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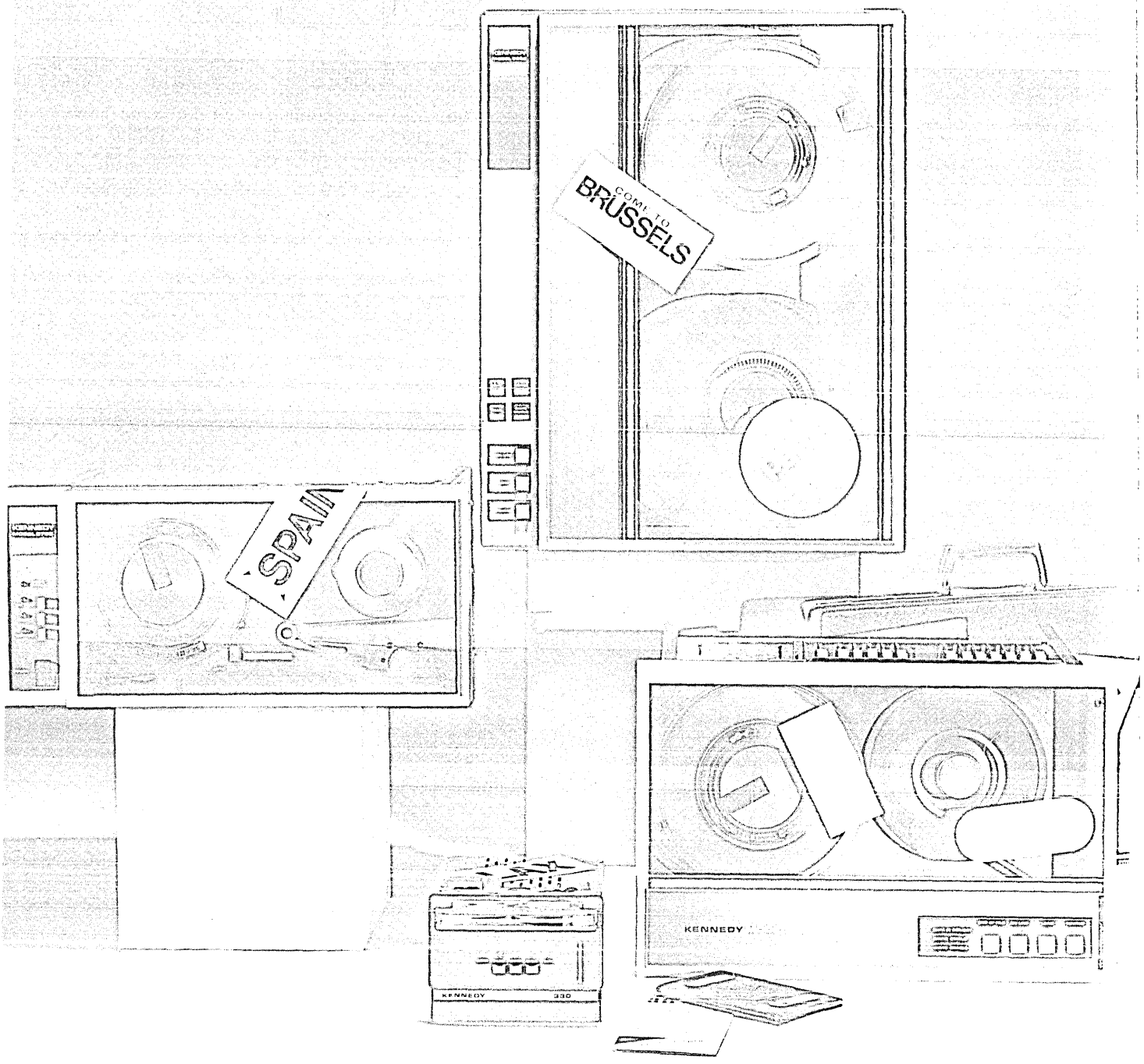

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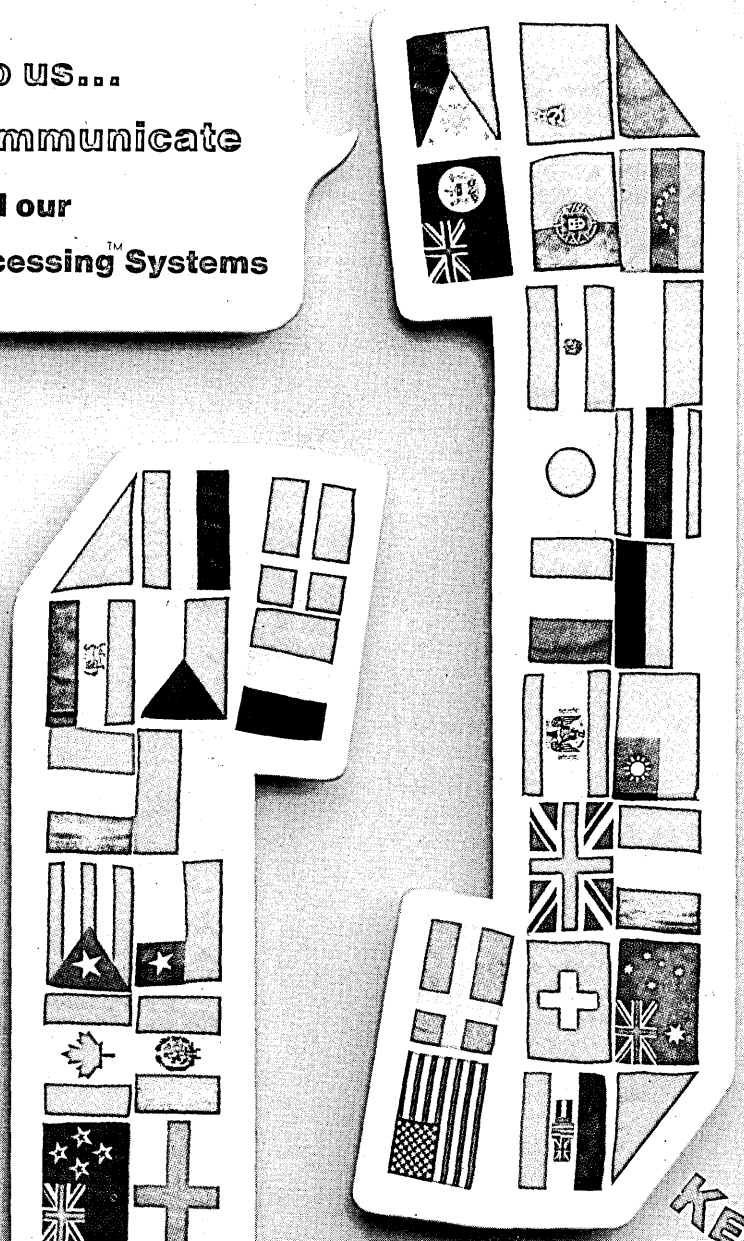

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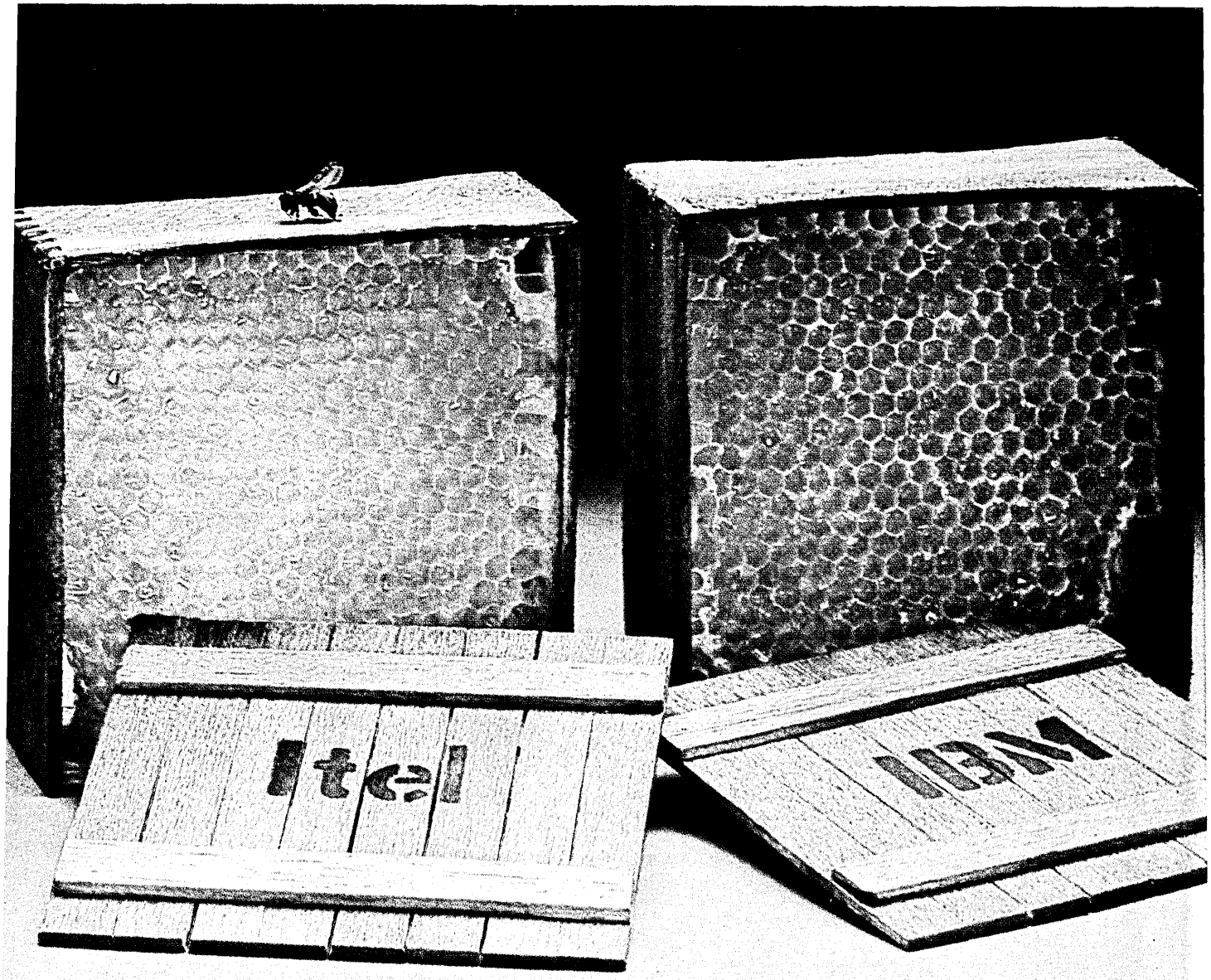

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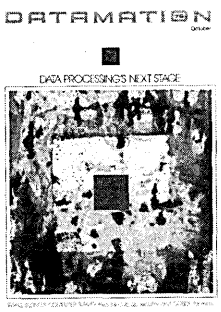

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About the Cover
Data processing is working its way through another period of change. The shape the next stage will take emerges in several articles this month. Our design is by Barbara Benson.

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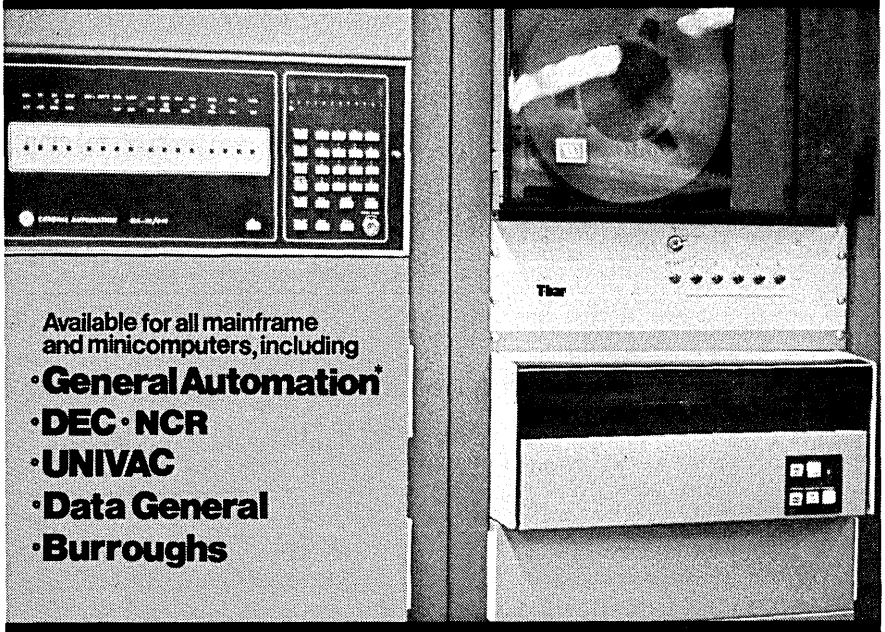

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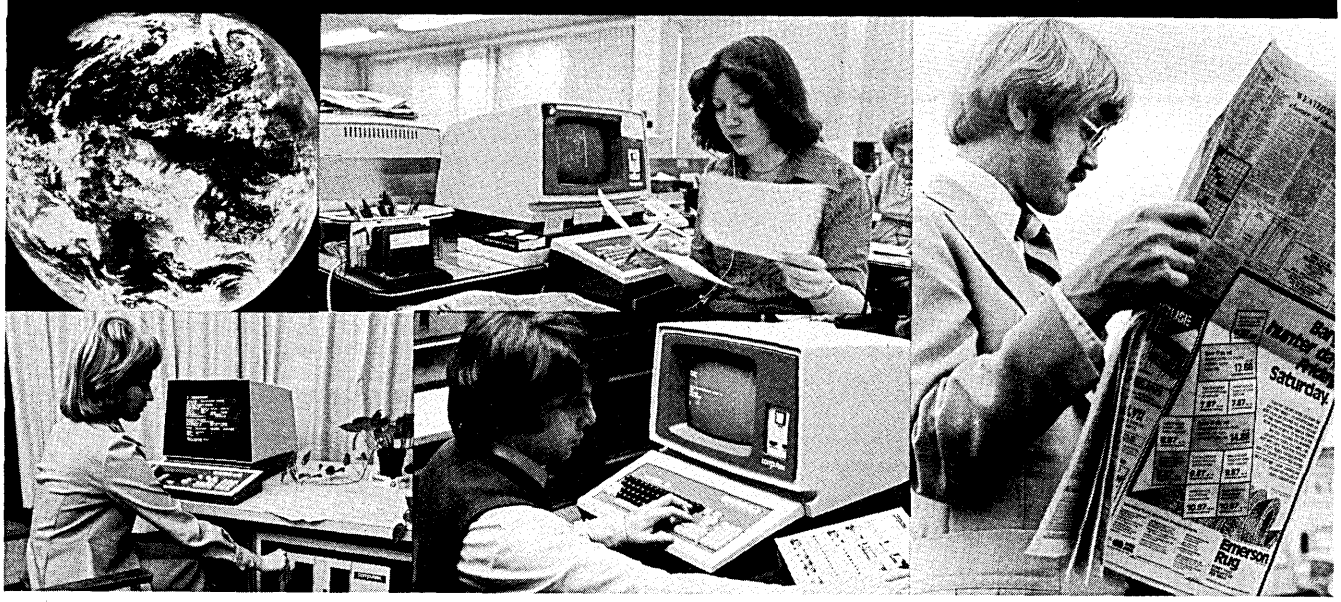

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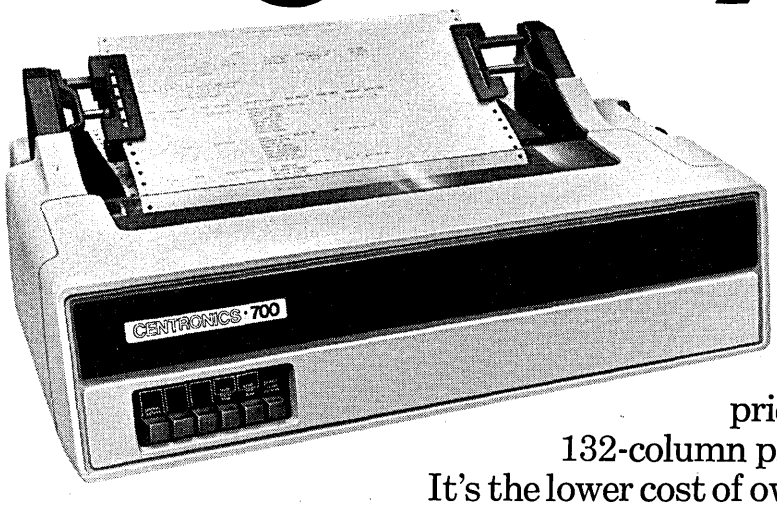

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letters

On certification

I refer to the "People" item (July, p. 13) on Ms. Janis Miller, recently selected as the "newest member of the Certification Council for the Certification of Computer Professionals." Since decisions and conclusions reached by this Council will impact on the futures of thousands of data processor's, it would be of interest to the field to know what qualifications are required for this membership and by whom the selection process is conducted.

I would also greatly appreciate it if Ms. Miller could provide some clarification of her statement that the certification "helps keep garbage out of the field." Since there are many thousands who for one reason or another do not choose to pursue certification, her comment is most disturbing particularly coming from one elevated to such a responsible position of authority.

DEAN H. RAY
Administrative Services Directorate
Defense Civil Preparedness Agency
Washington, D.C.

Prof. Wm. J. Horn (Boston College School of Management, Chestnut Hill, Mass.) is chairman of the Certification Council, Inst. for Certification of Computer Professionals. He replies to Mr. Ray's first point:

For qualifications, a council member must be a recognized leader in the field, must be a holder of the CDP—preferably a high scorer—and must show an interest in contributing to objectives of the council.

The selection process is as follows:

1. A search is conducted by council members, past and present.
2. References are taken from the ICCP board representing eight associations.
3. The candidate is interviewed.
4. A final recommendation is made by the council to the ICCP board.
5. The final selection and approval of any council member is made by the ICCP board.

The council is intimately aware of the serious implications of its decision making concerning CDP candidates and CDP holders. They do indeed take this responsibility seriously.

. . . and Ms. Janis Miller replies to Mr. Ray's second point:

Data processing affects corporate decisions, social decisions, legislation, peoples' lives. It is now beginning to produce documents and records that not only affect our contemporary generation and environment, but those of the future as well.

Data processing then is becoming a tool that is writing history. The ominous weight of that responsibility dictates that the dp practitioner who wields this tool be qualified. Just as the public demands that other practitioners, from lawyers to CPAs to interior decorators, be qualified, so should they also be assured of qualified dp persons.

I think we should have a standard, and if presently the certification program does not represent that standard, then it should be strengthened and supported within the dp community until it does. Conveniently choosing not to pursue a credential does not enhance our reputation for being reliable technicians. Personally, I don't like to run from, or ignore, a problem to solve it.

Misrated

I noted that Oscar Rothenbuecher's ranking of the top 50 dp companies (June, p. 48) failed to list Four-Phase Systems. Actually, with 1975 dp revenues of $50 million, Four-Phase should be rated 45th—just above Wang, Tektronix, and Datapoint.

For your information, here is a quick update on the company:

1975 Revenues	$50,149,977
Current Income (2nd Quarter, 1976)	$1,011,705
Total Employees	1,200

BILL STEINMETZ
Manager, Corporate Communications
Four-Phase Systems, Inc.
Cupertino, California

Because the stock of Four-Phase Systems was not traded publicly until June 8 of this year, we did not have the full information available. If Four-Phase Systems' earnings continue at its present rate, it will no doubt be listed in future Datamation 50 articles. We do invite information from dp companies which would allow us to keep as up-to-date as possible.

Privacy legislation

Dr. Phil Koltun's letter (August, p. 7) disagrees with two points made concerning privacy legislation at Honeywell's privacy symposium. First, he disagrees with Phoenix attorney Ronald Meyer's belief that the Supreme Court will uphold the right to privacy. Myself and most of the other speakers at the symposium would be in agreement with Dr. Koltun on this point. Most of us were careful to point out that well constructed legislation is needed, and no one, other than Mr. Meyer, expressed the belief that the Supreme Court would uphold the right to privacy.

Secondly, he indicated that many of the speakers were misguided in suggesting that privacy legislation would be passed this year. Given the American public's increased concern with our growing bureaucracy, he may be correct. However, the American public has also shown an increased concern for individual rights.

Unfortunately, these concerns are in conflict. You can't have privacy legislation without increased bureaucracy.

Sometime, perhaps not this year, the issue will rise again. It is important that we, as dp professionals and as citizens, aid our legislators in framing that legislation. The belief that any privacy legislation is better than none is false. Poorly constructed privacy legislation can *reduce* privacy and cost the American public a fortune. Don't write your legislator to tell him that you consider privacy legislation a top priority, as Dr. Koltun suggests; rather let him know precisely what type of legislation your industry can live with.

LESLIE D. BALL
Assistant Professor
Arizona State University
Tempe, Arizona

The "good" programmer

Every time I read a letter (or article) such as the one from Joe King ("I Can Hardly Wait," July, p. 8), I am astounded by the monumental ego and lack of perception shown by the author.

Of course "good" programmers have been using the "new" techniques of programming for years—that is why they are considered "good." But why, then, does study after study of commercial systems assert their sorry state and proclaim that over 80% of system costs is spent on debugging and patching? Because not *all* programmers have the instinctive knowledge of these techniques that King and others attribute to themselves.

