feedback can reduce such errors substantially, there is no reason to assume that an operator will always be paying full attention to the video unit.

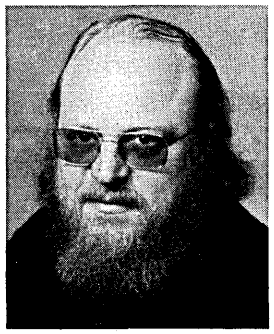
As a case in point, consider the prescription of drugs in the hospital information system. A certain drug is used in two distinct disease situations—one requiring a dosage of 500 milligrams and the other, 50 milligrams. If, by some error, a 50-milligram patient is fed a 500-milligram dose, he is likely to be "cured" once and for all of his worldly woes. In this situation, even though the 500-milligram dose is used for 98% of the prescriptions, it will be appropriate to use 50 milligrams as the default, or to have no default at all.

Design of or by default?

Other situations may not be so serious as this, but the principle is clear—default errors can occur and must be weighed in the design. The choice among evils may not be easy, but will always be better than not facing up to the difficulties at all.

There are a variety of other design techniques that could be used to fortify the default design. In the hospital situation, for instance, we could improve control if a statement of disease type was available to the input routines, to check against the prescribed dosage. But whatever approach we take, we shouldn't leave our *design* decisions to "default," or Murphy's Law will surely bring us to our knees. ❋

Mr. Gilb is an independent consultant living in Norway. He is already familiar to Datamation readers as the author of "Laws of Unreliability" (March 1975, p. 81) and "Parallel Programming" (October 1974, p. 160). His most recent book, "Software Metrics," which concerns the measurement of critical properties of programs and data, is also available through the Winthrop Computer Systems Series.



Mr. Weinberg is by now a well known author, having produced such volumes as "The Psychology of Computer Programming" and "An Introduction to General Systems Thinking." A frequent contributor to Datamation, he is also the editor of Winthrop's Computer Systems Series. Jerry does his consulting and teaching from a home base in Lincoln, Nebraska.

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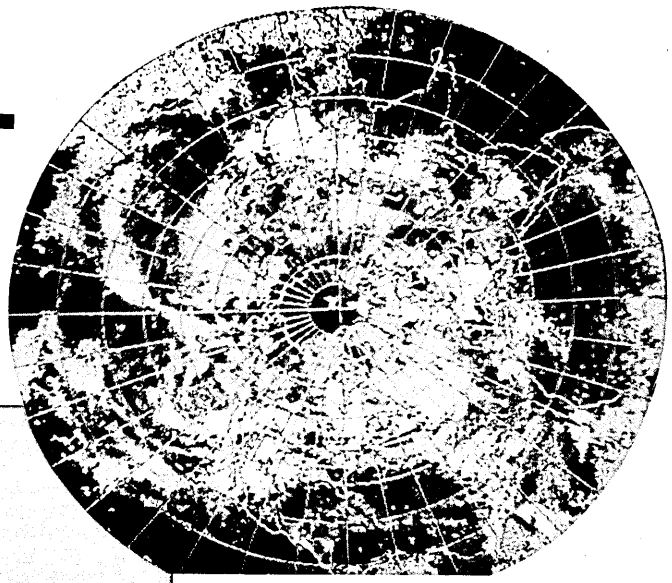

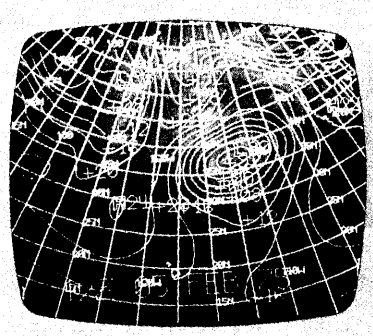

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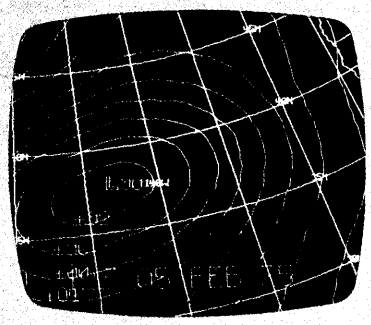

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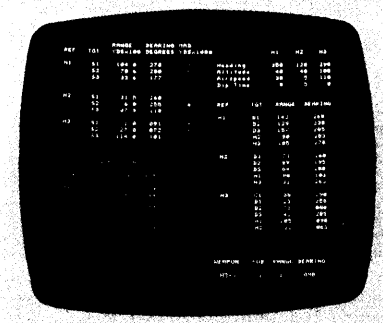

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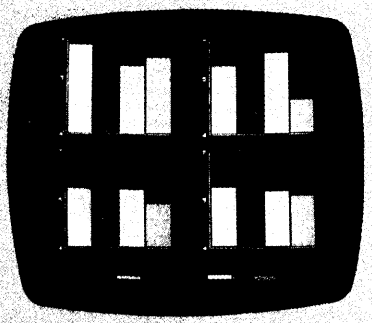

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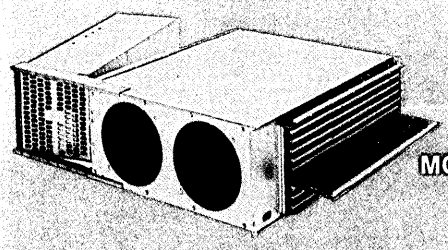

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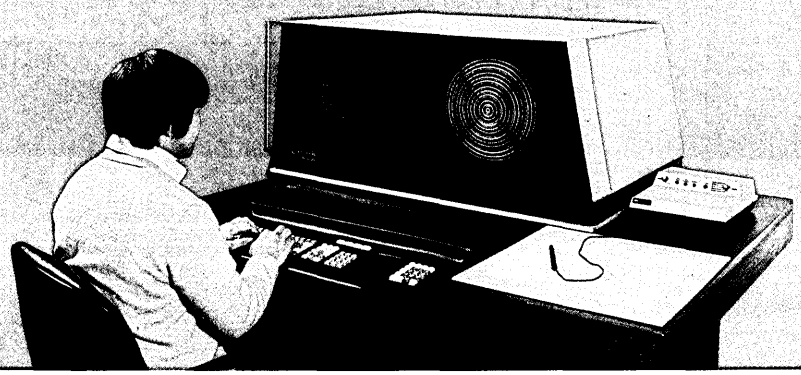

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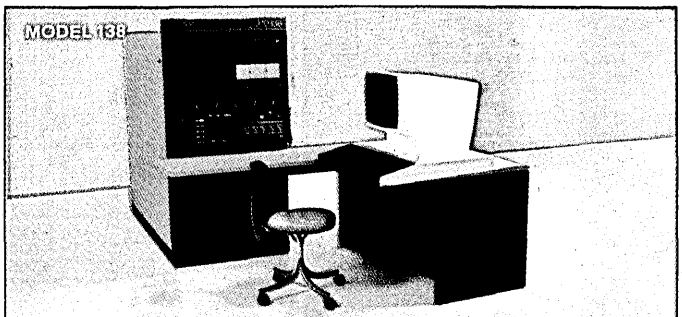

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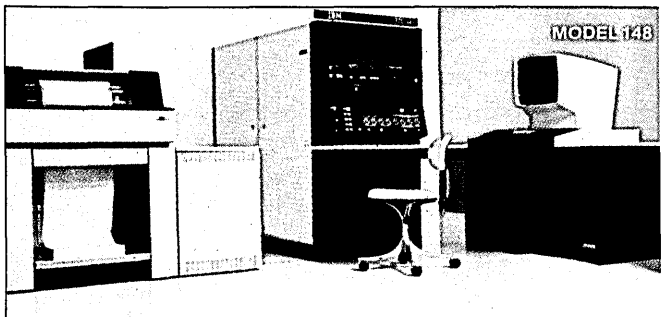

In addition to peripheral printers, one or two 3203 Model 4 Printers can be attached directly to the 148 or 138. The new 3203 is rated at 1200 lines per minute.

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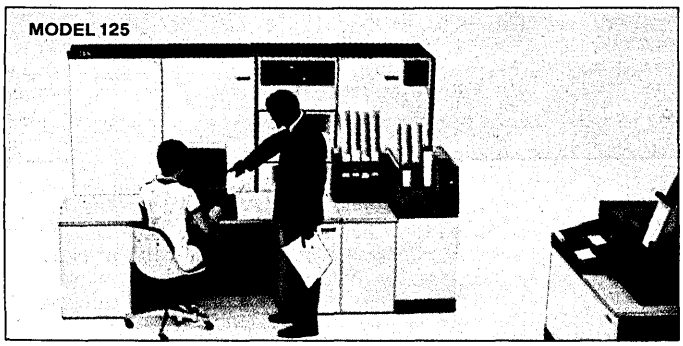

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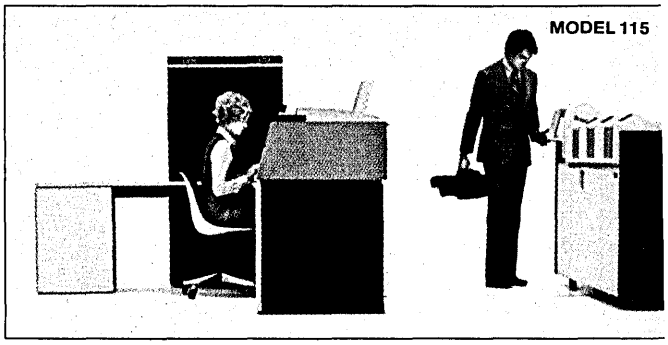

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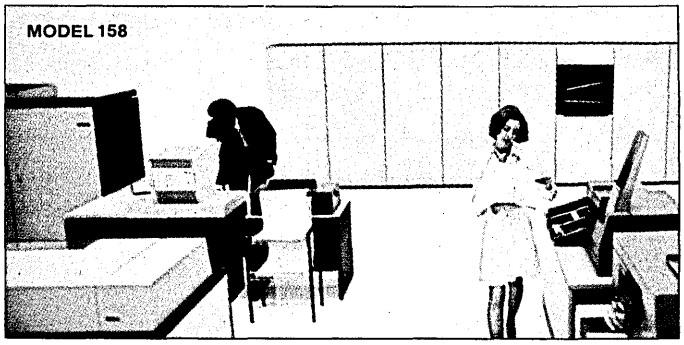

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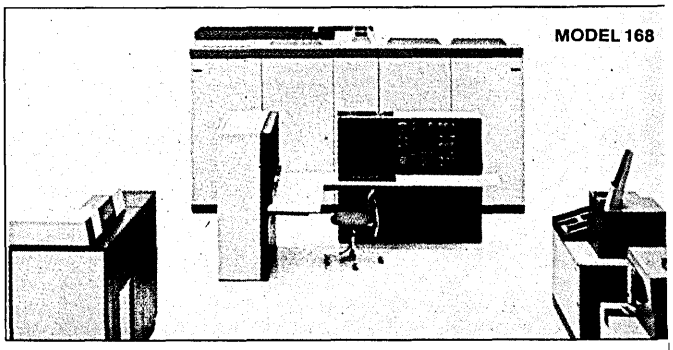

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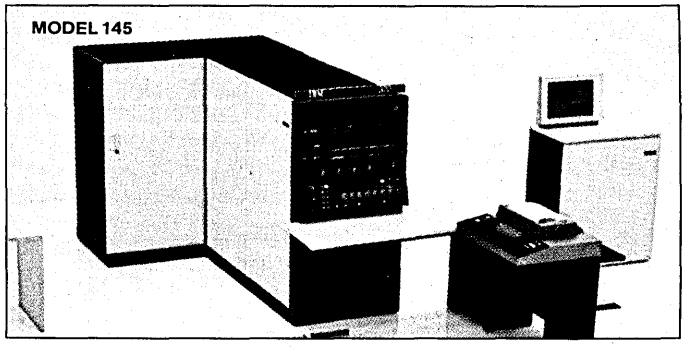

1970

1971

1970

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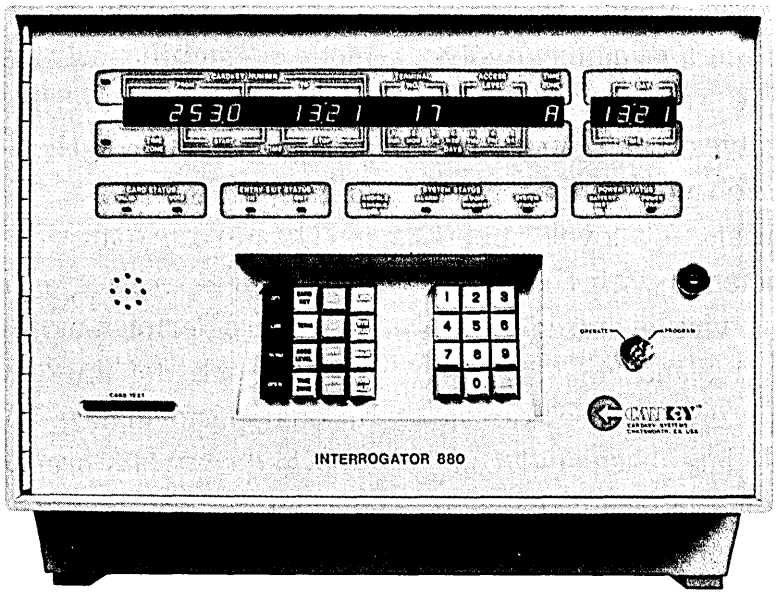

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CIRCLE 14 ON READER CARD

Protecting Data by Encryption

by David J. Sykes

Data communications presents new security problems for computer systems. Encryption is the only practical means of providing protection.

Since there is no way of making data communications links physically secure, particularly if some form of radio transmission is involved, encryption is the only practical method of protecting data outside the computer room. Military and diplomatic circles have used encryption techniques for centuries, and most of their current methods are very sophisticated and highly classified. In the commercial world and nonmilitary parts of government, there is a growing need for encryption, but it cannot be as expensive and as shrouded in secrecy as that used by the military.

This need for encryption is not just to satisfy the legal requirements for privacy, but also to protect systems from criminal activities. Used in conjunction with adequate physical security, both at the computer site and at terminal locations, encryption can be a powerful method of combatting several threats. These threats include the monitoring, misrouting, substitution, modification, and injection of messages. Data files can also be safeguarded by encryption techniques.

Presented here are various methods of applying encryption and a summary of requirements for an encryption capability. A specific examination of the proposed NBS standard, its properties and implementation possibilities are also discussed. (See page 82.)

Communications link encryption

The original data known as *plaintext* (or *cleartext*) is converted into *ciphertext* by *encryption* and back to plaintext by *decryption*. (*Encipherment* can be used synonymously with encryption.) The encryption/decryption process is based on some form of transformation which is solely dependent on a *key* (a pattern of bits). A viable encryption system will have a large number of keys and, only if a recipient of the ciphertext has the correct key, can he obtain the original cleartext message.

As opposed to encryption devices, *scramblers* are relatively simple devices which give protection only against casual eavesdropping and will not hinder a determined individual. (The term *code* is often used in the encryption field, but since the word also applies generally to any prearranged relationship of characters, words, phrases, etc., it will not be used here.)

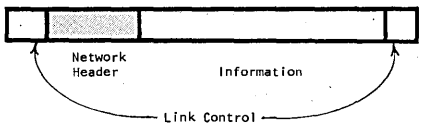
By placing encryption devices at the modem interfaces, all data on the link will be encrypted and decrypted in a manner which is essentially transparent to the sending and receiving stations. The clear bit stream entering the encryptor is reproduced at the exit from the decryptor. Thus, all synchronizing, delimiting, and control characters can be recognized by the receiving station as usual. If a transmission error occurs which modifies the ciphertext, the resulting cleartext will contain an error. The error detection mechanism will thus operate as it would without the encryption devices.

Link encryption is adequate for protecting against wiretapping, but in a network it does not guard against misrouting. In a network which contains a routing (switching) function, this switch handles cleartext, and if a message sent from A to B is misrouted by the switch to C, the message is as intelligible to the user at C because it has been reencrypted using the key that deciphers the encryption at that station. The misrouting could be due to an error, but it could also be brought about deliberately by a penetrator.

End to end encryption

By encrypting at the source only, and not decrypting until the communication reaches its ultimate destination, the information content of the message is only usable by recipients who possess the appropriate key. With this approach, it is of little consequence if misrouting of the message occurs. The message can be sent via networks of any type, private or public, employing circuit switching, message switching, or packet switching. All users can share a network with confidence if their messages take the appropriate form and the keys are properly assigned, distributed, and controlled.

The message header, which contains routing, priority and other information used by the network itself, cannot be encrypted. The messages at the interface to the network will take the following form, the shaded area representing encrypted data.



Link error detection is performed on the total combination of encrypted information, clear header and link control characters. If it is thought that monitoring the header could reveal frequency of communication between certain users or other facts, this can be countered by superimposing link encryption onto an end to end encryption scheme.

One major threat to a system with remote terminals is that of someone falsely claiming to be an authorized user. This can take place either at actual system terminals, or by intercepting the communication link. The second case includes the injection of previously recorded authentic messages into the system.

This threat can be effectively combatted by a combination of encryption, passwords, and time/date stamping of messages. The basic principle is based on end to end encryption. The user initiates the dialog by transmitting a request in the clear identifying himself and the terminal (the terminal ID may be automatically performed by the terminal). The computer then looks up the current key for that terminal and sends an encrypted response contain-

(Continued on page 84)

The proposed NBS standard

In March 1975, the National Bureau of Standards published a description of an encryption algorithm in the *Federal Register*. This algorithm was selected from responses solicited earlier by NBS from the manufacturers of data processing equipment. There is only space here to describe this algorithm very briefly, but full details can be obtained by writing to the Systems and Software Div., Inst. for Computer Sciences Technology, Bldg. 225, Room A-265, National Bureau of Standards, Washington, D.C. 20234.

The algorithm is based on a recirculating block product cipher, where a block of data bits is enciphered all at once (as opposed to a bit stream cipher where the plain text is encrypted bit by bit). The NBS proposed block size is 64 bits of input and output data with a 64 bit key, although only 56 of these key bits are active—and which ones are to be active can be varied independently. The other eight bits are for key parity.

The big advantage of block encryption over bit stream encryption is that the one-to-one correspondence between input bits and output bits is avoided. Each bit of the input block can potentially affect all 64 output bits, thus making analysis of the output extremely difficult.

The term "recirculating block product cipher" means that encipherment is achieved by alternately performing linear permutations (using wire crossings) and non-linear substitutions (based on table look-up).

Fig. 1 illustrates how the recirculating block product cipher works. The data input is subjected to an initial permutation (accomplished, in practice, by wire crossings) and then entered into a key dependent cipher computation. Only 48 of the 56 bits of the key are used at this time. The output of this process is fed back to the input and a similar computation performed, but with a different 48 bits selected from the key. This recirculation process is repeated until a total of 16 iterations have been performed. Finally, the output of the last iteration is subjected to a permutation, the inverse of the initial permutation. (The initial permutation, and its reversal, actually provide no additional security, but they are part of the proposal.)

One iteration of the algorithm is shown in Fig. 2. If Ln and Rn are the leftmost 32 bits of the input and output, Ln+1 and Rn+1 the rightmost, then

$$Ln+1 = Rn$$
$$Rn+1 = Ln + f(Kn, Rn)$$

where f is the cipher function containing the non-linear substitution and Kn represents the key selected for that iteration. All 16 iterations are similar except the last one in which the R and L crossover does not take place.

The cipher function f(K,R) is computed as shown in Fig. 3. The 32 bits from the leftmost or rightmost part of the input are expanded to 48 bits according to a table and modulo 2 added to the 48 key bits, Kn, selected for that particular iteration. The resulting 48 bits are handled as 8 groups of 6 bits and entered into 8 substitution (S) boxes. Each S box is represented by a different table mapping input to output, and the output of each box is only 4 bits (making the mapping irreversible). The 32 bit output is then subjected to a 32 bit

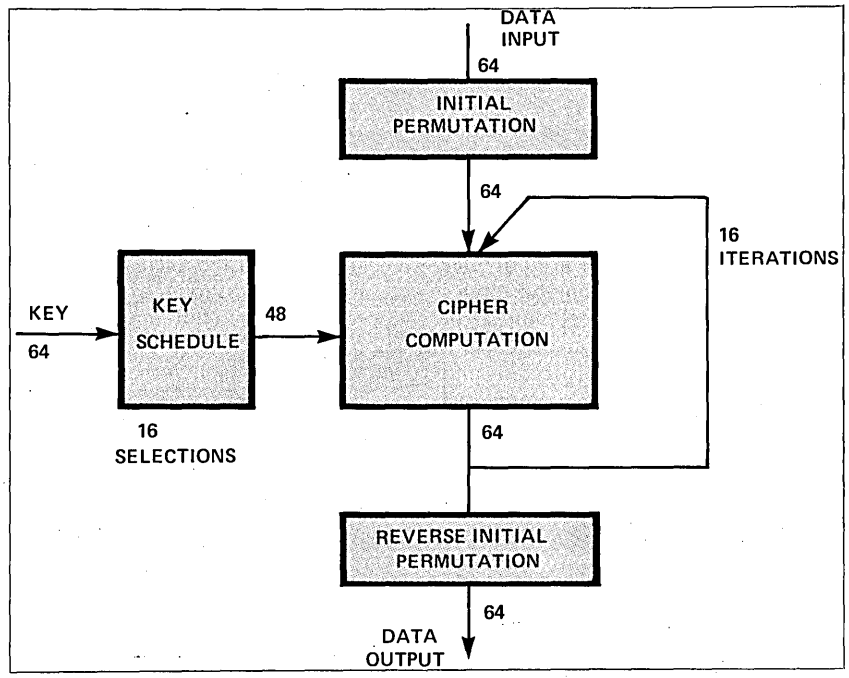


Fig. 1. Recirculating block cipher

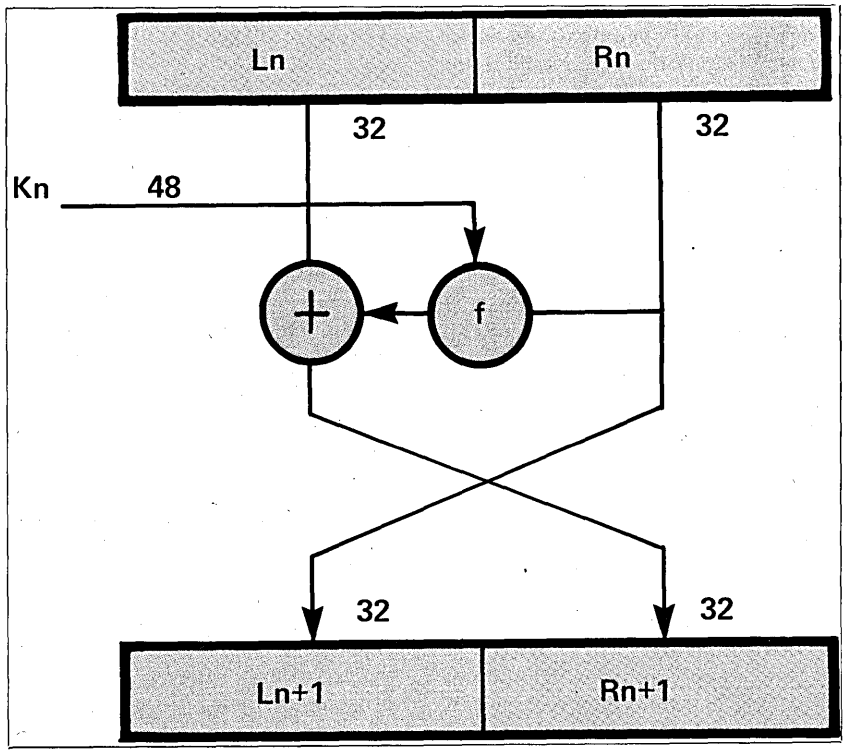


Fig. 2. One iteration of the enciphering function

permutation to yield the f(K,R).

At each iteration, the 48 key bits are selected according to a "schedule" which itself involves permutations and rotations of the key bits.

Decryption is accomplished by performing the same process as the encryption but with the selected key bits in reverse sequence, i.e., the 48 bit key pattern used in the 16th round of encryption is used in the 1st round of decryption, and so forth.

Properties of the Standard

It can be assumed that an adversary would fully understand the algorithm, including its particular implementation. Also, he would possess reasonable quantities of clear and matching cipher text, but would not know the key in use. To break the cipher, two approaches could be taken:

a) to determine the key by trial and error of the cipher text.

b) to analyze the cipher text statistically.

Trial and error would need an average number of attempts equal to half the number of possible keys. With a 56 bit key ($2^{56} = 7.2 \times 10^{16}$) if each trial took one microsecond (which is not really possible today), it would take over 1,000 years to find the key. If one tried to speed things up by multiple simultaneous trial and error tests using expensive five microsecond devices to obtain the key, 4 million devices would be required to guarantee finding the key in 24 hours. Such resources would not be available in any organization outside of the government.

The statistical approach would need a great deal of expertise in cryptography and a large amount of computing resources. The NBS proposed algorithm has been designed to be highly resistant to statistical attack by careful choice of the various permutation and substitution tables involved. It is not possible to quantify this resistance, but the consensus of experts across the industry believes it to be adequate. Nevertheless, it is not out of the question that a government organization could find quicker ways to break the cipher if the need were great enough.

Other properties worth noting are that super encryption with the same key does not produce plain text, and that the encryption/decryption process can be interchanged (i.e., decrypt plain text to yield cipher text and then vice versa).