Our problem as an aspiring profession is to find a way to codify and formalize these techniques so that all our practitioners can achieve a consistent level of competence of which we can collectively be proud. Too many "good" programmers are either unable or unwilling to teach their techniques to others. Unable, perhaps, because they cannot put their "instinct" or "art" into words; unwilling, perhaps, because they are selfishly afraid of someone discovering these "secrets," thereby diminishing the difference between "good" and "bad" programmers. If we are to be recognized as a profession—as are doctors, lawyers, and CPAs—we must make every effort to set and achieve standard levels of performance which can be recognized and accepted by our clients.

Thank goodness, then, for those of us who are unselfishly trying to describe and define the techniques they use as "good" programmers. Their efforts move us towards the goal of professionalism.

If engineers hadn't latched onto this attitude of making public their techniques, why, we wouldn't even have our computers to play with!

LOIS A. ROSE
Systems Consultant
Parsippany, New Jersey

letters

NSF grants

Granting that greater freedom may be afforded by that section of your magazine, I submit that an impropriety was committed by Stephen R. Levine III in the July Forum ("Another Parker Game," p. 155). (My opinion of the work of Donn B. Parker is entirely irrelevant to the thrust of this letter.)

Were the Forum piece a review, no matter how unfavorable, of Parker's published work, I would not be concerned. I would not be bothered by a criticism of NSF generally, nor of the subject matter of this or any other grant. Neither would I complain were a parody of the probable results of a grant like the one in question published without attribution.

However, to impute, in advance, a procedure, a methodology, and a result to the work of a named person is just plain dirty pool. It is unscholarly, unfair and smart-alecky.

What is worse, the writer of the Forum shows no more knowledge about what is wrong with the computer field than the man in the street.

ARNOLD I. DUMEY
Princeton, New Jersey

I share Mr. Levine's disgust with the funding practices of NSF, but I think he is wasting his breath. . . .

I would personally never apply for a grant. I ended my short trial in academia a few years ago precisely because of the shabbiness of the game surrounding grants. (Of course, Stanford Research Institute is not technically academia, but the symptoms are the same.) Fundamentally, the grants are not for research at all, but to subsidize graduate education—which ultimately benefits those firms who hire graduates (assuming, which I don't, that those graduates are a help, and that most of them don't go right back into academia, which they do).

Anyway, thanks for the article, even though it won't make a scratch on the NSF-academia edifice. It serves itself, just as you and I do—only the scale is much larger and they're using our money to do it.

GERALD M. WEINBERG
President
Ethnotech, Inc.
Lincoln, Nebraska

Freedom of the Press

The Editor's Readout in the August issue (p. 51) presented the case for free press very well. It did leave out one point—that a *responsible* press deserves to have the right of free speech.

You did include one sentence that indicated the press may publish misinformation. Until the press is willing to take the responsibility to correct the misinformation with the same fervor that they publish it, and take responsibility for what they publish, there is a reluctance on my part to provide the support that you are requesting.

BERNARD M. SLOTNICK
Palos Verdes Peninsula, California

The thing we speak of as "the press" is made up of people, including for the moment Mr. Slotnick with this letter. Some people act responsibly most of the time, others do somewhat less frequently. We agree that the people of the press should be held responsible for their actions. We ask only for the right to exercise that responsibility.

Views on managers' views

In Jackson Granholm's article, "The View from the Manager's Office" (August, p. 52), *Datamation* has succumbed to the presently fashionable practice of placing all civil service employees in the "do nothing and can't be fired" category. Not only is this idea mentioned, but it is highlighted in boldface type apparently for emphasis.

As a federal civil service manager, I take strong exception to the suggestion that all civil service employees (federal, state, county, and municipal) fit this stereotype, and the apparent implication that all private sector employees are the converse.

FRANCIS J. PALUSKA
Mechanicsburg, Pennsylvania

The statement was not Mr. Granholm's but rather that of the manager quoted in the article.

I especially enjoyed "The View from the Manager's Office." The direct quote format is a pleasant diversion from the usual statistical summary of opinion.

WILL GALLANT
IDP Software Marketing Manager
Tektronix, Inc.
Beaverton, Oregon

I direct one question to Jackson Granholm: Where are $Jane_1$, $Jane_2$, $Jane_3$, $Jane_4$, and $Jane_5$'s stories?

PEGGY DIETSCHE
Business Data Processing Instructor
Metropolitan Vocational
Education Consortium
White Bear Lake, Minnesota

Higher level languages

With reference to Mr. Frank's "The Second Half of the Computer Age" (May, p. 91) and Mr. O'Rourke's supportive letter (August, p. 8), I must stress the one important fact that seems to be overlooked.

Higher level languages may well have inadequacies and inefficiencies. However, in my opinion they are more than offset by the interchangeability of programming skills. An IBM COBOL programmer can easily write COBOL programs for an NCR, Honeywell, or Burroughs computer.

A small computer user who loses one programmer could easily be losing one half, if not all, of the dp department's programming staff. Searching for two months for a NEAT/3 Level 2 programmer as compared with one or two weeks for a COBOL programmer will convince any small non-IBM user of the superiority of COBOL.

ROGER R. GLOVER
EDP Officer-Manager
First National Bank & Trust Company
Troy, Ohio

Looking ahead to '60s

We read Mr. O'Rourke's letter [also mentioned above] with great interest and we feel that his points are well taken and represent the type of practical, forward-looking outlook we need to meet the coming challenges of the 1960s. In particular, we could not help but think how well he summarized the drawbacks of the new, so-called "higher level" languages, such as IBM's FORTRAN (short for FORmula TRANslation) and Remington Rand's MATHMATIC. With hardware costs presently constituting roughly 90% of overall system costs, and with higher level languages still in their infancy, the case for coding in assembler language is a strong one. After all, present hardware (operating at speeds of roughly 200,000 operations per second) is already severely taxed merely performing actual computations, and the expenditure of precious computing resources for nonessential tasks such as language translation or compilation cannot be justified on the basis of cost-effectiveness.

Of course, some optimistic visionaries predict marked decreases in hardware costs and increases in computer speed in the distant future. (Extremists are predicting improvements as great as a full order of magnitude!) If such cost reductions could be effected, this could conceivably change the cost effectiveness of higher level languages. Such a cost reduction could be achieved, perhaps, through the mass production of computer hardware, but this is a doubtful possibility since the large size and power consumption (20,000 vacuum tubes!!) will almost certainly restrict the use of computers to a few scientific laboratories.

We here at Reactionary Computing, Ltd. feel that computers are potentially useful for a few types of problems, and we plan to explore such possibilities. We have already ordered a large supply of assembler language coding forms for our own IBM 704 supercomputer, which should arrive next week.

RICHARD D. STUTZKE
CURTIS L. NELSON
Reactionary Computing, Ltd. ❋

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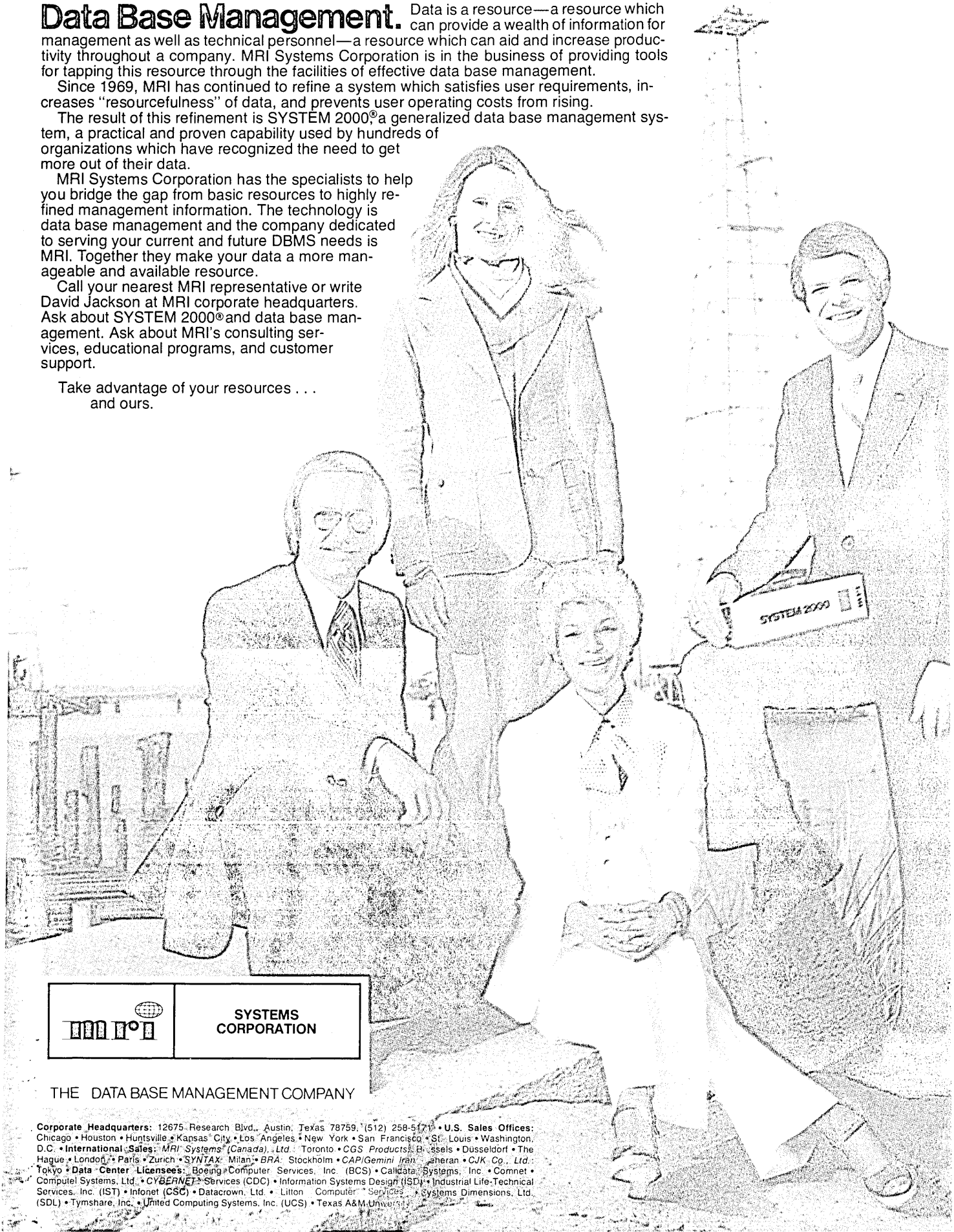

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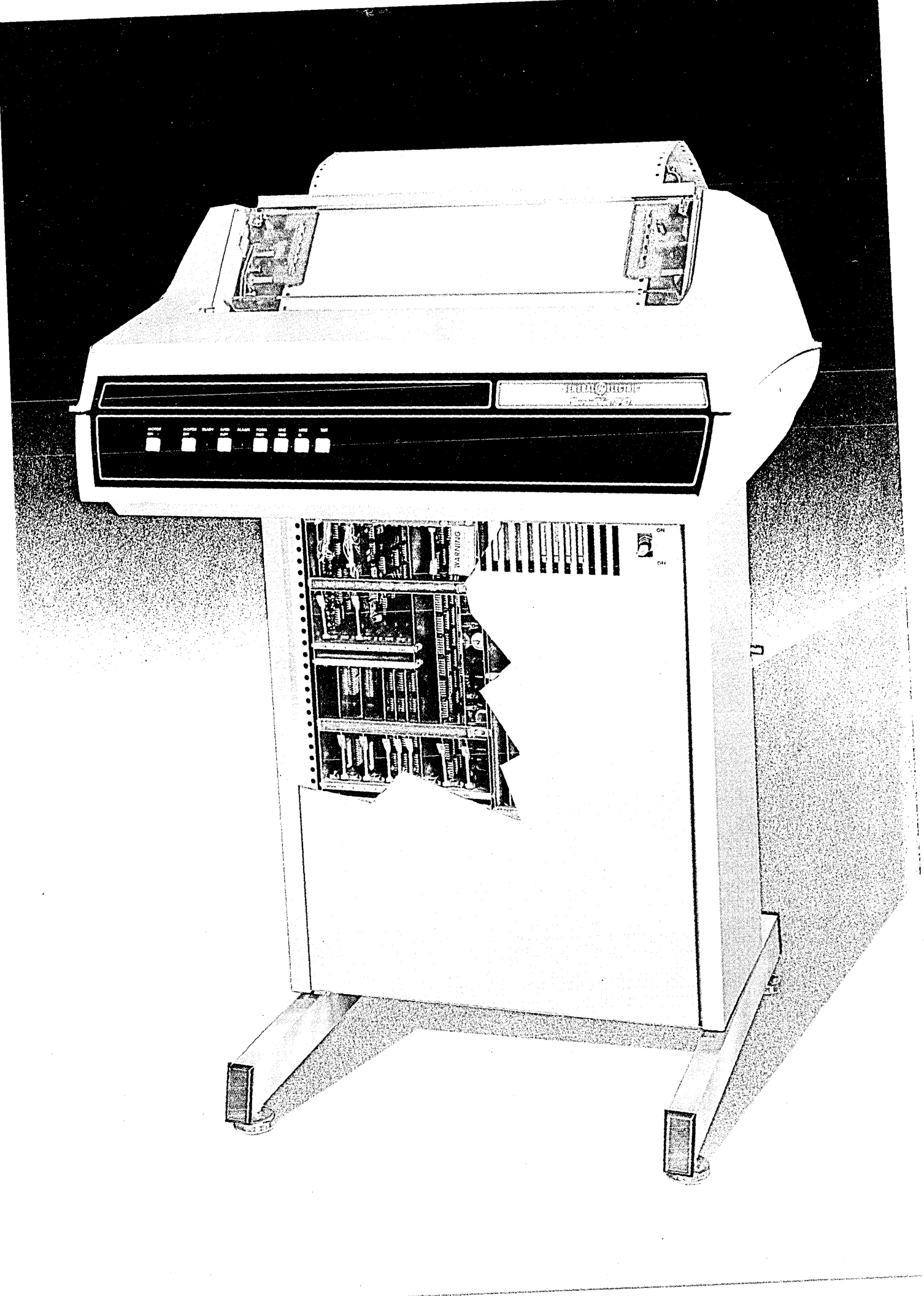
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A Circuitous Route

"The timing is right," said Pete Warkenton in explaining his optimism on past and anticipated growth of California Software Products, Inc., a Tustin, Calif., software firm he joined last year as executive vice president.

"There's a growing awareness in the end user spectrum. Prices of hardware are coming down. Software is becoming more efficient."

Warkenton hasn't always been that fortunate with timing. As president and one of six founders, he launched Computer Operations Inc. in 1969 to produce the Gemini computer which was to have been a big time-sharing machine. It was designed but never built as the economy fell on bad times and committed money failed to come through. COI went into voluntary bankruptcy in late 1970, tried to continue operating but couldn't make it.

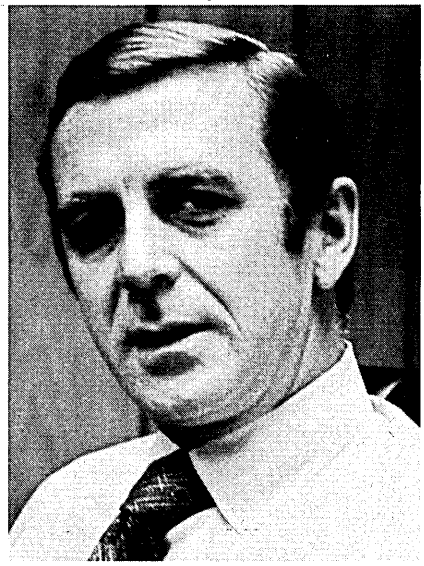
Warkenton said he learned a lot about the ways and hows of raising money in trying to keep COI afloat even if he wasn't successful. Between COI's folding and his joining Computer Software Products he consulted "in the financial area."

California Software Products was a partnership between Dean Moore, its present president, and Tom Benson before incorporating in May of '75. They were doing compilers "one at a time." The company still does compilers. "We've got as good a facility with COBOL as anyone in the world," says Warkenton. But the company is into other things now. It offers a variety of languages to minicomputer manufacturers and users. It is also designing a management system for factory applications and is working on a data base management system which Warkenton describes as "both hierarchical and relational" and which is expected to be announced at the end of this year. He'd like to call it Oasis but that's not official. The firm has grown from three people when Warkenton joined to 20. Most are technical people, he said. Three exceptions are himself, a marketing type and Cathy Diaz whom he describes as "a super girl Friday." He's in a position to know. She's worked with him in three different companies.

Joining California Software Products, Inc. was a return to software for Warkenton. Prior to COI he had founded Information Development Co., a systems software supplier which he later sold to Leasco. He signed a non-competitive agreement with Leasco which kept him out of software for awhile but that has expired.

It was a circuitous route that took Warkenton from Russia, where he was born, to Orange County, Calif. "My family had been on the wrong side of the Russian revolution," he said. When an attempt was made to conscript his father, a wheat farmer, into the Red Army, his mother bribed some officials and the family escaped to Latvia.

At the time, Warkenton explained, the Canadian Pacific Railroad was trying to get people to work farm land it had acquired in western Canada and



PETE WARKENTON
"The timing is right"

was doing this by offering to pay the way of refugee families from Europe to Canada. The Warkentons took advantage of this and worked the land just long enough to pay the railroad back. Then Warkenton's father opened a grocery store in a small town in Saskatchewan.

Pete recalls that, as a small boy, he greatly admired a favorite uncle who was a cowboy. "I wanted more than anything else to become a cowboy until I learned how dumb horses are."

He says his mother was a driving force in his life. "She wanted me to get an education." He was one of only "a couple of kids" in his elementary school to go on to high school and the only one from his high school to go on to college, The University of Saskatchewan.

From college, Warkenton joined the Canadian Air Force as a pilot. When he got out, he joined the McBee Company, Ltd., a subsidiary of Royal McBee Corp., which was marketing the Librascope LGP 30 general purpose computer. He sold computers for McBee first in Canada and then in Atlanta. His work took him often to the Librascope plant in Southern California and he came to like the area.

His next job was there, as national sales manager for the Autonetics Industrial Products Div. of North American Aviation, with responsibilities for the development and administration of the marketing organization for worldwide sales of general purpose computers.

He left Autonetics to join Mesa Scientific, a software firm. When this firm was acquired by Planning Research Corp. in 1965, he and others left it to form Information Development Co.

Warkenton likes where he is now. He likes the place. The firm occupies 4,000 sq. ft. of space in a sprawling two-story office building with lots of gardens, and has options to take on more space as it becomes available.

And he likes the people. "We're kind of an international group." In addition to him, with his Russian/Canadian origins, the firm has people from Columbia, Formosa and Japan.

He also likes the fact that the company is "very flexible as far as employees are concerned. We don't believe in strict 9 to 5. It's getting the job done that's important." They have two women with small babies who do documentation at home and they expect to hire more. "We give them their choice. They can either become employees with salary and fringe benefits or they can work on a private contractor basis."

Warkenton lives close by the office in Newport Beach. He doesn't own a boat but does enjoy sailing on boats belonging to other people. His other favorite extracurricular activity: beating his 24 year old son at tennis.

"You Get What You Pay For"

With the proliferation of minicomputers, not only in factory environments but also in the front office, we are seeing minicomputer users who previously had been users of maxis. They are accustomed to a level of support from their hardware vendor that is still available to them, as mini users, but at what seems to them to be an inordinately high cost. Critical of those who balk at that service cost is Rick Dove, marketing vice president for Ball Computer Products, Sunnyvale, Calif.

Dove says those users find they can acquire a mini-based system for as little as $15,000, and can't understand why they are being asked to pay an

people

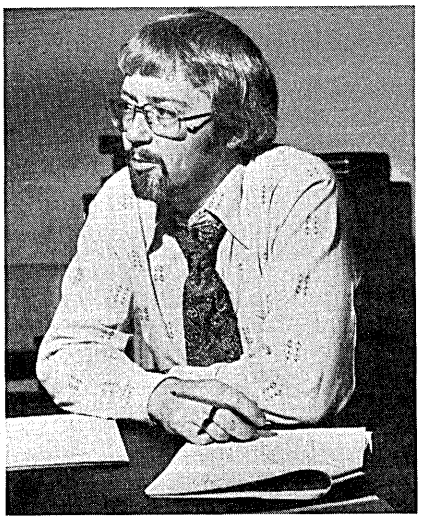
additional $1,000 for maintenance. Instead, he explained, they find someone who's willing to contract for the service for only $500 and provide only $500 worth of service, rather than the $1,000 worth that the users continue to expect. "You get what you pay for," says Dove.

"But we've seen a change in the last year," he continues, "We've seen people begin to understand that if they want this kind of service and they need it, they've got to be willing to pay for it. Now they're starting to be willing to pay for it."

Ball Computer Products is the former Decision Inc., acquired in 1975 by Ball Corp., the folks who bring you those home canning jars and the lids that were in such short supply last year. With the financial resources of a Fortune 500 company (the parent firm even carries the paper on systems leased by BCP), the computer company was able to vacate a storefront facility in a rundown section of Oakland, Calif., and take over much fancier digs across the San Francisco Bay.

The new affiliation has also enabled the company to acquire for its product line a mini-based system for remittance processing, called ReaDoc. With the acquisition of this product, Ball Computer finds itself in the turnkey systems business. And the firm that got its start by making interfaces and controllers for the Data General Nova minicomputers, products sold to the oem marketplace, is now selling also to end users. The ReaDoc cash management system is being sold to those firms that process turnaround documents, such as credit card stubs and utility bills and the like.

"This is our first thrust," says Dove. He says it is possible they will develop a second turnkey system for the end-user market, using a mini-based system called DASL. This is a system that can be expanded to support up to 16 crt terminals, with up to 400 megabytes of disc storage. It also comes with a Data Access System Language (thus DASL) that is said to facilitate the development of business applications programs. This system is currently being marketed to what Dove calls second-level oem's, those who lack a systems integration capability but have the software know-how to develop and sell a turnkey system to a specific vertical industry, such as trucking firms or law offices.



RICK DOVE
". . . They're starting to be willing"

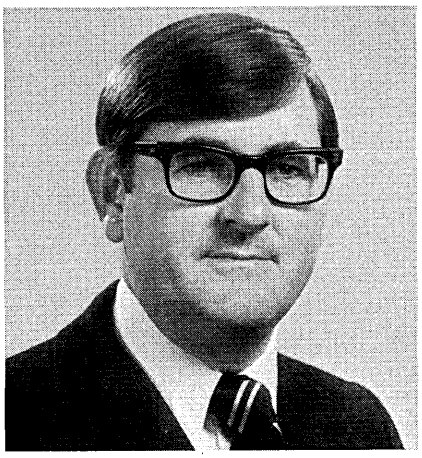
Dove says today's minicomputers have the capabilities of the low-end maxis of five years ago, but at one-tenth the price. "Consequently minicomputers are being used more and more for large data base management requirements where you need large disc file storage."

It's Always Been IBM

Norman J. Harris is an IBM salesman's dream. In a long-time data processing career, he has uninstalled 21 computers from a variety of mainframe manufacturers and installed 13—all IBM.

Why? "I've never had a loser," said Harris from the company he affectionately refers to as "big brother."

Harris is the new vice president in charge of corporate information systems for BancOhio Corp., Columbus, a bank holding company with 41 banks in Ohio and 224 branches. He has been charged with expanding the company's information systems unit. "We're getting into electronic funds transfer, setting up a large host data center, and implementing distributed processing for every branch," Harris said. He's installing two 370 158s which will be running SBS, CICS, IMS, and TSO and disposing of "a multitude of equipment from a variety of vendors."



NORMAN J. HARRIS
"I've never had a loser"

Before joining BancOhio Corp., Harris was consultant to the president of I.M.S. America, a pharmaceutical market research company which provided information to major pharmaceutical manufacturers around the world. "We went from nothing to a large on-line teleprocessing system in four years," he said. "All based on one IBM 370/158." While he was in this job, he said, many other companies sent representatives to see "what we were doing and how." BancOhio Corp. was one.

Also while with I.M.S. America, Harris was tapped by IBM as its 1975 data processing executive to tour Japan. He spent two weeks there talking to Share and Guide groups and to individual companies and calls this "the greatest experience I've ever had in my life." He said his audiences were "interested and cordial" and even though he had to work through an interpreter, he established good rapport.

He was the fifth dp man sent by IBM on such a mission and he didn't even know the program existed at the time he was selected. "They just called me up and told me about it and—bingo—I was on an airplane."

Harris loves being in data processing but, like most in it, he didn't set out to be. He studied business administration at Missouri State University and, after graduation, went to work for Vendo Co., a vending machine company in Kansas City, Mo., in the production and planning area. He took a test while there and the next thing he knew he was in data processing working with 1401s. From there he moved through 360s and 370s—always IBM.

Other dp jobs have included serving as vice president—information systems for Franklin Mint, which he said is the largest privately owned mint producing "collectables," like medallions, and marketing them all over the world. He also served as director of the Midwest Data Center for Emerson Electric, a manufacturing conglomerate, and director of Information Systems for United Telephone System of Ohio.

He likes life in Columbus and says his family, his wife and a daughter, 10 and a son, 5, do too.

In New Posts

DAN A. BARNES was appointed vice president of marketing at TRW Communications Systems and Services . . . EDWARD G. KEYES is the new manager of information services at Kitchens of Sara Lee.

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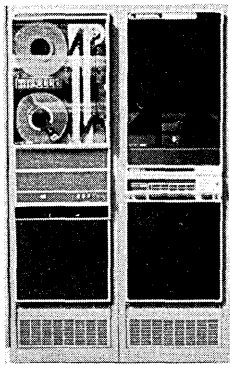

It's a complete language system that comes with features like an interactive debugger, and an integrated SORT/MERGE. Plus it also includes an IBM-compatible RPG II and real-time FORTRAN.

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CIRCLE 48 ON READER CARD

LOOK AHEAD

PEACHTREE RUCKUS OVERSHADOWS IBM'S RPQs

All the ruckus about IBM's Peachtree minicomputer, expected to be announced this fall, is overshadowing another important but quieter development in the General System Div.'s mini effort. GSD is increasingly RPQ'ing important big orders and, in the end, these could make deep inroads into the mini market. IBM has developed a mini for Sears Roebuck for point-of-sale terminals, for instance. Another RPQ for Citibank could end up placing a mini in each of the bank's branches. Other Peachtree RPQs include Westinghouse, and the Air Force's Joint Tactical Information Distribution System. As word leaks out of more and more mini RPQs, other IBM users want a chance to get specialized and new equipment. By this summer, orders had slowed to a trickle for IBM's System/7, the company's antiquated sensor based machine first announced six years ago. Price cuts on the System/7 in June 1975 and May 1976 did little to boost sales of the machine.

ANOTHER BIG CITIBANK ORDER FOR MINIS

Decentralization is obviously the final word at Citibank. Honeywell Level 66 systems being used in a long aborning funds transfer project were sent back, not because of vendor performance, not because of the Government moratorium on EFTS projects, but because the bank is going whole hog into small systems.

Honeywell is making out on the deal since in return it received a $7 million order (said to be more than the 66 deal) for more than 200 Level 6 minicomputer systems that will be used in several projects. We're told that by next year there won't be anything bigger than a 370/145 at the bank, and in '78 a PDP-11/70 will be the heftiest system around.

CRAY-1 IN A CLASS BY ITSELF

Cray Research's Cray-1 supercomputer received high marks in preliminary evaluation runs at the Los Alamos Scientific Laboratory in New Mexico. A final report is due this month from Los Alamos where the first of Seymour Cray's two machines has been installed since early this year, but not ordered.

The lab says it "now appears" that the Cray-1 is in a new class of computer, which it calls Class VI, that is capable of executing 20 to 60 million floating point operations per second. It lists the CDC Star and the Texas Instruments ASC 4X in Class V, capable of executing 6 to 20 million floating point operations per second, and the CDC 7600 and IBM 370/195 in Class IV with 2 to 6 million operations per second.

In the preliminary evaluation of the machine's hardware performance, the Cray-1 was matched against the lab's CDC 7600. Doing scalar processing, the Cray-1 was two and a half times faster than the 7600 and it was five and a half times faster in executing vector lengths of 500 words. (The 7600 doesn't have a vector capability, so for the tests the lab coded in the equivalent scalar function.) The preliminary report also said the machine meets both the vector and reliability criteria established in the laboratory. It did not address Cray's hardware/software performance because only the most rudimentary software exists for the machine at this time. A Cray spokesman in Minneapolis said work is still underway there to develop a Fortran compiler for the machine.

CDC CLAIMS 12 PROSPECTS FOR THE STAR

Control Data has identified at least 12 prospects for advanced versions of its Star computer (September, p. 168). The Lawrence Radiation Lab at Livermore has installed two Stars, NASA Langley has one and last month the fourth Star went into service on the CDC Cybernet network. CDC will submit a proposal later this month to a new consortium of Common Market nations for weather prediction called the European Common Market Weather Facility--presumably for the Star A. Another prospect is a seven agency Federal government weather facility called the Federal Committee for Meteorological Service and Supporting Research, probably to be installed in 1980-81. Other prospects are Los Alamos, National Oceanic and Atmospheric Administration, Kirtland AFB in Albuquerque and several intelligence agencies.

IN SEATTLE DP'S FRONT PAGE STUFF

Data processing makes news in Seattle, Wash., at least the city's data processing and what it spends on it. "The Times and the Post Intelligencer (Seattle's two leading newspapers) are beginning to look like Computer World," bemoaned John Elliott, assistant budget director for management information systems, who is getting a bit tired of seeing his name in the paper.

LOOK AHEAD

He especially doesn't like it if the facts are wrong such as in one story where he was quoted as having advised the city council to scrap an integrated financial system in which the city had invested $1.45 million. It wasn't finished and still isn't. "It was my position that we use it and try to improve it" said Elliott and that's what the city is doing but not on its own NCR equipment. It has been sharing a 370/165 with the county since July. The council mandated the sharing while it studied the possibility of going facilities management (August p. 129) which still could happen.

And now the county can't handle the city's work and the city is beginning conversion back to its equipment. It is preparing an RFP for a new computer which Elliott says will be "on the order of a 145." In the meantime, facilities management firms are pitching hard to King County, which isn't inconvenient because they're still going after the city and the two are virtually next door to each other.

A BANK OF VOTERS

Most registered voters of Stark County, Ohio, probably don't know it but they're in the bank, Harter Bank and Trust Co. of Canton, to be specific. The bank is developing an on-line, real-time voter registration system for the county's Board of Elections. It had hoped to be on-line in time for the big '76 elections but didn't make it. Philip Morgan, vice president of computer services, said that won't happen until mid-December. But voters in next month's elections already are part of a data base maintained by the bank and updated via crt's in the Board of Elections office. Next comes a jury selection system which Morgan said will be implemented next June. The county is banking on it.

IBM "SECRET" MACHINE WON'T OUTPERFORM AMDAHL

IBM's new product offering in the high end--equipment that will slug it out with Amdahl--has been as widely heralded as the new King Kong movie. Everyone knows it's coming, but no one has seen it yet. One U.S. user, though, thought he had found the new machine recently when he discovered a "secret" machine in Japan. Called the 370/158 Submodel 2, the IBM equipment turned out to be a special machine aimed at meeting Japanese competition. It's been quietly delivered in Japan for two or three years, but has never been announced in the U.S. The Submodel two apparently is not powerful enough be effective against the Amdahl machine.

UNIVAC HEDGES ON RELIABILITY, LOSES BIG ORDER

Bowery Savings Bank, a Univac bastion since 1961, is shifting to a pair of Burroughs 4800s to control its universal teller system. Univac did the old "snatching defeat from the jaws of victory" trick. First in the running with an 1100-12 multiprocessing system, it dragged its feet on reliability guarantees to the New York bank. For just one processor Bowery wanted a guarantee approximating the 99.7% uptime it's achieved on the good old 492s. While Univac mulled whether it wanted to put that in writing, Burroughs brought the new 4800 and stole the Bowery show. That's a lesson Univac may have to apply often, as many other 490 series users currently are deciding where to move next.

STOP ME IF YOU'VE HEARD THIS ONE

A very low-priced speech recognition system, applicable to a wide range of control uses, is up and running in engineering prototype form in San Mateo, Calif. The microcomputer-based system was designed to have limited capability but also at minimal cost--less than one-tenth that of current commercial systems (August p. 65) which are priced from $10,000 to $20,000 and rely on minicomputers. The developer, Centigram Enterprises, seeks licensees to incorporate the device into their systems.

The cost still is too steep to consider incorporating into a toy, except for something that Neiman-Marcus might feature in its Christmas catalog. But there also are environmental control systems in hospitals and wheelchair control applications and the like where the ability to recognize eight or 10 spoken commands is adequate. Of interest, too, is the ability to recognize words embedded in continuous speech; action would be triggered only when those words are heard. Like the sound of a "bleep" when a four-letter word is spoken.

THE CPU'S A CALCULATOR

A system based on a calculator? Could be coming. Neff Instruments is dickering with Hewlett-Packard over use of Neff's model 620 analog-to-digital multiplexor as an

(Continued on page 164)

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calendar

OCTOBER

45th Management Conference, Assn. of Data Processing Service Organizations, Oct. 25-27, Toronto. This conference will be held in conjunction with ADAPSO's annual meeting. The theme is "Posturing for Change"; meetings and workshops will cover impact of corporate consolidation on the industry, can software companies go public, common carriers now and in the future, distributive data processing, data base management, managing the litigation function, and systems software and its future. Special committee reports will be presented on electronic funds transfer systems, privacy and security, and taxation. Fee: $175, member company, $125 for each additional representative; $275, nonmember company, $175 for additional representative. Contact: ADAPSO, 210 Summit Ave., Montvale, N.J. 07645, (201) 391-0870.

NOVEMBER

Federal ADP Procurement, Nov. 1-3, Washington. Changes in dp technology, new federal procurement regulations, and rfp development, proposal solicitation, and other vendor/contract information will be covered in this meeting sponsored by the American Institute of Industrial Engineers in cooperation with federal departments and independent agencies. Fees: $295, teams $195. Contact: Dept. DTM, AIIE Seminars, P.O. Box 25116, Los Angeles, Calif. 90025 (213) 826-7572.

INFO 76, Nov. 8-11, Chicago. Specialized conferences on dp management, word processing, office systems, banks, insurance, retailing, manufacturing, hospitals and finance will be featured during this year's conference and exposition for information management. More than 150 exhibits will include word processing equipment, computers, terminals, and peripherals. (See INFO 76 preview, p. 62.) Fee: three or four days, $125; $45 and $75, one or two days, respectively. Admission to the show only is $5 at the door, $1 with the advance registration card bound in this issue. Contact: Clapp & Poliak, Inc., 245 Park Ave., New York, N.Y. 10017 (212) 661-8410.

International Conference on Pattern Recognition, Nov. 8-11, Coronado, Calif. Sponsored by the IEEE Computer Society, the conference will cover theoretical and applied pattern recognition, and will feature presentations by scientists from all over the world. On Nov. 11 a one-day symposium will be held on computer-aided diagnosis of medical images. Fees: $70, member; $85, nonmember; $20, student. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901.

Sixth Annual Conference, ACPA-6, Nov. 10-12, Washington, D.C. "Pathways To The Future" is the title of this meeting sponsored by the Assn. of Computer Programmers and Analysts. Papers on the following subjects, among others, will be presented: career development, on-line interactive search systems, women in data processing, networked minicomputers, and unionism in data processing. Fee: $85, member; $100, nonmember. Contact: Daniel Van Belleghem, 504 N. Lincoln St., Arlington, Va. 22201, (202) 254-3081.

3rd Annual Computer Security Conference, Nov. 15-17, New York. Dr. Ruth Davis, director of the National Bureau of Standards, will be the keynote speaker; other authorities in the field will speak on such topics as physical security, data and software security, disaster recovery, risk analysis, privacy and EDP auditing. A one-day exhibition on Nov. 16 will feature physical access control systems, fire protection and water detection systems, UPS, software and other related products. Fee: $445. Contact: John C. O'Mara, Computer Security Institute, 43 Boston Post Road, W. Main St., Northboro, Mass. 01532 (617) 393-3666.

Computer-Aided Design and Computer-Aided Manufacturing Conference and Exposition, Nov. 15-18, Dallas. More than 30 technical papers and presentations will highlight conference sessions on group technology, CAD/CAM services for manufacturers/users, CAM applications, manufacturing applications, and distributed computing systems. Contact: Society of Mfg. Engrs., 20501 Ford Rd., Dearborn, Mich. 48128 (313) 271-1500.

Government Micrographics Symposium and Exhibition, Nov. 22-23, College Park, Md. The first event of its kind, exclusively for employees of federal, state and local governments, will be held at the Univ. of Maryland with the cosponsorship of the ADP Management Training Center of the U.S. Civil Service Commission, and the Federal Government Micrographics Council. More than 50 vendors will have exhibits of micrographic equipment and services. Tutorial and classroom sessions will include computer output microfilm, computer input microfilm, feasibility studies, managing microform records, impact of freedom of information and privacy acts, cost/benefit analysis of microform systems, among others. Fee: $65. Contact: ADP Training Center, U.S. Civil Service Commission, Attn: TOA, Rm. TC 815, 1900 E. St., N.W., Washington, D.C. 20415 (202) 632-5650.

MEDCOMP Congress, Nov. 24-26, Berlin. This is the first in a proposed series of international conferences to examine the role of computers and computing techniques in the fields of medicine and public health. The theme is "Systems Aspects of Health Care Delivery," and the meeting will cover the application of computing to medical research, health care management, and patient care. Main conference languages will be English and German, with simultaneous translation available. Information is available from Online, Cleveland Road, Uxbridge, Middlesex, England.

ON THE AGENDA

Third Illinois Conference on Medical Information Systems, Nov. 4-5, Chicago. (312) 996-3423. **American Inst. for Decision Sciences, Nov. 10-13,** San Francisco. (404) 658-4000. **Computer Measurement Group Conference, Nov. 16-19,** Atlanta. (408) 743-0934. **Interface '77 DataCommunications Conference, March 28-30,** Atlanta. (617) 879-4502.

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.

Only DDI has patented, self-sharpening, rotary cleaning blades that carry a lifetime guarantee. So because we keep an edge, you have the edge.

Think about it for a moment. Blades that must be periodically replaced, need to be replaced for good reason. They lose effectiveness with every pass over your computer tapes. So by the time you're ready to replace them, they're practically useless. With our self-sharpening blades that can't happen. They're constantly being rejuvenated so they always work at peak efficiency.

And unlike our competitors, we don't use tissues that have to be replaced, either. Instead, our vacuum system removes oxide particles before they get a chance to imbed themselves again.

And there are other bonuses as well.

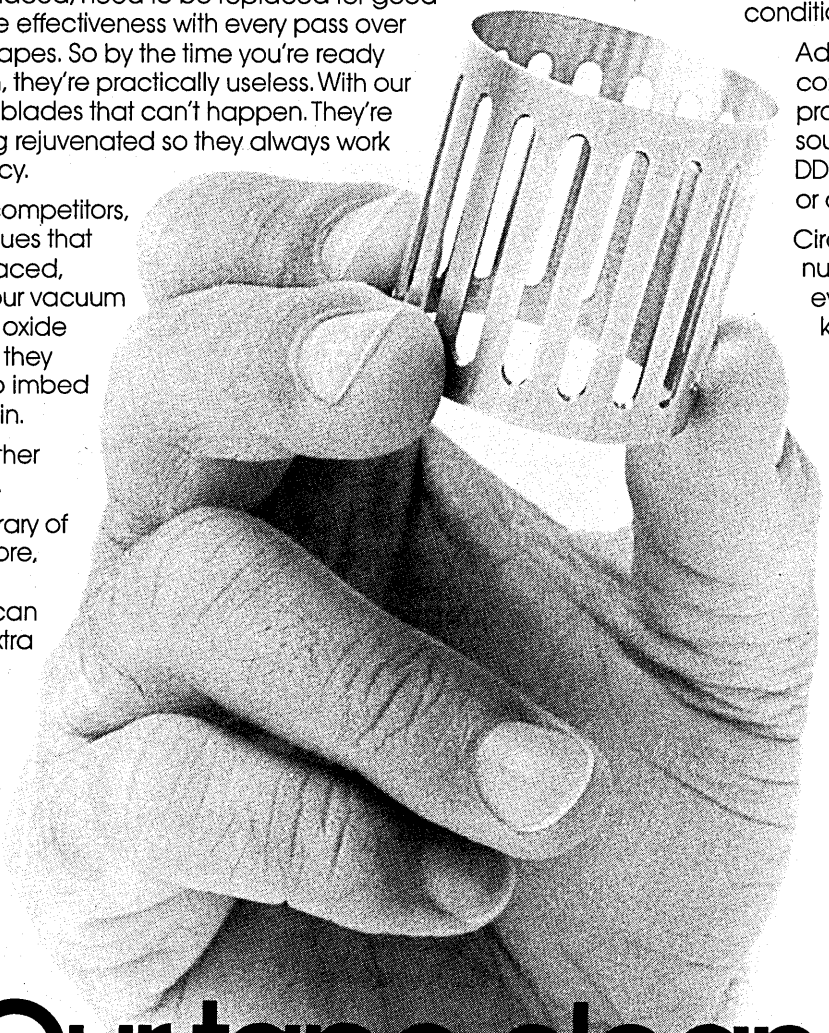
If you have a library of 5,000 reels or more, the savings on supplies alone can amount to an extra $500 a year.

With the high cost of computer leases, errors are expensive. Each shutdown costs your company money. We can reduce those costs. In fact, our tape cleaners and disc cartridge cleaners can pay for themselves in a year's time or less under normal conditions.

Add all these savings to the competitive price of our products, and you have a sound justification for choosing DDI over Kybe, Computer-Link, or anyone else.

Circle the reader service number and we'll send you everything you need to know about our products, plus the facts about our factory authorized trade-in program that lets you upgrade your older equipment, with new DDI equipment.

You'll like the way our edge can reduce your media maintenance costs.