Implementation	Time to Encrypt (64 bits)	Data Rate (bits/sec)
Software		
Large computer	100 usec	640×10^3
Minicomputer	50 msec	1.3×10^3
Hardware		
T^2L	5.0 usec	1.3×10^7
LSI chip	50 usec	1.3×10^6

Table 1. Estimates for encryption using NBS proposal

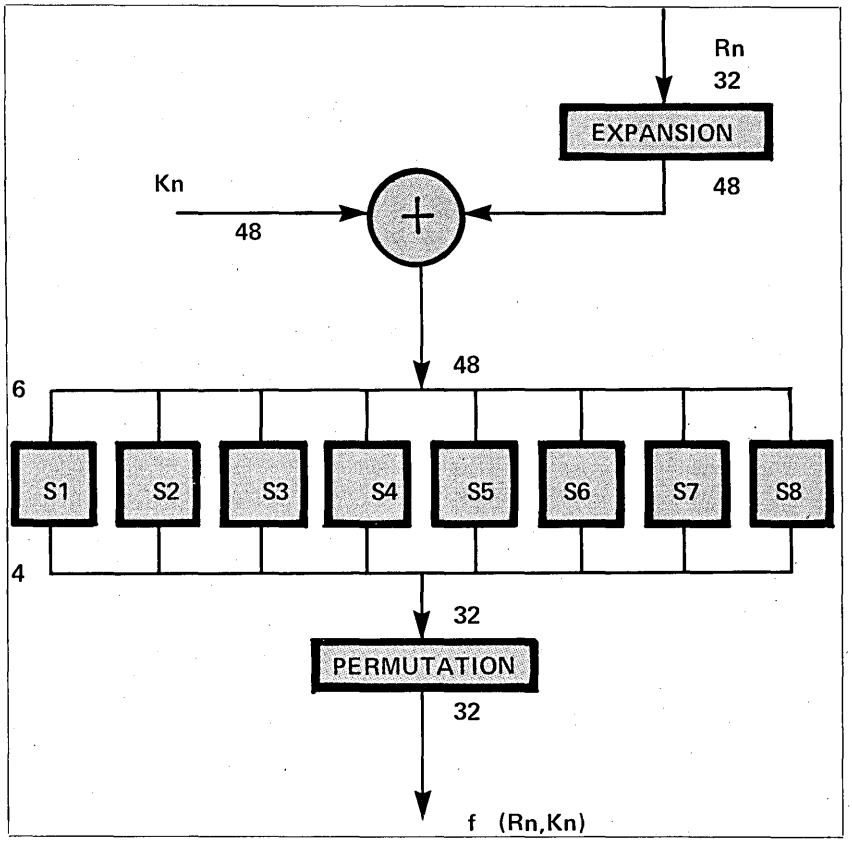


Fig. 3. Computation of the cipher function

Implementing the Algorithm

Although it is possible to implement the algorithm in software, this would not be a practical solution for encryption on a continuous basis. Table 1 compares the estimated time using typical implementations of the NBS algorithm to encrypt or decrypt a block of 64 bits. The large computer is much faster than the minicomputer, not just due to the word length but also because the large memory enables the permutation and substitution tables to be implemented more effectively.

Hardware solutions are immensely more efficient than software because the permutations are achieved by wire crossings and the substitution tables are in read-only memories. The T^2L hardware would take a "large board" full of logic and would cost approximately 10 times as much as the LSI chip. The LSI chip approach is relatively slow (due to lower power and limited pin connections) but is still perfectly adequate for most data communications applications. Only the T^2L circuitry would be fast enough for encryption of media on high speed disc and tape drives, the serial bit rate of which are already in the region of 10 Mbps.

Status and schedule

NBS has a goal of getting the standard finally approved by September 1976. There has been some opposition from a few individuals in the academic community on the grounds that the key is not long enough. However, none of the major computer and terminal manufacturers has raised any formal objection to the proposed standard. As a result, several manufacturers are known to be already developing semiconductor devices which implement the algorithm as currently defined. Such components are expected to be available in late 1976 or early 1977 at a price in the region of $100 each. With higher volumes in later years, the price could drop to around $20. Terminals and communications processing equipment which incorporate these encryption devices can be expected to appear in the marketplace toward the end of 1977. ❄

ENCRYPTION

ing the date and time. On receipt of this response at the terminal, the date/time is decrypted, the user password (PW) entered, and the combined date/time/password encrypted and sent to the computer where they are verified. Allowances are made for a few seconds difference due to response time. The dialog can only proceed beyond this point if this verification is positive. Subsequent messages in this dialog can be tied to this validation by including the date/time as part of the encrypted text.

There are several variations of this principle such as the key being made user dependent rather than terminal dependent. In such an implementation, the user would enter the key into the terminal by means of a magnetic card reader, or by a similar method.

Distributing the key

The subject of key generation, distribution, and protection is a critical issue since the whole principle is based on the security of the key. Keys themselves should be generated with no predictable relationship between them. They should be changed as frequently as can be achieved, or whenever a compromise is suspected, and distributed by courier or registered mail. For special situations it could be arranged that two or more keys held by different persons would be necessary to validate a "user." These multiple keys would be entered sequentially, their sum being the effective key.

If the encryption device is terminal rather than user oriented, it is possible to down line load the new key encrypted with the current key. If this is the only long term method, down line loading has the problem that if a key becomes known to a penetrator, he can easily obtain each subsequent key. On the other hand, the keys never become physically recorded on media which can be lost or stolen. Perhaps some combination would be the best solution, but careful planning should be performed by the system implementors to achieve the most appropriate method.

Media encryption

The encryption principles described for communications are equally applicable to encryption for storing data on removable (or fixed) media. To avoid any performance degradation, however, the device controllers must contain high speed encryption hardware. For fast disc/tape applications, bit rates up to 10 Mbps must be handled, which are several orders of magnitude higher than required for most data communications.

The encryption/decryption would take place in the controller using a key entered by the application program. With media encryption, the secrecy of the key must be maintained as long as the data is valuable or sensitive, compared to communications applications where the key can be changed frequently.

Media encryption not only combats media theft but guards against the effects of misaddressing where one user gets another user's data. It also allows media to be reused without extensive degaussing or erasing.

Requirements for encryption

In nonmilitary applications, the techniques used for encryption should have the following characteristics:

1. Security must depend solely on the current key. It should be assumed the adversary has complete knowledge of the encryption algorithm, its implementation, and its application.

2. Without the knowledge of the particular key, deciphering is not feasible in a reasonable period of time. This implies a nonlinear algorithm and a large number of possible keys.

3. It should be suitable for high volume production, thus yielding low unit cost.

4. It should not adversely impact system performance.

5. It should be difficult to modify the encryption process.

Need for a federal standard

Because the federal government intends to procure a significant amount of data communications and terminal equipment with encryption built in, it is obviously to the government's advantage to deal with only one standard. Furthermore, this standard can be thoroughly understood and tested so that a known confidence level can be established. It is the consensus among manufacturers of data processing equipment that this algorithm is adequately secure and that, because of its nonlinear nature, it would take resources beyond the reach of individual organizations to break the cipher within a reasonable time.

The most significant advantage of a standard will be the cost savings due to high volume production of the devices. Another advantage of such a standard would be the relative ease of communicating between equipment built by different manufacturers. Finally, since all requests to export equipment containing cryptographic devices have to be approved by the government, this procedure may be simplified by having a federal standard.

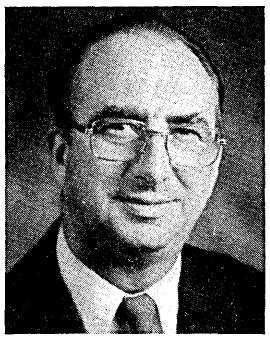
Conclusion

Encryption, properly implemented, is an essential ingredient of data communications security. Adequate physical security at computer/terminal sites, security features in computer hardware and operating systems, and sound auditing methods, however, are still vital to overall system security.

The proposed NBS standard encryption algorithm, if adopted, will benefit both users and manufacturers. The proposed algorithm has more than adequate security for most nonmilitary applications, and having a standard would not preclude the use of other algorithms in special cases where the expense can be justified.

The problems of voice and facsimile should not be overlooked either. It is possible to purchase scramblers for voice and facsimile today, but the eventual solution will be by digitizing the analog signal at the source (40.8 Kbps is more than adequate for a voice channel), and using encryption to protect this digital information in a manner similar to that described for data communications.

Data communications and remote terminals introduced new threats to the security of computer systems. Encryption can be effectively used to counter these threats and reduce the problem to the common demominator of reliance on certain trusted people. The entire encryption scheme, including key generation and distribution, must be very carefully planned. If a casual approach is taken, the situation could be worse than having no encryption at all. ❋



Mr. Sykes' present position is as manager of communications system design for Honeywell Information Systems in Phoenix. His responsibilities include the system level design and specification of data communication processors and associated software for front-end and remote applications. Prior to this he was responsible for minicomputer system design.

Before joining Honeywell, he was with RCA Defense Electronic Products in Princeton, engaged in the design of equipment for data communications associated with spacecraft.

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CIRCLE 47 ON READER CARD

The Cable Bus in Data Communications

by Victor A. DeMarines and Lawrence W. Hill

Lower error rates, higher throughput, more terminals served—and all for less money—are available by using cable tv technology.

Data processing in many organizations is changing as more and more services are provided outside the computer room. In long distance applications, networks of remote terminals and minicomputers are being supported by communications satellites and innovative uses of wire-line technology, such as the packet switching techniques pioneered by ARPA. Another marketplace is expanding rapidly: communications which, though outside the computer room, are confined to local environments (as opposed to long haul communications systems such as ARPANET) like an office complex, manufacturing plant, or hospital, with activities ranging from simple time-sharing services to complex data base and management information systems, transaction processing, and process control. Some important technology trends are of interest in the application of networks serving these physically small communities.

A marriage of technologies

Data communication equipment is now available which takes advantage of CATV technology to produce better performance at lower cost. Conventional data communication techniques typically use telephone-oriented modems and concentrators whenever the wire lengths exceed a few thousand feet. By "piggybacking" simultaneously on CATV industry developments in coaxial cable distribution techniques, and on the use of LSI (large-scale integrated) modern digital logic design, manufacturers are producing equipment which provides service at low cost, high speed, high reliability, and very low error rates.

The systems and techniques, no longer isolated or specialized, are the beginning of a trend. Communications systems based on CATV technology and multiple-access bus techniques—referred to generically as *the cable bus*—offer real advantages to computing facilities which either serve many terminals or employ distributed processing. It is expected that cable bus systems will probably come into extensive commercial use, possibly within the next decade. They will significantly impact computer system configurations and the range of specific services which can be supported economically. This marriage of technologies, the advantages it offers, where it does and does not apply, are considered here.

Several organizations are currently involved in this thrust. For example, Interactive Systems, Inc. of Ann Arbor, Michigan, one of the early entrants to this field, has made turnkey installations in, among others, several automotive plants, a food processing operation, and a major steel-making facility. ISI offers a proprietary TDM (time-division multiplexed) system which can be custom tailored to a customer's application. The basic control unit is a minicomputer and multiplexor; it is connected by coaxial cable to remote units having standard RS-232 or TTL (transistor-transistor logic) interfaces, which connect to the customer's terminals.

Intech Laboratories, Inc. of Ronkonkoma, New York, manufactures a complete line of frequency-division multiplex, broadband, radio frequency digital data modems which fit into the user's broadband network like today's telephone-type data modems, providing either point-to-point, or multidrop service. Intech modems are currently installed to provide remote job entry services from 4800 baud to 50 kbps for several New York City banks via the Manhattan Cable CATV system, and for similar service in chemical plants in Michigan and Texas.

The MITRE Corp. has built MITRIX, a time-division, multiple access bus system which uses a one and one-half mile long CATV cable network to interconnect an IBM 370/158, various terminals, and several minicomputers located throughout MITRE's corporate headquarters in Bedford, Mass.

A number of other organizations have worked with experimental or research-oriented systems. Among these are the Naval Electronics Labo-

ratory in San Diego, Xerox Corp., and Bell Telephone Laboratories.

It is expected in the near future that manufacturers of CATV components such as Jerrold, and major systems suppliers such as Collins Radio, will have digital and audio equipment available for this marketplace. As with all expanding technology, while the number and types of users grow, so do their needs for new products and services. To better understand the technical trends and applications, a users group is in the early stages of formation.

Multiple access, multidrop architecture

The cable bus approach depends for its utility on three key technical features:

- a multiple access, multidrop architecture
- radio frequency signals transmitted through a CATV medium
- decentralized control.

Multiple access, multidrop architecture makes all data potentially available to all subscribers on the network (see Fig. 1). A variety of protocols are possible, including simple polling, priority request, contention, and cyclic time division. In a priority request system such as Digital Equipment Corporation's copyrighted Unibus, users ready to transmit make a request, and are given access to the bus according to priorities controlled from some central point. In a contention system such as the ALOHA network, users transmit short bursts at random, and retransmit in the event that interference among two or more simultaneous transmissions occur. Cyclic time-division procedures like MITRIX dedicate particular, regularly recurring time slots to specific users for their transmissions.

Subscriber interface units, which connect subscribers to the network, contain logic to support the bus protocol. The systems described earlier share the characteristic that all subscribers are connected in parallel, rather than on separate circuits. This characteristic results in improved flexibility, reduced processing, and a reduced amount of wiring and equipment required.

On a cable bus, all subscribers can receive all transmitted data, and by selective filtering—using address codes or other identifiers included in each message packet—each subscriber can extract from the data stream just those packets meant for him. The existence of all data on one channel implies that all subscriber modems must run at the aggregate instantaneous date rate; and the subscriber's interface logic must process data at this high speed even if the data rate needed to support an individual subscriber is much lower. With today's digital and analog integrated circuit technology, however, a single bus rate in the range of ten MHZ is achievable at practical cost.

The cable bus architecture creates completely flexible connectivity patterns and data rates. Upgrading the data rate to a specific subscriber requires no change in installed communications hardware, but merely a change in the rate of message packet transmission at a subscriber's interface unit. Asymmetric data rates can easily and economically be supported—for example, filling crt displays quickly while the users enter data only at typing speed. Indeed, the bus's ability to respond rapidly to even "dumb" displays can obviate the need for distributed processing to handle such displays locally.

The address fields in data messages can be used to cut processing requirements in some kinds of data management systems. Address codes denote specific subscribers, but they can also be used to denote message content by using data descriptors like data base keywords. Subscribers filtering the total data stream can thus obtain messages relevant to a designated area of interest, instead of performing the equivalent filtering in software.

Multidrop wiring significantly reduces the amount of cable to be laid,

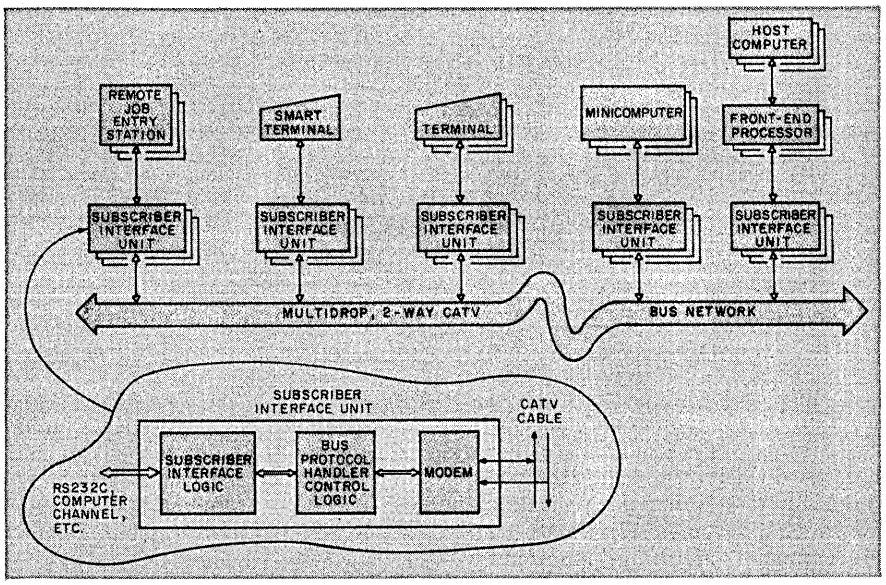


Fig. 1. The general configuration in which a subscriber interface unit connects each device or group of devices is shown here. The subscriber interface device matches the terminal I/O characteristics, has a control logic unit, and uses a modem to convert digital signals to an RF (radio frequency) modulated carrier.

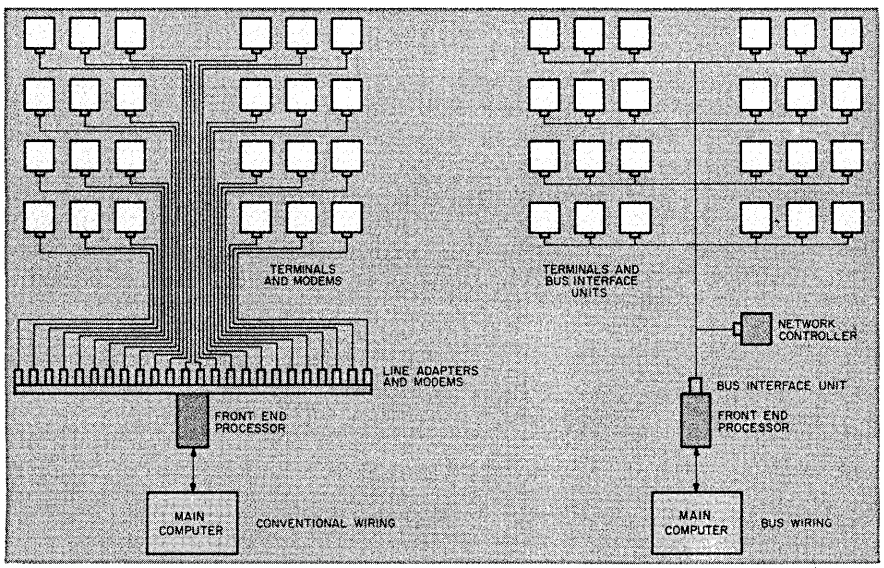


Fig. 2. The traditional wiring approach shown on the left requires 2N connections to service N subscribers. Here 48 connections for 24 subscribers can be compared to 25 connections (one additional for the network controller) for the same number of subscribers in multidrop wiring.

and the amount of communications hardware required (see Fig. 2). The difference is even more dramatic if, for example, several minicomputers must all communicate directly with one another. With multidropping, the distribution media, cable or wire, must be designed to avoid catastrophic failure of the system. Although the active devices (amplifiers) found in CATV systems have been proven to be extremely reliable in operational installations, techniques such as dual routing of cable, and use of redundant circuits can be employed for added protection. Costs for providing reliability to the degree desired are low when compared to total system cost. As well, maintenance control can be centralized in such systems since all signals appear at all locations within the cable network.

Also, a bus approach can significantly reduce the load on a communications processor since messages can be routed through the network by means of the address-code filtering, instead of via a software message switch.

Once a multidrop network has been installed in a building, terminal devices can be moved from room to room and plugged into taps on the cable with little installation effort. Identical signal interfaces can be provided at all locations on the cable network; no extensive rewiring back to the central facility is required along with the move. Such changes are thus easier, quicker and cheaper.

Radio frequency, coaxial cable distribution

Use of a coaxial cable distribution system is desirable for three reasons: it permits use of standard, reliable, mass-produced hardware from the CATV industry; it provides excellent noise immunity; and it supports data and multicode communication at no additional cost for the distribution plant. Use of a radio frequency modulated carrier permits simultaneous use of the cable for purposes other than data exchange through frequency division multiplexing. For example, spare capacity in the New York CATV plant is being used by Time, Inc. (parent company of Manhattan Cable) and Bankers Trust to provide point-to-point digital service for credit verification and electronic funds transfer using modems developed by Intech.

As another example, the MITRE cable system is being used for: cable tv (commercial channels, broadcasts of internal meetings, and video tapes); video-telephone conferencing; telephone service (the Collins ATX-101 system, an FDM computer-controlled telephone exchange with conferencing, call forwarding, message holding, and similar features); and a security system using video, data, and voice for remote control of access to building entrances.

Services like these can be provided at drastically lower cost by using a cable distribution network which is already in place and cost-justified for purposes of data communications. Indeed, many imaginative information-moving options, whose cost could never be justified separately, become reasonable when considered as part of an existing system.

To ensure immunity from external RF signals and to prevent unwanted radiation, the CATV industry has adopted an 80 db isolation standard for all distribution network components. This means that in most environments, including factories with electromagnetic interference from heavy electrical machinery, the noise level in the cable is low enough for excellent error performance with simple, cheap, low-power modems. Error rates better than one bit in 10^8 have consistently been measured in operational installations. Proper placement of standard CATV amplifiers and taps in the cable produces a nominally constant signal level throughout the network, so that the dynamic range required of the subscriber interface unit modems is small. With this benign signal environment, modem circuits capable of operating at a one megabit per second have been built for a total parts cost of around $100 each. A number of manufacturers have announced coaxial cable modems selling for under $1,000, including Computer Transmission Corp. and Interactive Systems, Inc.

A one megabit transmission uses about two MHZ of bandwidth including guard bands, less than one percent of the 300 MHZ cable bandwidth. There is ample room for other simultaneous applications: CATV, videotape, electronic distribution of mail, etc.

Although in some cases, the installation of conventional twisted-pair cabling may be cheaper, its lower bandwidth and poorer noise immunity require more expensive modems, as well as limit capacity and flexibility. Fiber optical technology, with its extremely high bandwidth and virtual immunity to electromagnetic noise and eavesdropping, will be a useful alternative to coaxial cable in the future. However, it is not yet cost-competitive.

Distributed control

Besides a modem, each subscriber interface unit must contain digital logic which filters received messages and controls transmissions in accordance with network protocol. Buffering and interface circuitry to match the subscriber's needs must also be provided. Using microprocessors and standard interface logic packages, the interface circuitry can be adapted to a variety of equipment without changing the basic hardware of the subscriber interface unit. Currently available, cheap microprocessors such as the Intel 8080 have the necessary speed and capacity to perform logic functions in the BIU (Bus Interface Unit), including bus access control with associated timing and synchronization, message formatting and buffering, error checking, address-code filtering, and similar functions.

It is important to distinguish these functions, which are necessary to establish and maintain communications among bus subscribers, from those of the process-level computer networking protocols, which may provide security, accounting, connectivity definition and change control, and error correction. These latter functions can be implemented in a manner largely independent of the transmission medium, and can be supported by a cable bus system, telephone lines, or other means.

A multiple access, multidrop design decentralizes communications processing functions from a control or switching computer to the individual subscribers, a move made possible by the plummeting costs of digital hardware. As a result, the communications system can grow almost indefinitely without creating expensive bottlenecks at central nodes; total capacity is limited by bandwidth of a single bus, which is far more than most applications require. It is thus not necessary to buy excess capacity as a hedge against expected growth, and to bear the cost of that capacity for a period of time before it is actually needed. (With conventional approaches, this is often the only alternative to even more costly, frequent upgrades in capacity.)

Cost constraints

In the next few years, the cost of cabling and communications equipment will remain high enough to put two kinds of limits on the cost effectiveness of cable-based bus systems. One has to do with distances in the network, the other with the number of subscribers and the complexity of their interconnection.

If all subscribers to a network are located in the immediate vicinity of the computer room, or if they are tightly clustered in two or three widely separated areas, CATV cable may not be economical. Depending on the local application, point-to-point connections of twisted pairs of wire, or a high speed parallel bus may then be appropriate.

At the other extreme, use of CATV cable is limited over long distances—more than a few miles—by the cost of laying the cable and installing amplifiers in the line. CATV cable installation costs are roughly $8,000 per mile for cable hung on existing telephone poles.

Together with the problem of obtaining use of poles, this severely limits the distances which are practical. Inside large buildings or over short distances, however, costs can favor coaxial cable, and in some cases, existing CATV cabling may be used. For example, most hospitals are extensively wired for entertainment tv, and an increasing number of cities contain commercial CATV networks with unused capacity.

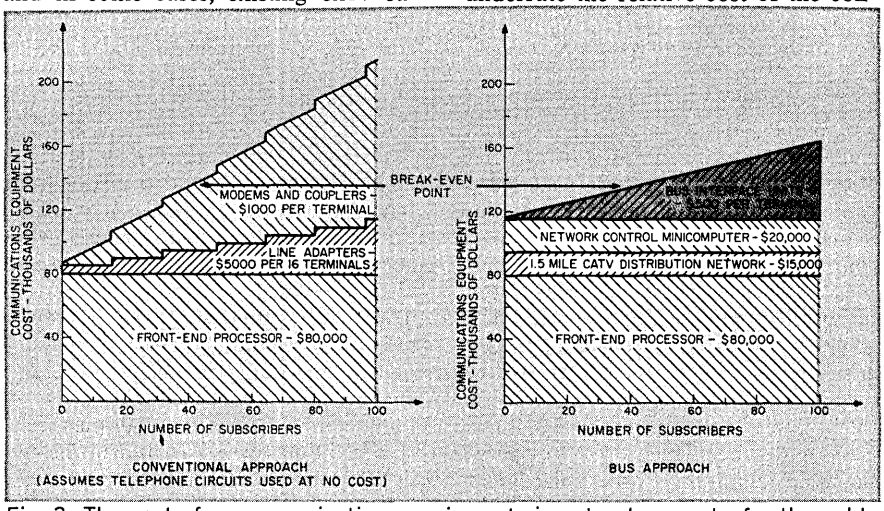


Fig. 3. The costs for communications equipment rise at a lower rate for the cable bus approach than for the conventional approach. Separate terminals with individual subscriber interface units are assumed for the bus approach; if terminals are clustered, or the interface unit is built into the terminal, the bus approach costs are lower still.

For systems with few subscribers, there is no compelling reason to use a cable bus. But for over 20 to 40 subscribers (large computers, terminals, minicomputers, remote job entry stations, or whatever), the economics can favor a cable bus. The precise crossover point depends on many factors, including the nature of existing facilities, complexity of interconnections required, and distances involved.

Considering communications equipment alone (line adapters, modems and concentrators with a conventional approach; bus interface units, cable network and simple control computer for the bus), costs may be expected to vary as shown in Fig. 3, as low- and medium-speed terminals are added to the system. The upward steps in cost with the conventional approach are caused by adding line controllers, each driving 16 lines to a front-end processor. The modem costs assume a representative mix of data rates over voice-grade telephone lines. Cost of the telephone equipment, although sometimes considerable, is not included. The charts assume that terminals are separated so that each requires its own subscriber interface unit; if terminals are clustered so that several share a single unit, or if the bus interface unit is designed and built as an integral part of the terminal, the cost comparison favors the bus more strongly.

These figures, from cost studies performed for specific installations, are intended only to illustrate a general trend. Each installation, of course, is different. The assumptions on which the charts are based, however, tend to underrate the relative cost of the conventional approach; in many cases, on the other hand—as for high speed transmission or where message-switching is required—the bus's ability to provide these features at no added cost makes it far more attractive than the chart suggests.

Where the cable bus applies

CATV-based multiple access bus communications systems seem to have real potential in moving data around computation facilities involving a substantial number of terminals and/or distributed processing. The cost and performance of the cable bus are particularly advantageous if:

- substantial message-switching is required
- several computers are involved, with requirements for intermittent high speed data exchange
- future growth requirements are uncertain as to capacity or geographic distribution
- the environment is electrically noisy, as in a factory with heavy electrical machinery, or
- a CATV distribution network already exists, as in hospitals and some urban environments.

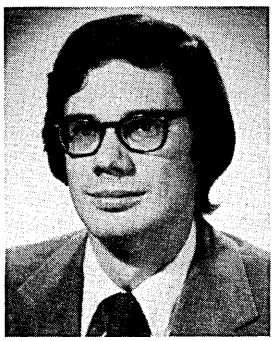
On the other hand, this technology is not:

- a replacement for common-carrier or packet-switching networks over distances in excess of a few miles
- a replacement for the cabling in a computer room or small building, or
- a replacement for process-level networking protocols such as SNA or DECNET.

It can be transparent to protocols at this level, providing service analogous to a direct wired connection.

In summary, three converging forces will encourage the use of cable buses in the future: first, advances in digital technology are making modems containing the requisite "intelligence" economically competitive; second, the changing role of data processing in many organizations requires more interactive and real-time services outside the computer room; and finally, the system configurations dictated by this change, with more users physically separated from any central computer, can benefit dramatically from the inherent capacity and flexibility of a cable bus. ❋

Mr. DeMarines is associate department head in the Applied Technology Dept. at The Mitre Corp., Bedford, Mass. With Mitre since 1962, he is active in cable communication work. While on leave from Mitre, in 1972-73, Mr. DeMarines worked for the Dept. of Transportation's Office of R&D.



Mr. Hill is manager of software at Modicon Corp., Andover, Mass. He was previously with Mitre where he worked in data communications and systems analysis. He has also been a partner in Datachart, a software firm specializing in computer graphics.

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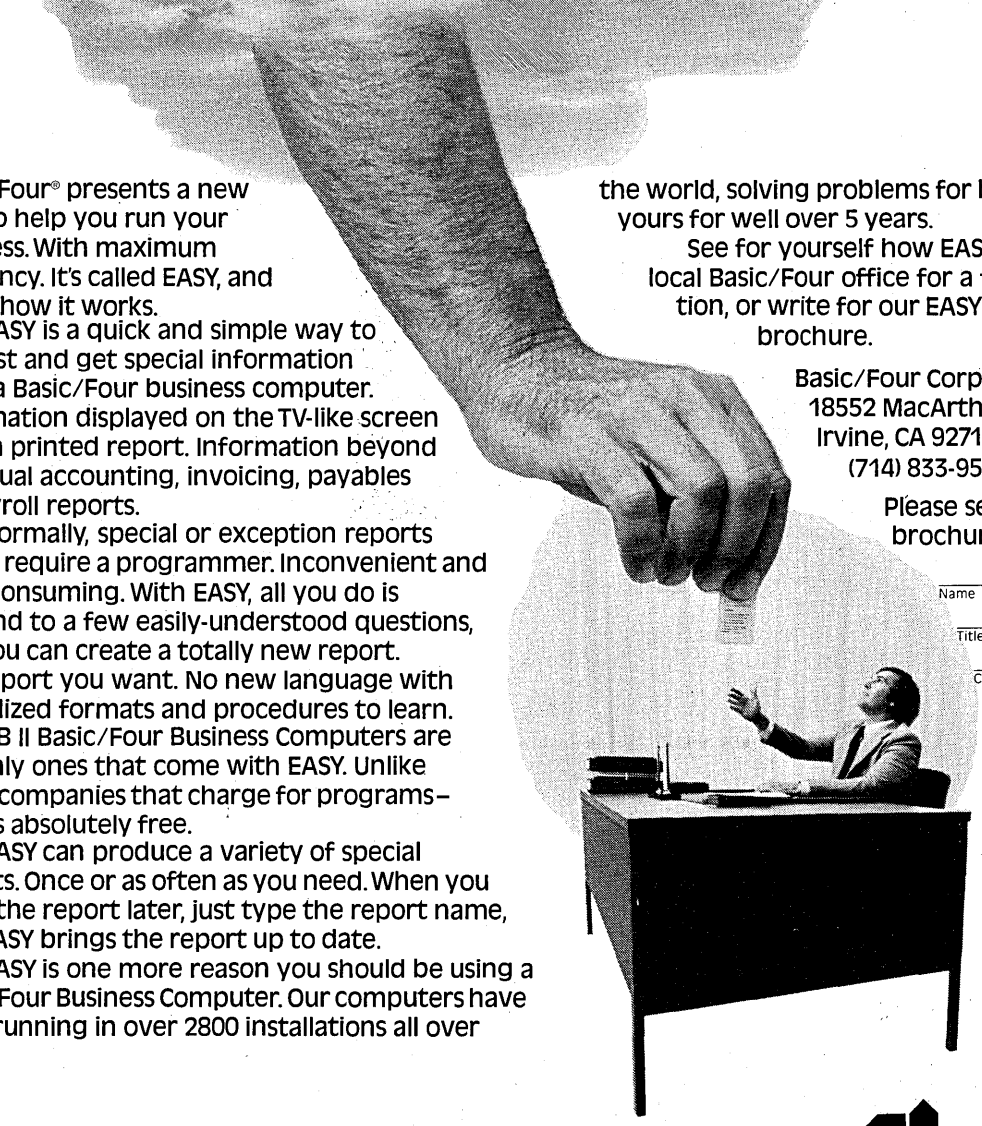

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Software

Will IBM Unbundle Its Operating Systems?

Yes, but gradually. It probably first will show up in MVS "selectable units," later in the 138-148 line.

Will IBM unbundle its operating systems? The question has been on the minds of users and of independent software companies, among others, ever since the giant unbundled its applications software in 1969. Several recent developments—including the introduction at bargain-basement rates of the 138 and 148—have heightened that interest. And there is evidence that the company may be testing the water with selective operating system unbundling.

Control Data Corp. first said it was unbundling all the way with the announcement 28 months ago of its Cyber 170 line. Under a Separate Element Pricing (SEP) scheme, every bit of the Cyber 170 operating system, including utilities and peripheral device drivers, was priced separately. This spring and summer NCR Corp. and Burroughs Corp. announced unbundling with their Criterion and B80 lines respectively.

CDC, Burroughs and NCR unbundle partially. Can IBM be far behind?

"For us to market the Criterion as a bundled system would have meant that most users would have had to pay (through hardware) for costly software they might never need," says NCR chairman and president, William Anderson. "It is software which is labor-intensive, rather than hardware," he said. Burroughs announced it would put a price of $2,500, or a monthly license of $70, on its master control program for the B80. The master control program (MCP) is the name Burroughs gives to all of its operating systems, but which it separately prices only on the B80. The company hasn't explained why it is unbundling the MCP on the B80, but it obviously makes the hardware package more attractive against competitive products, some of which are bundled. (Burroughs recently announced its B6800 which it said it was pricing to compete with IBM 138 and 148 machines. But a spokesman said the MCP would remain unbundled.)

Reflects lower cost

Such activity, of course, reflects the diminishing cost of hardware from technological innovation and the ever increasing cost of labor-intensive software, which a recent Defense Dept. report said would account for 90% of the Pentagon's dp budget by 1985.

Control Data's general manager of computer system strategy, Frank Vince, says that although all software has been priced separately, it still is subsidized partially in the price of the hardware. But it is Control Data's goal to make it truly reflect the development costs.

"We are a leader in separate element pricing—we took risks—but there has to be much greater general acceptance by the industry before we can reach the fully unsubsidized stage." The company has installed some 70 Cyber 170 systems—mainly the 172 model, but at least a dozen 174s and 175s—and the acceptance of SEP is "better than a lot of people had hoped." Vince thinks that the software will be paying its own way "by 1978, if not by next year."

The company has extended SEP to its recently announced minicomputer line, the Cyber 18 line, "but not to the extent that the 170 was priced separately." That means a considerable amount of the software is underwritten in the price of the hardware. Some older models of CDC equipment also are being re-sold under the SEP plan.

Control Data chairman William Norris said recently that separate element pricing is bound to catch on, but it won't have much of an effect on the industry until IBM goes along with it. At the time of the CDC announcement, the Assn. of Data Processing Service Organizations (ADAPSO), which had criticized the practice of "free" software as a tie-in to software, saw the CDC move as merely a "moral" victory.

However, former IBMer Jerry Enfield, president of The Computer Software Co., thinks IBM is changing its view with regard to bundling of operating systems. Enfield was on IBM's Implementation Task Force that devised the details and the actual announcement of the unbundling of certain services and applications software in 1969. He testified recently in the Justice Dept.'s antitrust trial against IBM. He said that he argued in 1969 that the company should price all of its software separately, not merely applications programs.

Enfield said later he was "amazed" that during the cross examination period, the IBM lawyers did not attack any part of Enfield's testimony concerning the advisability of unbundling operating systems, suggesting the company is not as opposed to unbundling as it was seven years ago.

In his testimony, Enfield argued that there is no technological reason for bundling operating systems software today. Bundling simply makes it a convenient package. He added that if operating systems were unbundled, users would have the option of evaluating software against software as they do when selecting hardware today. And, he suggested, independent suppliers of software would elect to compete in the development and marketing of systems software if IBM were to put a price tag on it. Lower prices would result, thus assisting users.

There is no technological reason for bundled operating systems software today.

Comfortable position

Computer industry analyst Gideon Gartner of Oppenheimer & Co, of New York, thinks IBM is poised to unbundle

operating systems, but that this will come gradually as IBM finds itself playing the follower. "This is obviously a more comfortable position legally, should plug-compatible mainframe firms cry foul."

Gartner ties his reasoning to IBM's new method of breaking out software releases for its Multiple Virtual System (MVS) into modules—or Selectable Units (July, p. 17). These represent a performance and/or functional enhancement to a base release of an IBM operating system. "In the past, if a user wished a single new enhancement, he had to wait and convert to the next release of his operating system which probably contained many new features the user did not need or want," Gartner says. "Now, IBM has minimized massive change, since the user can select only those functions (SUs) which he needs."

In late May, IBM announced eleven SUs, and earlier this year announced TCAM 9 and VTAM 2 (which are SUs, although IBM didn't call them that). These were not priced, but IBM also recently announced a "Program RPQ" enhancement package for its Virtual Machine (VM) operating system for $800 a month, which Gartner calls the "first clue" to operating systems pricing.

Gartner thinks that while the SUs were announced for MVS, which is IBM's top of the line operating system, the commonality of certain functions across various operating systems makes it seem inevitable that the SU approach will quickly spread across the line. He expects that some degree of pricing may be introduced without any corresponding drop in hardware prices—until future mainframe announcements in which a large number of new SUs might be made available for a price.

He notes that features of "System Q," uncovered in the Telex trial documents, included substantial modularity, "and the introduction date was 1976 and slated to be 'gradual', just like the SUs. There has been speculation that IBM would try the 'back door' approach to System Q, presumably to catch the industry by surprise."

Control Data's Frank Vince says "IBM has no choice but to go to separate element pricing," given the price of its new 138 and 148 and the competition from Amdahl Corp., with its IBM compatible machine, and Control Data and others, with model 145 emulators.

The 138 and 148 machines were announced last month at prices some 45% below their 135-145 predecessors and 22% below on rental, with considerable improvements in performance (see page 134). Vince expects that IBM soon will make a follow-up announcement which would include pricing of some operating software.

Gartner notes that the new machines can run IBM's VMS without any performance degradation on production work. He thinks IBM will push MVS very hard to 138 and 148 users, encouraging the users to convert to more sophisticated environments. "These environments will include interactive, remote communications and data base which eventually will lead to acquisition of new software that is priced."

—Tom McCusker

SHARE, Others Offer Modifications to OS

Some users of IBM 360s and real memory 370s are quite blasé about the notification from IBM that support for their operating systems, OS/MFT and OS/MVT, will be discontinued by the end of next year. "All things have to come to an end sooner or later," says a 370/155 user in New Jersey. "I don't think anyone expected OS to live forever." Another user, with a utility company in the South running a 360/65 and a 155, both purchased, says, "We don't see it as an immediate problem to be worried about."

The scheduled withdrawal of support by the mainframe vendor comes as no surprise to users of OS, which has been out for 10 years or more. But they've been asking their vendor to give them more than a six-month warning that the support was coming to an end. Users of Release 21.8 have been provided an 18-month notice.

OS users now know their base is stable and they no longer will hesitate to modify or enhance their operating system.

Bobby R. Cabaniss, vice president at Itel Corp. in San Francisco, says that OS users now know their base is stable and they no longer will hesitate to modify or enhance their operating system. He sees a hefty market of purchased 360s and 370s that independent software companies could serve. In the federal government alone, he figures there are more than a hundred 360/65s on OS.

More and more modifications

This month in Montreal the big IBM users group, SHARE, meets. And Dr. Robert T. Rannie of Union Carbide, who heads up the OS/MFT-MVT Project within SHARE, says it will be business as usual—people will be passing around modifications and enhancements to OS. "Nowadays the thing we find is that people are spending a lot of time talking to each other and passing around more and more mods," says Rannie. "And I think that aspect of the business may even have increased a little bit now."

One of those enhancements is a replacement for ISAM, the index sequential access method, under OS. In its place, Itel has brought back VSAM from the VS operating system. The utility company in the South has it running on a 165 under OS. But the user, short on capacity, is also getting a 370/158, and the plan is to run OS/MVT while they examine the equivalent virtual operating system, MVS.

Itel's Cabaniss says he still gets calls from 158 and 168 users on MVT, people who are looking for VSAM for it as a step toward moving to MVS. "I think most of the virtual system users expect that some day they are going to be on MVS, and they're looking for a step-by-step approach to getting there."

Migration problem

Getting users to migrate from real memory to the virtual memory systems has been a problem for IBM. And the discontinuation of support for real memory operating systems is seen by many as IBM's way of effecting this migration. One user contacted for this story said he thinks IBM will begin introducing its next generation of machines a few months after all support for OS has been dropped. "I think it's another indication of the way IBM can control things," he commented. Indeed he's trying to decide whether to get a DAT box for his 155 or go to a 158.

But a systems programmer at a service bureau in California says their 360/65 under MVT can remain in service for them several years more. This installation has taken advantage of modifications to OS available through SHARE.

One of the latest of these, according to Rannie, is the in-core job queue. He reports that some people say they can eliminate 96% of the I/O's to the OS job queue by dedicating from 40K to 100K of core to the job queue. But there's a proviso. "You must be running a HASP or an ASP system where you can OS cold start every time you IPL," he says. This is because the job queue, being in core, has nothing current. But people are finding that by putting this on their system they can greatly reduce the I/O load on their job queue, which presumably is one of the big bottlenecks in OS.

At the SHARE meeting, as usual, Rannie will be carrying a paddle with the inscription, "Help Support OS/MFT/MVT," signifying the necessity for OS users to paddle their own canoe. But when he's back in his office at Oak Ridge, Tenn., Rannie fields a number of phone calls from users seeking a specific mod or enhancement or who have come up with a few themselves. "We have something over a million card images of mods and enhancements (to MFT and MVT) that people can get," he says. Which seems to support his comment to the effect that, "There's a very enthusiastic group of paddlers out there."

—Edward K. Yasaki

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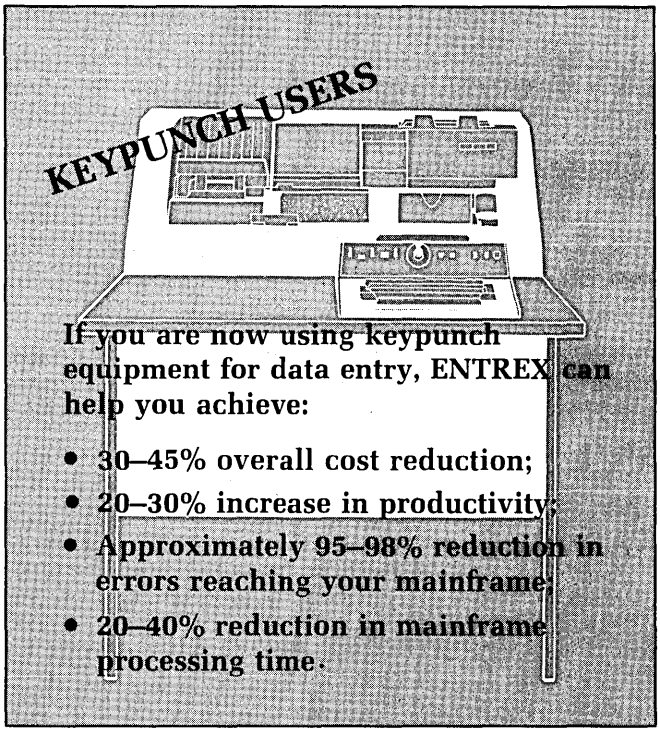

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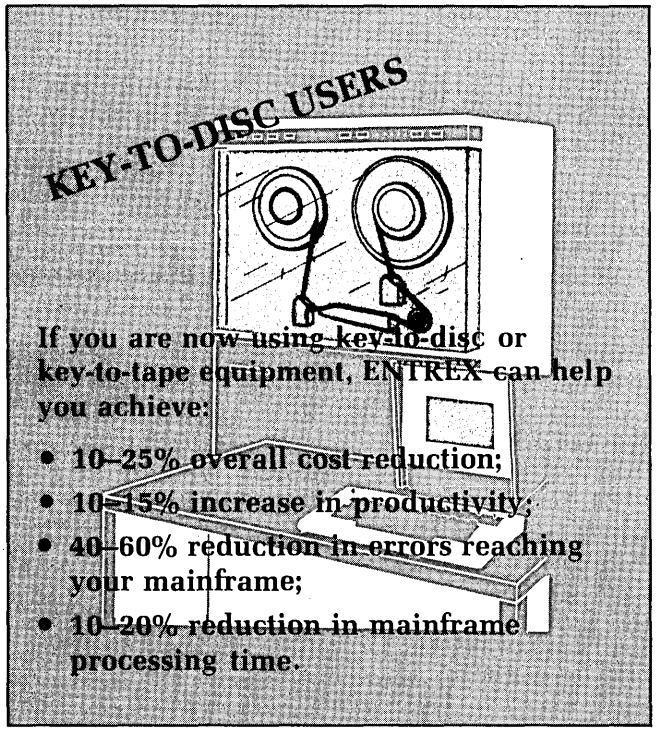

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news in perspective

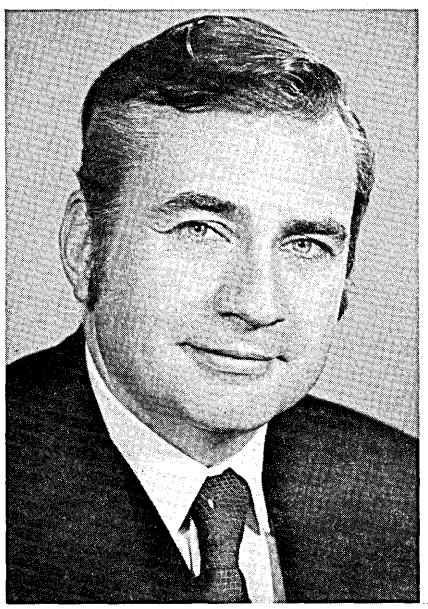
Electronic Funds Transfer

TNS Up and Running In Seattle

AT&T's long talked about Transaction Network Service (January, p. 17) is seeing its first use in Seattle.

Bell says the service (TNS) is "intended to provide the basic communications service for short data messages such as inquiry-response financial transactions." And the user doesn't have to worry about paying for those first three minutes. A lower price buys a smaller chunk of time. There is no charge for installation.

The telephone company says TNS will interface with non-Bell equipment as well as touch-tone phones, existing



PETER F. MC CLOSKEY
Wants interface specs. . .

models of Bell's Transaction Telephone, and a Bell terminal called Transaction III which can collect and store data for later polling. Voice response is another available feature, particularly attractive to bankers.

CBEMA isn't so sure. At a hearing preceding issuance of the temporary tariff by the Washington Utilities and Transportation Commission on April 27,

"We wanted more technical information," said Peter McCloskey, CBEMA president.

CBEMA (Computer and Business Equipment Manufacturers Assn.) asked a temporary delay on the issuance of 120 days. The request was denied. "We wanted more technical information," said Peter McCloskey, CBEMA president. "We wanted interface specs. We wanted them (AT&T) to make clear the scope of the project and the real meaning of their rates." He said in mid-July CBEMA had no plans to appeal the decision of the Washington commission.

Electronics Funds Transfer (EFT) is clearly Bell's first thrust with TNS but the phone company has made it clear it sees other applications such as reservations systems, library retrieval, monitoring systems, quotation services, and medical applications.

But what about the Federal Communications Commission? The FCC already has ruled that Bell's Dataspeed 40 terminal is a data processing terminal which puts it outside of AT&T's tariff realm. Possibly Bell is pinning its hopes for the success of TNS on its lobbying efforts on behalf of the Consumer Communications Reform Act, which it is sponsoring and which has a lot of support in Congress. The bill, among other things, leaves regulation largely up to state commissions. Hearings on the bill are expected to start in September.

Site a surprise

Bell watchers who were surprised that the phone company chose Seattle for its pilot TNS project (most supposed New York would be first) were speculating last month that it was because an evaluation of the possible cooperation of state regulatory bodies gave the northwestern state the edge.

Gale Hirschy of Pacific Northwestern Bell said that while the pilot project initially was operative only in Seattle, it would be spread throughout the state of Washington by the time the temporary tariff expires on June 1, 1977.

Bell's Transaction Telephone, introduced in late 1973, is finding widespread use in EFT systems outside the Bell sys-

The service will spread throughout the state of Washington by the time the temporary tariff expires on June 1, 1977.

tem too. TRW Validata has extended its nationwide credit and check verification service to small businesses through use of the device. Initially the service is available to small businesses in the Los Angeles area but plans are to extend this to local merchants throughout the U. S. as Transaction telephones become available through various local phone companies.

In the new TRW service, a small merchant can automatically dial its Validata service via the Transaction Telephone and, within seconds, verify the validity of a customer's credit card or learn of a bad or stolen check. The Validata files include information from such card issuers as Master Charge, BankAmericard, American Express, Carte Blanche, and Diners' Club.

National Data Corp., Atlanta, has upgraded its credit card authorization service, one of the most active in the country, to support Transaction Telephone I and II. It also has developed an audio response system that will allow merchants to utilize the Transaction Telephone I touch-tone telephone to access its system.

Since 1969

National Data's credit card authorization system was developed in 1969. More than 50 percent of the Master Charge banks are on its system, as well as a variety of retail, airline, travel and entertainment, and petroleum customers.

Last month the company said it had successfully completed a computer-to-computer interface with National Bank-

Small merchants can now use the TRW Validata credit and check verification system via the Transaction telephone.

Americard's BASE I system which will allow it to offer its credit card authorization services to banks participating in the National BankAmericard program.

National Data also has added Security Pacific National Bank, second largest issuer of Master Charge cards, to its authorization program. The Georgia firm will provide a turnkey system for Security by installing and maintaining and operating a "beefed up" minicomputer in the bank's computer facility which will be linked with National Data's real-time computers in Atlanta.

Security, almost at the same time, started another EFT related pilot. It installed the first of a series of 750 Transaction Terminals in what ultimately will number a dozen Alpha Beta supermarkets. The terminals, manufactured by Concord Computing Corp., Bedford, Mass., are designed for check and credit authorization and financial transaction entry at the point of sale.

A similar project was started in the Cincinnati area by Kroger supermarkets using NCR 279 terminals. The program is a cooperative effort between Central Trust, the Kroger Co., and NCR. It was operative in two Kroger stores last month. Central Trust customers activate the on-line terminals by entering their Central cards and indexing their personal identification numbers for verification by the bank's computers.

Statewide system

In Iowa, Iowa Transfer System, Inc., a corporation owned by Iowa banks, signed an agreement last month with Dial Financial Corp. that will result in

implementation of a statewide electronic funds transfer system.

Russell S. Howard, Jr., president of Iowa Transfer, said "To our knowledge this will be the first such statewide system in the nation." Iowa Transfer, a non-profit corporation, was organized this year to develop and provide EFT for its member banks. The initial contract, which runs through 1978, provides for Dial to develop the software and operate the system.

Some Iowa banks already offer EFT services to their customers via terminals in supermarkets, but only to their customers through their own terminals. The new system will allow customers of any member bank to carry out a transaction through any terminal in the state. The transactions will be processed through a central switch provided by Dial which currently has some 2,200 terminals in 47 states hooked up to its computers. No implementation date for the Iowa bank system was announced.

In California, implementation date for an EFT system under development for Savings Assn. Central Corp., a service organization formed by savings and loan associations which has 88 participating institutions, has slipped from Feb. 1, 1977 to late fall of 1977.

System Development Corp. has a contract to design the message switching system. James Campbell, SACC president, said a request for proposal for the network portion of the system has been issued with a deadline of Aug. 13.

Back in Chicago

Meanwhile, back in Chicago, EFT pioneer Continental Bank continues its war against Illinois' unit banking laws and the impediment those laws have been to the bank's EFT efforts.

It strongly supported a city of Chicago ordinance, passed July 8, permitting expansion of banking facilities, and immediately filed a suit in Cook County Circuit Court asking the court to declare the ordinance constitutional and asking for a permanent injunction prohibiting state banking commissioner Richard K. Lignoul and his office from interfering in any manner with "the lawful activities of Continental Bank as permitted by the ordinance."

Continental also has petitioned the U. S. Supreme Court seeking to overturn a ruling of the U. S. Court of Appeals for the Seventh Circuit Court that off-premises customer bank communication terminals (CBCTS) are branches.

Continental received a temporary stay from the Appeals court to continue operations of two CBCTS. In its Supreme Court petition the bank said the issue is whether "the participation of national banks in the nation's new electronic payments mechanism can be foreclosed or restricted through application of branching laws even as to electronic funds transfer in states where this is unnecessary to preserve competitive equality between state and national banks."

Continental said the status of electronic terminals under the federal branching laws is significant for national banks in all states, not only where the state's statute relating to state chartered banks prohibits, or limits, the number or locations of branches.

"The Federal branching laws," said Continental, "do not expressly encompass a number of CBCT functions, and there is no reason to stretch them to deprive the public of the benefits of the new technology."

—Edith Myers

Banking

Major Bank Replaces Large Mainframes With Minicomputers

In the data processing operations of large banks, a certain classical monotony has been in existence for years: the old big IBM mainframes are wheeled out and the latest model big IBM mainframes are wheeled in. It is a life cycle as predictable as the return of the swallows to San Juan Capistrano.

But, at First National City Bank in New York City, the life cycle is being broken. When the big IBM mainframes are wheeled out, they aren't replaced with newer IBM mainframes or with anybody else's big dp mainframes either for that matter. They are being replaced by minicomputers and the phenomenon shows signs of gathering momentum in the future.

The most dramatic development has occurred at the bank's Securities and Government Services Group where

Eight Interdata minicomputer systems are performing data processing duties once carried out on an IBM 370/165.

eight Interdata minicomputer systems are performing data processing duties once carried out on an IBM 370/165.

"We account for the largest dp application at the bank," says John L. Hughes. "We're the first ones out of the bank's central data center and, after a few weeks experience with the minis, I can say that everything is working well."

And Microprocessors Too . . .

From a paper presented at Interface '76 in Miami by Seymour Ratner, Citibank systems officer.

We are currently implementing a *Global Communications Network.* It will link all the major countries of the world via a complete communications belt, totally dedicated to serving Citibank's communications needs. This will enable us to communicate, on a real-time basis, timely information to be used for transaction processing, foreign exchange trading, worldwide liability reports and our accounts reconcilements.

The hardware to be used for our new world will be minicomputers and microprocessors. They will be the driving force in technology over the next decade. We recognize the potential available in the mini/microcomputer configuration as opposed to the million dollar large scale equipment . . .