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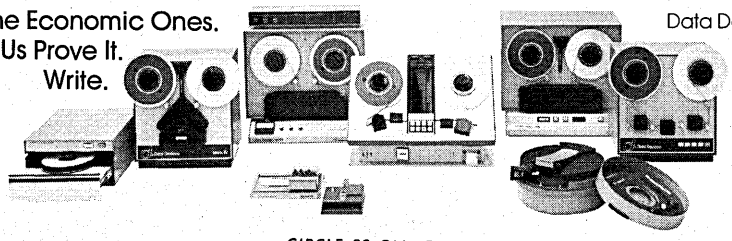

Data Devices International, Inc.
6301 De Soto Avenue
Woodland Hills, Ca. 91364
(213) 884-5500

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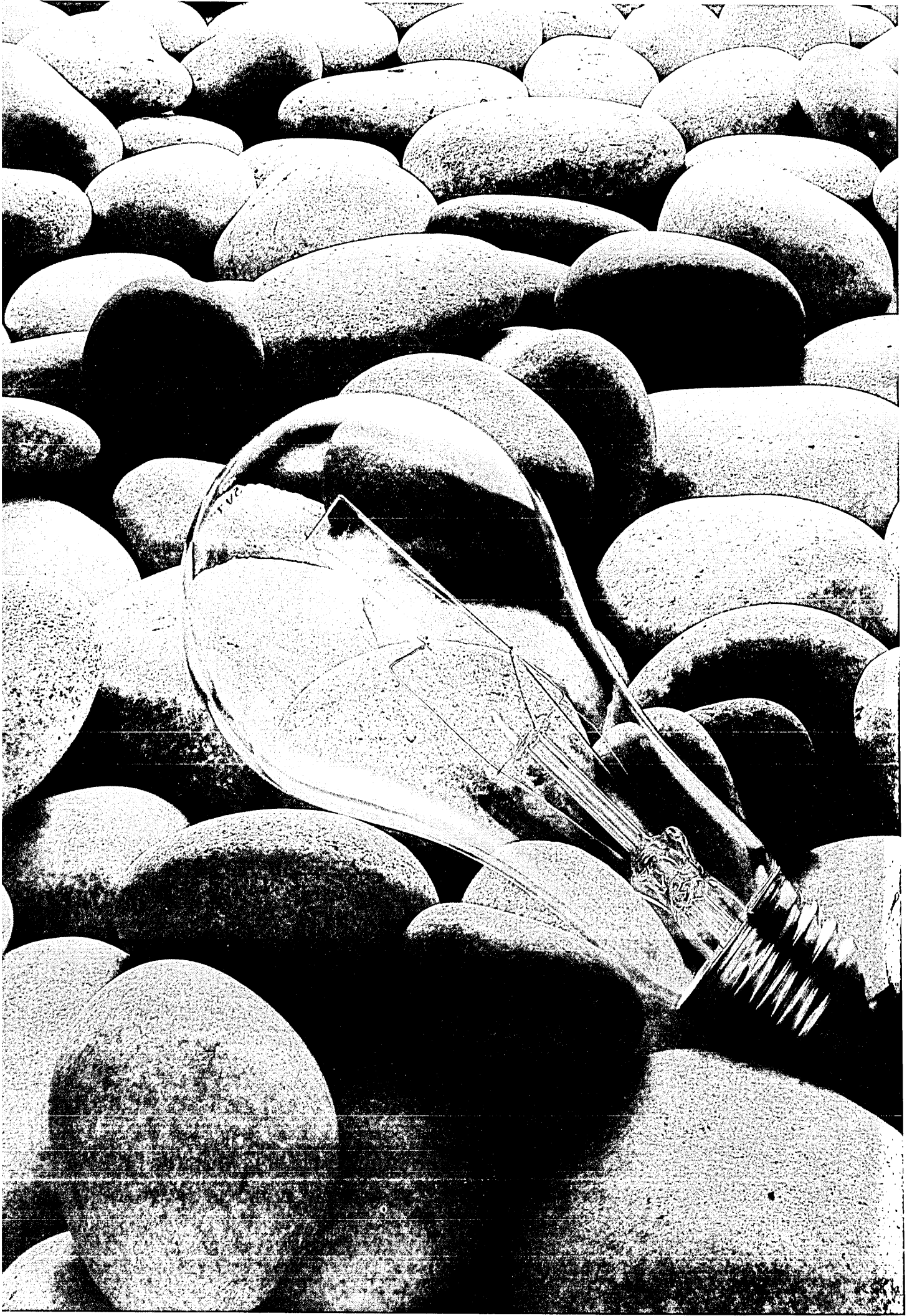

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More computer power for your dollar.

The SEL 32 family of high performance 32-bit computing systems offers a balance between big computer performance and minicomputer prices. Microprogrammable input/output processors, compatible central processing units, high-speed memory systems, and efficient data processing peripherals make up the hardware elements. On the software side, operating systems, language processors, libraries, application packages, and interactive terminal support balance the scales. Together, SEL 32 hardware and software provide a cost-effective solution to your current requirements, with expansion capability to meet your growth needs.

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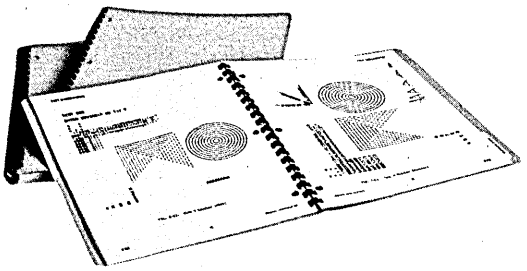
"As the first interactive small plotter, it was the only intelligent choice."



The 4662 contains its own character generator, alpha rotation, and page scaling, thus minimizing support software. Proven graphic and plotter software is provided by Tektronix.

Problem: Until now, no small plotter could carry on an intelligent conversation.

Because most B-sized plotters have been pretty much the same: slow, unreliable, and dumb. Even with large off-line plotters you can wait hours, even days, for results ... and if there's a mistake—start over.

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The 4662 is the first smart buy among 11"x17" flatbed plotters. Its digital design and vector generation offer exceptional accuracy and repeatability without drift or slidewire dirt build-up. Its 1600-byte buffer lets the host work while the 4662 plots ... at speeds up to 22 ips.

It's the first B-sized plotter with graphic input. Digitizing capability and built-in joystick mean you can input corrections in seconds, experiment with designs, and run off camera-ready copies practically as fast as you load paper.

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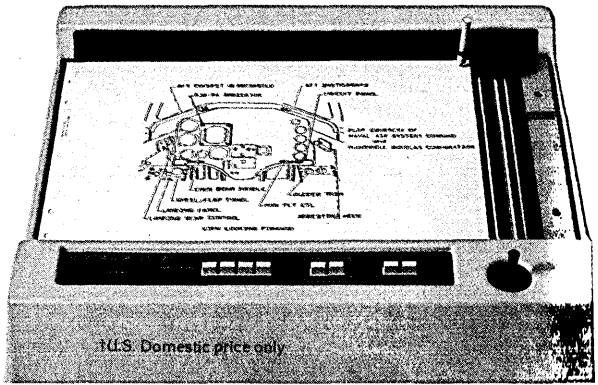

†U.S. Domestic price only

CIRCLE 54 ON READER CARD

source data

SOURCE DATA provides information on books, courses, references, reports, periodicals, and vendor publications.

books

The Privacy Act of 1974: A Reference Manual for Compliance
by A. A. Bushkin and S. I. Schaen
System Development Corp., "Privacy Project," 7929 Westpark Drive, McLean, Va. 22101 (1976)
184 pp. $15

As the title suggests, this book is intended as a reference manual for designers and managers of personal data systems within the federal government. However, it should be nearly as relevant to their private-sector counterparts who are almost certain to be faced with equivalent legislation within the next few years. Such an individual is primarily interested in two questions:

1) What specific actions will I have to take, and what capabilities will I have to add to my systems in order to comply with the law; and

2) How can I achieve these compliance objectives most effectively and economically.

This book does a very excellent job on the first of these questions, and is somewhat less successful on the second.

The primary source for answering question number one is the Privacy Act, itself. However, as might be expected, the Act is far from a complete, detailed, and unambiguous blueprint for action. Thus, the authors have employed two additional sources: a variety of earlier congressional reports which shed some light on the intent of the lawmakers, and the implementation guidelines prepared under Section 6 of the Act by the Office of Management and Budget. They have taken all of this material, reorganized it by topic, and then presented it in logical sequence, starting from the decision to establish a new information system, and proceeding through the initiation of a record, its use and disclosure, to its ultimate removal from the system. The responsibilities of an agency to the individuals about whom data is stored are neatly laid out, as are the special circumstances under which personal data can be disclosed or used without complying with all of the normal safeguards.

This technique of consolidating and reorganizing information from several sources not only removes some of the ambiguity of the Act, itself, but also identifies several apparent inconsistencies, for example, between the Act and the OMB Guidelines. In these situations, the authors note the problem, but typically refrain from offering any opinions on how to resolve it. The user is left either to make his own interpretation or to seek legal advice.

In a similar vein, users of this book should be aware that not all of the sources used have the same authority. The Privacy Act itself has the force of law. The OMB Guidelines do not, at least until they have been tested and approved by the courts. There are a number of topics where, to the ordinary observer, it is far from obvious that compliance with the Guidelines is equivalent to compliance with the law. Users shoulds keep that in mind when developing their own compliance strategies, although I presume that no federal employee would suffer personally as long as he was in compliance with the Guidelines.

Following the detailed discussion of the requirements of the Privacy Act, Bushkin & Schaen have a chapter on technical implications. This chapter, which is concerned primarily with computerized information systems, should begin to address the second of the two questions stated above. Unfortunately, it is much too short to do that in a satisfactory way, and for the most part, confines itself to simply restating things from the previous chapter. Occasionally, it gets as far as describing what might be called a "derived problem" such as the need to identify individuals without recourse to Social Security Numbers, but little is offered in the way of solutions for the Federal systems designer. Section 4.3.4.2, "Notifying Prior Recipients of Corrected or Disputed Information," is probably the best example of how all of this chapter might have been written.

Nowhere is the ambiguity of the Privacy Act more evident than where it calls upon agencies to establish "appropriate safeguards" for security and confidentiality, and where it requires information to be kept with "such accuracy, relevance, timeliness, and completeness as is necessary to assure fairness." Not only is it basically unclear what these phrases mean, it is also obvious that implementing them could be extremely burdensome, both technically and financially.

As someone who has spent a great deal of time wrestling with exactly these problems of interpretation, this reviewer looked forward with keen anticipation to Chapter V which proposes to deal with them. It was therefore with considerable disappointment to discover that this chapter is only six pages long, and that, although it mentions both of the critical phrases in its introduction, its substance deals almost exclusively with the security and confidentiality issue—and hardly at all with the accuracy, relevance, timeliness, and completeness one. Furthermore, its approach is basically to requote the relevant portions of the Act, some of which have already appeared and been commented upon in both the preceding chapters. The book also includes a number of apprendices presenting reference and source material.

In summary, Chapter III, which is nearly half the book, is an excellent discussion of the requirements of the 1974 Privacy Act, and is certainly the easiest way for anyone concerned with the Act to find out exactly what it means. The two subsequent chapters address important questions, but in a rather superficial manner. This is somewhat surprising since the authors and their employer have considerable expertise in the solving of system design problems. Is there another book coming, or are the authors understandably reluctant to give away expertise which could more profitably be sold? Speaking of "giving away," at $15 for 117 pages (plus appendices) this will be one of the most expensive paperbacks on anybody's shelf, and should keep the copyright authorities busy standing guard over photocopy machines.

—**Robert C. Goldstein**

Dr. Goldstein, an assistant professor at The Univ. of British Columbia, is the author of "The Cost of Privacy."

BOOK BRIEFS . . .

Management Data Bases
by R. Clay Sprowls
Wiley & Sons, 1976
382 pp. $15.95

This book is basically a roadmap for definition, design, development and management of a data base. The basis for discussion is the development of a small data base for a purchasing department from design through implementation, from the reasoning behind the design through procedures, to the ultimate processing of the data base using the system's data manipulation language. The preface includes two "route maps" for use of the book, one based on the complete volume, and one based upon a shorter subset of chapters, showing how to get to the same place in two different ways. Im-

source data

plementations are shown for Codasyl-type systems, Adabas, and System 2000.

Managing High-Technology Programs and Projects
by Russell D. Archibald
Wiley & Sons, 1976
278 pp. $18.95

Although descriptions of computer-based planning and scheduling systems are included as tools within this book, this is essentially a broader look at methods for organizing and managing programs and projects for business, industry, and government. It should be useful both to the seasoned manager and to those suddenly thrust into that role. Appendices include outlines for two 5-day seminars on project management, which could be a most effective approach to studying concepts and principles contained in the book.

Computer Aids to Design and Architecture
Nicholas Negroponte, ed.
Petrocelli/Charter Publ.
289 pp. $24.95

Selections in this anthology of original and previously published papers are by leading authorities (e.g. Eric Teicholz, Phillipe Villers, Murray Milne) in the field of design and architecture. Trends in research and practice—both failures and successes—are discussed; the book covers attitudes and ideas on computer-aided design in other countries.

Computer Networking
Robert Blanc and Ira Cotton, eds.
IEEE Press, 1976 (Order prepaid from IEEE Service Center, 445 Hoes Lane, Piscataway, N.J. 08854.)
368 pp. $17.95 ($13.45 IEEE members); $8.95, paperback

The 46 papers reprinted in this volume were first presented in journals and at conferences during 1970-1975. They are grouped in six categories: introductory, technology, design, considerations, examples, network management, and future developments. Sample topics include the ARPA network, packet-switched networks, data base system for management and design of telecommunication networks, Tymnet, and the future of computer utilities.

Conference Record, 1976 Joint Workshop on Pattern Recognition and Artificial Intelligence
IEEE Computer Society, 5855 Naples Plaza, Suite 301, Long Beach, Calif. 90803.
182 pp. $12 ($9, members) paperback

The conference, held June 1-3 in Hyannis, Mass., was organized for and attended by leading researchers in both of these increasingly important fields. This record contains abstracts of most papers and condensed versions of others presented at the meeting. Also included are two panel session reports.

reports & references

Security Analysis & Operating Systems

An in-depth discussion of security problems that arise in operating systems is found in the 62-page report, *Security Analysis and Enhancements of Computer Operating Systems.* The discussion is applicable to most general purpose operating systems; however, it goes into detail on security features of three systems: IBM's OS/-MVT, Univac's 1100 Series OS, and the TENEX system for the PDP-10. (The first two are the most commonly used large systems in federal government agencies.) Guidance is provided for specific security enhancements. Price: $4.50; ask for NBSIR 76-1041. NATIONAL TECHNICAL INFORMATION SERVICE, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, Va. 22161.

Data Communications

Datapro Reports on Data Communications is a new monthly updated information service covering data communications products, services, and techniques. The service includes over 2,000 pages in three loose-leaf volumes of reports; the monthly supplements; a new monthly newsletter, *Datalink;* and telephone inquiry service. The service is aimed at helping to plan, design, and estimate costs for communications systems and networks, and to aid in evaluation and selection of data communications equipment, software, and services. Charter subscriptions are $390 (regular rate is $430); price for *Datalink* alone is $42/yr. DATAPRO RESEARCH CORP., Delran, N.J.

FOR DATA CIRCLE 297 ON READER CARD

State of the Art Reports

Infotech State of the Art series continues to be some of the most thorough reviews available. The 880-page oversize volume, *Real-Time Software,* contains 474 pages of analysis "drawing on the experience and expertise of 112 computer professionals." Topics include operating system design, distributed processing methods, teleprocessing monitors, software performance and reliability, the nature of real-time languages, etc. This is followed by 19 invited papers and an extensive annotated bibliography and reference section.

The 504-page *Virtual Storage* follows the same format of analysis, invited papers, and extensive bibliography. Characteristics, implementations, performance optimizations, and specific experience with particular machines are featured.

Dijkstra, Hoare, Jackson, Chapin, Naur, Yourdon, and other experts have contributed papers to the 495-page *Structured Programming.* Called "the first full-scale survey of the theory and practice of structured programming," the volume's analysis section includes a spirited discussion of the topic by top-level participants. Controversy and criticism of structured programming is not lacking in the report.

Each volume is $185; they are available on a subscription basis also. INFOTECH INFORMATION LTD., Berkshire, England.

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COM

The *Auerbach Guide to Computer Output Microfilm,* a 99-page report, provides an overview of the market, current trends, a directory of suppliers, and price data on every major system on the market. Price: $24.95. AUERBACH PUBLISHERS INC., 6560 N. Park Dr., Pennsauken, N.J. 08109.

TA

If you would like to learn the rudiments of transactional analysis, an 11-page monograph, "Using Transactional Analysis to Improve Communication," provides an introduction. Descriptions of the ego states (parent, child, and adult) and sample transactions are included. The author is Herbert Seidman, a consultant and member of the International Transactional Analysis Assn., and IIS is a consulting organization. INNOVATIVE INFORMATION SYSTEMS, Palo Alto, Calif.

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Remote Computing

Distinctions between a remote batch business and a time-sharing business are disappearing, and the majority of vendors now perform both functions—referred to as remote computer services. So concludes a report summary, *Remote Computing Services in the U.S.,* a six-page brochure which briefly discusses "key issues," summarizes industry trends, and presents a much abbreviated vendor overview. A second brochure covers developments in Canada. INFO-DYNE., Minneapolis, Minn.

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Minicomputer Industry

Although the growth rate in the minicomputer industry will slow somewhat compared to the spectacular growth of

(Continued on page 30)

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
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- 24-line by 80-column CRT with keyboard
- Programmer's front panel and software
- All peripherals interfaced

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*Quantity discounts available.

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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.

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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.

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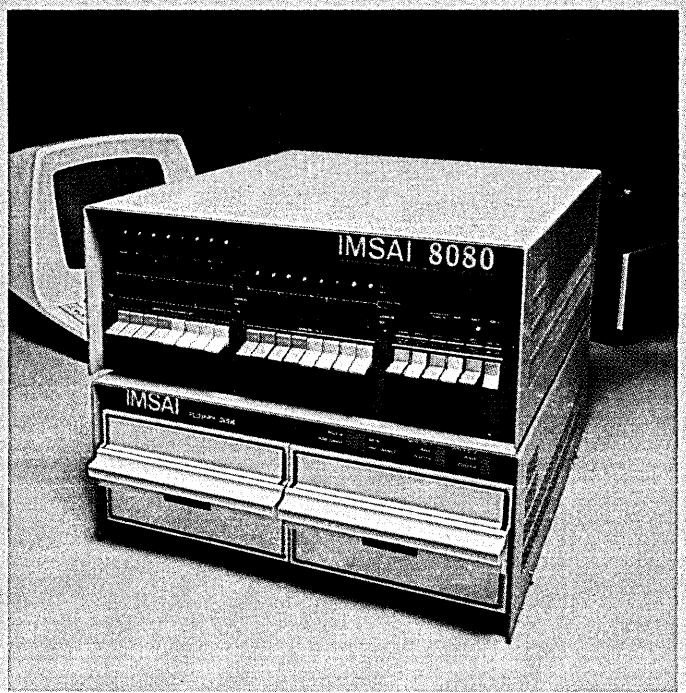
You can immediately develop your own application software using DOS, assembler, text editor and debugger. In addition, extended BASIC and FORTRAN, both integrated with DOS, will soon be available.



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.

Dealer inquiries invited.

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A complete, integrated system for business. Express™ is a complete, integrated business computer system with extensive peripheral support. It's got an incredibly comprehensive set of software, built around a multiprogramming virtual memory operating system. It's flexible, expandable and gives you full upward and downward software compatibility from one Express configuration to another.

More power for less money. Express has the best price/performance ratio on the market. Microdata's user microprogramming lets you tailor our system to create the most powerful minicomputer in the world for your application. And comprehensive multiprogramming capabilities enable each of 32 independent users to use the system for his own individual needs.

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Express is the way to go. With Express, you can develop a whole line of minicomputer systems for a variety of applications. You can offer low cost. Stack architecture implemented in firmware. Fast I/O throughput. And a list of other features that reads like an OEM wish-list.