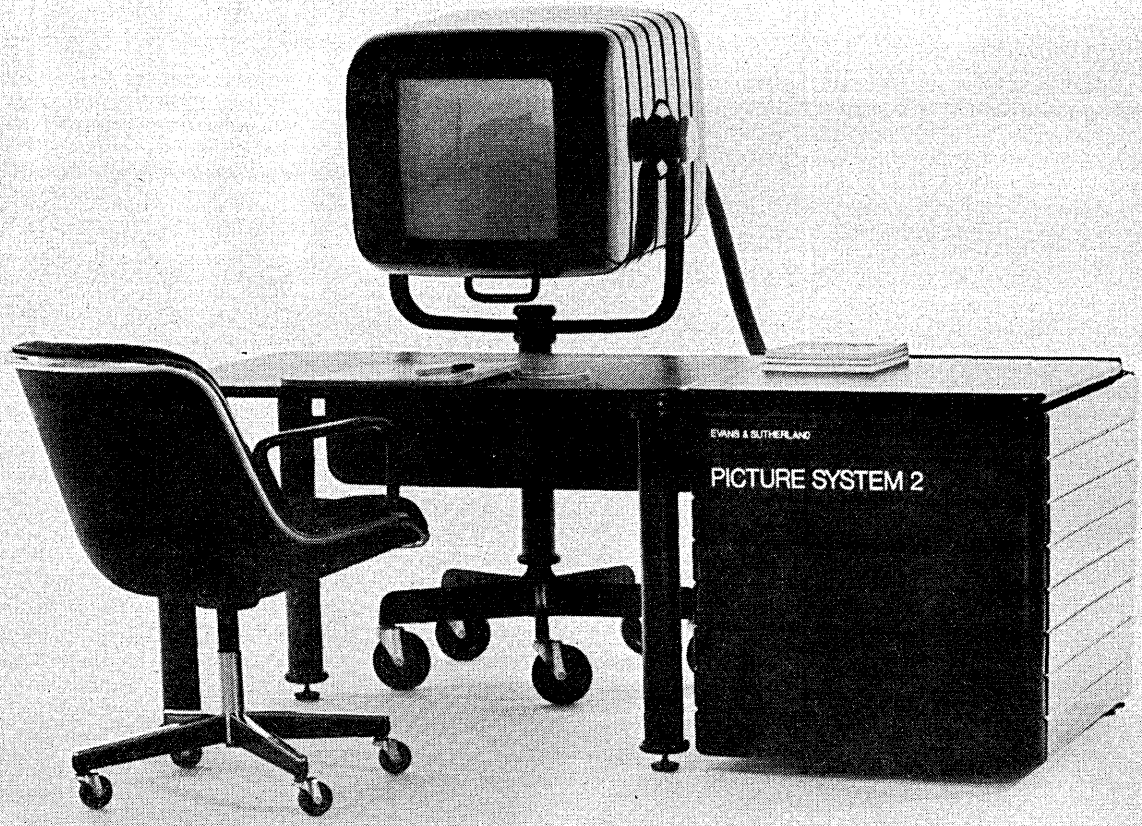
The microprocessor will allow us to further decentralize our processing operations, permitting the decentralization of files to the local branches and allow us to render statements in the branches and print interim statements upon request on a standalone vending type of machine . . .

To date, some of this is still a dream but we have managed to design a check processing system using this new state of the art microprocessor technology . . .

The near future will surely see microprocessors being used around the bank as commonly as hand calculators are now . . .

One system developed during 1975, was the LOCKBOX Automation System. It utilizes the "work station concept" with a microprocessor, the Intel 8080, controlling a display and a Burroughs Check Encoder. The entire terminal was designed under Citibank direction and is communicating directly with DEC equipment . . . We're going to add a Citibank designed optical scanner to process invoices in order to offer our customer a greatly enhanced remittance service. . . .

Our plans for the consumer business also include a transaction processing model . . . The customer's transaction, keyed into the terminal, is processed by a locally based Transaction Processing Computer, a microprocessor in the local branch probably, and a customer advice is transmitted. This microprocessor will send accounting and MIS data, via our TTI network, to perform the accounting and generate corporate reports. ✲



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EVANS & SUTHERLAND

CIRCLE 15 ON READER CARD

news in perspective

Hughes is dp vice president for Citibank's Securities and Government Services Group—a unit that is primarily concerned with stock transfer applications. His data processing requirements represented about 25% of the work load at Citibank's central data center.

Hughes figures the bank will save $1.4 million annually by using the minicomputer systems after the $750,000 startup expense has been paid. Previously Hughes' operation was paying the bank's central data center $2.8 million a year and he says the annual cost henceforth will be one half that.

DP managers too

Were there any difficulties in the changeover to the mini systems? "The hardest thing we had to do," says Hughes, "was to take line managers and make them data processing managers too. They couldn't be trained for the experience and there was no way they could really learn until they took responsibility for the equipment."

While there were initial difficulties in preparing the managers for their new dp responsibilities, Hughes found that programmers, systems analysts and operators thrived from the start with the mini installations that are scattered about the bank.

"The job satisfaction is better," says Hughes. "The operators, for instance, can do everything on a mini system, while they often couldn't even see the disc drives in the large data center. In a sense, they feel like they're running the operation."

Hughes directed the training of the personnel in the changeover using in part a series of videotapes provided by Interdata. As might be expected system programmers and systems analysts had the most trouble adapting to the minis while applications programmers adapted very easily. The applications programmers continued using COBOL on the Interdata equipment, which Hughes says was the most like IBM's of all the mini vendors he examined.

Hughes said experienced operators adapted to the new equipment in one day but "totally inexperienced" operators took more than a month before they could effectively work with the Interdata equipment.

The IBM mental set

"I have found," says the outspoken Hughes, "that the major problem in implementing minicomputer systems is the difficulty you have in overcoming what I would call the IBM mental set. You must get your people to think in terms

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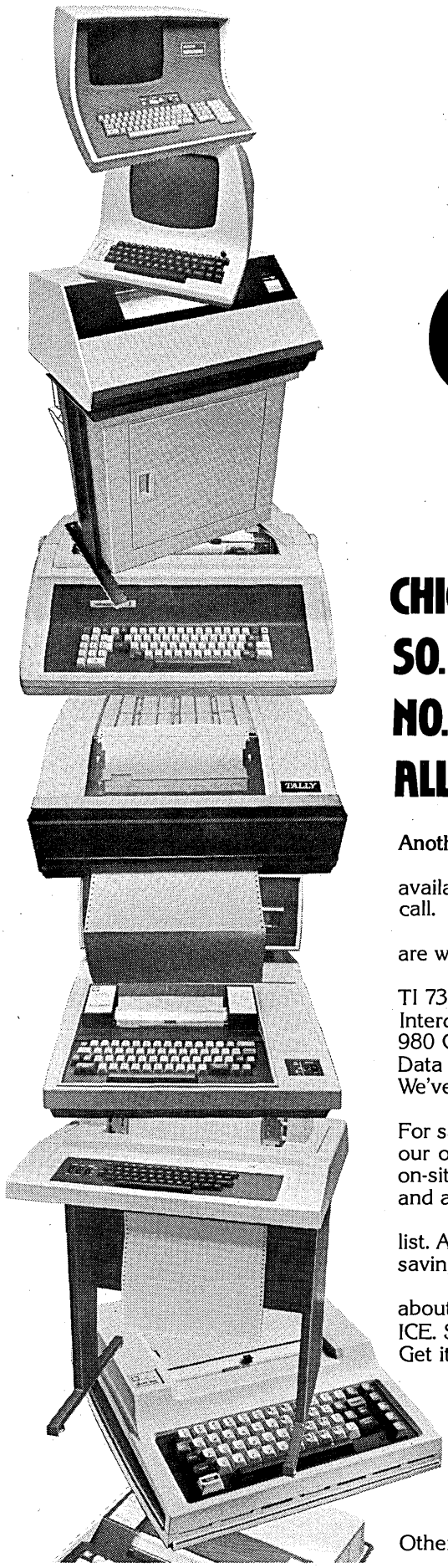

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of functional systems and small modular programs. Do not accept any excuses as to why their program or system is unique and cannot be converted to a mini."

Hughes points out that his dp operation went directly to minis from the large scale IBM equipment. Other departments in the bank which use the central data center are moving to smaller IBM systems as interim steps along the route to the final goal of installing super minis. Hughes says there will be hundreds of minicomputers scattered about the bank. More than 50 minicomputers were installed at the bank last year.

Actually, Citibank's move to minicomputers was based on a decision to move toward decentralized data processing rather than any misgivings about large IBM mainframes. A few years ago, the bank moved from a management philosophy that centered on cost centers to a management philosophy that emphasized a profit center approach, which carries with it wider responsibilities.

Citibank's move to minicomputers was based on a decision to move towards decentralized data processing.

The overall project of decentralizing the bank's operations was studied and implemented in a Citibank plan given the code name of Operation Paradise. The aspect of the plan that called for the breakup of the central data center was called Project Independence. In a lighthearted notice of the move Hughes' staff ordered campaign buttons sporting an illustration of an Interdata mini and carrying the words, "Independence, July 1, 1976."

The cheapest price

"We were given a free hand in Project Independence," says Hughes. "The only requirement was that costs had to remain flat. We decided to find the cheapest price for doing our data processing."

The data center, with two 165s at its heart, had been located on the 11th and 12th floor of the Citibank building on Wall Street. The configuration contained scores of sophisticated tape drives and disc drives.

"But we wanted to put powerful and self-contained computing equipment in different locations in the bank," Hughes recalls. "And one of the problems with IBM is that you can't put its equipment in a little corner."

Hughes' activities were important enough to IBM for the firm's chairman, Frank T. Cary, to call Hughes who remembers that Cary suggested some alternate ways of doing the job. Although Hughes stuck by his decision to go with the Interdata equipment, he points out that IBM made out quite well in the deal: IBM was already paid for the 165s.

Hughes also made special arrangements to provide for service and maintenance for the new Interdata equipment. "When you have ten minis," says Hughes, "you need a high level of support. We demanded and we also paid for on-site coverage."

Eight Interdata field engineers work out of an office at the bank's sixteenth floor and provide coverage 24 hours a day, Monday through Friday. A key job of what Hughes calls the "Interdata presence" has been to provide preventive maintenance and Hughes says the bank has experienced "very little down time" with the Interdata equipment.

Others considered

Before choosing the Interdata equipment, Citibank also reviewed equipment from other leading minicomputer manufacturers. While Hughes was favorably impressed with the other minicomputer equipment he saw, the feature of the Interdata equipment that tipped the scales in its favor was its similarity to IBM equipment.

Each Interdata configuration at the bank has an Interdata 8-32 Megamini with 524 K bytes of main memory, three 300 M-byte discs, and two high performance tape drives and line printers. In addition several local and remote crt's are connected to each configuration.

Largely as a result of Citibank's success with the Interdata equipment, Hughes has become something of a missionary on the subject of procuring mini equipment to replace dp mainframes.

For users with dp equipment considering a move to minicomputers, Hughes offers the following advice:

"Require that all proposals for new systems include one or more bids from minicomputer vendors. For your first venture into minicomputing use one of the consulting firms who have oem agreements with minicomputer manufacturers. It will save you money and provide an education for you and your staff. The benefits that you reap are in cost reduction, controlability, accountability, and it brings data processing closer to your users."

—W. David Gardner

Government Procurement

The Brooks Act for Competition in U.S. DP Buys: 10 Years Later Competition Declines

The General Services Administration and data processing systems manufacturers were thoroughly lambasted recently when a House Government Operations subcommittee, chaired by Rep. Jack Brooks of Texas, conducted a three-day hearing in the implementation of the legislation that bears his name.

Specifically, Brooks was concerned about the apparently-growing percentage of sole source procurements by federal agencies since enactment of his bill 10 years ago. One of its major purposes was to reduce sole sourcing. He also was unhappy because the dp standards program has failed to make system components more transferable.

A partial solution to the standards problem was suggested by Dr. Ruth Davis, director of the Institute for Computer Sciences and Technology at the National Bureau of Standards. She reported that over the next two calendar years, NBS plans to issue four input/output standards. One of these will specify a channel-level interface for large and medium cpu systems, and be based on work now underway within ANSI's X3T9 working group. The other three will be device-level interface standards. They involve minicomputer peripherals, high-speed disc units (3330-type and above), and tape drive connections for large systems.

"We would like to have these standards adopted in step with industry-sponsored voluntary standardization activities, but if they cannot be kept in phase, we do intend to adopt these federal interface standards and take the lead ourselves," said Dr. Davis. She added that a study is now underway aimed at determining whether federal agencies legally can be compelled to use federal standards.

Competitive buys decline

When the hearing began, Brooks pointed out that statistics gathered by his subcommittee show the percentage of fully competitive procurements negotiated by GSA declined from 60% to 36%

The percentage of fully competitive procurements negotiated by GSA declined to 36% from 60% between 1968 and 1975, says Brooks.

between 1968 and 1975. The first witness, Donald L. Scantlebury, of the General Accounting Office, ticked off several "horror" stories illustrating how agencies have wangled new systems long before the equipment was actually needed, without adequately determining their requirements, and without fol-

lowing the procurement regulations. In at least some cases, regulations apparently have been flouted intentionally.

Scantlebury said that in 1974, the Social Security Administration (SSA) ordered only 10 of 64 tape drives allegedly required for a new IBM 370/165 system, thus "avoiding having to obtain a procurement delegation from GSA. The other 54 tape drives were diverted from other SSA systems . . . Also, SSA acquired a Univac 1108 without obtaining a delegation of authority."

Competition is "inappropriate"

The subcommittee didn't receive much assurance that things will change from the official who oversees most federal adp procurements—Ted Puckorius, Commissioner of GSA's Automated Data and Telecommunications Service (ADTS). Competition is "inappropriate" in many cases, said Puckorius, because the agency procuring the system needs it for only a short time. In other cases, the buy involves acquisition of peripherals for an already-installed mainframe.

REP. JACK BROOKS: Author of Brooks Act is concerned about the apparently-growing percentage of sole source procurements by federal agencies since his bill was enacted 10 years ago. He's also unhappy that dp standards program has failed to make system components more transferable.

He agreed that there is an "opportunity" for injecting more competition into the federal procurement process but insisted this could be done by making greater use of third-party suppliers. As he put it: ". . . the free market may be expected to correct any trend toward a greater number of sole source procurements, without our intervention, when 'sole type and model' or 'sole type and model or equivalent' is the appropriate method of procurement."

Rep. Brooks normally doesn't suffer opposing views kindly, so it was rather surprising that he didn't challenge any of these comments. One possible explanation is that Brooks has decided on a more direct approach. Recently, ADTS was "requested" to defer approval of three procurements until Brooks' staff has investigated them. All three involve big IBM systems. One procurement is for a Navy facility at Mechanicsburg, Pa.; another is for the Defense Supply Agency, and the third is for the Air Force Strategic Air Command. The agency is complying with the subcommittee's "request."

Meanwhile, a knowledgeable non-Congressional source said there were "hot and heavy" rumors in May that Puckorius was on his way out, although since then the talk has died down. "Maybe Brooks is waiting until after the election, on the assumption that installing a new regime over there will be easier with the Democrats in power," said another source.

Opposing views

Two industry groups—CBEMA (Computer and Business Equipment Manufacturers Assn.) and CIA (Computer Industry Assn.)—testified at the hearing, and to no one's great surprise, they were 180 degrees out of phase on the issues of competitions and standards.

CBEMA president Peter McCloskey stressed the need for "stratified procurement." User agencies should have the "primary role" in determining their dp requirements, while GSA should have an "advisory" role, he added. Also, McCloskey criticized the federal emphasis on purchasing systems rather than leasing them. He argued that it results in obsolescent, inefficient operations.

Stratified procurement, he explained, involves the use of different acquisition techniques for different kinds of requirements—e.g. a system to support a totally new application would be procured differently from components needed to extend an existing system so it could accommodate new applications. Extensions to accommodate additional workloads would utilize still another procurement technique.

He didn't describe in detail the different procurement techniques he was recommending for these different sets of requirements, but later we asked CBEMA vice-president Vico Henriques for an example. He said that in the case of add-ons to existing systems, GSA or the using agency would simply publish an announcement in the Commerce Business Daily asking for bids on a specific make/model of, say, a tape drive; an independently-made equivalent of the specified make/model could also be offered. All bids would be analyzed, and a contract awarded, on the basis of price/performance.

This procedure, said Henriques, would eliminate the need to describe the tape drive in terms of lengthy specifications based on each of the applications involved in the agency's workload. It would also eliminate the lengthy, costly evaluation of each bid to make sure it conformed to those application requirements.

Henriques insisted that CBEMA's proposal would not reduce competition because all vendors with suitable equipment would still have a chance to bid. Actually, he added, by reducing the cost and complexity of the procurement process, the proposed scheme probably would lead to more bids and greater competition.

Not a panacea

Ray Lunceford, vice-president of Government Sales Consultants, Inc., which specializes in assisting federal dp contractors, commented that "GSA already is using make/model or equivalent specifications in most procurements that involve add-on peripherals for existing systems. But in any case, such specs aren't necessarily a panacea. The government must still define equivalency, keeping in mind only those functional requirements necessary to obtain the desired end result."

If these requirements—known officially as "salient characteristics"—are based on the equipment rather than the mission, competition can still be restricted, Lunceford explained. "Say the government asks for a specified make and model of disc equipment, or the equivalent, having a storage capacity of 317.5 megabytes/drive. If there is only one manufacturer of such equipment, only he can bid; another company, which may be able to offer the same price/performance by providing the total storage in different increments could be excluded."

Many times, instead of specifying make/model or equivalent, the feds will require each bidder's peripheral to interface with a specified cpu. But IBM and the other mainframers guard their I/O interface specs jealously, particularly on new cpu models, so it takes time for independent peripheral makers to develop competitive equipment. A mainframer can, and often does, extend this time lag by modifying his interface once the original specs have leaked out.

Biddle's view

Adoption and implementation of standard I/O interface specs would end this game, or at least reduce its anti-competitive effects, which is probably why the mainframers haven't exactly encouraged the development of such standards. As CIA president Jack Biddle told the Brooks subcommittee: "The adoption of standard hardware and software interfaces would go further toward meeting the intent of (the Brooks Act) than all the GSA oversight in Washington, because standard interfaces would promote a competitive, multi-vendor environment with quantitatively-recognizable cost savings to the federal government. GSA knows this, NBS knows this. But no one seems willing to act."

Standard interfaces would promote a competitive, multi-vendor environment with quantitatively-recognizable cost savings to the federal government.

Later, in a question-and-answer session with Brooks, Biddle reported that IBM documents which his organization has collected from the big federal anti-trust trial in New York City show that the company has a "public posture" favoring adoption of standards but a "confidential proprietary position" which is totally opposed.

Brooks then asked why IBM had withdrawn recently from ANSI's X3T9 working group, which is developing an I/O interface standard. "Their alleged reason," said Biddle, "is that the committee is not . . . developing a standard that will not impede technology." But IBM refuses to state its specific objections to the X3T9 proposal, or offer alternative proposals, he contended.

Unlike CBEMA's McCloskey, who argued that federal agencies don't have enough control over their dp procurements, Biddle said they have too much. The Brooks Act, he pointed out, requires an agency to justify each request for a delegation of procurement authority (DPA) on the basis of economy, efficiency, or national security. Biddle contended that GSA has interpreted these restrictions so broadly, they embrace "virtually any request" for a DPA and "as a consequence, the federal procurement process has drifted toward decentralization."

Brooks made it clear throughout the hearing that he agrees with Biddle. One question left unanswered at the end of the proceedings is how the Congressman will bring about greater control over the agencies. Closely-related to this question is another: in the process of lassoing the agencies, what additional restraints will be imposed on the dp industry?

—**Phil Hirsch**

Standards

Standard U.S. Link Protocol Seen "Possible" by Year-End

Chairman Gerald Schutz of ANSI's X3S3 subcommittee believes there is a "good chance" that ADCCP (Advanced Data Communications Control Procedure) can finally be adopted as a U.S. standard "by the end of 1976." The subcommittee voted on the bit-oriented communications protocol in July. It still must receive the blessing of X3 and ANSI's standards review board.

Suppliers have been following the progress of ADCCP closely and it's likely that the first terminals, concentrators, and communications processors implementing the standard will be announced within a few months after ANSI adopts it. These new products should enable data communications users to reduce their transmission overhead, interface more easily and economically with the new data networks proliferating in this country and elsewhere, and communicate directly with additional makes and models of terminals. The basic reasons for these benefits is that ADCCP provides a code-transparent information field—unlike present protocols in general use, which require the text of the message to be formatted in ASCII or some other specified code. Also, ADCCP needs far fewer bits to represent transmission control functions than its predecessors, which are character-based.

If and when ADCCP becomes a U.S. standard, it hopefully will be compatible with HDLC, the international link control protocol now being developed by the International Standards Organization (ISO).

Significant differences

At the moment, however, ADCCP contains several provisions which haven't yet been accepted by the ISO group working on HDLC. There also are significant differences between ADCCP and the link control portion of X25. The latter is a packet protocol adopted recently by Study Group VII of CCITT, the standards-writing organization of international telephone carriers.

"Not everyone favors total compatibility," says a knowledgeable source. ANSI, ISO, and CCITT could, for example, each develop their own link control standards, containing some common elements but also some different ones. For users, this probably would mean additional software, additional complexity, additional cost, and reduced system performance.

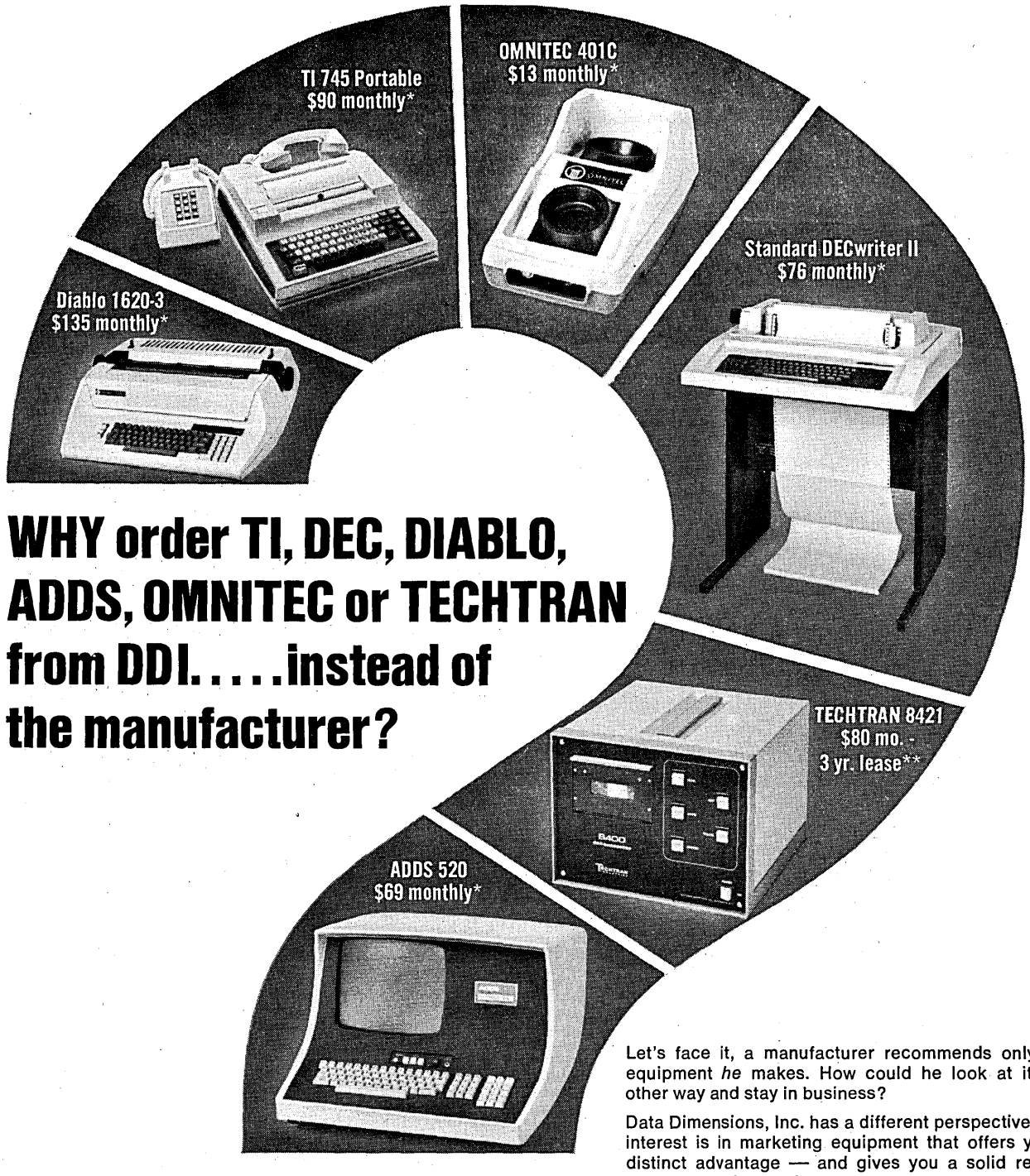
ADCCP provides a code-transparent information field—unlike present protocols in use.

Basically, ADCCP defines the controls needed to regulate communication across a data link connecting two or more buffered intelligent terminals (a central computer is one such terminal). The protocol also specifies the codes that implement these controls and physically positions the individual codes relative to each other.

Message data is transmitted within information "frames" that also contain related address, control, and error-detection codes. Besides the information frame, the protocol also defines a "supervisory" and an "unnumbered" frame format—they're used strictly for control. Each format begins and ends with an 8-bit "flag sequence" that represents the frame's physical boundaries.

The "frame structure" section of ADCCP describes the internal arrangement of the three formats. An information frame, for example, consists of the flag sequence followed respectively by address, control, information, and error detection code fields, plus a final flag sequence.