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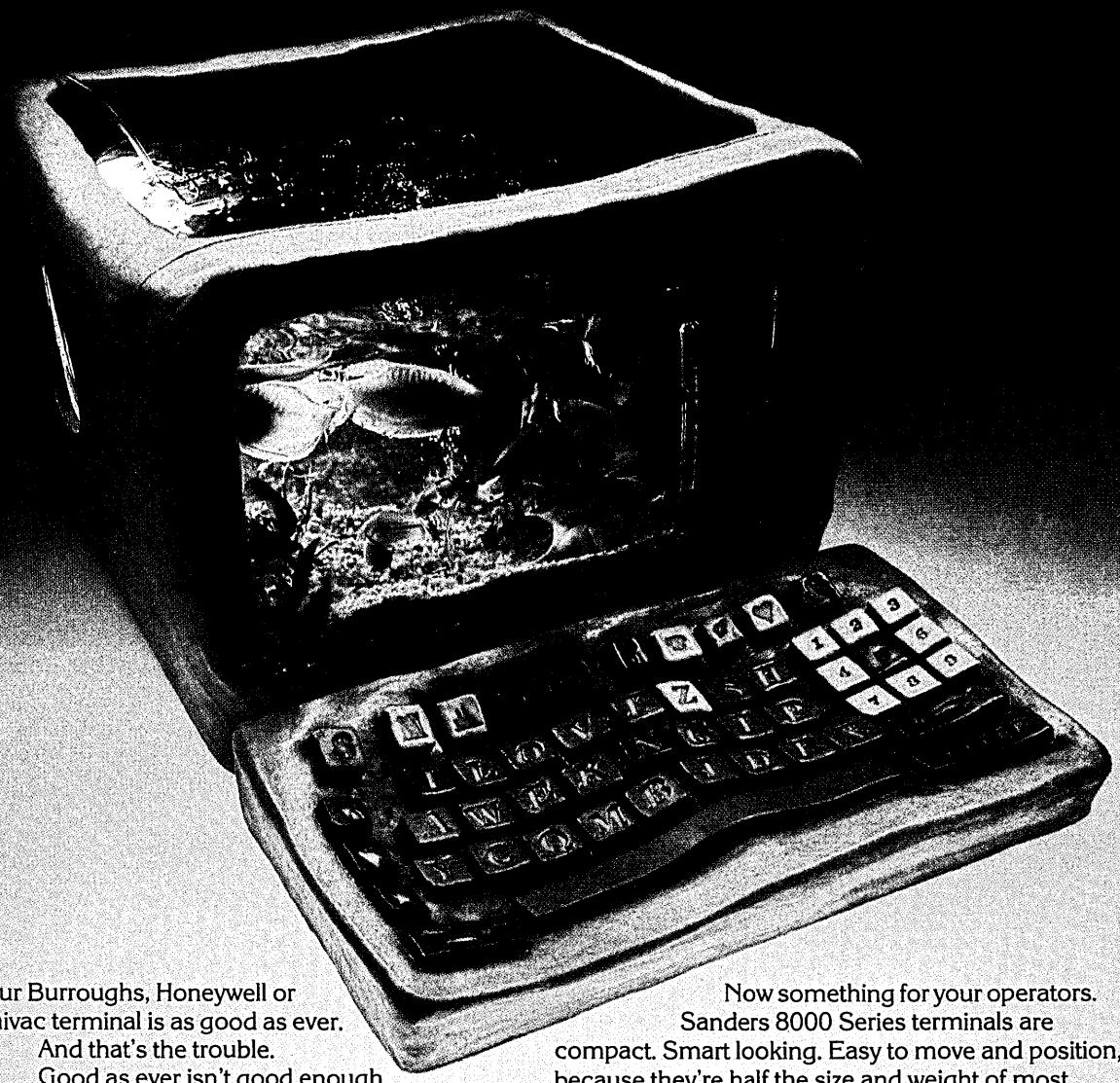

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It's the Sanders interactive 8000. Emulates your terminal and does more. Much more.

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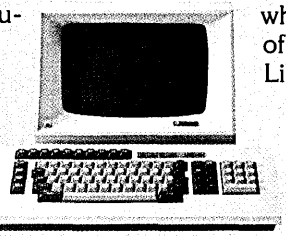
Does your terminal have a communications monitoring capability to help you debug software?

The Sanders 8000 Series has.

If you want to replace or add terminals, will you get fast delivery? You will with the Sanders 8000 Series.



Now something for your operators.

Sanders 8000 Series terminals are compact. Smart looking. Easy to move and position, because they're half the size and weight of most other terminals. And they keep cool and quiet.

Finally, something for your treasurer. The Sanders 8000 Series is priced lower—up to 25% lower—than those other terminals.

The Sanders 8000, from the terminal specialists. It makes your Univac, Honeywell, or Burroughs outdated—which can leave you with a fine kettle of fish, unless you do something. Like call us for details and a demonstration.

SANDERS DATA SYSTEMS GROUP
Sanders Associates, Inc.

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†Trademark of Sperry Rand Corporation *Trademark of Sanders Associates, Inc.

source data

(Continued from page 26)

the last decade, the domestic market will still grow at a compound rate of 19% per year. Worldwide shipments by U.S. manufacturers should top $1 billion by 1980. And most successful will be suppliers of complete systems rather than of components. These and other predictions are found in the 40-page report, *The Minicomputer Industry,* which discusses in detail the industry, the market, technology, and the competition—company by company. Price: $495. CREATIVE STRATEGIES INC., San Jose, Calif.

FOR DATA CIRCLE 300 ON READER CARD

RJE

The remote job entry industry is currently 12 years old, comprises 150 firms servicing 25,000 clients, and generates $360 million in gross annual revenues. By 1984, the number of clients will grow to 115,000, and annual revenues will reach $1.3 billion.

Software packages for RJE applications will in general become more specialized and complex. While the average vendor size will grow, the number of vendors will drop from about 150 to approximately 100.

These conclusions and others are part of the analyses and forecasts found in the 194-page report, *The Remote Job Entry (RJE) Services Market.* Particular forecasts for the banking and finance, health, and science industries are supplied. User needs are identified, and equipment and software package trends are discussed. The report is based on in-depth interviews with users. Price: $650. FROST & SULLIVAN, INC., 106 Fulton St., New York, N.Y. 10038.

Standards Catalog

The 1976 catalog of American National Standards and international standards contains more than 6,000 domestic and about 4,000 foreign entries and recommendations. The 192-page ANSI catalog contains information on dimensions, ratings, terminology and symbols, test methods, and performance and safety specifications for materials, equipment, components, and products in a number of fields—electrical and electronics, informations systems, chemical, materials handling, nuclear photography and motion pictures, construction, etc. A 28-page index to publications listed and instructions on how to order them are included. Available without charge from Sales Dept., AMERICAN NATIONAL STANDARDS INST., 1430 Broadway, New York, N.Y. 10018.

vendor literature

DBMS

Called the first big computer Data Base Management System for minicomputer users, the TOTAL system is described in easily understood detail in an illustrated 14-page brochure. The brochure not only discusses the TOTAL system as flexible network structure for the data base manager, and as a data management language for the applications programmer, but it also is a pretty good primer on DBMS in general, and what to look for in evaluating one. TOTAL operates under the VORTEX II operating system, and is equally adaptable to inquiry-response and batch processing. TOTAL data bases can be used for real-time and data communication systems. VARIAN DATA MACHINES, Irvine, Calif.

FOR COPY CIRCLE 301 ON READER CARD

Electronic Banking Retail Systems

An illustrated brochure describes this vendor's Series 7700 retail banking subsystems. Included are the Intelligent Transaction Controller that can be on-line with the central computer facility; the AT4 Customer Transaction Facility

which is a "lobby teller station"; the AT8 Cash Delivery Facility, which can be operated with the AT4; and the Integrated Banking Facility, which integrates the functions of the AT4 and the AT8, and can be installed in an interior or exterior wall. INCOTERM CORP., Wellesley, Mass.

FOR COPY CIRCLE 303 ON READER CARD

Alphanumeric Displays

A 6-page brochure describes this vendor's second generation SELF-SCAN II alphanumeric displays for data terminals. The appearance, readability, adaptability and output flexibility, languages available, special display capabilities, and other design features are compared with crt displays. Compact 480, 240, or 40 character displays are available, and it is claimed that new design techniques employed produce the "lowest cost per character yet available in panel technology." BURROUGHS CORP., Electronic Components Div., Plainfield, N.J.

FOR COPY CIRCLE 302 ON READER CARD

HP 3000 Series II

The HP 3000 Series II is a small computer system designed to operate in both batch and terminal-oriented environments. It was planned for primarily small to medium sized businesses or divisions, but it also offers "large system capabilities" such as teleprocessing, data and file security, job accounting, multiprogramming, multiple languages, and data base management. Several configurations are available, and an attractive, illustrated brochure describes the system and gives five mini-case histories of use of the system in as many industries. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR COPY CIRCLE 304 ON READER CARD

On-Line Directory Assistance

A merging of computer technology, microfilm, and digital displays, as a 16-page illustrated brochure puts it, can now provide directory assistance on-line. The DAS/CM system which performs this feat consists of a keyboard, Ultrastrip microfilm, a computer controlled reader, the digital display, and on-line capabilities. A 40,000 times area reduction is achieved by the company's Ultrastrip; and up to 50 such strips can be loaded into a single reader, providing up to 15,000,000 directory listings. (New York City listings are reduced in volume to smaller than a deck of cards.) MICROFORM DATA SYSTEMS, Mountain View, Calif.

FOR COPY CIRCLE 305 ON READER CARD

ACM Cassettes

A catalog describing selected presentations from the ACM 75 Annual Conference in Minneapolis includes topics such as structured programming, data bases, software development, networks, minicomputers, and management. The Turing Award Lecture is also included. Most of these talks are not printed in proceedings, and the industry leaders who gave them have reviewed their recordings for completeness and accuracy. ASSN. FOR COMPUTING MACHINERY, New York, N.Y.

FOR COPY CIRCLE 306 ON READER CARD

(Continued on page 125)

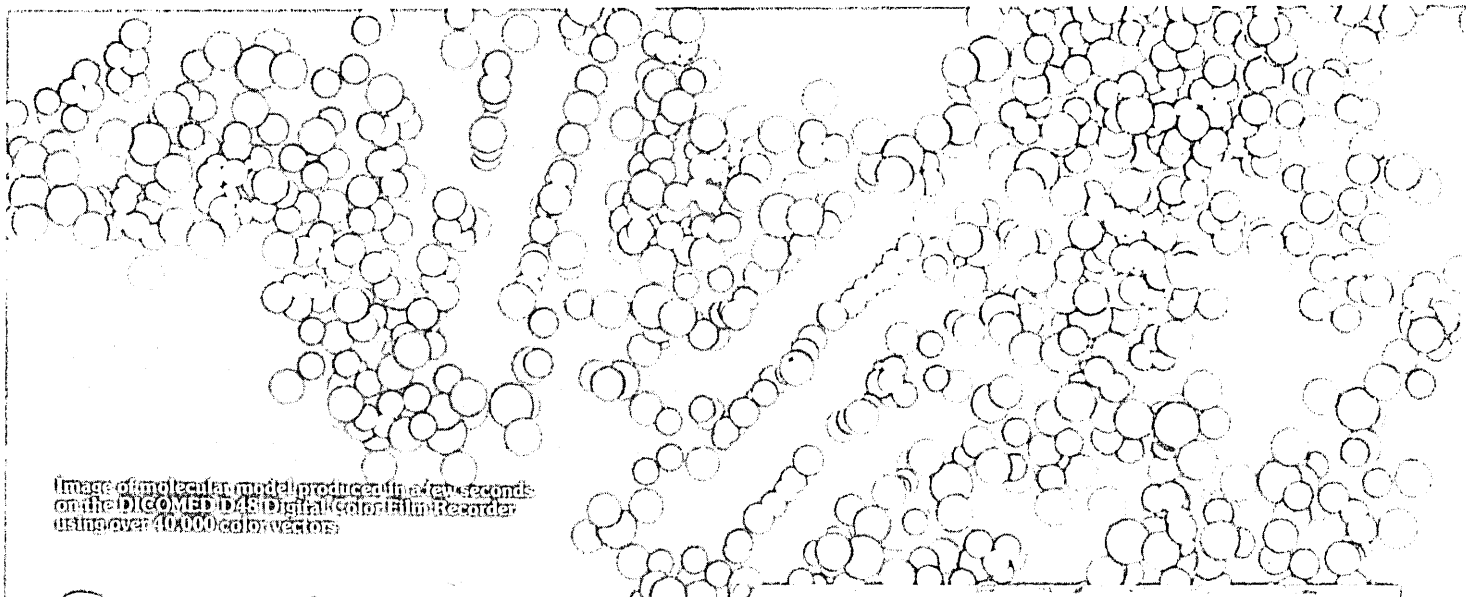


Image of molecular model produced in eight seconds on the DICOMED D45 Digital Color Film Recorder using over 10,000 color vectors.

Sometimes Words Alone Are Not Enough

Can you imagine effective learning, managing, teaming, investigating or just plain communicating taking place without the use of pictures? Not really! Neither can we.

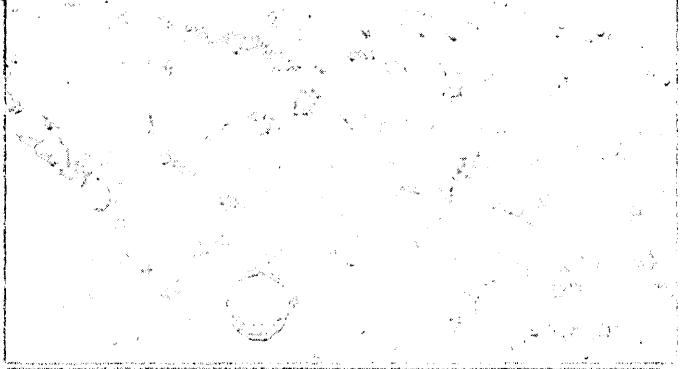
That's why we've spent the last seven years at DICOMED harnessing the digital computer for the production of high-quality color graphics... Digital Color Graphics. A technology that greatly extends the communicative power of digital information systems.

The technology developed at DICOMED involves the recording of computer-compatible information on standard photographic film. Film offers several key advantages over other mediums: high recording resolution, complete range of color, continuous grey-level control and most importantly, compatibility with other communications media. Our customers have already employed this technology to produce slide presentations, motion pictures, television material, printed color maps and transparencies in formats designed to communicate.

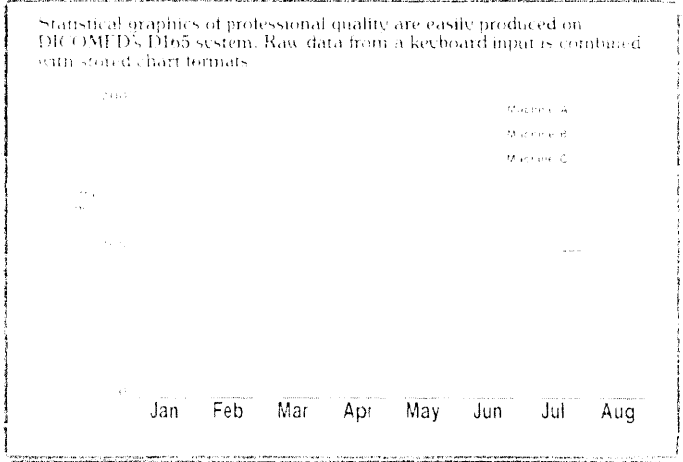
So when you think about high-quality color graphics output from your data base... think DICOMED... the company that brought color hard copy to the data processing industry.

DICOMED®

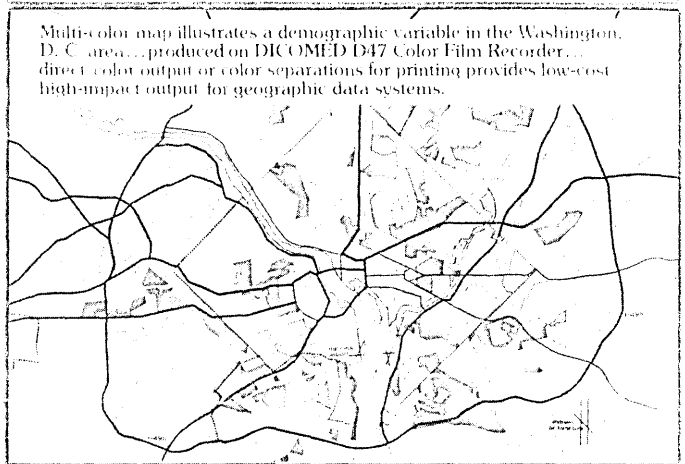
Martian surface as seen by orbiting Viking spacecraft — computer-processed images recorded on DICOMED D46 precision black/white film recorder — chosen by Jet Propulsion Laboratories as the primary black/white hard copy device for this history-making scientific project.



Statistical graphics of professional quality are easily produced on DICOMED's D165 system. Raw data from a keyboard input is combined with stored chart formats.

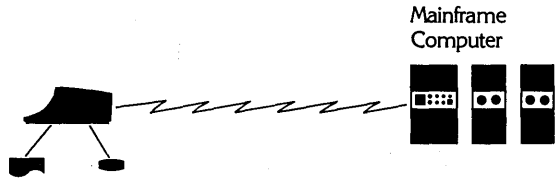


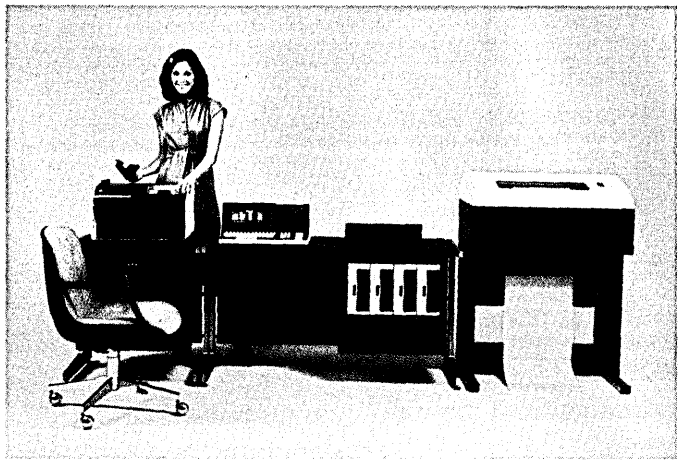
Multi-color map illustrates a demographic variable in the Washington, D. C. area... produced on DICOMED D47 Color Film Recorder... direct color output or color separations for printing provides low-cost high-impact output for geographic data systems.



DICOMED Corporation 9700 Newton Avenue So. Minneapolis, Minnesota 55431
Telephone (612) 888-1900 Telex 29-0837

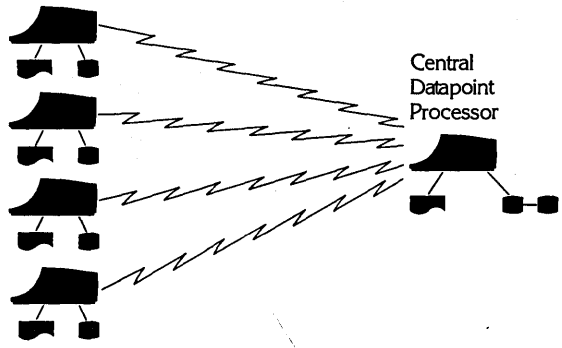
1. REMOTE BATCH PROCESSING
(EMULATORS)



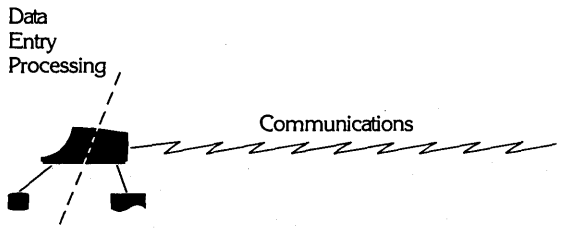


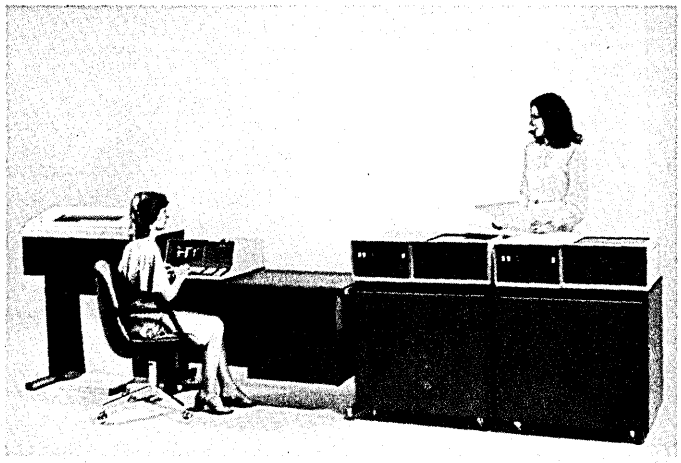
2. FIELD DATA GATHERING & DISTRIBUTION
(DATAPOLL)

Remote Datapoint Terminals & Processors

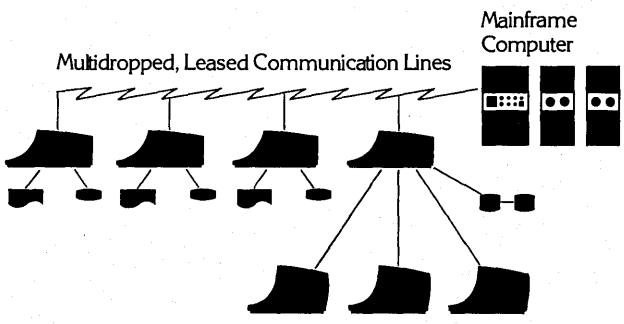


3. CONCURRENT COMMUNICATIONS & DATA PROCESSING
(PARTITION SUPERVISOR)





4. REAL-TIME ACCESS TO REMOTE DATA BASES
(MULTILINK & DS3 NET)



Data Communications is more than a Buzzword at Datapoint.

It's a corporate commitment.

Data communications is the critical link in Dispersed Data Processing. Without proven, flexible and compatible communications, a computer network can become just scattered hardware and a corporate liability.

Datapoint's leadership in dispersed data processing is due in large part to its broad range of communications hardware and software that provides the system planner with a tremendous range of flexibility in system design. This capability also assures the system user that data will be transferred easily and error-free.

These four areas illustrate ways in which Datapoint hardware and software combine to produce profit-making business processing systems:

1. Remote Batch Processing — Datapoint processors with associated peripherals, including card readers, printers and disk and tape storage units, provide a world of "intelligent" remote batch capability, capable of changing to different communications disciplines as required. Emulation routines are available for IBM HASP 360/20, 2780 and 3780 units, Honeywell GRTS, Univac DCT 2000, Control Data's UT 200 and Burrough's TC 500 terminals.

2. Field Data Gathering and Distribution — for the collection of business data from field locations. Datapoint's DATAPOLL communications packages make it possible for a centrally located Datapoint processor to poll other remotely located unattended Datapoint processors on an overnight basis over standard dialup telephone lines to take advantage of the lowest possible Datacom rates. Field equipment can include either stand-alone Datapoint intelligent terminals or processors. During the day, operators may use the keyboard and video display screen on these units for rapid, error-free data entry. This information is then stored on magnetic media until the optimum transmission time. DATAPOLL maintains full file compatibility between systems as the information is transferred.

3. Concurrent Communications and Processing — Under our sophisticated Partition Supervisor, a 5500 processor in a DATASHARE configuration can handle batch processing, communications and other "background" chores while simultaneously servicing up to 16 remote terminals. Users at these remote terminals can perform all necessary day-to-day interactive data entry and processing while batch needs are being met. This eliminates the need for expensive and time consuming shutdowns at local stations while batch processing or communications work is being handled.

4. Real-time Access to Remote Data Bases — Datapoint offers MULTILINK for real-time access to a host computer's data base. Under MULTILINK, Datapoint 1150 and 5500 stand-alone systems along a multi-drop communications line can perform all necessary local processing tasks, including intelligent data entry and report generation. When data is not available from the data base, the local processor can ask the mainframe for the desired information. 5500 DATASHARE systems may also be connected to the multi-drop lines, allowing users at each of up to 16 field stations full inquiry capabilities with the host mainframe. If the requested data is not available from the host computer, the host computer can request the information from the other processors on the line. This data transfer can occur totally transparent to the user.

For communications with a Datapoint DATASHARE system, another Datapoint software package, DS3NET, enables field office users of Diskette 1100, 1150, 2200 and 5500 systems to access data files in a host DATASHARE system as well as the files on their own local data base. This alleviates the need for costly and time consuming physical transfer of these files from storage unit to storage unit. DS3NET makes it possible to establish a true corporate wide data base without having to physically deposit files in a central storage unit, relieving a substantial burden on data communications capacity.

With this kind of data communications capability, you'll find that Datapoint equipment is hard to beat for efficient and error-free fulfillment of all of a company's communications needs. The Datapoint commitment to data communications reflects its overall analysis of what business users need to build profitable data networks. With its lengthy lead in dispersed processing technology, Datapoint is in an excellent position to help you out with your expanding computer network and data communications needs. For more information contact the sales office nearest you or Marketing Communications, Datapoint Corporation, San Antonio, Texas 78284.

DATAPOINT CORPORATION

The leader in dispersed data processing™

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CIRCLE 61 ON READER CARD

Sycor introduces the in-between machine.

More capacity than a stand-alone intelligent terminal. More economy than a mini-computer.

It's the new Sycor Model 410. A data entry and processing system that combines the editing capabilities and price of an intelligent terminal with the file and processing power of larger, more sophisticated mini-computer systems.

That means you can store and manipulate data where the work is. Economically. For report generation, file listings, post data entry editing and file maintenance. And you can perform these tasks faster than ever before, because they're done at the source, instead of on your large, central computer.

Cobol means processing clout.

The Sycor 400 series of distributed data entry and processing systems is now available with Cobol capability. At no extra cost. So while you're doing Cobol processing, remote job entry and file maintenance in the background, concurrent operations such as intelligent data entry and inquiry/response can be performed in the foreground. You save time by processing more data faster. And you save money, by getting mini-computer processing power at a stand-alone-terminal price.

$600 per month means more dollar power.

You can lease a Model 410 directly from Sycor for one year for only $600 per month. And you get a lot for your money.

- 2.5-million-character disk
- 40k bytes of random-access memory
- display station with typewriter or keypunch keyboard
- binary synchronous communications (1200-4800 bps)
- 60-cps bidirectional printer
- fast maintenance response from one of our 100 service centers

Sycor flexibility lets you tailor a Model 410 to meet your specific requirements. Choose from three additional speeds of printers (120, 180 cps and 300 lpm), up to 64k bytes of memory, 5 or 10 million characters of fixed-disk storage and cassette or flexible disk interchange.

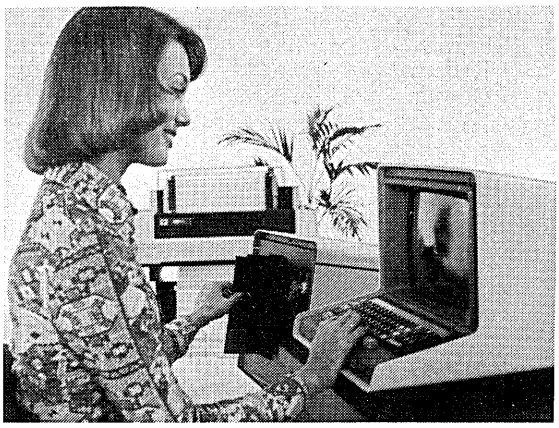
The 400 series lets you grow where you need to.

The Sycor 410 and the Sycor 440 (a clustered system with up to eight CRTs and 20 mb of storage) let you distribute processing power across your network without under- or overequipping a branch site. The result is cost-effective distributed data entry and processing. At all locations.

All Sycor systems are compatible, too. There's no retraining of operators or reprogramming required when it's time to upgrade the system at a specific location. That means the cost of growing is kept to a minimum.

Get all the particulars.

To learn more about all the ways the Sycor Model 410 can stretch your data processing dollar and increase the processing power of your remote locations, send in the reply card today. Or call the Sycor office nearest you. You'll find it in the Yellow Pages under "Data Processing Systems."



Sycor puts computer power where the work is.

SYCOR

It's the only 300 lpm impact matrix printer and plotter.

It produces print quality the others can't match.

Its new technology makes it inherently more reliable.

And it costs less.

PRINTRONIX 300

It's your best buy!

When you get down to it, little differences in a medium speed printer won't upset anybody. But poor print quality will. The 6th copy should be as good as the first. They're meant to be read.

That's where the Printronix 300 beats them all, with the first new technology for impact printing in years. It's an "elegantly simple" mechanism that has virtually no frictional wear, never needs adjustment, has a 100% duty cycle, and is driven with uncomplicated electronics to print uniform density characters with precisely placed overlapping dots.

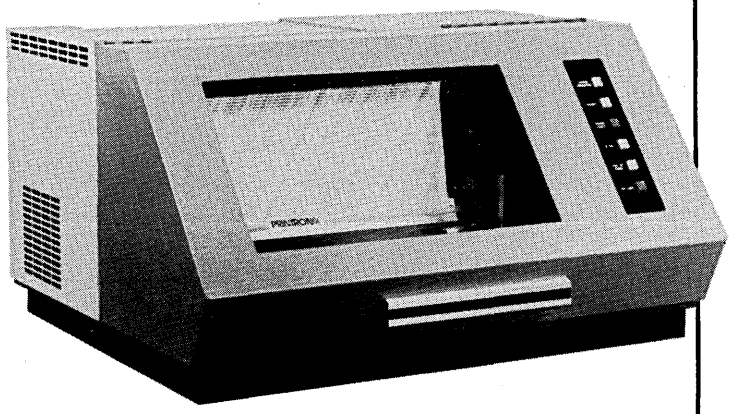
A substantial reduction in moving parts, elimination of most bearing parts, and simple hammer drive circuits substantially increases MTBF. Modular design simplifies maintenance.

The Printronix 300 does everything other impact printers do, and more.

It's the only one that doubles as a plotter for extra capability, provides extended height characters, has a self-contained VFU... all at no extra cost.

We've been shipping units to OEM's and users since mid-1975. They work. So have our rep give you a demonstration. We think you'll agree... it's your best buy.

Printronix, Inc., 17421 Derian Ave., Irvine, CA 92714. (714) 549-8272.



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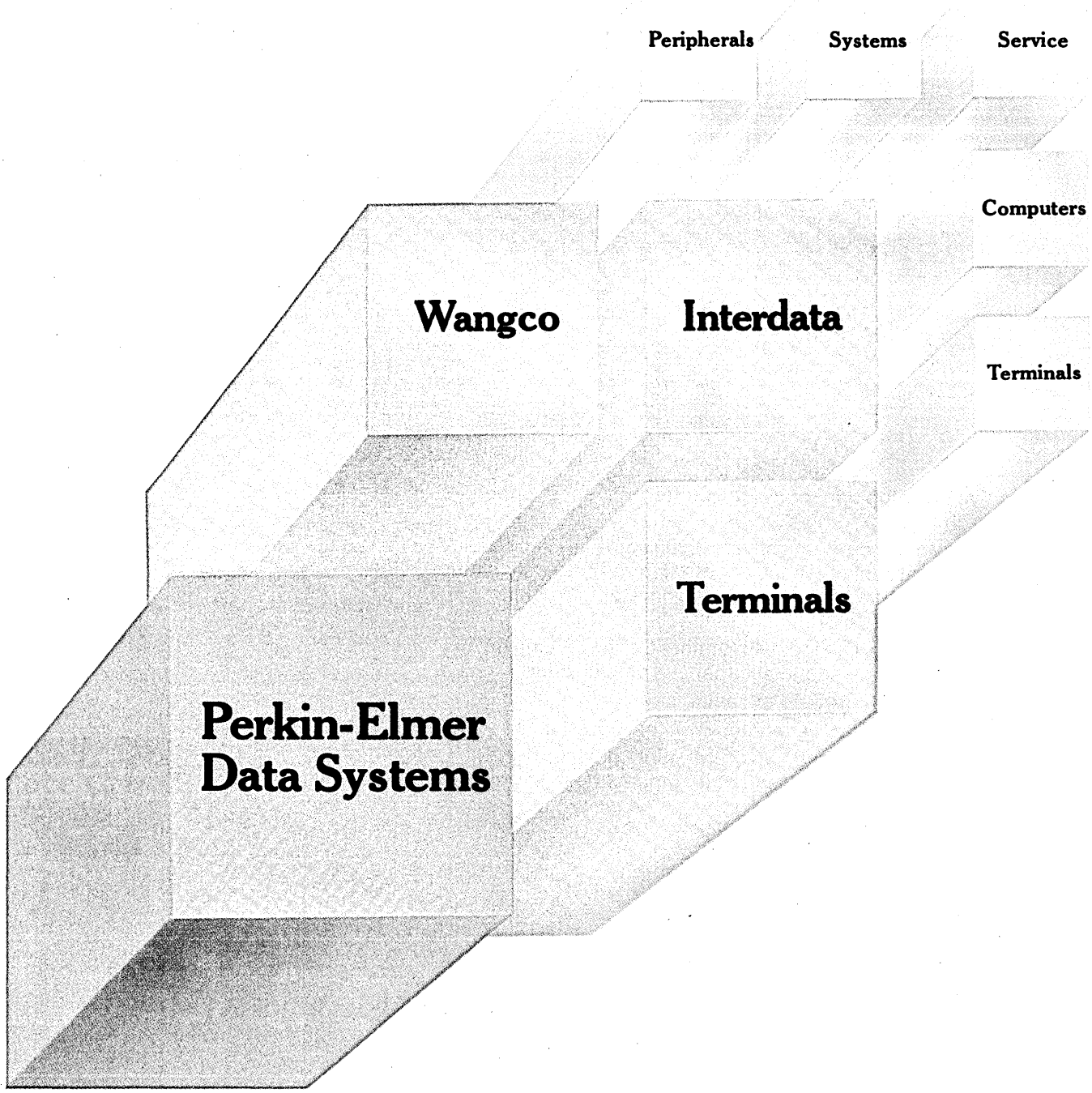

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Beats other small plotters coming and going.

Zeta's 1200 Drum . . . The speed and throughput you've needed

If you've been looking for a small plotter with super speed, your search is over.

Zeta's new desktop 1200 delivers 3,000 steps per second at 2.5 mils (1,500 at 5 mils). That's about 2½ times faster than other small plotters. And the 1200 operates from standard plotting subroutines—with a plotting area 11 inches by 144 feet.

Timesharing? Add a Model 40 Remote Controller and get up to 3,240 steps per second at either 300 or 1200 baud.

Price? Far less than you'd expect to pay.

OEM? Designed and discounted with the OEM in mind.

Any wonder we beat our own drum? Write now for complete specs on the 1200 and other models in the advanced Zeta line.
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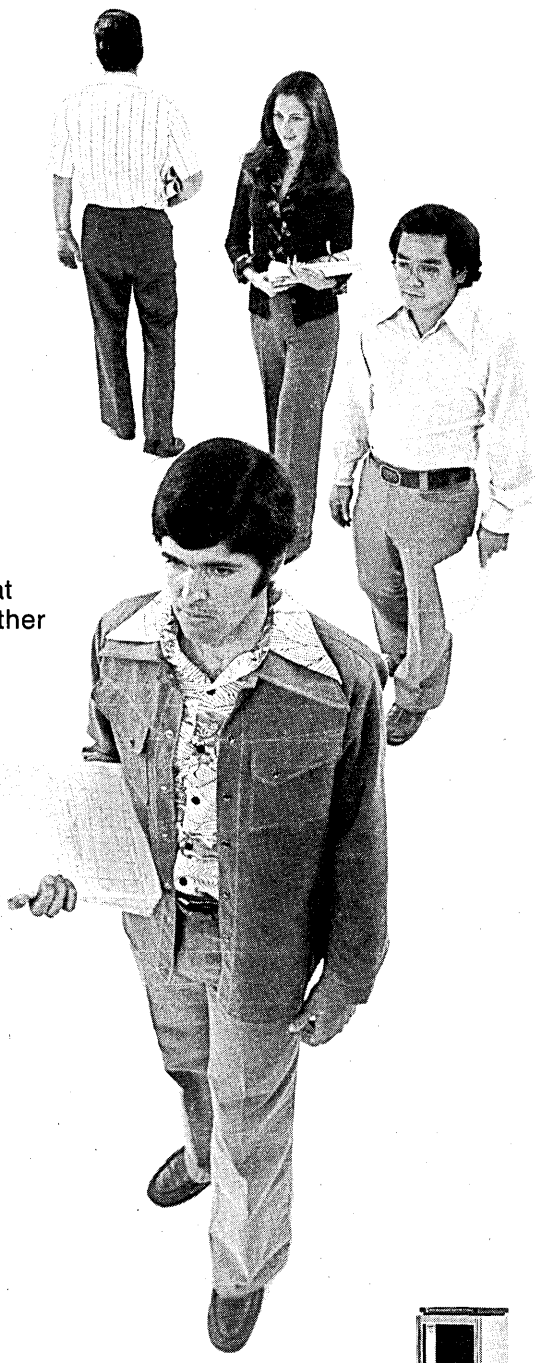

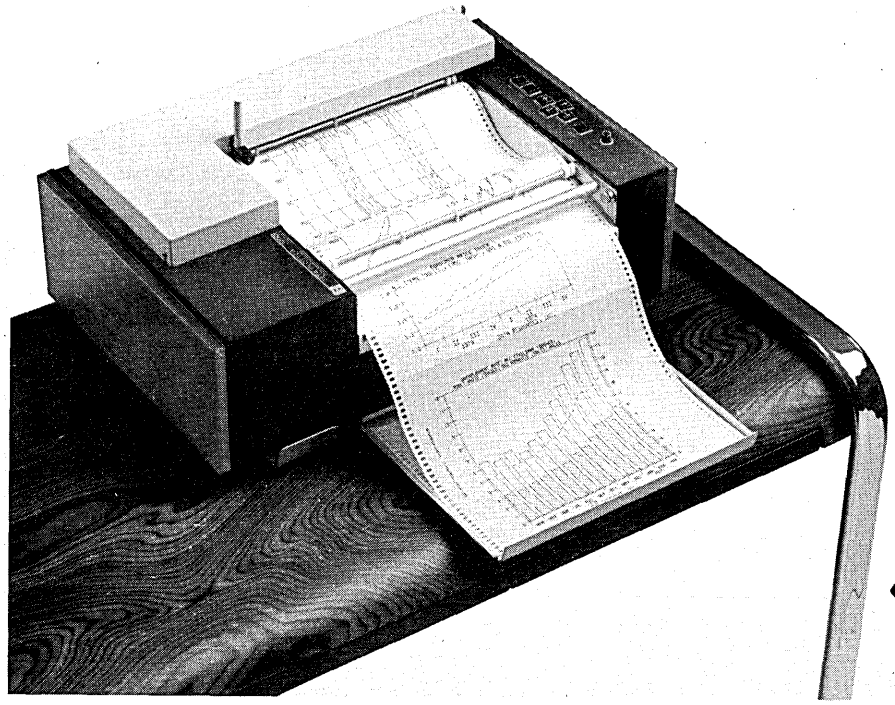

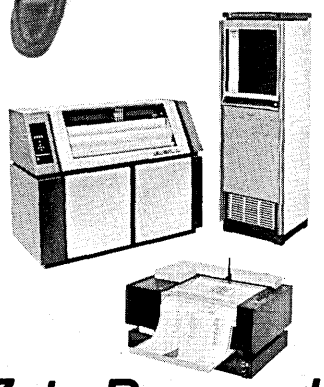

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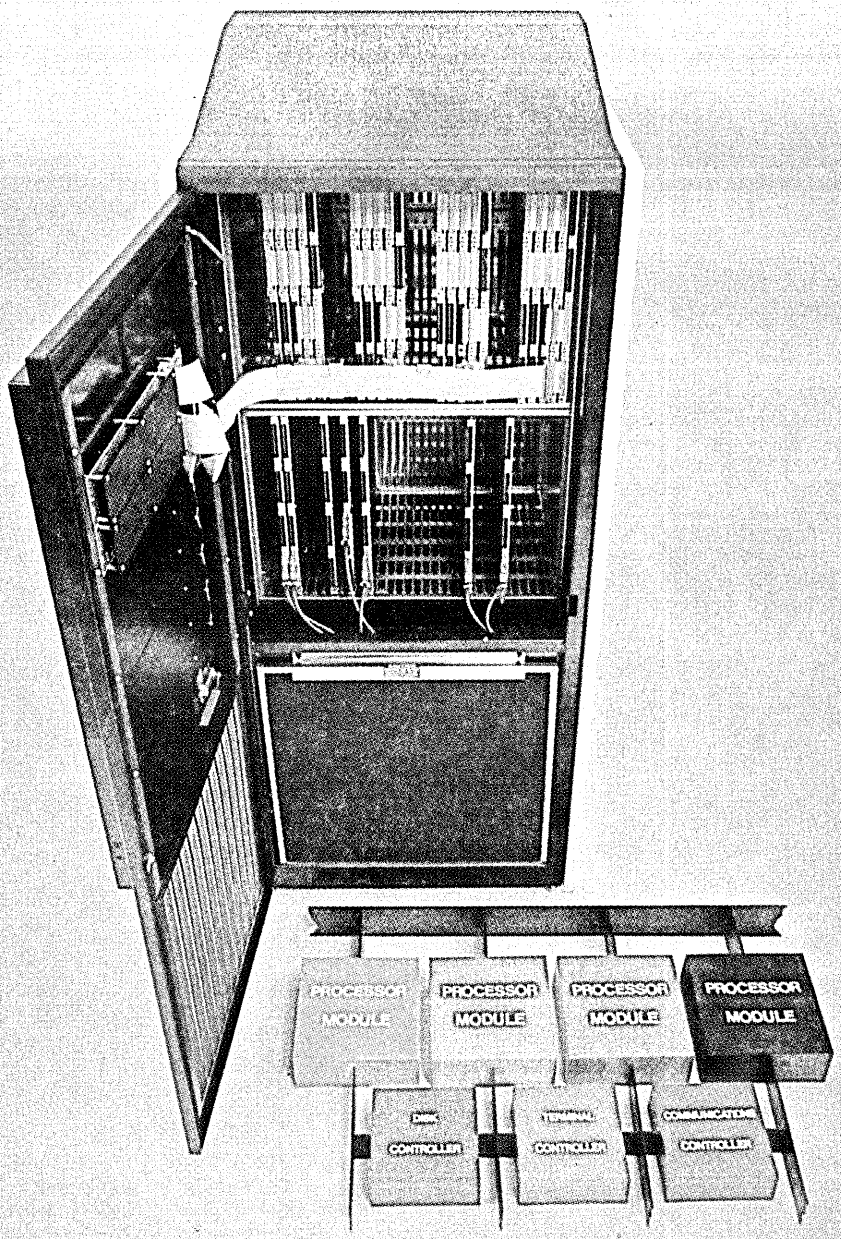

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And that means the company that came up with it had to have a lot of experience in both big and small computers. And there is only one company that does.