Although the information field, theoretically, can be any length, it is actually limited by such factors as the buffer capacity of the user's terminal. Thus, in many cases, more than one information frame is needed to transmit a complete message across the data link. ADCCP includes a scheme enabling the stations at either end of the link to keep track of these frames. It is similar to the frame-accounting system IBM developed for SDLC, and utilizes codes recorded in the



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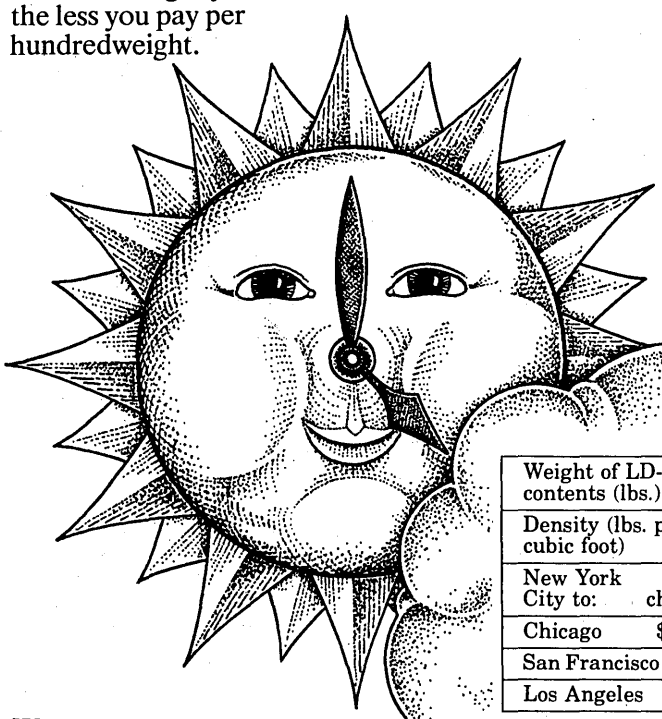

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San Francisco	403	26.87	19.19	14.93	13.43	12.75
Los Angeles	385	25.67	18.33	14.26	12.83	12.18

*Based on airport-to-airport Time of Tender "Daylight Savings" rates. These rates were effective February 15, 1976, and are subject to change.

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control field of the information frame. For the user, the big benefit of this feature is increased throughput. The user doesn't have to wait for each portion of a message to be acknowledged by the receiving terminal before he sends the next portion.

"Send-sequence number"

A sequentially-assigned binary code, referred to in the protocol as a "send-sequence number" (Ns), is coded into the control field of each information frame when it's dispatched from a terminal. This code, which has a value of zero to seven, is also stored within the sending terminal's memory.

When the frame reaches the other end of the data link, the Ns becomes a "receive-sequence number" (Nr) and is stored within the receiving station's memory. An equivalent send-sequence number is then assigned to the acknowledgment (ACK) frame, and when this frame arrives at the station that began the dialog, a similar transformation occurs—the Ns attached to the ACK is converted into an Nr. The latter sequence number is then subtracted, in effect, from the transmitting station's Ns record, which wipes out the entry. Finally, the transmitting station generates a *new* receive-sequence number, one unit higher than the one just received. It not only identifies the *next* ACK expected from the remote station, but also shows that all frames bearing lower Nr numbers have arrived at the transmitting station and have been accepted.

Each outgoing frame, besides carrying its assigned send-sequence number, also carries the Nr of the next ACK expected by the transmitting terminal. Thus, if a particular frame of ACK is lost or garbled en route, the difference between Ns and Nr in *succeeding* frames will increase steadily.

Choice of seven

One ADCCP option ("basic mode control field") allows a maximum Ns-Nr difference of seven—i.e. up to seven sequentially-numbered frames can be transmitted across the data link before the transmitting station must receive an acknowledgment that the first one was correctly delivered. Alternatively, up to 127 information frames can be outstanding at any time. This latter option ("extended mode control field") is designed mainly for satellite data links, where transmission generally takes longer than on terrestrial channels.

Error recovery can be initiated in either of two ways:

1. If a frame is lost en route, or gets garbled and can't be accepted upon arrival, a gap will appear in the Nr sequence recorded at the receiving station. It then sends back a supervisory frame, containing the missing Nr, which requests re-transmission of the associated information frame.

If there is just *one* frame missing, the supervisory message may contain a "selective reject" (SREJ) code. Sometimes, however, more than one information frame is missing. In that case, a "reject" (REJ) code may be used. It tells the sending station to re-transmit all previously dispatched information frames beginning with the one having a sequence number equal to Nr.

2. A "primary" station can initiate error recovery by transmitting a frame that contains a "poll" bit—i.e. a "1" recorded in the fifth position of the control field. The receiving station—known as a "secondary"—then sends back the Nr of the next information frame is anticipates receiving from the primary. This response frame contains a matching "1" in the fifth bit position of its control field. (It's often called the "final" bit. Collectively, the two codes mentioned above are referred to as the "poll/final" or "P/F" bit.)

If the secondary has failed to receive a particular information frame or frames, there will be a difference between the Ns in the primary's poll frame and the Nr in the secondary's "final" response to that frame. Thus, by comparing these two sequence numbers, the primary identifies the frames it originally transmitted which failed to get across the data link in acceptable form. After making the comparison, the primary retransmits these frames.

Coding is different

The supervisory frames that perform many of these error-recovery chores have a format similar to the one utilized by information frames. However, the supervisory format does not include an information field and the control field coding is different.

Unnumbered frames—the other type included in the ADCCP protocol—have essentially the same format as supervisory frames, as well as a similar mission. Basically, the unnumbered frame provides a place for implementing data link controls that couldn't be physically accommodated within the supervisory frame. There are also some unassigned bit positions in the unnumbered format where the user can set up his own control codes.

ADCCP assigns flow control and error control responsibilities on the data link to specific terminals.

ADCCP assigns flow control and error control responsibilities on the data link to specific terminals. An "unbalanced" link is one where control of communications in *both* directions resides permanently in the same terminal—for example, a central computer connected to a polled network. On a "balanced" link, by comparison, error and flow control in *each* direction is exercised by *different* terminals.

On unbalanced data links, the protocol defines two basic levels of control that can be exercised by the "primary" station—the one that's in charge—over the others, which are referred to as "secondaries."

In the "normal response mode" (NRM), a secondary can begin transmission only after it receives specific authorization from a primary. In the "asynchronous response mode" (ARM), the secondary can initiate transmission whenever it wants to, but it has to interrupt this flow if the primary sends a supervisory, unnumbered, or information message that requires an immediate response. The primary exercises this control—in either case—by setting the value of the poll/final bit at 1.

A balanced data link can operate only in the ARM mode.

The primary changes the unbalanced data link from one mode to another by transmitting a "set asynchronous response mode" (SARM) or "set normal response mode" (SNRM) command to the secondary. The SARM and SNRM codes are recorded in bit positions 3, 4, 6, 7 and 8 of the unnumbered frame's control fields. ✻

Communications

Ruling Would Widen Phone Line Sharing

Unlimited sharing of Telpak and other private line services has been ordered by the Federal Communications Commission in a move whose effect would be to cut data communications costs drastically for many users.

The present mileage rate for a Telpak derived voice grade channel is about 70% of the Hi-density rate for a similar facility. The difference between Telpak and Lo-density rates ie even greater.

The FCC is requiring AT&T, the other domestic telephone carriers, and the international record carriers, to revise their present private line tariffs by next Sept. 1. However, this deadline may change if, as appears inevitable, the carriers ask for a stay.

Telpak channels, at present, can't be shared except by the airlines and certain other user groups who have been granted "single customer" status by AT&T and the other telephone carriers. Thus, most users with smaller communications traffic volumes can't exploit Telpak's sav-

ings. This new ruling allows such users not only to form sharing groups on their own and collectively lease Telpak, but it also permits intermediaries ("resale common carriers") to buy Telpak channels in bulk and then divvy them up among independent end-users.

The same options are made available to users who want to share single voice grade circuits. As in the case of Telpak, the present rules restrict resale and sharing of these facilities to certain types of

New ruling allows users with smaller communications traffic to form sharing groups on their own and collectively use Telpak.

users, certain classes of private line service, and certain kinds of communication. AT&T's Tariff 260, for example, allows a private line to be shared by a "customer" and "authorized users," but both entities must be in the same line of business and they can use the shared circuit only "for the transmission simultaneously of communications which relate directly to matters of common interest . . ." The FCC decision sweeps away all of these restrictions.

On their own, or buy

Users who want to share communication channels can do so on their own or they can acquire shared facilities from a resale common carrier. User-operated sharing arrangements won't have to be approved by the commission, but resale carriers will—and before rather than after they begin operation. The certification procedure will be simpler than the one imposed on other types of common carriers, though. Notably, the prospective resale carrier won't have to demonstrate that a special public need exists for his service. Also, the commission has decided to impose only minimum restraints on the resale carrier's charge and profits. Essentially, the new order allows each supplier to write his own tariff but warns him that it must be non-discriminatory, just and reasonable.

The decision permits three basic kinds of sharing arrangements:

1. " 'pure' sharing, wherein two or more users . . . share only the costs of communication line services."
2. sharing through a "non-profit intermediary"—i.e. a group set up jointly by the participants.
3. sharing "either through a for-profit intermediary" or in an arrangement where one user acts as manager for the others.

Participants in the latter two arrangements can be charged a "management fee," said the commission, but only if it is collected by an "outside entity"—i.e. a "non-profit intermediary" or a "for-profit intermediary," and "no sharer obtains a profit therefrom." Intermediary-run sharing groups can also provide "augmented services"—such as communication hardware and software—but here again, no participant can earn a profit from the charges for these facilities.

Costs will tumble

One possible result of the FCC decision is that the cost of existing services offered by on-line service bureaus, specialized carriers, and value-added carriers will come down because each of these suppliers is eligible to share and/or resell communication channels obtained from the telephone carriers.

A specialized carrier like MCI, for example, could lease one or more Telpak groups from AT&T and tariff the individual channels to separate end users at rates considerably below what those users are now paying for individual voicegrade channels on MCI's own network.

An on-line service bureau could organize its customers into one or more sharing groups and make its data-processing facilities accessible through subdivided voicegrade circuits. The communication facilities would have to be offered at

Cost of existing services offered by on-line service bureaus, specialized carriers and value-added carriers will come down through resale.

cost, but the service bureau could continue earning a profit on its computer time and related support. The end user's total bill would be reduced because he would be paying less for the communications link.

Another possible result of the decision is that it will encourage users to negotiate with system suppliers on a joint basis, and to develop common specifications for hardware, software, and communication protocols. The lack of such common action in the past has been due largely to the unwillingness or inability of datacom users to see much value in it. The cost savings inherent in sharing should reduce that obstacle noticeably.

Delays are likely

But it probably will be a while before the new sharing/resale policy is implemented, judging from the history of major pronouncements made by the commission. And there are a number of other factors that could hamstring the new policy even after it's implemented, according to FCC watchers. For example:

If Telpak bulk rates are abandoned shortly, as recommended early this year by the FCC's common carrier bureau, a major source of the savings anticipated

One observer says the new policy is an attempt by the FCC to save Telpak.

under the new resale/sharing policy would be eliminated. (One knowledgeable observer suggests that the new policy represents an attempt by the commission to save Telpak. The common carrier bureau, in its recommended decision last January, said in effect that Telpak should be eliminated unless marketed "in direct response to the competitive offerings of other carriers." The new policy, by allowing resale carriers to offer Telpak, provides a way of satisfying this requirement, he reasons.)

Even if Telpak isn't eliminated, the savings produced by the new policy are apt to be "insignificant," says Tariff Analyst Minor Huffman, of the Center for Communications Management. He argues that the migration of private line users to Telpak will increase the fill of the latter service, raise the phone company's costs, and force it to increase present rates to a point where the charge to the user for a voicegrade channel will be virtually the same whether he gets it from a Telpak group or on an individual-line basis." Regarding the sharing of individual private lines, Huffman indicated that AT&T's present policy is far more liberal than the FCC suggests in its present policy statement. He believes the major impediment to greater sharing is the user, not the phone company: many companies, for example, don't want their traffic to be mixed in with that of others.

Another limitation involves the amount of sharing that can be done, as a practical matter, on a non-profit or even a for-profit basis. "As communication requirements become more complex, and as the number of sharers increases, the management costs grow, reducing the prospective dollar benefits to each participant," says one source.

Conceivably, resale carriers—which are allowed to earn a profit—could offer shared facilities to users who weren't able to justify such an arrangement on their own. "But here again, there may be problems," says our source. "Can the resale carrier offer a service that's sufficiently specialized, at a price the customer will accept, and still come out ahead on the deal? Almost certainly, every resale carrier will concentrate on those user groups likely to produce the biggest profit, which means inevitably that other users will be ignored."

Possibly the best summary of the new policy's impact came from the commis-

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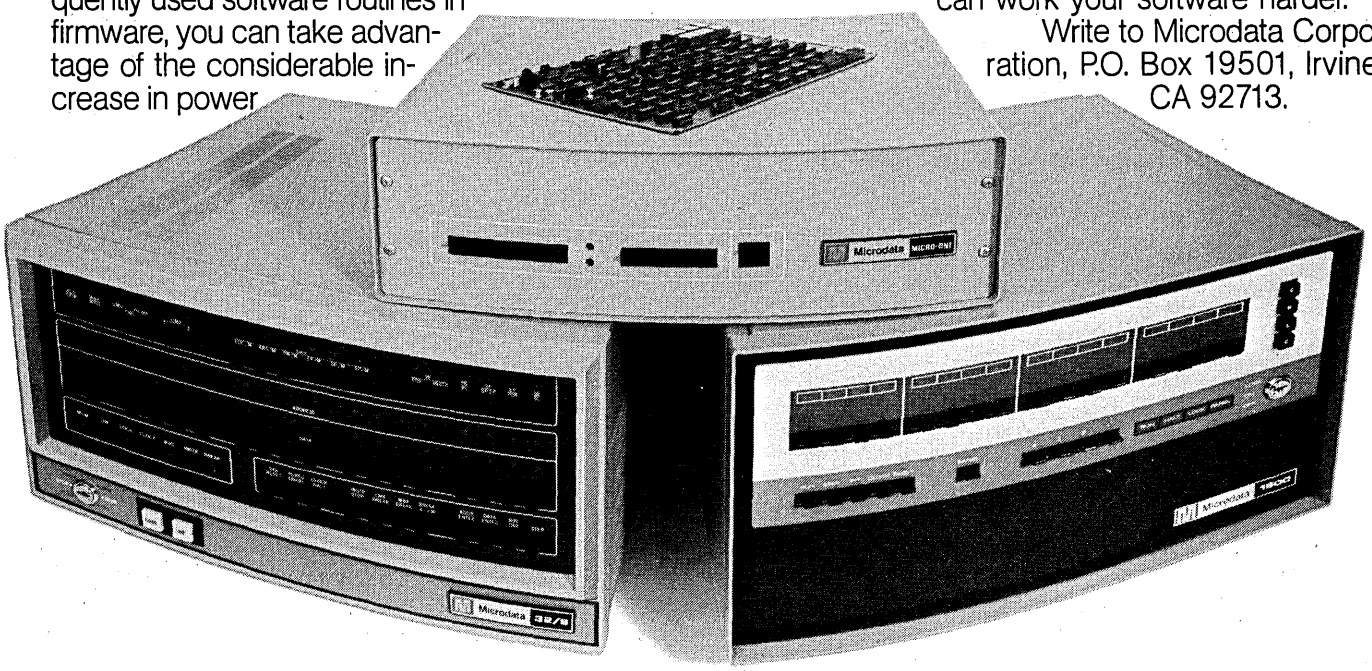

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sion: "It is crucial . . . to understand exactly what our decision today does and does not do. . . . AT&T voluntarily allows certain groups to purchase communication services and share the services among their members. Thus, AT&T has itself decided who should receive such status and who should not. What our decision does is simply to require AT&T to treat all of its customers alike unless valid reasons exist to the contrary." ✲

FCC Urged to Cancel Predatory DDS Tariff

Two administrative judges with the Federal Communications Commission have ruled that the Dataphone Digital Service (DDS) rates charged by AT&T are unlawful. They called the tariff "predatory and anti-competitive" and said it should be cancelled immediately. Until the phone company comes up with an acceptable set of charges, the two judges said, DDS should be offered at analog private line rates.

If this recommendation is adopted by the commission, a DDS customer who now leases 2.4 kbs service and pays 41 cents per mile per month for the interexchange link, will be charged 92 cents for the same facility, explains Minor Huffman of the Center for Communications Management, a tariff analysis firm. For the DDS user of 4.8 kbs, the interexchange mileage charge will rise from 62 cents to 92 cents per mile per month, he adds. There also will be differences in termination charges, but they'll be nominal in most cases.

Since the FCC's rules allow the phone company to object to the administrative law judges' decision, after which the commissioners must issue a final ruling, the present DDS tariff probably will continue temporarily. But the two judges—Chester F. Naumowicz, Jr. and Walter C. Miller—indicated that even a temporary extension is undesirable.

Judges rule out even a temporary extension because it allows AT&T "to continue offering a service whose propriety" is unacceptable.

The "practical result" of this month's decision, they pointed out, is to "permit AT&T to continue offering a service whose propriety the Commission has been unable to accept . . . That inability arises from the inadequacies of AT&T's own presentation." At another point, they endorsed a statement by Wyly Corp's subsidiary, Datran, one of the parties in the case. Datran pointed out that under the present statutory scheme, AT&T can initiate an illegal, noncompensatory rate and by the time it's finally held to be illegal, the competitive damage is done. "This is true," said Naumowicz and Miller.

Find evidence of bundling

In the course of deciding that DDS is unlawful, they found that the tariff's restrictions on the sharing and resale of DDS channels have not been justified. Also, they accused Bell of bundling certain DDS rate elements to discourage competition. Specifically, they objected to charging a single monthly rate for an access line and a "customer service unit."

The CSU is one part of the interface at the customer's site; the other is a "digital service unit" (DSU). The customer is free to install an independently-made DSU, but in that case he must pay for the telephone-company-provided CSU (since it's part of the access line charge).

The "basic flaw" in this arrangement is that some customers might, "without harm to the system, elect to provide their own equipment to perform both the CSU and DSU functions," explains the decision. "The tariff should be restruc-

tured to eliminate CSU costs as a basic element, with customers to be charged only . . . for the Bell-supplied CSU or DSU units which they may elect to use. Stated another way, it is improper for AT&T to bundle (CSU) rates with (access) line rates in a manner that further inhibits competition. This impropriety must be corrected."

Regarding the sharing and resale restriction—which, basically, restricts sharing to non-carriers and limits resale to "composite data service vendors" (CDSV's)—the decision said "the general regulatory assumption is that the public benefits in the more widespread use of resale and sharing, (yet) AT&T has failed to even allege a public detriment to more widespread resale and sharing." One result is that competing common carriers are denied access to DDS "solely on the basis of their identity as competitors" and entrepreneurs are "discouraged by the necessity of attempting to persuade AT&T to modify a tariff restriction which it had no legal right to impose in the first place."

Other highlights of the decision:

—Judges Naumowicz and Miller implicity accepted the idea that DDS, because of its improved technology, produces savings which AT&T could legitimately pass on to customers in the form of lower rates. This was the basic significance of their finding that the two offerings "employ significantly different equipment at significantly different costs to perform a significantly different electronic task." Their complaint is that the reductions in the present tariff aren't based on technology but rather on a desire to squeeze out competitors like Datran. One result is that the benefits of DDS technology, instead of being distributed equitably among all DDS users, are structured to retain the phone company's competitive advantage and in the process—at least according to the decision—some users get rate benefits they're not entitled to.

—"It simply strains credulity to believe that Bell spent only $715,000 in R&D to develop the DDS service," as maintained by the company during the FCC proceeding. Bell has been "researching and developing DUV (Data Under Voice—the basic transmission technique used in DDS) since the late 1960s and early 1970s," Miller and Naumowicz pointed out, adding that an FCC trial staff, one of the parties in the case, ". . . places the *identifiable* research and development costs associated with . . . DDS at a minimum of $23.5 million. While we cannot agree that (this is an accurate figure) . . . our review . . . convinces us that the trial staff is far closer to being correct."

—"AT&T . . . should continue to be aware that no class of user . . . should receive a free ride . . . Yet, if AT&T's concept of economic benefit were allowed to stand, the DDS users would receive a free ride on the rates paid . . . by the users of the other services with which DDS plant and equipment (are) common. Not incidentally, AT&T would derive a competitive advantage by being able to exclude those plant and equipment costs from the investment base upon which its DDS rates are calculated," says the decision, adding that although AT&T contends its rates are compensatory whether based on long-run incremental or fully-distributed costs, "internal company discussions belie that assertion . . . Bell was told by its own experts that it could offer competitive (DDS) rates only if costs were computed on the long-run increment cost (LRIC) method . . . Hence, Bell's insistence on . . . LRIC . . . must be regarded as an attempt to make a non-compensatory rate appear compensatory in order that its rates may be competitive. Such a practice is prima facie predatory . . . "

—The public interest requires that DDS rates (include) that service's fair share of common costs. While this could lead to higher rates for DDS, it could also lead to somewhat lower rates for other services . . . "

—"In sum, the DDS rates represent a competitive response rather than a design to insure that each class of user pays its proportionate share of providing the service. While a competitively-responsive rate is not, per se, im-

permissible if it remains compensatory, it becomes impermissible if . . . designed to attract or retain customers on whom the carrier will lose money. Such is the case with the DDS tariff. Costs are understated or ignored, revenue projections are suspect, (and) the tariff is structured to attract customers from competitors." —P.H.

First Blow to The Bell Bill

The Senate Judiciary Committee has voted 5-4 to approve a bill prohibiting federal agencies from taking anti-competitive actions. This mandate is subject to some qualifications but even so it's diametrically opposed to the "Consumer Communications Reform Act" drafted by the telephone industry, which now is pending in Congress.

The Federal Communications Commission is among the agencies named in the bill (S2028). A final vote on the Senate floor is likely next month, according to a committee spokesman. Companion legislation has been introduced in the House, but no hearings have been held yet.

S2028 permits individuals and organizations to sue an agency suspected of violating its provisions. In certain cases, they can also get the government to pay their legal bills.

Bell Bill support

Slightly more than one-third of the House membership—147 representatives—have endorsed the Consumer Communications Reform Act of 1976, generally referred to as the "Bell Bill." The total includes 89 Democrats and 58 Republicans, of whom two are members of the House communications subcommittee, the group that will initially consider the legislation. Five more belong to the full committee. (The House communications subcommittee has a total membership of eight, while the full Commerce Committee has 42 members.)

In the Senate there are now 13 sponsors—nine Democrats and four Republicans. They comprise 13% of the total Senate membership. Only one of these sponsors, Vance Hartke of Indiana, belongs to the Senate Commerce Committee, but if reelected in November he's slated to become chairman of its communications subcommittee.

ADAPSO, the Assn. of Data Processing Service Organizations, has jumped into the fight over the "Bell Bill." The association announced an "action program" early this month that will begin with visits and letters to individual members of Congress. The association's executive vice president Jerry Dreyer said the bill, among other effects, would "lead to increased computer system costs" and "severely limit technological innovation."

Hinchman letter

"It appears that the Bell System may be incurring substantial expenses in connection with its current efforts to secure passage of the telephone industry's legislative proposals," said Walter Hinchman, chief of the FCC's common carrier bureau, in a letter to AT&T last month. He asked the phone company to report to the commission "all the costs incurred in pursuing" this program—"direct and indirect, whether incurred solely for the purpose of influencing public opinion or public officers, or incurred incidentally to the routine activities of the companies and their employees." The purpose of the accounting is to determine whether the costs "are properly chargeable to (telephone company customers) or to stockholders."

Meanwhile, Philip Hart, chairman of the Judiciary Committee's antitrust subcommittee, has introduced S3429, a proposed amendment to the Sherman Act that would make it easier for the feds to win antitrust suits like those pending against AT&T and IBM, but would also soften the penalties. Essentially, the Justice Dept. would no longer have to prove that a company intended to monopolize its industry, nor could the company cite the beneficial effects of its control as a defense. But if the court decided that the company was, in fact, violating the Sherman Act, this would no longer be considered prima facie evidence of guilt in treble-damage suits brought by private parties. Also, if the company—because of its size—was able to market products or services at lower cost, the court could consider such economies of scale in deciding how to restructure it.

S3429, the "Monopolization Reform Act of 1976," is now pending before Hart's subcommittee. No date has been set for hearings. ✲

Services

Co. Hopes SPRINT Can Run Past FCC

Southern Pacific Communications Co. (SPCC) has proposed a new switched service called SPRINT. It's designed for "small and medium size users" and provides "features now affordable by only a few large companies." The first phase of SPRINT, connecting six cities on either

coast, will go into operation this month if the FCC accepts the tariff.

Essentially, SPRINT enables a user in one city to access the local dial-up network in another city, or another private-line terminal, through computerized switching equipment and an inter-switching circuit supplied by SPCC. Alternatively, the access link at one end of the message path (or at both ends, if the service links two leased-line terminals) can be obtained from AT&T. Next January, when SPCC plans to expand SPRINT to 11 more cities, it will allow the inter-switch link, as well as the access connections, to be provided by another carrier.

The rates proposed for SPRINT consist of a $65/month charge for each switch port, an access line charge (typically, $32/month if obtained from SPCC), and a usage charge of 26 cents/minute. The customer, with certain exceptions, is also subject to a minimum usage charge. If his service includes a single city pair, this charge is $100/month. It increases $50 for the second city pair, and goes up $25 for each additional pair beyond two.

SPCC officials emphasized that SPRINT is distinctly different from Execunet, an MCI offering which has been rejected by the FCC in response to complaints from AT&T. SPCC pointed out that, unlike Execunet, SPRINT requires at least one dedicated access line (although the customer can reach this line through any touch-tone telephone, even one installed in a public telephone booth). Customers must specify in advance the cities they want to communicate with, and although the lines between switches are shared, "every call must travel through dedicated facilities set aside for a particular customer," according to SPCC.

An interesting question raised by the filing is whether these differences are sufficient to get SPRINT around the objections which AT&T raised, and the FCC supported, regarding Execunet.

The first six cities to be included in the proposed SPCC service are Anaheim, Los Angeles, and San Diego, Cal.; Boston, New York, and Philadelphia. The expansion planned next January will add Chicago, Cleveland, Dallas, Detroit, Houston, Indianapolis, Phoenix, Pittsburgh, San Francisco, St. Louis, and Washington, D. C. ✲

Signs of The Times?

Earnings are up—up big—for three big computer manufacturers but flat for a fourth. IBM ended the six month period to June 30 with consolidated net earnings of $1,137,193,842. Earnings per share were $7.57 on 150,210,440 shares. Net earnings for the same period in 1975 were $905,993,041 or $6.09 per share on 148,647,154 shares. Control Data Corp. reported consolidated net earnings of $11.6 million for the three months ended June 30, compared to a restated $9.3 million earned in the same quarter of

1975. William Norris, chairman, said computer business earnings improved to a $2.8 million from a restated loss of $601,000 in the second quarter a year ago, while earnings of Commercial Credit, the finance and insurance subsidiary, declined to $8.8 million from $9.9 million. And Burroughs Corp., benefiting from a lower tax rate, reported that second quarter net income rose 8.5% to a record $42.5 million, or $1.05 a share on an 11% revenue rise. Net a year earlier was $39.1 million or 99 cents per share. NCR Corp. reported second quarter revenues of $556.3 million, up from $516.5 million a year earlier but said income was $18,503,000 or 75¢ per share in the current second quarter compared to a close $18,472,000 or 76¢ a share last year. ✲

Computer Art

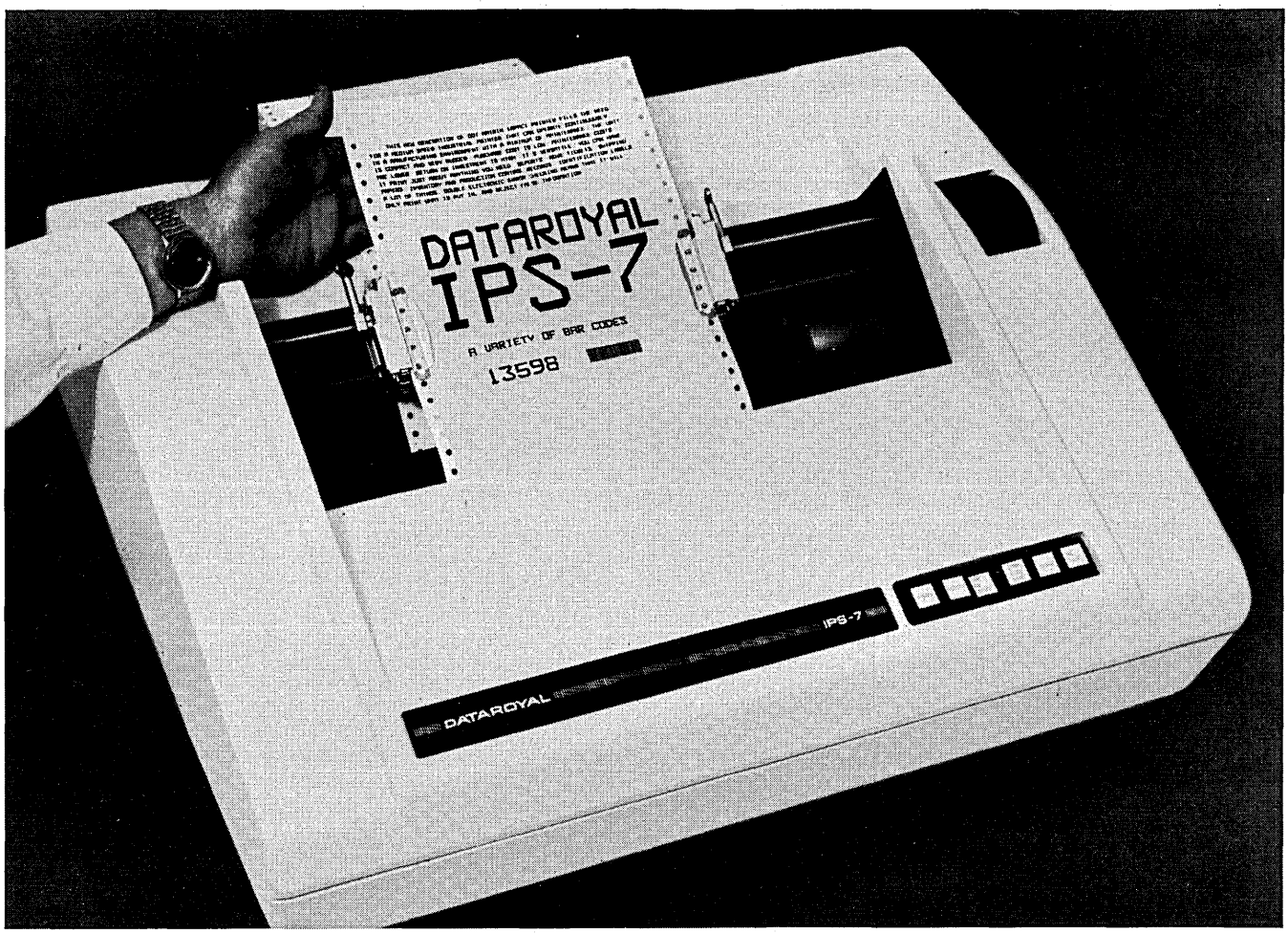
It's An Interestingly Disorganized Process as Many Are Working Alone

The development of any field is an interestingly disorganized process. Duplications abound because communication channels between workers in the field just don't exist yet—but because so many people are working individually, personal explorations and expression can bring about great innovation and insight.

At the Second International Computer Film Festival, held May 7-9 at the Univ. of Washington, the development of the field of computer animation was explored by a well-rounded group of speakers: John Whitney, Sr., a pioneer in the field and a distinguished artist and technician; Bo Gehring, Creative Director of MAGI, Inc.'s Synthavision Group, makers of many commercially and artistically successful pieces of computer animation; Stan Vanderbeek, a filmmaker and video artist on the Arts and Humanities faculty of the Univ. of Maryland; Ken Knowlton of Bell Laboratories, well-known for his innovative and sensitive development of computer software; and Bruce and Katherine Cornwell, independent makers of educational computer animated films in mathematics and physics.

Whitney's presentation during the seminar portion of the festival covered his early explorations in the field of animation. Interested both in cinematography and music, he started his career learning about the structure of music and experimenting with various kinds of hardware for generating images and making movies. These ranged from a system that included servo motors, a voltage-regulated camshaft and a World War II gunfire control mechanism ("a fine, specialized mechanical problem-solver," says John) to slit-scan optical printing to, in 1965, a digital system. "I was getting farther and farther away from cinematography," says Whitney, "I realized I had been trying to invent the computer!"

Since then he has evolved his hardware and software and expressed his conceptualization of abstract motion and the structure of music in many of his films. Before showing his latest film during his presentation, he talked about the structure of music and the manipulation of harmonics. Because harmonics is a mathematic phenomenon, the digital computer can be a tool for the visualization of harmonics. Just as the composer of music can use harmonics to make his or her audience expect something to happen (and hence, make them impatient or satisfied), so John believes the computer-animated film can elicit from an



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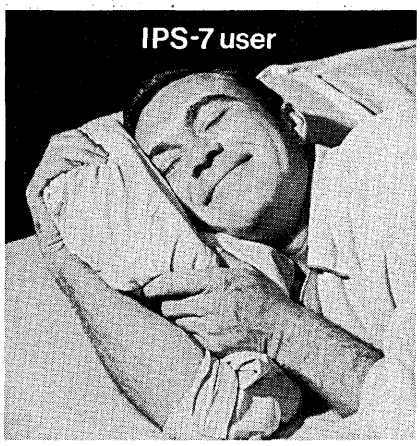

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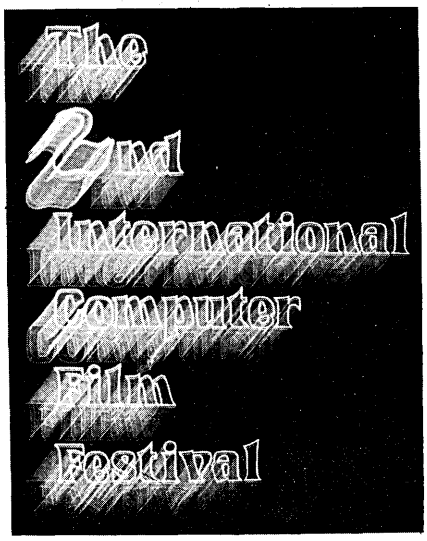
audience an innate response to a similar time experience. This is proved by his latest film, *Arabesque*—a lovely, moving exploration of aesthetics using time and space.

Gehring described the Synthavision process of animation as closer to cinematography—he stressed Synthavision's use of the imaginary camera's view. The requirement for this, he explained, is a high-level language with words similar to "move" or "zoom." The basic concept of computer graphics is that using certain mechanical or electronic devices, anything described to the computer can be represented visually.

Often this description is achieved by specification of points in a visual field. The Synthavision description is different—they "build" objects sculpturally of solids. "It's a brute force approach," says Gehring. "It may not be technically elegant, but it's a working system that makes movies." The main criticism Gehring hears of the Synthavision process is that it's not interactive, but he doubts that an interactive system could handle the tremendous amount of information necessary in the animation of the complex, lifelike motion typical of Synthavision's work.

Knowlton has been developing and refining the sophisticated interactive system at Bell Labs that he uses alone and in collaboration with other artists and scientists to make many computer-animated films. Knowlton sees the price of software going down and computer hardware being developed so quickly that it may soon "catch up" to present software. Yet as we approach this high-level ability, he wonders why the *content* of computer films isn't more often exciting. "Lots of stuff you see is, frankly, unimaginative," says Ken.



WASHINGTON UNIV. students generated this logo for recent film festival where trends and advances in the art were explored.

Computer animation is a tool unlike any tools before it—there are inherent mathematic and time aspects to the medium which can be used to express relationships that have never been expressed before. Whitney's visual harmonics are an example; so are the visualizations of abstract mathematic and physical concepts in the educational films of the Cornwells.

Perhaps Bo Gehring best described the field when he referred to what he does as "sculpting mathematics." The phrase implies both the artistic and the scientific aspects of the field—and in considering this highly developed technological craft, it is comforting to find that science and art can no longer be separated.

Whitney believes that because of the unique opportunities afforded us by the new field of "sculpting mathematics," we are on the threshold of learning to manipulate the world of graphics in an equally rich way as the world of western music has been manipulated. After spending three days listening to some experts in the field share their insights and innovations, I am inclined to agree.

—Sarah Rolph

BENCHMARKS

A Profit for Amdahl: Fledgling Amdahl Corp., Sunnyvale, Calif., showed a $1.7 million profit in the second quarter on revenues of $13.6 million. First half profit was $3.1 million, including a tax credit of close to $1.5 million, on sales of $26.3 million. An amended prospectus for the company's first offering of stock to the public says Amdahl has shipped 15 of its 470V-6 IBM compatible computers which range in price from just under $3.9 million to more than $5.2 million depending upon size of memory. Amdahl currently employs 547 people and has a sales staff of 25. Date and price of its offering of 1,065,000 common shares haven't been announced.

Cogar to ICL: The Singer Co. wrote "fine" to its business machines operations when it signed an agreement in principle for International Computers Ltd. to acquire its Cogar Corp. subsidiary. Neither firm was talking about the money involved. The two companies also agreed that ICL would take over the manufacturing and development activities for the Singer System Ten and point-of-sale terminal products. George Cogar, president of Cogar Corp., who was named president of Singer Business Machines after the resignation of Richard O. Baily, holds a staff vice-presidential post at Singer. His position with Cogar as it is assimilated into ICL was uncertain. Cogar manufactures and markets intelligent terminals. It was one of the few units of the former Singer Business Machines Div. which was profitable.

One, Two, Three: California Computer Products has done some shifting. George M. Canova, who last month moved up from executive vice president to president, has moved long time senior vice president, Richard I. Tanaka, to the staff of chairman Lester L. Kilpatrick. Tanaka was replaced by Paul E. Seckendorf. The post of assistant to the president, held for many years by James Pyle, a one-time CalComp marketing director, was eliminated. Pyle has left the company.

"Second Life" Agreement: The Valcomp division of Tymshare, Inc., a company which describes itself as specializing in supporting the "second life" of computerized information processing production and process control systems, has signed an agreement with Ampex Corp. giving Valcomp rights to manufacture and sell spare parts for several out-of-production Ampex manufactured digital tape drives. The agreement includes the TM-2, TM-3, TM-4, TM-7, TM-9, TM-12, TM-16, FR400, DE100 and DE200 tape drives and electronics. It was estimated that there are more than 2,000 of these drives in operation of which Valcomp currently services some 1,000 annually.

Insured Earnings: The insurance industry market for computer equipment and services, currently at $526 million annually, will increase to $1.5 billion by 1985, a study by market researchers at Frost & Sullivan, Inc., indicates. The 148-page study said "the total market over the decade will come to $11 billion." It said a "big new market," the independent insurance agent, will open up. These agents, the study concludes "will turn to computers as matter of factly as they now buy typewriters."

A Piece of the Wave: Compata, Inc. Los Angeles based high technology software and engineering firm, has been acquired by Wavetek, a San Diego firm

BENCHMARKS . . .

which produces a line of general purpose electronic test instruments and data communication systems. Terms of the cash transaction were not disclosed. Compata, which has extensive experience in development of advanced teleprocessing software systems and in design and service of nationwide credit authorization and bank card electronic funds transfer systems, will operate as a division of Wavetek. Present management of Compata has been retained. Lowell D. Amdahl, chief executive officer, has been named General Manager of the Compata Division.

The French Connection: Merger of Honeywell Inc.'s French computer affiliate, Compagnie Honeywell Bull, and Compagnie Internationale pour l'Informatique (CII) is complete. The merged operation will employ 19,000 people, including 5,000 transferred to CHB from CII who will be employed in marketing, field engineering, and systems research and development. Honeywell president, Edson W. Spencer, said the basic terms set forth in the agreement signed in December 1975, had been maintained. He said the merger will result in a larger share of the French and European computer market for the merged company and more capital through new French shareholders. The French government will provide $250 million in subsidies from 1976 to 1980 to offset merger costs.

Univac in Sweden: Sperry Univac beat out IBM and Burroughs to win a $9 million contract for three computers and related equipment from the Swedish tax department. The acceptance in principle involves three 1100-43 computers. It represents the largest order to date for a Swedish government unit. Equipment, to be installed by next April, will be used to process tax data.

Time Sharing for National Data: National Data Corp., Atlanta based company specializing in information collection and dissemination systems, said it has entered into an agreement with COMSHARE, Inc., Ann Arbor, Mich., underwhich National Data will offer its customers time-sharing services through the COMSHARE network. COMSHARE is an international group of computer services firms providing management information and administrative systems for medium and large sized companies. It specializes in services for certified public accountants, personnel administrators and financial officers.

Pertec Acquisition: Pertec Corp., Marina Del Rey, Calif., manufacturer of digital tape transports, disc drives, data entry and communications products, has issued a letter of intent to acquire ICOM, Canoga Park, Calif., producer of microprocessor based subsystems for minicomputers. Ryal Poppa, Pertec president, said ICOM will continue to operate as an independent organization, reporting to Don Muller, president of Pertec's Peripheral Equipment Div.

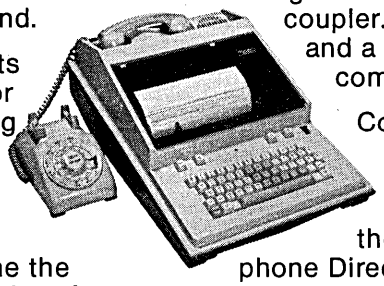
Ripe for EDP: International Data Corp. says there are about 500,000 small to medium U.S. companies that "are ripe for the introduction of data processing at this very moment." The problem, however, is reaching them. IDC made the comment as it announced the availability of a file of 18,187 such companies following an extensive mail and telephone campaign to identify for service bureaus and small business equipment manufacturers the information processing trends among companies in the 20-250 employee range. It says the file, entitled "Information Processing at Small Firms," should grow to 30,000 entries at the end of 1976.

Analytical Instruments: The value of microprocessor, memory and interface chips used in analytical instruments, valued at $1 million in 1975, will soar to $35 million in 1980 and could reach $100 million in 1984, says a study by Frost & Sullivan, Inc. of the market for analytical instrumentation. The New York research concern says the market in the U.S. for analytical instrumentation will rise from $535 million last year to $1.3 billion in 1984. U.S. know-how in microprocessor technology will give domestic companies a "competitive edge through 1980." The 205-page study shows that the biggest growth categories will be fluorescence analyzers with a 390% jump over the next 10 years, followed by liquid chromatographs at 350%, thermal analyzers at 224%, and polarographs at 175%. Design changes foreseen in the study include preprogrammed setup of operating parameters, automatic instrument calibration, improved displays, and the replacement of complicated instrument panels with a touch-tone keyboard. ✲

"I baptize thee, 345-26-4155 . . ."

The NCR portable terminal gives you access to the computer via telephone. Any telephone. And gives you a hard copy of your communication at the rate of 30 characters per second.

Think how that multiplies the benefits of your communications network: For placing/checking orders. For shipping and inventory status. Payroll. Instant answers in trade show booths. Test results. To report or check the current standing of any changing situation. Even to determine the proper formula to match the exact color of a paint chip 3000 miles away.



The NCR 260-5 portable terminal has a self-contained printer, keyboard, power supply, integrated modem, and built-in acoustical coupler. All you need is an electrical outlet and a phone to communicate with a computer or other on-line terminals.

Cost is very low (under $2000 in OEM quantities). And you can count on service. We have 7000 field engineers in over 480 offices across the country. For immediate action, phone Director of Marketing at the factory (607) 273-5310 or write Terminal Systems Division - Ithaca, 616 S. Aurora St., Ithaca, N.Y. 14850.

Printed answers from any phone. It multiplies the value of your computer.

NCR

Terminal Systems Division — Ithaca

CIRCLE 17 ON READER CARD

LOOK AHEAD

(Continued from page 18)
Data's management should have an interest in this subject as a part of their overall civic obligations...It was noted that the company cannot legally make political contributions, nor can it reimburse contributions made by employees; therefore, these contributions must be direct contributions by the employees..."

FM STILL LOOKS GOOD BUT NOT YET...
The city of Seattle, Wash., which was on the verge of going to facilities management late last year, is still doing its own thing. The city last December wanted to grant an FM contract to Computer Sciences Corp. but ran into political problems when the other contender wrote a letter to the mayor (December '75, p. 132) and the matter was tossed into the laps of city councilmen. The council mandated investigations of a sharing arrangement with Washington's King County which at one time had excess capacity but not any more, not since it disposed of one of two 370/165s.

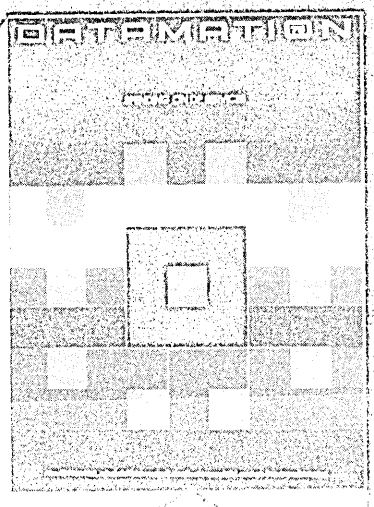
The city, which has been hobbling along on its minimal NCR equipment which it had hoped to sell by the end of this year and now feels it will need through next year, is beginning to implement systems on the county's remaining 165. But, John Elliot, assistant budget director for management information systems for the city, figures these systems alone will take "60% of what the county could provide." And a sharing contract, presumably for three years, has yet to be signed. FM may win out yet.

ECONOMY OF SMALL SCALE
A user of large scale computers, after inquiring with the respective vendors, makes this observation. He says Cray Research, with only 30 employees, spent $5 million to produce its first machine, the Cray-1. Amdahl Corp. has 350 employees and spent $50 million before coming up with its first computer, the 470V/6. He then asked an IBM representative what it would cost them to develop a competitive machine. The estimate was between $500 million and $1 billion. Noting the order-of-magnitude increase in employees and cost for each company, he figures IBM would put more than 3,500 people on such a project. But the IBMer reportedly said the small market for such a computer dictated against such an effort by the giant.

WHERE ARE THEY NOW DEPARTMENT
From software to hardware and back and forth again and again. It's software now for the prime founder and president of ill-fated Computer Operations which never got one of its promising Gemini time-sharing computers out the door. And maybe this time it will be the end of the switching. Peter Warkenton's latest company, California Software Corp., Tustin, Calif., just completed its first year of operations --- "successfully." If offers a variety of languages for minicomputers including a "full" COBOL 2.

RUMORS AND RAW RANDOM DATA
Rumors are making the rounds once again that IBM will announce a 370/178. IBM has a big new machine, still unnamed internally, and many think it won't be unveiled unless the competition (Amdahl?) becomes painful to IBM...On the subject of Amdahl, there are those who think that some of the monkey wrenches in IBM's 3.7 software release (MVS) were aimed at Amdahl whose users may have trouble with the software...When IBM announced prices for the 138 and 148 that were lower than the 135 and 145, many looked at the unique move as a subtle IBM reminder to users that it still pays to stay in the IBM leasing fold: Those users who are leasing 135s and 145s from IBM, can upgrade to 138s and 148s for better performance and pay less. Those users who purchased must pay dearly for the upgrade. Shades of the 155 and 165 DAT box...
Microdata Corp. last month delivered its 500th REALITY small business computer system to McDonald's Corp., Oakbrook, Ill., but was not clear as to how the hamburger chain would use the system or how many more it might order...Forget those rumors that the Justice Dept.'s Joseph Widmar will be named to head the antitrust division's case against IBM. Widmar is leaving the Justice Dept. to enter private practice in Washington, D.C. ...Remember Leachim, the 250-pound, six-foot tall talking robot that was stolen a year ago last month from the truck of its inventor Michael Freeman? Lloyds of London last month paid Freeman $75,000 for his loss, after offering a $7,500 reward for information and receiving "absolutely no word" on the giant robot.

*



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letters

(Continued from page 8)

ability, which is a major claim for structured programming.

R. L. WELLS
Senior Program Analyst
Imperial Oil Limited
Calgary, Alberta
Canada

Thank you very much for airing Dan McCracken's views on structured programming in COBOL. His point is well taken that the language is very usable and would be made infinitely more so by some relatively minor changes. Your interest in this issue is to be commended.

I cannot help wishing, however, that your interest in COBOL development were matched by your accuracy in reporting it. In the same issue, you announce Data General's new compiler as "full ANSI COBOL" while admitting that it lacks both the report writer and telecommunication modules (Software & Services, p. 226). By no stretching of definitions can a compiler without these modules be called "full ANSI COBOL." If Data General is the source of this little bit of misinformation, they should be firmly chastised.

WILLIAM B. SIMMONS
Simmons Data Advisory Services
Montreal, Quebec, Canada

Data General should not be "chastised" for the use of the phrase "full ANSI COBOL." We made that slip all by ourselves.

More structured Cobol

Jan L. Mize ("Structured Programming in COBOL," June, p. 103) put into concise, pertinent terminology much of what had eluded me in reading extended, non-COBOL oriented articles on the subject. I also appreciated his avoidance of flailing other authors' approaches to structured programming, and recognizing that COBOL is a workable language worthy of attention.

As an extension of his recommendation to place all numeric fields used as counters and accumulators under one 01 level in WORKING-STORAGE, we have found it of value to eliminate all 77 level items in favor of descriptive 01 entries such as SEQUENCE-CONTROL, BREAK-CONTROL, and SUBSCRIPTS. This segregation adds to the self-documentation capabilities of COBOL and "automatically" extends to WORKING-STORAGE the excellent concept of relevant data name prefixes.

JOHN R. WALLMAN
Programming Manager
Data, Inc.
Sioux Falls, South Dakota

Risk analysis

Your June "News in Perspective" article on risk management (p. 155) is certainly a timely note. Your readers might be interested to know that there is a concerted effort being made to provide a methodology on how to conduct a risk analysis.

The process will probably embody several concepts in a complement of subjective and objective evaluations. It will require management involvement through funding and staffing of the risk analysis team and making decisions on security needs and protection alternatives. It will be designed to minimize resource cost, to be an iterative process, and to simplify succeeding iterations. The process proposes the concept of a "base level" of security which provides reasonable protection for most conditions. It will also be designed to use the level of existing security so that resource requirements for the analysis are induced. . . .

This methodology . . . is being developed within the Federal government and should be available as a guideline within several months. It should also meet the General Accounting Office's needs for a "risk management" technique.

T. Q. STEVENSON
Computer Specialist
U.S. Department of Agriculture
Washington, D.C.

source data

(Continued from page 40)

RPG II

An audiotape and workbook training package designed to introduce the RPG II programming language is available. Essential programming skills such as simple file-to-file processing, tables, subroutines, and multiple file operations are covered. The package consists of two one-hour audio cassette tapes; a workbook containing graphics, coding examples, self-administered reviews; and test data for problems. Average time to complete the course is 16 hours. Price: $125. INFO 3, 13263 Ventura Blvd., Studio City, Calif.

periodicals

Telecommunications

This Month In Telecommunications is a new monthly publication providing information and analysis of regulatory and common carrier events. Special sections include "Product/Service of the Month," "At the State Level," "Looking Ahead," and "The Forum." Additional material and charts from CCMI's telecommunications research reports were also used in the tightly packed, 8-page June issue, the first issue. Minor S. Huffman, Jr. is the editor. Subscription: $75 per year in North America, $95 elsewhere. CENTER FOR COMMUNICATIONS MANAGEMENT, 79 N. Franklin Turnpike, Ramsey, N.J. 07446.

ASIS Indexes

The *Collective Index to the Journal of the American Society for Information Science, Volumes 1-25,* covering the years 1950-75, should significantly ease the task of tracking down technical articles from the average 10 per issue. The 282 page book is arranged by abstracts of the articles and brief communications, author index, and subject index. Price: $60 ($42 ASIS members, $51 ASIS affiliates).

The 224-page *Cumulative Index to the Annual Review of Information Science and Technology, Volumes 1-10* provides coverage of state of the art review papers for 1966-75. Price: $27.50 ($22 ASIS members, $24.75 ASIS affiliates).

All orders from private individuals must be prepaid. AMERICAN SOCIETY FOR INFORMATION SCIENCE, P.O. Box 19448, Washington, D.C. 20036. (Purchase orders go to ASIS, 1155 Sixteenth St., NW, Ste. 210, Washington, D.C. 20036). ❋

hardware

Off-line

It's hard to lose with this deal: buy 50 floppy discs from Wabash Tape Corporation, and they'll give you a polystyrene storage cabinet to keep them in. Called the Free File, the specially designed unit holds up to eighty floppys in eight compartments with removable dividers. The lightweight, tabletop container can easily be moved about. Wabash Tape Corp., Huntley, Illinois 60142.

Signs of the (Good) Times Dept: With the economy booming again--partly because it's an election year--many companies are reporting milestones in product shipments. Among them: Shugart Associates has delivered its 30,000th floppy disc drive; Amdahl Corp. installed four System 470s during May alone; and Lear Siegler seems almost surprised that it is shipping more than 700 "dumb" terminals (essentially tty replacements) from its Anaheim, Calif. plant.

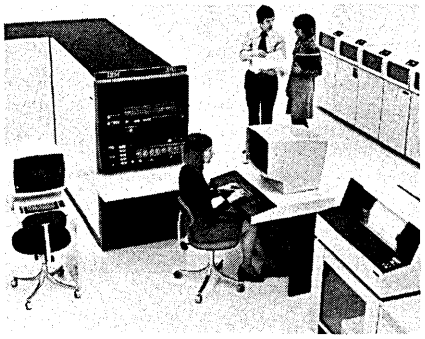
The Complot Division of Houston Instrument has developed an interface to attach any of the firm's digital plotters to the IBM 5100 desktop computer. Another relatively unusual interface has been accomplished by the Portsmouth, Ohio, public accounting firm Reynolds, Borden and Chapman. There, a Sycor model 340 terminal complete with dual floppy discs has been teamed with an IBM System/32. The duo is used to convert information previously stored on punched cards to diskette via the terminal's card reader.