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Up to 1.2 million bytes of core memory. And up to 1.4 billion bytes of high-speed, on-line disc storage.

All of which is how the DECSYSTEM-20 combines the best of the big systems with the best of the small.

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Stages of Growth

by Paul A. Strassmann

Information system projects should be chosen, and scheduled, to maximize positive cash flow. Today's best opportunities for doing that may lie outside the present scope of data processing, due to dp's relatively high level of maturity.

The idea that organizations, nations or cultures evolve through predeterminable stages of growth has attracted historians and scientists alike. Understanding the "stages of growth" is only second best to possessing the magnificent gift of prophecy, because it endows the individual who has such an insight with ability to anticipate what comes next.

"Stages of Growth" in information systems relate to the systematization of all new investments needed to improve the productivity of people engaged in information processing. To understand this evolution requires insights that stretch beyond computer technology. Telecommunications, word processing, administrative systems, decision systems are some of the classifications that may become useful in comparing experiences in diverse organizations, at comparable stages of development.

"S" is the shape of growth. The "S" curve can be used to apply to the origin and growth of anything. It reflects the outcome of the underlying structural conflicts and balance from the conception to the maturity of any phenomenon. It can be found to represent histories of societies (as expounded by Spengler to Toynbee), success patterns of organizations, market penetration patterns of products, as well as life cycles of technologies.

Though much effort is expended in describing the conditions that prevail during various phases of growth, the really worthwhile insights come from an examination of those elements that would allow us to explain the delicate relationships that drive the growth process and make it ultimately obsolete. We can try to describe the current

status of our understanding of the computing environment, and its growth, as seen through various "stages" theories.

Nolan's four stages

The spokesman most articulate about the cyclical growth pattern in dp is Professor Richard L. Nolan from Harvard. Perhaps the best summary of Nolan's analysis is that the dp budget for a number of companies, when plotted over time from initial investment to mature operation, forms an S-shaped curve.

Based on this insight, Nolan proceeded to segment the growth history into four "stages" (Fig. 1), each with unique characteristics. For instance, it appears that many organizations have developed a pattern for growing applications as they move into more advanced stages of development. Similarly, increased personnel specialization can be found in organizations as they progress from functional simplicity to more complex forms of division of labor. Most importantly, a shift in management focus, control methodology and presumably the successful leadership personality type changes as costs escalate and the role of dp matures. (See Table 1.)

Withington's five stages

Ted Withington starts with the same objective as other "stage" theorists. He points out that "few executives have a clear picture of each of the generations of computerization and of the ways in which these succeed each other." However, if stage theory is applied, "such an overview . . . permits rational long range planning; management can plan for each generation with a clear idea of the goals it ought to be able to achieve . . . and how to prepare for transition to the next generation."*

Withington's view of the evolutionary process is that it is essentially technology-driven (see Table 2) and that rapid reductions in technology costs have the decisive impact on variables such as: new applications functions brought into the dp fold; and organizational structure for managing the dp environment with the resultant effect it has on organization structure.

Most of us today follow Withington's reasoning process treating technology as the dominant enabling factor that paces the rate at which computers enter into the life of an economy.

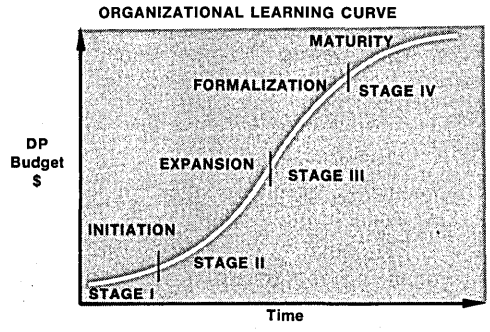

Fig. 1. The "S" curve can be used to depict the beginning, growth, and maturity of anything whatever, including dp budgets.

*For the sources of quotations and for details on points made by other authors, refer to the bibliography at the end of this article.

Limitations of stage theories

Many organizations are now entering Nolan's Stage IV or Withington's Stage V and must be experiencing some anxiety about what will follow. The basic "S" curve also seems to have different shapes depending on industry or geography. For instance, dp budgets for many government agencies are barely keeping up with inflation, and investment funds are not available. When viewed from a global standpoint, we also find some major anomalies in the stages of development. For instance, we can find Withington's "Stage III or IV" equipment engaged in execution of rudimentary applications.

Another peculiarity of the current environment comes from new opportunities for organizations to "jump" stages of development by acquiring sophisticated packaged applications either from computer service organizations or from minicomputer system contractors. Suddenly, the entire information processing scene has become open to quick leaps from "no experience" to advanced computer uses.

A difficulty in explaining observed phenomena leads to a re-examination of assumptions. We should be asking questions such as:

- Is the dp budget the most important variable to watch when tracking the growth of information systems?
- What happens after the data base phase becomes successfully assimilated?
- What makes the "S" curve of one

APPLICATIONS			
STAGE I	STAGE II	STAGE III	STAGE IV
Cost Reduction-Accounting	Proliferation In All Functions	Emphasis On Control	Data Base Applications
Payroll Receivables Payables Billing	Cash Ledger Budgets Inventory Personnel Orders Sales Production	Project Control Scheduling Cost Analysis Chargeouts	Simulations Planning On-Line Inquiry On-Line Order Entry
MANAGEMENT			
STAGE I	STAGE II	STAGE III	STAGE IV
Lax Management	Promotional Management	Control Management	Resources Management
In Accounting	In Finance Systems Analysis Decentralized	Independent Function Steering Committee	Independent Unit Systems & Programming Decentralized
Control Lacking	Lax Control Few Standards Informal Project Control	Standards Project Control Chargeouts; Audits; Operate Controls	Chargeouts Services Pricing Design Controls
Loose Budgets	Loose Budgets	Strong Budgets	Long-Range Planning
PERSONNEL			
STAGE I	STAGE II	STAGE III	STAGE IV
General Specialization	Applications Specialization	Control Specialization	Data Base Specialization
Operator	Systems Programmer	Development Programmer	Data Base Programmer
Programmer	Scientific Programmer	Maintenance Programmer	Teleprocessing Programmer Operating Systems Programmer
Analyst	Business Programmer	Functional Analyst	Data Base Manager

Table 1.

	HARDWARE	FUNCTIONS	ORGANIZATION
Stage I	Vacuum tubes	Experimental Batch	Controller's Department
Stage II	Transistors	Full Range	Proliferation
Stage III	LSI	Networking RJE	Consolidation, with terminals
Stage IV	Large Files Satellite Computers	Integrated Files Transaction Processing	Satellite Processing
Stage V	Distributed Systems Exotic Memories	Private Information Simulation	Interconnected networks to all parts of organization

Table 2.

organization differ from that of another?

• What is the intrinsic driving mechanism that makes it possible for us to observe the end result in the form of "S" curves?

Make-up of growth curves

If one has held a job long enough to analyze the development of dp in a single organization over 10-20 years, he finds that budgetary increments that make up a firm's smooth "S" curve history are actually made up of a multitude of individual learning curves. (See Fig. 2.)

If projects are initiated in quick succession and completed successfully, dp budgets rise rapidly. *The aggregate curve levels off if the project initiation rate slows down.* As a matter of fact, if the innovation rate stops altogether, it is conceivable for the top of the "S" curve to decline as cost reduction activities made possible by a rapidly improving technology drive overall expenditures down.

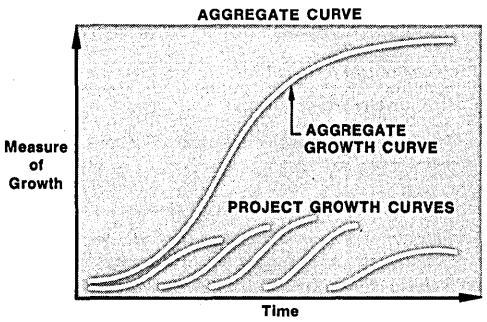

Fig. 2. The dp organizations budget curve is actually made up of a multitude of learning curves for individual projects. The aggregate curve levels off if the project initiation rate slows down.

The key to the analysis of the stages of growth in information systems lies then in a careful examination of individual events causing project authorization as well as the overall timing of successive projects.

Look at the cost curve generated by a typical computer project (Fig. 3). As a rule of thumb, the operating expense for a set of applications (including maintenance and enhancements) will equal or exceed the expenditure rates during development. Or, to put it another way, once an application is automated, it permanently adds to the fixed costs of the computerized (systematized) sector of an organization. Technology improvements do not subsequently contribute much to cost reductions without investing further development funds, since technology "locks in" costs by tying the application into a particular technology configuration.

Insofar as labor constitutes a major part of the cost anyway (it typically accounts for 50%-70% of any dp budget), inflation guarantees that the costs of all computer applications will grow with time. Watching the cost curves is therefore not the most significant fact in judging the speed with which an organization evolves through stages of growth. Project profitability —the cost/benefit ratios—are more likely to give us a cue about the desirability of new dp projects.

Project profitability

The shape as well as the ultimate size of an organization's "S" curve will be the result of several conflicting forces. Fig. 4 shows a characteristic pattern of cost/benefit relationships where the gain or loss is defined as the positive or negative cash flow as result of the computerization. Several rules can be gleaned from these relationships:

• Project development phase time should be short for an unstable environment. Otherwise expenses for maintenance and retrofits for enhancements defer the breakeven point until the project becomes uneconomical.

• Projects should be selected primarily on their capability to generate positive cash flow. New projects should not be funded until a substantial portion of old projects is successful, because a quick succession of new project starts would simply keep piling up negative cash flows.

• Technological uncertainty in dp project execution calls for a highly conservative approach to project selection. Since 100% overrun on development expense and 200% overruns on operating expense are not uncommon, return-on-investment targets well in excess of comparable capital budgeting targets are desirable. For instance, if a manufacturing corporation uses 20% return-on-investment as its minimum target for new equipment, its dp projects should have a minimum cutoff of 40%.

• High returns on investments become extremely sensitive to the realization of estimated benefits. To return ROIs in excess of 30%-40% before taxes requires very attractive targets of opportunity indeed. Consequently, benefits planning, benefits validation, and benefits assurance should receive the same, or perhaps more attention than systems planning, systems definition, and computer expense evaluation.

Characteristically, technical project planning and control should consume 5%-8% of total development costs. Clearly, we need to spend at least this much on the benefit side of the cost/benefit equation.

We have now in our possession the concepts that permit us to answer new questions concerning the dynamics of a "stages" evolution in a specific organization:

1. Maturity in the introduction of computers occurs when the rate of innovation ceases.

2. The rate of innovation for information systems projects is defined by new projects having attractive cost/benefit ratios. Insofar as technology succeeds in lowering the cost element of the ratio, it permits consideration of projects previously deemed unaffordable.

But technology alone does not dictate the stages of growth. All factors that have a bearing on a high project ROI (such as organizational capabilities, cost displacement opportunities, development risks, project sequencing, etc.) have equal or higher importance.

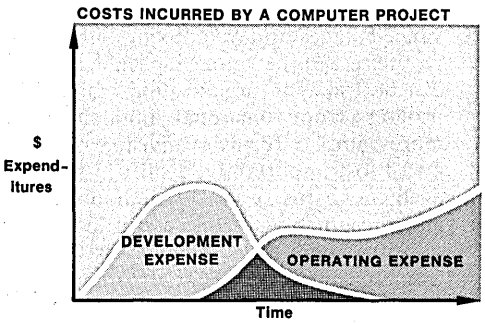

Fig. 3. The operating expense for a given computer application will generally equal or exceed the development expense. Operating costs become fixed costs, usually not much affected by technology developments.

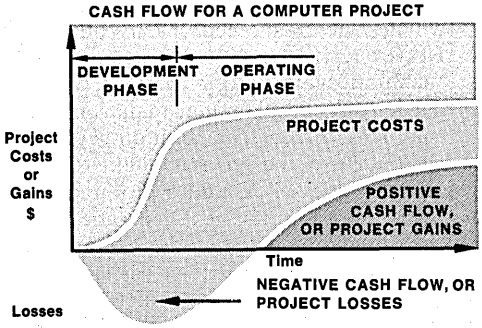

Fig. 4. In its development phase, a computer project results in a negative cash flow, naturally, which will hopefully become positive when it is operational. New projects should not be started until old ones are becoming successful, otherwise it is possible to keep piling up negative cash flows.

3. The overall strategy of project sequencing and thus assuring positive cash flows is of greatest importance. Otherwise the organization will not be willing to engage in innovation through successful office automation investments. Consequently, management control and planning to detect, propose and manage attractive cost/benefit ventures will dictate the shape of an "S"

curve in a specific situation.

4. The primary concern of the top information systems executive is management of ventures that improve organizational effectiveness and/or profitability.

5. The top information system executive cannot concentrate exclusively, as is currently the case, on just managing technology costs. His job is much bigger. To budget new project investments optimally, he must be able to help in setting investment priorities by giving greater attention to expected benefits.

6. With increased scarcity of capital —whether it is defined as investment in buildings, tools, R&D or systems— organizations must begin redefining the role of their top information systems executives primarily as capital venture managers.

With systems development budgets typically broken down in the 10%-30% range for development and 70%-90% for on-going expense, and with systems expenses in the range of 0.5%-1.5% of total revenue, systems development budgets frequently equal one-fourth to one-half of a company's R&D budget.

Money for innovation is scarce and therefore attracts top management attention. Also R&D or systems development investment share the common characteristic of having great leverage on on-going expenses or revenue. This is why the organizational characteristics of the information systems budgeting process change not as a function of technology, but as its importance to the investment management process becomes apparent.

Predicting

These new insights allow us to examine a broader range of realities than previously was the case. For instance, Nolan is much concerned about the "fifth stage" of development. Since we believe that any aggregate "S" curve can be composed of several subsidiary curves, what happens after Nolan's Stage IV can be drawn as a new and major technology venture consisting of projects in assimilating data base technology. (See Fig. 5).

Most important, the new "stages" analysis based on cost/benefit maximization, profitability and innovation permit us to define the shape of an "S" curve possible for a specific organization, within a defined geographic and planning context.

Simply put, the drawing up of office labor automation long range plans becomes the generator of a particular "S" curve. The "stages of growth" theory then becomes a planning aid, because it allows a long range planner to map against his own curves those insights that experience has proven out elsewhere.

What is most attractive, however, is the fact that the "stages of growth" analysis can provide a helping hand in probing the limits of what is realizable. For instance, the technology forecaster would tell us that firms will ultimately evolve toward "semi-automatic operating decisions, plans initiated by many individuals, systems capabilities projected to all parts of organization; interconnected networks; interactive languages; simulators, etc." Applying the cost/benefit maximization criteria to an individual situation may reveal that it is unlikely that payoff could be realized from such an approach and that a relatively rudimentary technology would suffice for a 5-10 year timeframe.

I believe that the "stages of growth" approach is especially relevant to the analysis of long range plans and strategies of organizations that have gradually arrived at the end of their dramatic growth experiences in dp. The flattening of their budget curves has been almost equally caused by a loss of justifiable new investment opportunities

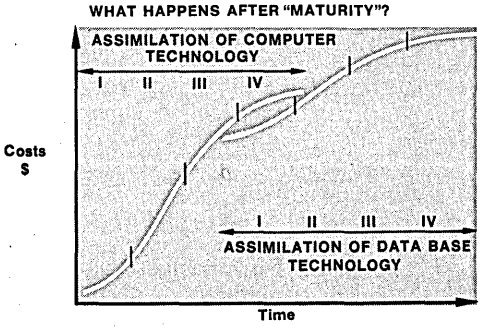

Fig. 5. What happens after an organization's "S" curve reaches its maturity level? That's when major developments in technology, such as data base technology now, can be expected to alter its shape.

and the increasingly stringent resources allocation processes in the last five years.

The lack of attractive new investment opportunities in productivity improvement applications is partially due to a narrow concept of dp missions and charters. When one views the extent of office automation, the rate of growth of the "white collar" sector in the economy, the increased complexity of information handling demanded by our society, and the high rate of inflation in labor rates while the cost of technology is dropping radically, it is hard to accept the idea that we have reached maturity in growth of office automation.

For example, an estimate of the costs of U.S. office expenditures for 1973 shows 84% of costs ($373 billion) spent on office labor, 10% ($42 billion) on administrative processing, and 6% ($26 billion) on dp. The extent of office automation is far from a saturation level since the average investment, per white collar worker, rarely exceeds $4,000 to $6,000. If we contrast this with capital investments needed per agricultural worker (about $50,000/capita) and factory worker (about $25,000/capital), we can quickly understand why the productivity for the agricultural and manufacturing sectors is so high (in the 6%-8% range, per annum, in real terms) while the productivity of our economy at large hovers within an unsatisfactory 2%-3% range.

The task of finding profitable and productive opportunities in information processing is not just a way of safeguarding job opportunities for computer people. It is an objective calling for national economic priority because our society is finding it increasingly desirable to migrate its labor force into information intensive occupations.

Redefining "Stages of Growth"

I suggest that the way to define "stages of growth" for any organization is to consider that organization's total information processing expenses, including clerical and administrative labor, as the base against which progress should be measured. The big divide is then that portion of the total information processing expense that is subject to systematized control, measurement, and management. If, for instance, an organization spends about 1% of its revenue for dp, this will show only a relatively small penetration into areas remaining "unsystematized."

As a rule of thumb I estimate that for every $1 of dp expense at Nolan's stage IV there will be an additional $5 falling into unsystematized activities, including the work of typists, secretaries, order entry clerks, administrators, switchboard operators, accounting analysts, budget specialists, file clerks, claims examiners, credit specialists, expediters, etc.

For typical organization we will then find coexistence of several technologies and of several investment opportunities simultaneously at various stages of development, where dp may be at Stage IV, telecommunications in Stage II, word processing in Stage II, and general administrative systems just beginning to emerge. This means that dp, as we define it today, is only one facet of the information processing environment and the overlapping dp are many other dimensions for tackling the overall problems of "white collar" productivity (Table 3, p. 50), at various stages of their respective "S" curve development.

The purpose here is not to dwell on

the attributes of the various "stages" that go beyond dp. It is important to note that I see great opportunities for improved cost/benefit performance in these new areas because of their latent potential originating from the fact that they have been largely neglected in the last 10-20 years when most energies were diverted to the glamor of dp. As increased understanding takes place concerning these opportunities, I can see how project development resources will be shifted where the potential is greatest.

To illustrate my point, I would like to show results from a test of several word processing installations using word processing equipment (Table 4). The financial results are really dramatic. The improvement ratios are certainly better than just about any dp project I have seen recently.

Before my colleagues in computer management abandon their dp projects and shift their personnel to word processing, I would like to warn them that success in this new field is hard to come by. Planning the human factors for successful word processing is of substantially greater complexity than just about anything encountered in dp except perhaps in large scale on-line terminal networks.

The issues are sociocultural—both on the part of the users as well as by the word processing operators. Word processing requires a reorientation of job attitudes, career path perceptions, status, work habits, measurements, accountability, and a redefinition of what is meant by secretarial services. In terms of organizational structure, the establishment of a network of word processing centers requires an approach that differs materially from the ways we implement computer projects. It is a challenge that I recommend for each information processing executive because it contains all of the elements of complexity that will be encountered someway as we move toward automated administrative systems.

Two remarks about attractive cost/benefit opportunities outside of the conventional dp sectors: the involvement of the information systems executive in the telecommunications area. I consider the need for integrating telecommunications planning (voice, data, facsimile, administrative messages, teleconferencing) an absolute requirement for achieving any semblance of cost effectiveness. In most organizations we find telecommunications systems management broken down into small pockets of control, without any integrative planning. Advancing into future growth stages calls for identification of profitable new projects in this area.

With regard to "decision systems," the best we can say is that this discipline can be expected to improve the productivity of management personnel in the same way as administrative systems were targeted at improving the productivity of clercial and administrative staffs. The theory of what constitutes the "stages of growth" in this area is yet to be written.

Summary

The driving force behind evolutionary growth is profitable innovation—the ability to find new project investment ventures. For future growth in information systems, the executive will have to reach increasingly into more difficult areas requiring major changes in organization and in work relationships. In this environment attention to techology matters will not be as important as the ability to secure the benefits arising from automation. As advanced stages of growth are attained, the dp executive will be left to grapple with technology. His boss—the information systems executive—will manage the new opportunities leading to dramatic improvements in overall organizational performance.

FUNCTION	STAGE 1	STAGE II	STAGE III	STAGE IV
DP	Cost Reduction	Proliferation	Control	Data Base
Telecommunications	Telephone Company Supplies	Interconnect Devices	Individual Networks	Integrated Switched Networks
Word Processing	Private Secretaries	Typing Pools	Word Processing	Text Management
Administrative Systems	Mechanization of Tasks	Machine-Aided Transactions	Work Redesign	Work Enlargement Computer Aided Instruction
Decision Systems	Analytic Generators	Planning Models	Interfunctional Simulation	Hierarchical Heuristic Models

Table 3.