Another first for the Lawrence Livermore Laboratory near San Francisco, famed for having more serial number ones in its labs than any other installation. The facility is taking delivery of the first CDC 38500 Mass Storage System, a 16-billion byte module to be followed by six others this year. The 38500 is CDC's version of the IBM 3850 Mass Storage unit. On a somewhat smaller scale, CDC has announced that it has delivered a six-and-one-half pound computer that will control the attitude of three High Energy Astronomy Observatories to be launched by NASA starting next year. Closer to earth, three SEL 32 minis will help lay a pipeline under the Mediterranean Sea next summer.

Medium Scale Systems

The 370/145 was always a fighter. It was the machine that made RCA decide to get out of the computer business when RCA management saw that the totally semiconductor machine was more than a match for RCA's offerings. The technology was so advanced that the 370/145 was the last 370 to receive a mid-life kicker—it simply didn't need one. Time takes its toll, however, and both the 370/145 and 370/135 have been replaced by the 370/148 and 370/138.

The most interesting thing about the announcement wasn't technology this time, but rather the aggressive pricing policy. One IBM user immediately termed the new systems "fighting machines" (wonder where he picked up that phrase?) But what might IBM be "fighting?" Inroads into its medium scale arsenal by the larger minicomputers in distributed processing applications? Perhaps. Rumors that Fujitsu is developing competitive machines



based on the Amdahl 470 technology? Maybe. But more likely the key lies in the new four-year lease policy: even if the other two opponents are IBM considerations, White Plains would like to do something to keep the leasing companies' hot little hands off their customer base. To sweeten the idea of signing up for a four-year lease, IBM takes off the extra shift computing charges on the machines. That's it: straight monthly rental, or a four-year lease.

The machines themselves contain relatively few changes, and perhaps the lower prices reflect the fact that the development program burden of the 135 and 145 didn't have to be applied to the new machines since they're by and large the same blueprints. Key points in the new machines: 138s and 148s now get the same MOSFET memory technology that the other 370s have. Model 138s are available with either 512K or a megabyte of storage. The 148 comes with 1 or 2 megabytes. Each machine incorporates a reloadable control store of 128K characters, five times the standard capacity of the 135, and four times larger than the 145. Undoubtedly this was done in an attempt to get the OS/VS1 and VM/370 operating systems to run well in the "relatively small" memories (at least small compared to 158s and 168s.) It worked: it's estimated that a 135 might run as much as 1.38 times faster than a similarly configured 135, while a 148 might run as much as 1.47 times faster than a similarly configured 370/145. These are batch performance ratings of a scientific/business job stream mix. A number of features that were options on 135s and 145s are now standard on 138s and 148s and include an APL assist, clock comparator and cpu timer, floating point, extended precision floating point, conditional swapping (138 only), advanced control program support and word buffer (148 only), and block multiplexor channels (two on the 138 and four on the 148.) Both new systems get video control consoles.

A one megabyte 138 rents for $12,550/month and sells for $435K. A 148 with a megabyte of memory rents for $19K/month and sells for $689K. Old 135s and 145s can be upgraded in the field. One megabyte 138s will be delivered late this year, with the other three models slated for early 1977. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 232 ON READER CARD

Continuous Forms Cutter

This German-developed continuous forms cutter is said to be the fastest one around, and now it's coming to the U.S. market. The Bowe 304 trims margins, cross cuts, center slits, strip cuts perforations, etc. Speed depends upon the forms depth, whether strip cutting is desired, whether a double-edged knife is required, and other factors, but 12 inches of forms with a ⅛-inch strip cut can be processed at 11,200 forms per hour. An optional feature can set the 304 up for cross cutting, selective strip cutting, grouping and classifying through pauses, bypassing forms, attaching of enclosures (also selective) and even sorting. Dare we call it the world's first intelligent forms processor? Prices begin at just under $9,500, which might seem like a lot, but would undoubtedly reduce the labor required in these types of paper handling operations. BOWE SYSTEMS, Plainview, N.Y.

FOR DATA CIRCLE 233 ON READER CARD

In data entry and communications, making The Intelligent Choice is as simple as M-D-S.

MDS stands for Mohawk Data Sciences. A worldwide company that can simplify your most complex management information problems with the most efficient data entry and communications equipment on the market today.

Since our introduction of the key-to-tape data recorder in 1964, MDS' engineering accomplishments have broadened considerably. Our research teams excel in meeting the widest range of industry requirements with superior problem-solving products. For example, the growing demand for decentralized data processing operations is answered by our top-of-the-line Intelligent Systems, which function with or without mainframe involvement. The MDS System 2400 highlights this category and demonstrates our path of achievement.

Our technology is backed up by MDS quality. We manufacture our own equipment to the most exacting standards in our own modern production complex. To support our far-reaching international operations, we also maintain an extensive engineering and support facility in Europe. Over 1000 MDS Customer Engineers are dedicated to satisfying the client. When one of our products—or a company-wide network of our products—is delivered to you, our relationship has just begun.

If your data processing system looks more like a puzzle than a solution, Mohawk Data Sciences will help you to put the pieces together. We've done it for a majority of the Fortune 500 companies. A call or letter to your nearest MDS office will show you why we are the Intelligent Choice for you, too.

CIRCLE 27 ON READER CARD

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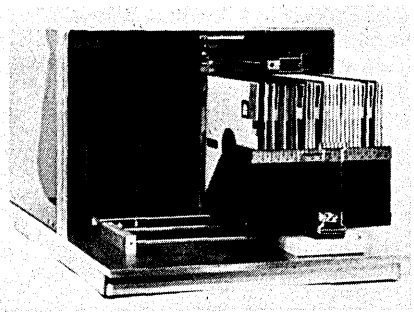
hardware

Mini Mass Storage

We'll give odds that Alan Shugart, the developer of the floppy disc and associated drive while at IBM in the late sixties, never foresaw this potential in his brainchild. It's a mass memory of up to 102.4 megabytes based on flexible disc media. The RAM³ automatically loads and unloads up to 32 BASF, IBM, or equivalent diskettes from a magazine into a double/single density flexible disc drive. (Sounds like a Wurlitzer Juke Box.) Total time for selection and load of a diskette can be as low as two seconds, with the average being three. Positioning of the magazine is accomplished by a stepper motor. In unformatted double density on 32 diskettes, the capacity is 25.6 megabytes of information. Up to 4 RAM³ units can be daisy chained to provide the 102.4 megabyte total. The price for the device is $5K in single units. GENERAL SYSTEMS INTERNATIONAL, INC., Anaheim, Calif.



FOR DATA CIRCLE 231 ON READER CARD

Calculator

What next. Now Texas Instruments has gone and added a printer to a handheld calculator. Not an auxiliary printer that you plug into it, but a fully integrated printer. The TI-5050M is a four function unit with 10-digit capacity that also features two-key roll-over and input buffering to allow rapid continuous data entry while calculations and printing of previous inputs are in

product spotlight

Univac Multiprocessor

It's been two years since Univac announced its last entry for the 90 Series (the 90/30, June 1974), and a good deal has happened at the Sperry computer factory since then. The 90/80 brings two major hardware developments to the line—multiprocessing and ECL circuitry—plus two significant software developments—a communications monitor and important conversion aids.

As its number suggests, the /80 is the top of Sperry's byte-oriented 90 Series. It has two processors, one for instructions and one for handling peripherals; both have writeable control store. Memory sizes range from 524KB (450 nsec/8 bytes) to 4MB. One byte multiplexor channel and one block multiplexor are standard; one more byte channel and six more block channels can be added. And all channels connect to the peripheral processor.

The 98 nsec instruction processor gets 16 programmable registers of 32 bits, 16 for supervisory functions, 16 more for control functions, and 4 which have 64 bits each for floating point. It also gets redundant logic for some critical paths.

The /80s are supposed to represent migration routes for IBM 370/135 and 145 users as well as for users of a mix of Univac equipment including 9400s, 9480s, and all the neé-RCA Spectra and Series 7 hardware. To this end, Sperry is providing several kinds of conversion aids, including assembly language translators, COBOL translators, "library transcribers," and a DOS emulator. The /80s versions of FORTRAN, RPG II, and even the operating system are supersets of that used on earlier RCA and Univac hardware, making that part of a conversion simpler. Object code compatibility is claimed not only for earlier 90 Series cpu's, but also for virtual storage ex-RCA machines. (On top of that, the RCA mainframes and all of those in the 90 line use the non-privileged instructions from the IBM 360/370, taking much of the trauma out of switching.)

Any conversion or compatibility to eventually link to the "other half" of Univac's family, the word oriented 1100 line, is left for future generations —a situation very much reminiscent of IBM's position in having a 7080 and 7090 which couldn't talk to each other, in pre-360 days.

Performance and price statistics are provided by Univac as an impetus to go through that conversion process. Using the Univac 90/70 as a benchmark standard of 1.0, the company figures the 90/80's performance at 2.5, that of the 370/145 at 0.9, and the 370/158-3 at 3.0. Given those performance ratios, price/performance indexes support a claim of 10%-20% superior Univac performance, (or roughly 'the power of a 158 at the price of a 145').

Systems start at about $47,000/-month, for a configuration with: 512KB of memory, two 1400 lpm printers, four 320KB tapes, 1B bytes of disc (plus a fixed head disc for the operating system), a communications controller with 12 lines, a card reader and punch. Fully configured systems can run double that amount. Deliveries begin in the fourth quarter.

Univac is aiming for 25% of the unit's sales to be to present IBM customers, and has positioned its machine to intercept IBM users on their way to the 158. Looks like the firm adopted more than just the product line of RCA. (Remember "Operation Intercept?")

SPERRY UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 230 ON READER CARD

progress. Running subtotals can be calculated and recorded in the four-function memory while separate data is summed in an independent add register providing the user with an equivalent "dual memory" capability for more complicated applications. The machine is priced at $149.95. Now if TI would just offer the printer on some of its jazzy scientific models . . . TEXAS INSTRUMENTS INC., Dallas, Texas.

FOR DATA CIRCLE 234 ON READER CARD

Fire Retardant Aid

Here's another one of those products that seems so obvious and simple that one would have thought they would have been invented long ago (maybe they were, but we've never seen one!) It's a little pillow, measuring 12 x 12 inches, and about 1½ to 2-inches thick, made of fire retardant treated cloth and completely malleable. It is used to stuff in any opening, such as those commonly found around cables coming through raised flooring, and help prevent the spread of any underfloor fire that might occur. At least as important a side benefit is the fact that they reduce the amount of air conditioning that escapes through these holes (which might cut down the utility bill somewhat), and possibly make life more bearable for operators (they may even move faster when they aren't so cold.) The pillows are removed in seconds when cables are changed. They're priced at $39.50 per carton in lots of 10 cartons, with each carton containing 30 pillows. An order of less than 10 cartons hikes the price to $47.50/carton. LENSCLEAN INC., Clifton, N.J.

FOR DATA CIRCLE 235 ON READER CARD

Terminal

The CASSETTERM is related to an earlier product by this firm, a terminal very little larger than a telephone handset. The latest version is even more impressive: a miniature cassette drive, capable of storing and transmitting up to 40,000 alphanumeric ASCII characters has now been built into the unit, which already had a 32-character

LED display. Using the built-in Bell 103 compatible modem, the CASSETTERM transmits data over the telephone at 300 baud. The full ASCII keyboard is also included in the price of $1,495. For $500 the cassette unit can be added to earlier models. MICON INDUSTRIES, Oakland, Calif.

FOR DATA CIRCLE 236 ON READER CARD

hardware

PDP-11/45 Cache Memory

First product out of the box from this new firm is an interesting one, a cache memory that simply plugs into one of the PDP-11/45's chassis slots. Once installed, it's claimed that performance increases up to 100% are possible, with the only catch being the phrase "depending on the software used." There's almost certainly going to be some changes necessary to realize the full benefit of the CACHE/45 product, but it might just be better than popping for a PDP-11/70 and the added cost. The CACHE/45 is priced at less than $7K. Buffer control is provided over every core memory address location on the UNIBUS, resulting in improved performance throughout the entire 0-124K byte address field of the 11/45 and is said to do away with the need for expensive MOS memory. Delivery is 30 days. ABLE COMPUTER TECHNOLOGY, Santa Ana, Calif.

FOR DATA CIRCLE 238 ON READER CARD

Calculator Floppy Disc

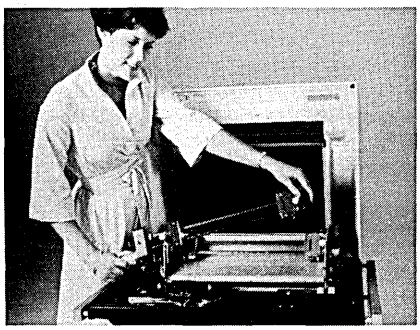
Hewlett-Packard 9830A scientific calculator users can now make that machine perform even more like a computer with the addition of the FD-30 random access storage disc system. The FD-30 uses the same control commands and syntax as the 9830's cassette unit, and all programs are said to operate with modification. For random access applications, it's estimated that

the FD-30 is fifty times faster than the cassette—and stores seven times as much information, at 305K bytes. A 10,000 word array can be stored in five seconds with the FD-30. The FD-30 is priced at $3,895 ready to plug in. Optionally available is an I/O connector that provides a connection point for another I/O cable by returning the used I/O slot. INFOTEK SYSTEMS, Covina, Calif.

FOR DATA CIRCLE 239 ON READER CARD

Printer

The 9232 is the first wholly Datapoint-manufactured printer. It's designed for business data processing environments, especially in dispersed data processing, a field the Texas company helped pioneer. The matrix unit has been designed in such a way as to keep the number of moving parts to a minimum, with all print head carriage operations controlled by one motor. The print head utilizes a 5 x 7 dot matrix pattern to print 96 upper and lower case characters across 132 columns of tractor fed forms. Up to six copies are generated (the original plus five.) The bidirectional unit operates at 80 cps when printing in every column, but the throughput is higher than the rated



speed, as the 9232 slews over blank areas in reports. Payroll checks, for example, are printed at a rate of 280 lines/minute. Other features include a changeable top-of-form control and an adjustable line spacing switch for 6 or 8 lines/inch performance. The 9232 is priced at $3,950, or $128/month on a three-year contract including maintenance. A second paper tractor can be added for $500 or $19/ month on a three-year lease. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 240 ON READER CARD

Laser Printer

Laser printers will undoubtedly become a mainstay in the data processing room configuration if users continue to want such a high percentage of their output in hardcopy form. The day your installation has one (or more) may be approaching even faster than predicted because of products like the ND2. It is manufactured by Siemens of Germany, the fifth largest electrical and electronic manufacturer in the world. The unit operates at 14,000 lpm for eight line-per-inch output (21,000 lpm for 12 lpi, if you can get by with that.) The constant printing rate is 146 pages per minute. A rotating drum with a vapor deposited photoconductor surface is cleaned and electrostatically charged. The information is then transferred to the drum via a laser beam and the forms overlay station. In the developing station, the toner particles adhere to the drum in accordance with the charge pattern. The paper to be printed is fed past the drum at the transfer station where the toner image is transferred to the paper. The image is then heat-fixed by rollers at the fuser station. The standard character set is 128, and characters are printed as very fine 18 x 24 dot-matrix images. Fonts included OCR-A, OCR-B, FORMAT, and some others are being prepared. A page buffer of 30KB is standard. The oem-only item is priced at $44K each. GENERAL SYSTEMS INTERNATIONAL, INC., Anaheim, Calif.

FOR DATA CIRCLE 237 ON READER CARD

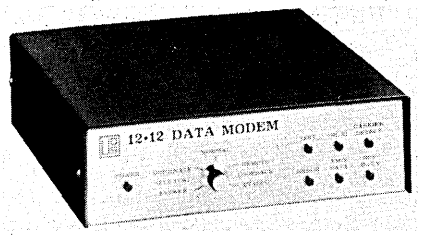
Oem Printer

This French manufacturer's products have always been well regarded by U.S. oem's, and the latest model printer also seems interesting. Called the LX360, it features two moving print heads for printing at 140 lpm. Each head prints half a line in one direction and then half a line in the other at 180 cps. The integrated paper feed speed is 25 lines/second, and paper widths can range from four to seventeen inches. One original and four copies can be generated. There are 136 columns, with horizontal densities of 10 or 12 cpi. In orders of 100, the LX360 is priced at $3K each. LOGABAX S.A., Arcueil, France.

FOR DATA CIRCLE 242 ON READER CARD

Modem

Modem development has been relatively stagnant of late, but here's a new twist: a 1200 baud unit that requires only two wires for full-duplex operation instead of the usual four. This was made possible by applying coherent phase shifted keyed modulation techniques that are used in 2400 baud units. The 12·12 can operate synchronously or asynchronously over either dial-up or leased lines. The user can select other transfer rates, too, if



1200 isn't what he needs: 600, 300, 150, or 0-300 baud is also available with no restrapping or adjustments required. The 103/113-type compatible modem is insensitive to word lengths. The 12·12 is available in free-standing or oem card configurations. Free-standing units are priced at $600, or can be leased for $20/month on a three-year contract. UNIVERSAL DATA SYSTEMS, Huntsville, Ala.

FOR DATA CIRCLE 241 ON READER CARD

Disc Storage

The REFLEX disc drive uses IBM 3340-like (Winchester Project) technology as the basis of a nicely designed large scale disc storage system. From 10 to

hardware

50 formatted megabytes are available in three basic versions having one, two, or three disc platters. REFLEX utilizes two heads per fixed recording surface to reduce the latency time to 10.12 msec. The data transfer rate is just over seven megabits per second, and the average access time is 30 msec. Error statistics look like 1 bit in 10^{10} recoverable, and 1 bit in 10^{13} nonrecoverable. Versions with 10 megabytes of capacity are priced at approximately $3,800. MICRODATA CORP., Irvine, Calif.

FOR DATA CIRCLE 243 ON READER CARD

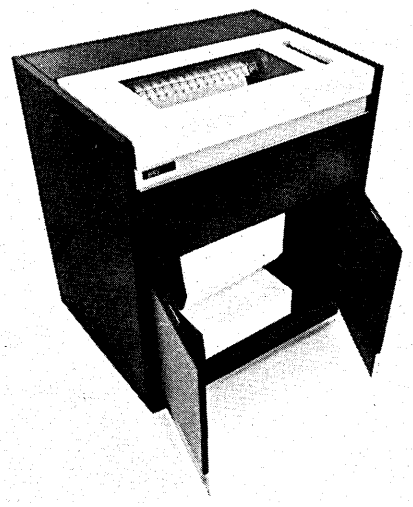
Oem Printer

This Series 2300 oem Matrix printer is an impressive unit. It feature bidirectional printing at 200 cps using a 9-wire ballistic head (UPPER and lower case), and using a 9 x 7 print matrix. The microprocessor controlled 2300 also sports high speed tabbing, skip-over space, incremental printing, and internal self testing. The ballistic head permits the nine-wire strikers to fly freely, thereby eliminating critical head adjustments in the field. The 132-column unit is priced at approximately $1,450 each in orders of 100. DIABLO SYSTEMS, INC., Hayward, Calif.

FOR DATA CIRCLE 245 ON READER CARD

S/3 Printer

Any System/3 users out there who might be thinking of giving themselves a midyear bonus ought to consider the BST/550 line printer. The third plug-

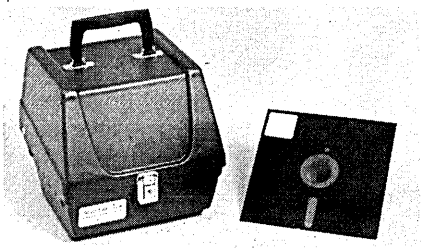


compatible printer from this firm prints at 550 lpm but is priced substantially less than IBM's 300 lpm 5203. Available on a one- to five-year lease contract, the BST/550 rents for $650/-month on the one-year contract, and $505/month on the five year agreement, compared to $683 straight rental for the 5203. There are other advantages, too. The BST/550 can generate up to 6 copies, is buffered, has sensing for paper low, paper out, paper jam, and paper runaway, has a faster paper slew rate at 20 ips, an enlarged character set, and wider form widths, from 3½ to 19½ inches. Delivery is 30 days. BUSINESS SYSTEMS TECHNOLOGY, INC., Irvine, Calif.

FOR DATA CIRCLE 246 ON READER CARD

Floppy Disc Holder

Floppy disks are just as prone to deterioration from exposure to dust, static electricity and improper storage as other recording media (maybe more so) and this manufacturer has decided to offer you something better than a shoebox to store the diskettes. It's a



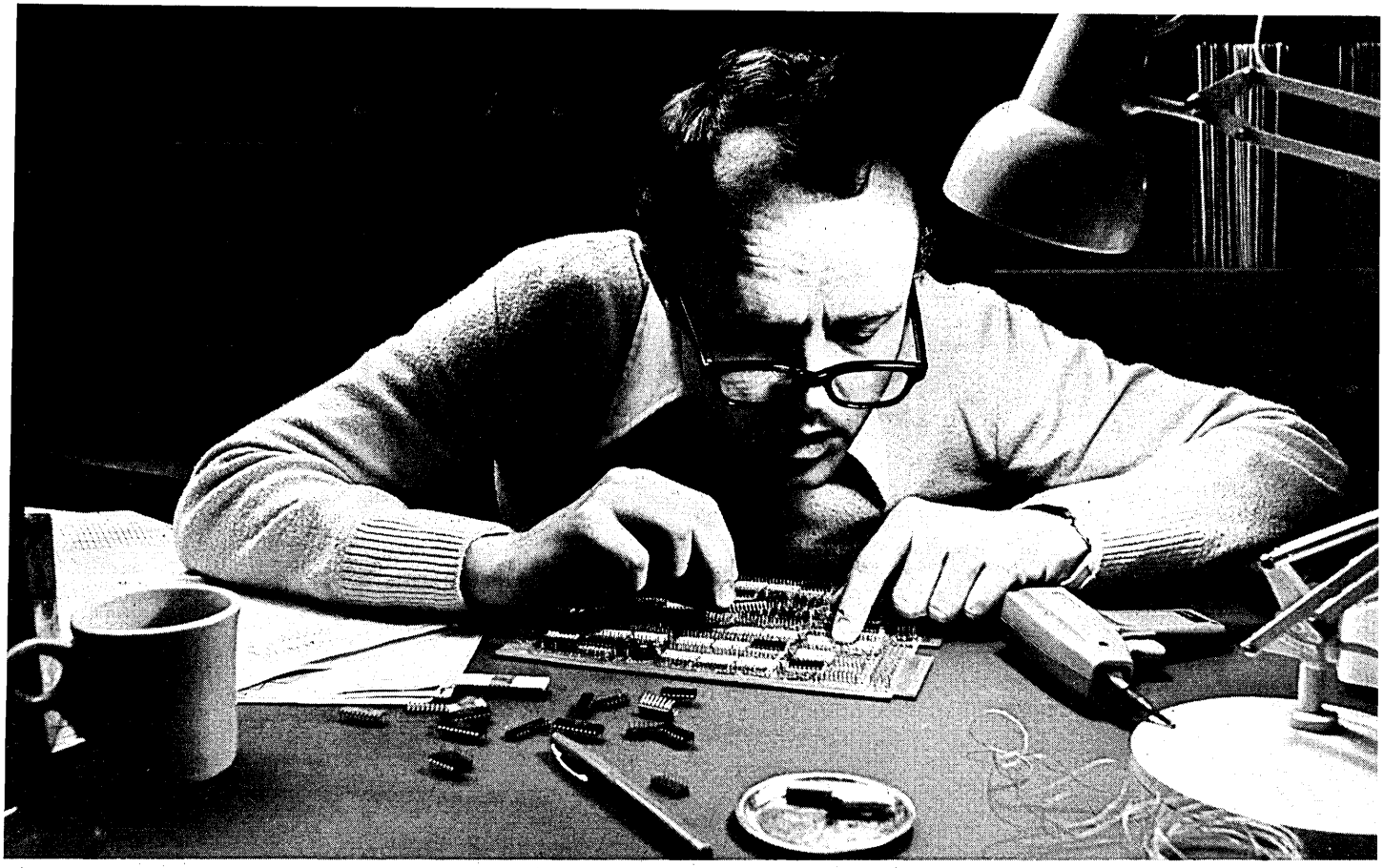
polymer carrying/storage case, made of the same material used in football helmets. The FLEX 80 stores 66 diskettes, each graduated slightly for easier access. The lockable unit is priced at $49.95. ADVANCE ACCESS GROUP, INC., Westchester, Ill.

FOR DATA CIRCLE 244 ON READER CARD

Voice Response

This long time manufacturer of audio response units is crediting recent advances in semiconductor technology (plus their own cleverness) for being able to produce a multi-line voice response system at the lowest prices ever. Obviously intended for the microprocessor market, a 16-line, 32-word system can be purchased for less than $1K per line, enabling a host of Touch Tone response applications to become possible that couldn't be economically justified in the past. Features include variable word and message length for maximum flexibility; custom vocabulary consisting of words, phrases and even the voice of the customer's own choosing; support of a wide range of audio response data sets, etc. The system controller is able to simulate the operation of an asynchronous terminal on the host computer's communications port. All transactions between the LVM-50 controller and the host computer are conducted using standard data formats without the need for elaborate support software or special interfacing hardware. VOCAL INTERFACE DIV., FEDERAL SCREW WORKS, Troy, Mich.

FOR DATA CIRCLE 247 ON READER CARD ❊



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Updates

A reference summary to help decode IBM OS and VS dumps has been developed by Chubb Institute, 51 JFK Parkway, Short Hills, N.J. 07078. The summary, organized on a 10-panel folding card that easily fits into a breast pocket, explains most error messages and suggests ways of debugging certain problems. The most common supervisor calls are listed, and there's even a hexadecimal to decimal conversion chart included. The reference is priced at $2.

The Osmond Brothers, though they aren't singing barbershop music on the Andy Williams show any longer, still maintain a sizable fan following. In fact, it takes a computer to handle the 130,000 member fan club correspondence. The machine chosen was ADAM, the "software-less" computer made by the Logical Machine Corp., Burlingame, Calif. (See November '75, p. 164.) ADAM keeps a record of what material has been sent to club members and generates cut and paste address labels when a correspondence is generated. ADAM also helps manage the brothers' apartment complex in Provo, Utah.

Not all minicomputers get stuck in some relatively mundane application. Take the case of a certain Varian 620L at the Univ. of California's Irvine campus--it's studying ancient Greek and reportedly doing very well. In an ambitious project called Thesaurus Linguae Graecae, the mini is collecting and storing every word of ancient Greek preserved from antiquity, and that adds up to 90 million. The purpose of the project is to provide scholars with an automated tool for studying how words were used and how their meanings and semantic shadings changed over the years.

More university work: Professor Martha E. Williams, Director of the Information Retrieval Research Laboratory of the Univ. of Illinois, Urbana, has recently received a $63K grant from the National Science Foundation to study the feasibility of an automatic Data Base Selector to assist data base manufacturers and users in reaching some degree of vocabulary compatibility.

DOS to OS Conversion

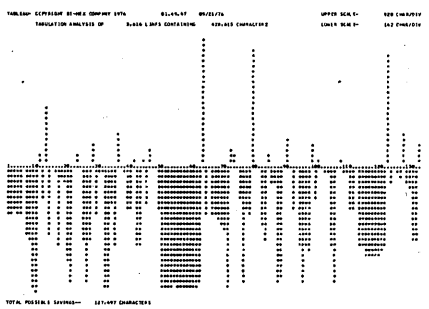
FOCUS is a collection of programs that convert IBM DOS COBOL source code to OS ANSI COBOL, DOS JCL to OS JCL, and prepares operating documentation for OS data controllers (sometimes known as the data staging function.) The conversion percentage claimed for FOCUS is a remarkable 100%, though in some instances it can drop to around 96%, claims the developer. What this can translate to in dollars is illustrated by the first beta test site, where the user's estimate of conversion costs was $180K done in-house, $225K if done by an outside vendor, and the actual cost winding up as $55K, or less than a third of the original estimate.

COBOL code is converted simply by assigning a DDname for each file in the program, then loading the program into FOCUS. The resulting OS code is more than a line-for-line exchange; every program is completely reformatted to improve maintainability. Record descriptions for files are moved to working storage, and files are read into and written from. FOCUS requires 10-80K of storage on any 360/370 OS machine. It's priced from $5K to $20K depending on options selected. ARKAY COMPUTER, INC., Newton, Mass.

FOR DATA CIRCLE 213 ON READER CARD

Output Optimization

This software product might just be a first. TABLEAU analyzes computer printer images to determine the optimal locations for horizontal tab stops for use in conjunction with communicating, spooling, or printing the images on remote terminals. According to the developers, the payoff has generally



been a savings of 10 to 30% in network and terminal resources over the best tab stop configurations specified by operators, programmers, or analysts. For fixed-tab equipment, such as tty's, the graphical output shows the effect on network performance that changes such as new report formats or volume fluctuations cause. More modern terminals with "firmware" tab stop capability can be set up with the optimized stops. The input to TABLEAU is a disc or tape dataset of the print images to be optimized, and the output is a single page bar graph that shows bad choices for stops as rows of asterisks below the horizontal line showing the column numbers, with good choices shown above the line. TABLEAU is written in ANSI COBOL and IBM assembler, is supplied in source form with complete documentation, and is priced at $650. A 6K partition is required, and support for 90 days at no charge is included with the package. BI-HEX CO., New York, N.Y.

FOR DATA CIRCLE 214 ON READER CARD

IMS Security

Remote Entry Flexible Security (REFS) is a module that can be added to IBM user machines running the Information Management System (IMS) to control user access to the system. The heart of the technique is a 5-character code assigned to operators and users when they're first introduced to REFS. A file of authorized transactions is kept that determines which users can perform what operations over 3270 model 2 intelligent terminal systems. The master list can be updated at any time. It is thus the user's responsibility to protect his or her password. Users can work from any terminal in the installation. IMS physical terminals should have only one logical terminal name assigned, or else, as the vendor warns, operation of REFS may be "unpredictable in unique situations." Translation: the whole system defeats its purpose.

Written in COBOL, the license fee for REFS is $1,500. For this the customer gets a master control manual, a message program requirements manual, an application terminal user guide, a security maintenance terminal guide, an audit trial application manual, the COBOL source coding, and telephone consulting services. SUNTECH COMPUTER SERVICES, Wayne, Pa.

FOR DATA CIRCLE 215 ON READER CARD

Information Service

A scientific information service developed jointly by the British Institution of Electrical Engineers and Control Data now makes more than 10,000 scientific abstracts available through CDC's worldwide CYBERNET data services network. The service is called TINA, for Technology Innovation Alert. The London-based professional

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IMS users such as *American Airlines, Dow Chemical, TWA, American Can, The Hartford, Union Carbide;* and TOTAL users like *Combustion Engineering, Northwestern Mutual Life, Anheuser-Busch, Corning Glass Works, Eli Lilly* and *Holiday Inns* are a few who agree ASI-ST and data base belong together. In addition, ASI-ST provides an unequalled return on investment by maximizing the productivity of both man and machine. Since ASI-ST fully supports conventional data files as well as complex data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:

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society is responsible for providing information on new technology in fields such as physics, electrotechnology, electronics, computers and controls, and CDC is responsible for distributing and maintaining the special TINA data base through its TECHNOTEC service organization.

There are two ways to use the data base. The user can either browse through the files himself, or supply a profile of particular areas of interest, and if any developments are made in the field, the user is alerted either via a computer terminal or mail. The data base will be regularly purged of obsolete or low interest level items.

Annual membership is $1K, plus a charge of $60 per profile. There are no charges for profiles in excess of 50, so the maximum annual expense to a subscriber is $4K. Random searches cost about $12, plus a $2 identification fee if details are requested. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 216 ON READER CARD

Operating System

OPSYS1 is an alternative operating system for the Computer Automation line of mini and "milli" computers with a number of features to recommend it. Two principal ones are the ability to create complex series of commands of arbitrary length that can be initiated at a later time by executing one user command, and the ability to concurrently access more than one type of storage device. Other features include a named file system, dynamic buffer allocation (which helps hold the amount of storage required for the system down to less than 3.5K), a text editor, an assembler, and free form command line structure. OPSYS1 is priced at $700 for a five-year lease. SYSTEMS PRO TEM, Belmont, Calif.

FOR DATA CIRCLE 217 ON READER CARD

IC Mask Analysis

If your firm has just decided to generate its own integrated circuit masks, you could appear especially smart to the boss by suggesting he consider obtaining the Mask Analysis Program (MAP) to analyze the circuit designs for validity. When he asks why, tell him that since the program was developed with public funds, it is being distributed for little more than the cost of reproduction: $770, plus $19.50 for the documentation.

MAP is written in FORTRAN IV, and is basically set-up to run on XDS Sigma 5 cpu's, but there's only one routine written in XDS assembler code (and all it does is reference the internal clock to determine elapsed time) and it can be dummied out without affecting the program, we're told. After resolving the idiosyncracies between what it takes to run FORTRAN IV on the Sigma, and your own brand, you'll need at least 180K bytes of storage to run MAP. The program operates on mask data that has been converted from its original form to orthogonal rectangles. COSMIC, Athens, Ga.

FOR DATA CIRCLE 218 ON READER CARD

Project Management

SDM-70 is not a computer program, but rather a methodology for creating information systems, complete with a set of guidelines to manage the entire system's life-cycle process. Features include the suggestion of "front-end" user involvement during the early stages of the life cycle process to minimize the risk of insufficient or improper design, review committee guidelines, documentation guidelines, a maintenance release approach that provides a "positive solicitation" for changes, step-by-step commitments, testing condition, post implementation reviews, and a checklist approach. The product is said to be very condensed, and can be used with existing procedures. The price is $12,500. ATLANTIC SOFTWARE INC., Philadelphia, Pa.

FOR DATA CIRCLE 220 ON READER CARD

Data Base Management

BIS/3000 is a data base management system alternative for the Hewlett-Packard 3000 Series of small scale systems, including the newly announced Series II. The developers claim that release 2 is 30 to 50% faster than the original announcement, and by the time systems are implemented on the Series II, a program controlled checkpoint facility will have been implemented. There are five parts to the system, a menu selection command interpreter, a structured programming language (called PL/DB), a data base management system, an error checking I/O subsystem, and a report generator. PL/DB is a PL/1 based language and includes intrinsic data base access and control statements. BIS/3000 is available bundled or unbundled on the HP-3000 Series II and unbundled on the HP-3000CX. The one-time, unbundled charge for BIS/3000 is $15K. A rental plan is also available. DATA BASE MANAGEMENT SYSTEMS, INC., North Miami, Fla.

FOR DATA CIRCLE 219 ON READER CARD

On-line SPSS

One of the more widely used statistical packages for the social sciences is no longer limited to strictly batch operation. An interface called CAESAR, (Card Archive and Edit System for APL-RJE) has been developed that allows users of the firm's APL time-sharing service to acess the package remotely. SPSS control cards and JCL are generated using keywords. A nice feature of the package is that the expensive number crunching required to develop the statistics is still billed at "wall clock hour" rates of $240. Connect charges are $13/hour, and cpu units are 50¢ per second, though these figures are only approximations since the billing is developed by an algorithm. SPSS printed output and raw data (Z-scores) are returned to an APL file where a user can access his output whenever convenient. APL SERVICES, INC., New York, N.Y.

FOR DATA CIRCLE 221 ON READER CARD

software spotlight

Time-sharing Services

For $800 per month, this corporation is willing to provide a package of computer time-sharing services for small businesses. Called System 800, the user has access to applications such as billing, inventory control, accounts receivable, and sales analysis, as well as a variety of monthly and quarterly management reports. Included in the price is a high-speed terminal to be located in the customer's office, including maintenance; performance of billing, inventory control, accounts receivable and sales analysis on-line, with two second response; on-line access to the vendor's large-scale computer center in Foxboro, Mass., 14 hours per day, five days a week, and ten hours on Saturday; access to system computer through the company's nationwide data communications network; plus the ability to connect up to three locations to the company's central data base. The six monthly management reports, and two quarterly reports, include inventory and analysis reports, stock status/item sales analysis, updated customer lists, and quarterly item list; plus a choice of four of the following six monthly accounting reports: invoice and credit memo register, tax register, a commission report, a transaction register, an open item aged trial balance, and monthly customer statements. KEYDATA CORP., Wellesley, Mass.

FOR DATA CIRCLE 212 ON READER CARD

More System/32 Programs

IBM, true to its word, has announced programs that qualify its desk-sized System/32 computer for applications in the medical field, and distribution finance. The Medical Group Management system is designed to handle patient billing, accounts receivable, insurance claims and statistical data for practice analysis. A wide variety of management reports are generated, all the result of one-time data entry, it's claimed. Recognized accounting techniques and terminology are used in the program, complete with audit trails and control techniques. Reports include charge slips, monthly statements (conventional or superbills for insurance claims by individual or group), accounts receivable reports, revenue analysis reports, diagnostic and procedure analyses and insurance claims. The programs are available for an initial charge of $1,250 and a monthly license charge of $64. That means users can get the System/32 machine and programs for just about $1K/-month.

FOR DATA CIRCLE 223 ON READER CARD

The Distribution Financial Accounting System (DFAS) consists of three sets of programs to assist in controlling costs and paperwork and in planning general ledger, accounts payable and payroll applications. The programs complement earlier routines for performing billing, inventory control, accounts receivable and sales analysis. The general ledger application monitors profitability and financial progress for multiple companies through a double-entry bookkeeping system. The system maintains accounting controls, audit trails, and security safeguards. It's priced at $405 plus a monthly fee of $18. The accounts payable module handles routine payables accounting for multiple companies and produces reports to help select open items for payment to take advantage of discounts. Cash requirements are projected before checks are written, expenses are distributed by account number for detail posting to the general ledger, etc. This module is priced the same as the previous one.

Finally, the payroll application is said to simplify paperwork and manage productivity by supplying labor cost information. Labor costs are automatically distributed by department to help identify out of the ordinary conditions. The package produces weekly, biweekly, semi-monthly and monthly payroll checks. It calculates gross-to-net pay for hourly, salaried and executive employees and handles varying pay rates, shift differentials, taxes, voluntary deductions, and exceptions. The initial charge is $515, plus a monthly license fee of $23. IBM CORP., GENERAL SYSTEMS DIV., Atlanta, Ga.

FOR DATA CIRCLE 224 ON READER CARD

Mini Data Entry

The Advanced Interactive Data Entry Transaction Processing System (AIDE/-TPS) makes possible custom data entry applications or conventional terminal system emulation by using Data General minicomputers with the memory mapping feature. A multi-tasking foreground/background control structure for multi-terminal transaction-oriented business data processing applications is created. Programs scheduled under foreground control are executed independently in the background while multi-terminal interactive data entry and data base inquiry or update operate concurrently in the foreground. Data entry transactions are processed in the foreground, while background processing programs are scheduled and executed automatically at the completion of data entry for a particular transaction type. Warm and cold start capabilities are featured, and recovery is accomplished without affecting the data entry transaction and collection process, it's claimed. Background programs can be written in any available programming language, including FORTRAN, ALGOL, RPG, COBOL, and assem-

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bler. AIDE/TPS is priced at $7,500. INTERACTIVE SYSTEMS TECHNOLOGY, Dallas, Texas.
FOR DATA CIRCLE 222 ON READER CARD

VS Utilization

Working Set VS is an on-line CICS/VS transaction that presents a graphic picture of a DOS/VS partition on a video terminal by indicating each "page" involved in that partition's working set. The routine can be used in several ways: to schedule jobs by measuring cpu utilization and choosing size parameters for dynamic programs; in programming by using the package to determine which programs should be rewritten for VS; and in tuning the system.

Two display formats are available, one that shows information for only a single partition, and another that shows all partitions. The single partition display shows the total working set in terms of amount of storage, the exact pages involved in the working set, the name of the program being executed, the address of the instruction to be executed next, the program state of the partition, whether the program is running in real or virtual mode, etc. The all-partition display shows each partition's working set storage amount, the total of all working sets, name of program being executed in each partition, whether it's running in real or virtual mode, and the number of shared visual area pages in storage. Working Set VS can be instructed to update the display every one to nine seconds, making it possible to observe the changing working set requirements of a given partition. Working Set VS sells for $1K and is designed to operate on 3270-compatible terminals with the full 1920 character screen. The program requires 3K of CICS/VS storage. SOFTWARE MODULE MARKETING, Sacramento, Calif.
FOR DATA CIRCLE 225 ON READER CARD

Memory Saver

The Pseudo-Resident Reader (PRR) is a routine that can be added to IBM OS/HASP systems to free 18-64K of storage for other purposes such as making 64 supervisor calls or 1100 BLDL entries resident. Even though PRR appears to be a permanently resident reader to HASP, the routine occupies storage only when a job is actually being interpreted. It's claimed the subsystem can be installed in 20 minutes with no modifications to OS or HASP code necessary. The price is $3K, which seems like a lot of money, but on the other hand, it's a lot cheaper than what *anybody* gets for another 64K chunk of IBM memory. SUBSYSTEMS, INC., Sunnyvale, Calif.
FOR DATA CIRCLE 226 ON READER CARD

Interdata Software

This software house has announced several new software products for both the 16-bit and 32-bit Interdata minis. The IBOLS-16 package for the 16-bit machines, including COBOL, ISAM, Sort/Merge, Translate and Hexcump, has been modified to operate under the new OS16/MT-II standard Interdata operating system.

OASIS-16 is a new file management system that also operates under OS16/-MT-II. Features include extremely fast data record retrieval by up to nine different keys using a multi-level, balanced tree index structure. The indices are dynamically maintained and the data record area is randomly, dynamically used and reused to eliminate the gradual degradation characteristics of many file management systems. OASIS-16 is about three months away from readiness, and hasn't been priced yet. A complete specification of it can be obtained by sending $10 to the vendor, however. The modified IBOLS-16 is $7,500. DIVERSIFIED DATA SYSTEMS, Tucson, Ariz.
FOR DATA CIRCLE 227 ON READER CARD ✲

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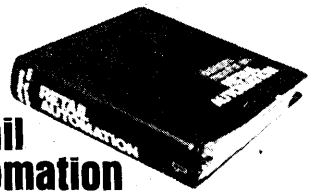

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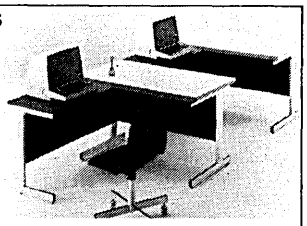

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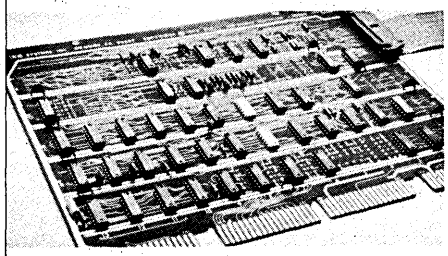

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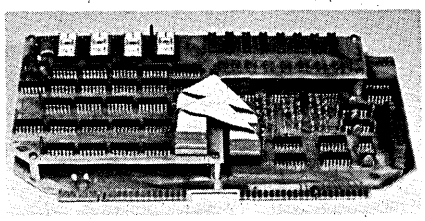

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This forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

the forum

Data Base for Results

The bandwagon for data base management systems continues to roll. The technology and operation of DBMS have been highly refined after just a few years. There is, however, a problem as critical to the success of management information systems as any technological or operational aspect of DBMS design. That problem is the fallacious assumption that the *content* of the data base will take care of itself. We feel, on the other hand, that there is a lack of result-oriented data in data bases.

The data legacy—growth like Topsy

The data in the data base tends to be the residue of the automation of clerical functions. It is transaction-oriented rather than result-oriented. The reason for this can be traced to the way that information systems evolve. Initially, to increase efficiency, clerical transactions are automated. Records of transactions are easily stored and become a data base. The next step is to structure the data base so that it may be easily manipulated or transformed into information.

As the data base develops in this manner, the potential variety of reports available to decision makers expands. The usual assumption is: the more data, the more information for decision making and the better the decisions. But by this unplanned evolutionary process, information is provided because it is available rather than because it is needed. It becomes information in search of problems to solve.

Typical transaction-oriented data includes useful figures on unit and dollar production and sales, equipment and employee utilization rates, employee and machine output and efficiency rates, absences, tardiness, variance from budget, and variance from standard cost. Although these data are necessary for day-to-day managerial control purposes, there is no way to combine them to show the effects of past decisions on long-term objectives, and thus suggest proper strategies for the future. And the danger of over-reliance on transaction data is that it tends to lead managers to play a superficial "numbers game." Amitai Etzioni, in speaking of this tendency among managers in the public sector, said:

> Instead of hearing how many persons have stopped smoking, we learn how many antismoking clinics have opened. Or, instead of reading about a decline of pollutants in the air, water and land, we [hear about] expenditures on depollution. ["The Grand Shaman," *Psychology Today* (November 1972), pp. 89-94.]

Input measures and activity measures are sometimes combined to produce pseudo cost effectiveness measures: for example, cost, a measure of input usage, may be combined with number of customers served to produce a cost-per-customer-served index. This is an easy manipulation in a typical data base management system, but it is an unreliable measure of effectiveness; it is rather more of a measure of "busyness." It ignores important factors such as the timeliness and quality of the service, which would depend on

data less commonly available in the usual inherited data base.

The more important managerial decisions must be based on knowledge about results or effectiveness. An enlightening story about a particularly effective information-decision system—that of IBM—serves to illustrate one important type of effectiveness data needed in the data base.

The story, told by IBM officials to a group of educators, is that in the mid-1960s IBM had in one respect lost control of itself. The telltale indicator was a rise in customer complaints on a customer satisfaction survey instrument, the means used to answer the question that Thomas Watson, Sr., IBM's founder, had insisted be continually asked: "Is the customer satisfied?" Phenomenal sales orders for the 360-series computer had overloaded the creaky order status and control system, which resided largely in the heads of a few schedulers. Customer surveys throughout the country began to indicate major dissatisfaction with deliveries: the need for a quick overhaul of the order and delivery control system was apparent. A team of top analysts was assigned to the problem, and in a few weeks, they designed an advanced information system that can provide fast order status or delivery information to any sales or manufacturing office.

It is instructive to note from this story that even though IBM is highly profit-minded, it relies on customer satisfaction data perhaps as heavily as profitability data for managerial planning and control purposes.

A data base containing customer satisfaction data (as well as cost and profit data) would still be quite deficient. In IBM's case, for example, other key indicators of its success would include market dominance, growth, innovation, returns to stockholders, quality of product, breadth of product line, employee satisfaction and motivation, development of employee potential, employee turnover, employee pay, and employee layoffs. IBM's MIS and supporting data base should be designed around those kinds of results so that the system is able to show when any of these critical indicators turns downward so that corrective action may be taken. By the same token these kinds of indicators, plus various others unique to each different case, are needed by any other firm or agency and should be available in the respective data base.

Priorities

The tendency to load the data base with readily available cost and activity data—and to treat profit as a sufficient or universal measure of results—is difficult to overcome. It carries over to MIS design because of the pervasive idea among systems practitioners that data base technology rather than organizational purpose is the basic building block of management information systems. Yet, given the limited resources available for management information and the inability of the manager to sort and comprehend vast amounts of sometimes irrelevant information, it is important that priorities be set straight, and that MIS and data bases be oriented toward what is needed rather than what is available. Until this reorientation takes place, the computer, the MIS, and the data base will often serve the firm negatively, acting as a drain on financial resources rather than fulfilling their potential to revolutionize the science of decision making.

—Byford E. Hoffman and Richard J. Schonberger

Mr. Hoffman is a graduate student at the Univ. of Nebraska with a special interest in computer simulation.

Dr. Schonberger teaches in the areas of MIS and operations management in the College of Business at the Univ. of Nebraska. He was formerly an industrial engineer in the Dept. of Defense.

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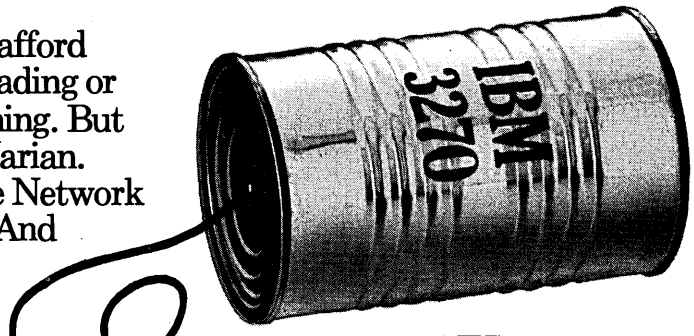

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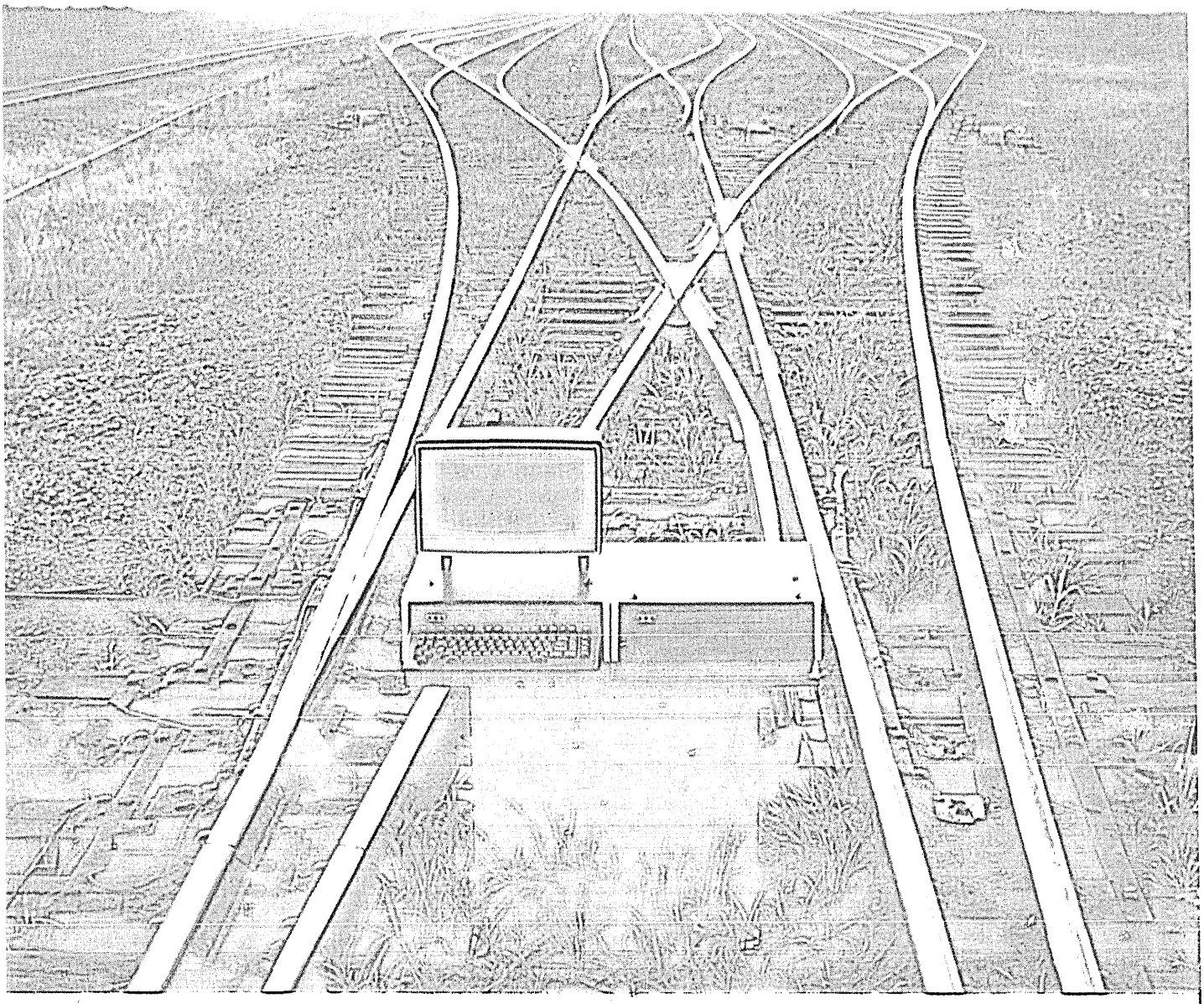

When it comes to flexibility, the model 40 gives you a lot of ways to go.

When we designed the model 40 system, we included a long list of features and options to give it the flexibility for practically any data transmission requirement. Whatever your industry or application.

First, there's a variety of speeds ranging from 110 to 4800 bps, along with a choice of interfaces, half/full duplex operation, and character and batch mode transmission. The model 40 system also has a number of on-line controls, even/odd parity generation and a destructive scrolling feature that permits continuous bottom-line reception with no loss of data until memory overflow.

Flexibility features don't stop there, either. There's an expandable memory with line and page scrolling, protected format with variable field transmission, plus many other features and options to select from. And since the entire system is modular, it can be custom-tailored to fit your needs.

These are just some of the many reasons why the model 40 has the flexibility to fit just about any system. But the model 40's strongest suit is economy. Because on a cost/performance basis, nothing even comes close. And delivery is a lot sooner than expected.

For complete information, please contact our Sales Headquarters at: 5555 Touhy Ave., Skokie, Ill. 60076. Or call Terminal Central at: (312) 982-2000.

TELETYPE

The Teletype model 40 system. Nothing even comes close.

CIRCLE 3 ON READER CARD