BASIS	SALARY/PERSONNEL SAVINGS PRE-IMPLEMENTATION	CURRENT	CHANGE
Annual Salary	$ 3,647,000	$2,804,000	
Average Per Installation	331,000	255,000	—23%
Number of Employees	264	203	
Average Per Installation	24	18.5	
Annual Supply Budget	$ 203,000	142,000	—30%
Temporary/Contract Labor (Annual Budget)	$ 129,700	40,500	—68%
Output in Lines of Text/Month (For Five Installations Monitored)	$ 51,834	70,000	+35%

Table 4. Great potential for cost/benefit improvement now exists in areas outside of traditional data processing, largely because these were neglected for the past 10 to 20 years while energies were diverted to the glamor of dp.

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Five-Year Planning for Data Communications

by Joseph Ferreira and Jack M. Nilles

Data, voice, message, graphics, and facsimile communications will merge with data processing to form a single entity strong enough to restructure existing corporate organizations.

Intelligent and cost effective planning of a major communications-oriented system is a formidable challenge. The proliferation of network management technologies, architectural schemes, communications protocols, and carrier services, of hardware alternatives in controllers, concentrators, modems, and the like, and of communications-oriented software is part of what makes it such an arduous task. But as we gain a familiarity with and a command of the information we have been exposed to, we are going to perceive the large scale teleprocessing system of today as only the first step in a process of restructuring the corporate entity and transforming its operating procedures.

There is some analogy with the impact on industry of two other historic developments. One was the rise of modern transportation. The other was the emergence of modern industrial processes, with important economies of scale, changing the world industrial system from a network of small regional procedures to a system of large, efficient, high capacity, specialized plants depending on large distribution networks.

Some similarly fundamental changes to industry and the surrounding society are going to be brought about by developments in communication over the medium term future. These changes, although as far-reaching and as fundamental as those brought about by the earlier wave of technology, will be of an entirely different nature. And, for a number of reasons, they will take place far more rapidly.

In order to lead up to the planning implications of this, let's first outline briefly the new technology and the commercially available facilities in our current period and near to mid-term future. Second, let's describe their impact: the structural and functional changes in corporate and other organizations, the internal opportunities for operational innovation and improvement, and the external or entrepreneurial opportunities opened up by the innovations.

We are going to perceive the large scale teleprocessing system of today as only the first step in a process of restructuring the corporate entity and transforming its operating procedures.

We cannot look at only *data* communications, since corporate communications will become increasingly integrated, making it more and more difficult to consider any one communication payload in isolation from others.

There are five major communication modes: data, voice, message, picture or graphics, and facsimile. There are significant opportunities opening up to save money and enhance function by integrating or coordinating these modes: at the administrative level, under one communications manager or office; or at the physical facility level, through shared-use equipment and channels.

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Changing costs

The most significant, even if the most mundane future development involving all of these communications modes, will be the drop in the dollar cost of transferring a bit of information from here to there (see Fig. 1, p. 52). The carrier component of this cost has been calculated as declining by about 15% per year since about 1960, and is forecast to continue at that rate into the '80s.

This rate refers to the cost of the actual common carrier channel and the immediate interface equipment, such as the modem. The continuing drop in cost is attributed to a combination of changed carrier tariffs, the availability of new, more cost effective carrier facilities, and drops in certain hardware costs.

While there will be a steadily moving decrease in the cost of land-based communications, the more interesting trend is for cost of domestic satellite-based transmission and for computer costs. These trends will have reduced the cost for moving a word or character or bit to almost nothing we can plot by the end of this decade. And with the era of the domestic satellite really just beginning, we can anticipate still further technological developments.

Of course what we are really doing in this projection is attempting to replace such labor-intensive activities as

cable laying or construction of microwave towers with technology-intensive techniques. A satellite is a prime example.

To reflect for a moment, in 1950 the Bell System invested $60 on the average for each mile of long haul circuit. By 1965 this had dropped to $25. For the newest coaxial cable system, L-5, the cost is something like $2 per circuit/mile. Where this will be when millimeter waveguide technology goes live is hard to predict, but it is clear that the cost will be very low by any standard of measure when one considers that just for starters 200,000 circuits will be jammed into one pipe.

Fig. 2 shows the trend line for cost distribution in telecommunications applications. While terminal costs for a specific application may change very little, there is expected to be a steadily reducing cost for processing the information and a steadily increasing cost for transmitting the data.

The whole idea of taking the local loop out and permitting connections between the computer and the satellite transmission device holds a promise that cannot be ignored by an intelligent planner, and if we were designing a new computer building or corporate headquarters today, we might want to leave a place on the roof for a satellite antenna and associated gear that will function in the 12-18 GHz range.

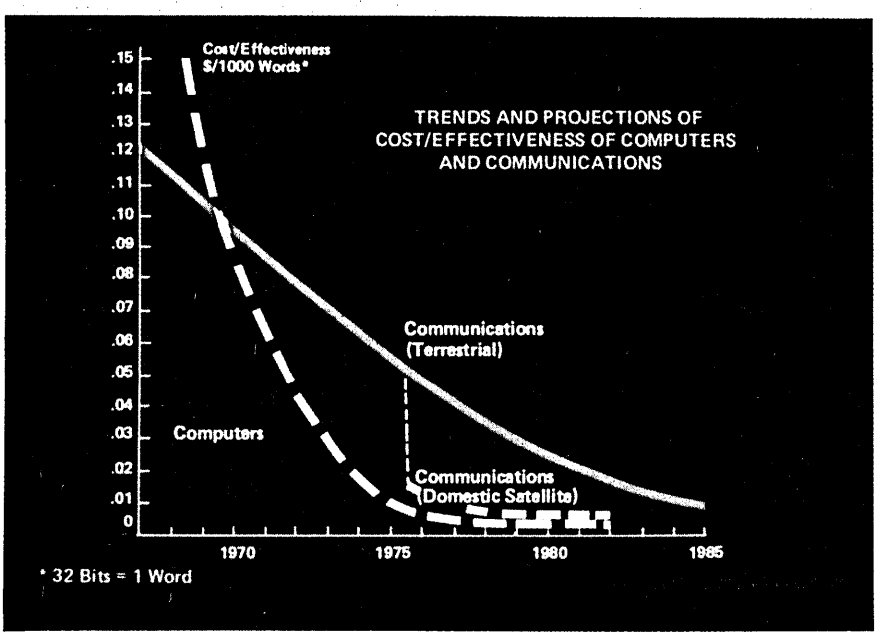


Fig. 1. The most significant development in the near future of communications will be the drop in the cost of transferring a bit of information. The carrier component of the costs is falling at about 15% annually, the computer component even more rapidly. Here the measurement is in $/1000 32-bit words. Source: The Diebold Research Program

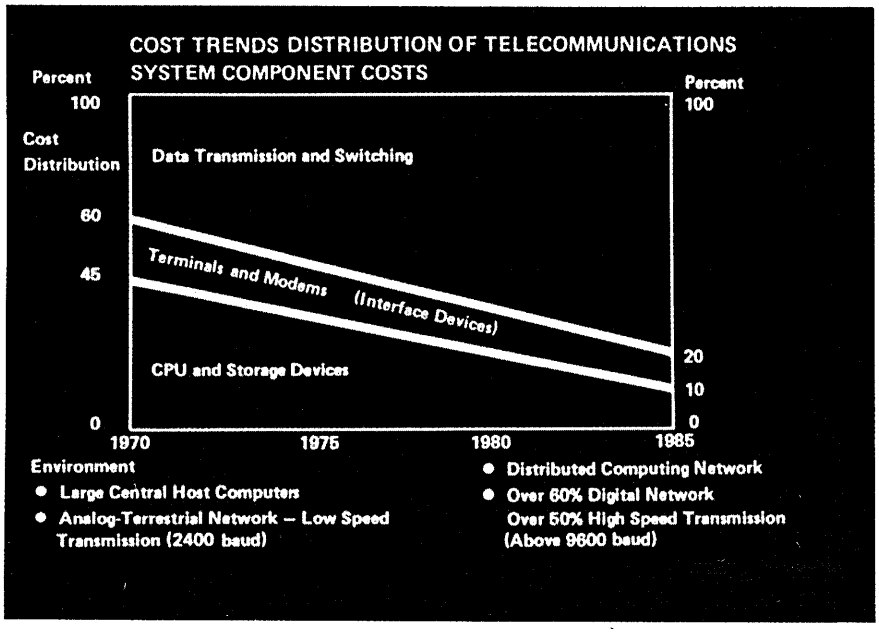


Fig. 2. Terminal and modem costs are expected to drop very little, and processing costs to drop rapidly, making transmission costs an ever larger percentage of the total communications cost. Source: The Diebold Research Program

The cost of computer processing has dropped far more steeply than 15% per year. This applies not only to mainframes but also to communications processing computers: front ends, concentrators, network managers, and the like. This has accelerated the drop in communications costs under a constant communications architecture, and potentially accelerates the drop even faster by making possible such innovations as packet switching, so that we will shortly begin to see communication costs, on a bit per mile basis, diminish to a small fraction of today's cost.

There are other factors which we can expect to cut the cost of communications-oriented data processing. In today's centralized mainframe facility, on-line or terminal-oriented processing is an "advanced function" in IBM's terminology, requiring a lot of hardware resource and some heavy software—as anyone will testify who has tried to implement IMS in less than two megabytes, or without specially trained IMS programmers.

But many of the minicomputers or small business computers now moving from the scientific-industrial world to the data processing world are on-line systems in their *native* modes, transaction-oriented in their fundamental structure, and hence capable of handling all kinds of terminal operations with far less overhead and complexity.

This can't be emphasized too much. In five to ten years the cost of a communications system will drop so far that all kinds of applications which seem exotic today are going to become feasible and attractive.

New communications carriers and services are already proliferating. In addition to the new end-to-end digital services still being implemented by AT&T, we have digital services—both dedicated and dial-up—from independent, specialized common carriers like Southern Pacific, and MCI, assuming they survive! We have packet switching value-added networks such as Telenet, which offer tremendous economies in moving digital data through shared-use techniques.

The wideband services, in place and still being implemented by AT&T and the specialized carriers, are opening up the possibility of combined or alternate use for digital, voice, facsimile, and video or picturephone.

The physical basis of these services is the recent and continuing development of digital technology, microwave, satellite systems, and the switching and

terminating equipment which routes, merges, and distributes all these disparate signals.

If we were dealing in a slightly longer time frame than five years, we would have to cite promising developments in such technologies as millimeter waveguide, optical and laser systems, two-way communication through the cable television system, with fiber optic networks providing massive intercity communications capability.

We are in a period of some regulatory confusion in the U.S. just now, so it is by no means certain just when or in what form some of these potential technologies will enter revenue service. This is particularly true of the cable television system, which is the object of a current tug of war between Congress and the administration.

This much is certain: the costs of all kinds of communications are descending steadily and significantly. At the same time, other costs of doing business are rising—travel, secretarial and clerical services, and administrative costs most notably. (Productivity in these white collar areas is static, too.)

Substituting communications for travel

This brings us to the substitution of communications functions for other functions in the corporation, and to a fundamental restructuring, organizationally and geographically, of the corporation as a prerequisite for gaining the economic benefits of that substitution.

This restructuring implies major new networks of combined-use channels where no such networks exist today. And it implies an array of new types of terminal devices, some available now, others still experimental or speculative.

The real planning task will be the evaluation of these proposed new uses for communications facilities, to determine their applicability, and their cost-benefit indicators, for each planner's individual company. The final analysis for each proposed application will depend heavily on what business the company is in, and on the size and nature of the particular company.

Let's look at one set of cost trends which are creating some of these opportunities (see Fig. 3, p. 56). Just as the cost in computing and communicating costs will keep dropping, the costs of transporting people has been and is projected to continue rising.

Let us first consider executive and intercity travel for the purpose of conferring with others, attending meetings. The technology is here today to substitute electronic mechanisms for meetings requiring travel. Let's call those mechanisms teleconferencing, of which there are three variations: computerized, voice, and video.

The most novel and the most interesting of these is computer conferencing, on which several studies have been made. Participants are each seated at a crt terminal, and they communicate with each other by means of a keyboard and a centralized computer. An important feature of such a system is that participants can work asynchronously, entering material while others are also keying in words, without interrupting their colleagues. This tends to allow each participant much fuller expression in less elapsed time. Additionally, each participant can "confer" even if none of his colleagues is on-line at the moment. This avoids the common problems of trying to assemble a large and dispersed group.

In addition to simply conveying dialog, a computer conferencing system enables such functions as retrieval of business statistics from a data base, storage and retrieval of verbal and numerical material developed earlier in the conference, the automatic generation of a written record of the conference, and "whispering" (the capability of one participant to transmit a message privately to another participant).

Let's take some cost comparisons of computer conferencing with conventional conferences requiring travel. Based on a hypothetical meeting of divisional representatives of an actual U.S. company with divisions and a corporate headquarters spread between eight U.S. cities, (and based on reasonable assumptions about typing speed, speaking speed, duration of the conference, and travel and accommodation costs), it can be shown that travel was twice as expensive as conferencing through a time-sharing service would have been in 1975. By 1977, it will be three times as expensive.

(This also assumes the commercial time-sharing service has a local access port in each city. See Table 1.)

Repeating the analysis on the assumption that a packet switched service is used (in which the costs are more related to the data volume transmitted than to connect time), the advantage rises to 17 to 1 in favor of teleconferencing by 1977.

Applying the same kind of analysis to voice teleconferencing, we find that by next year telephone conference calls will have a 3 to 1 advantage over travel on the basis of presently available telephone services. On the basis of such services as the switched long distance voice service via microwave which MCI is currently implementing, the cost advantages should rise to 4 to 1 by next year.

Because of the limited availability of Picturephone service we cannot compare visual conferencing on the same eight-city basis, but we can do this using a New York-Chicago-Washington triangle. For this example, travel costs are only slightly higher than visual conferencing for two people (projected at 1.2 to 1 for 1977). But the potential advantage is significant once we have six people in the conference (32 to 1); and even for the two-person "meeting," costs might be reduced by using facsimile, stereo audio, and slow-scan tv systems over ordinary telephone lines, providing most of the advantages of the more glamorous Picturephone system.

Changing the structure of business

The structure of an existing business organization can be attacked in a far more fundamental way than substituting electronics for executive travel to meetings. Electronics could also be substituted for ordinary commuting to and from today's relatively centralized offices and work facilities.

Administrative centers of conventional firms today are what we will call "centralized." Major business functions—marketing, accounting, personnel, etc.—are grouped together because of the "obvious" need of these functions to communicate with one another and for individuals within each function to communicate with one another. A firm with several ad-

AVERAGE RATIOS FOR TRAVEL COSTS/COMMUNICATIONS COSTS

Method of Conferencing	1975	1977
Computer Conferencing		
Commercial time-sharing	2	3
Minicomputer packet switching	11	17
Voice Teleconferencing		
Voice-grade lines	2	3
Specialized carriers	—	4
Visual Teleconferencing		
2-person conference	1.1	1.2
6-person conference	2.1	3.2

Source: The Diebold Research Program

Table 1. The various forms of conferencing already show cost advantages compared to the costs of executive travel. The ratios above assume very good conditions for travel, including: perfectly suitable air schedules, only major city access, and good weather. Costs computed include: air fare, ground transportation, meals, lodging, and executive salaries (figured both at $10 and $20 per hour). The visual teleconferencing costs were figured for a Chicago-New York-Washington loop.

ministrative centers is still centralized in this sense if several of these functions tend to be concentrated at each center.

Studies conducted at the University of Southern California identify three phases or stages in a process of decentralization in which the communication—between major functions at first, and then within each function—is increasingly carried on by electronic means. The first phase is *fragmentation* which takes two different forms, both already visible today. One form (segmentation) is locating one function (such as data processing) remotely from the administrative center and communicating with it electronically. The other form (branching) is one in which the administrative center is broken into smaller but functionally complete centers. A current example is branch banking.

The next stage, after fragmentation, is *dispersion*. In this stage, the firm establishes a number of scattered locations, and an employee reports to a local work site because it is local—the closest to his home—not because his administrative unit is located there. Thus members of the accounting department, for example, would now report to several locations, and handle all their necessary interactions via computer terminals and other telecommunications.

The final phase of this process is *diffusion*. An employee works in his own location—for example, his home—for one or several employers or clients, receiving his work input and delivering his work product by telecommunications. You can see how the development of communicating word processing systems, and of so-called augmented word processing which is conducted through a mainframe computer, will make it possible to extend this type of diffusion not only into number-processing departments like accounting, but also into secretarial and stenographic services and all types of text-producing operations such as report and proposal writing, and into all those areas requiring a mix of numerical and word processing, such as marketing, personnel, purchasing, and the like.

That such restructuring is becoming technically feasible does not necessarily mean that it will come about. But here are some strong economic reasons to expect such decentralization to occur as it becomes feasible.

From the corporate point of view, it would reduce real estate costs by reducing the need for space in high-priced centralized locations. It would relieve certain labor scarcities (for example, of secretaries in downtown business areas) and in its diffusion stage, make available labor confined to the home, such as mothers of young children. And it would meet the problem of rising employee dissatisfaction with commuting and business travel.

Pressures would be reduced on transportation systems; energy-intensive transportation would be displaced by communications (a much lighter user of energy); and travel time as well as cost would be saved.

The paperless office

What is proposed here, in general terms, is the *physical* dispersion of the business administration system, the nerve line of the corporation and its functional integration through a computer-communication system which joins its parts into a working whole.

Let's examine in a little more detail how some of the standard office or administrative functions can be moved onto such a system. We're speaking, of course, of functions which today are usually handled manually, through the creation and movement of documents and the movement of people. This is the "paperless office" concept you have probably encountered before, in which:

- interoffice correspondence is handled by an electronic mail system, in which a message-switching computer delivers a memo or document to the recipient in hardcopy or video display form.
- Most or all of the standard documents for the conduct of the business are created, stored, and delivered within the computer-communication system. This includes such items as invoices, purchase orders, production control documents, documents governing inventory and distribution activity, engineering drawings and documents, contracts and legal documents, manpower and payroll files, customer and supplier files, and all of the various items specific to individual businesses, such as insurance policies and claims, bank deposit and loan account records, and the like. Any worker with a responsibility to contribute to or use any such document accesses it via a terminal, performs his function, and releases the work product to the computer.

  This work product moves electronically through its processing sequence within the computer-communication system, not as paper, and in some cases may be delivered electronically to the ultimate recipient outside the company: customer, supplier, or government agency, for example. In other cases, a paper document is created at the end of the process and released.
- A multilevel on-line or archival file system replaces paper files entirely with electronic and microfilm storage, and all file material is updated and accessed via terminals. Graphic materials are stored digitally and are accessed or modified via graphic terminals, or stored on microfilm and moved via facsimile.

In other words, the paperless office concept is an extension of office automation to the broader, more free-form procedures which are largely manual or verbal today.

Handling such free-form materials as correspondence and engineering reports through the computer has been pioneered by word-processing and communication word-processing systems, already well established as stand-alone systems using dedicated computers and which are beginning to be integrated into centralized multiprogrammed computers.

Already appearing in newspapers

This type of text processing is particularly well established in the newspaper industry. Quite a number of papers are in various stages of implementing systems in which reporters key their stories directly into crt terminals. Editors call them up for correction and rewriting, and cutting to length, on their own desk-side terminals, and the corrected text goes directly to digitally driven typesetting machines. In some cases, the computer also participates in the page makeup process, and the typesetting machines produce entire pages ready for the printing presses.

As the newspaper adds to the computer such functions as classified ad processing—taking and composing the ads, making up the pages, invoicing the advertisers, and handling the receivables accounting—it is moving closer to the paperless office concept.

The completely paperless office may still be somewhat blue sky, but there have now been some real world trials of transitional systems as well as some pragmatic economic studies which bring paperless office concepts not only into the sphere of practical business planning but also into the five-year planning frame we are talking about here.

And at Dun & Bradstreet

The Dun & Bradstreet Co., for example, is completing the final phase of a totally computerized information system called AOS, the Advanced Office System. AOS maintains current records of financial, payment and corporate performance information of the companies on which it reports—records which its subscribers can access through terminals in their own offices, linked via the local D&B office.

Local regional centers called ALO, or Advanced Local Office Systems, are

fully operational and are collecting over 20,000 reports per day and are entering them through crt terminals into local minicomputers linked to a data base in Dun & Bradstreet's National Business Information Center.

Companies in D&B's Trade Tapes program submit over two million accounts receivable updates per day to be entered into the system. In fact, input via terminal and data communication has replaced most of the traditional clerical and administrative activities required to maintain Dun & Bradstreet's files.

In all, AOS has proven faster and more accurate than the manual system and is making possible new uses of the data base.

And at USC

Elements of a paperless office system have also been implemented and are in use at the Univ. of Southern California and its Information Sciences Institute near Los Angeles. In the system at the institute, sponsored by ARPA/DOD, a DECSystem-10 computer controls a network of terminals in 50 offices. The computer also provides a link to the main campus 15 miles away and is a node in the ARPANET linking these users with others all over the country and overseas (London and Hawaii).

These are some of the key system capabilities: internal and external "mail" is handled electronically. There is a memo message collection and distribution capability, daily task organizers, and a reminder or alerting system. There are multilevel files with archival retention. Report compilation editing software provides a system for extracting data from files and formatting reports. The system implementors have even provided a spelling checking module.

A traveling executive can phone the office and record his verbal dictation. The secretary then keys the information into a terminal and the information is stored in digital form. The executive can then phone the institute, learn if his task is completed, and—if it

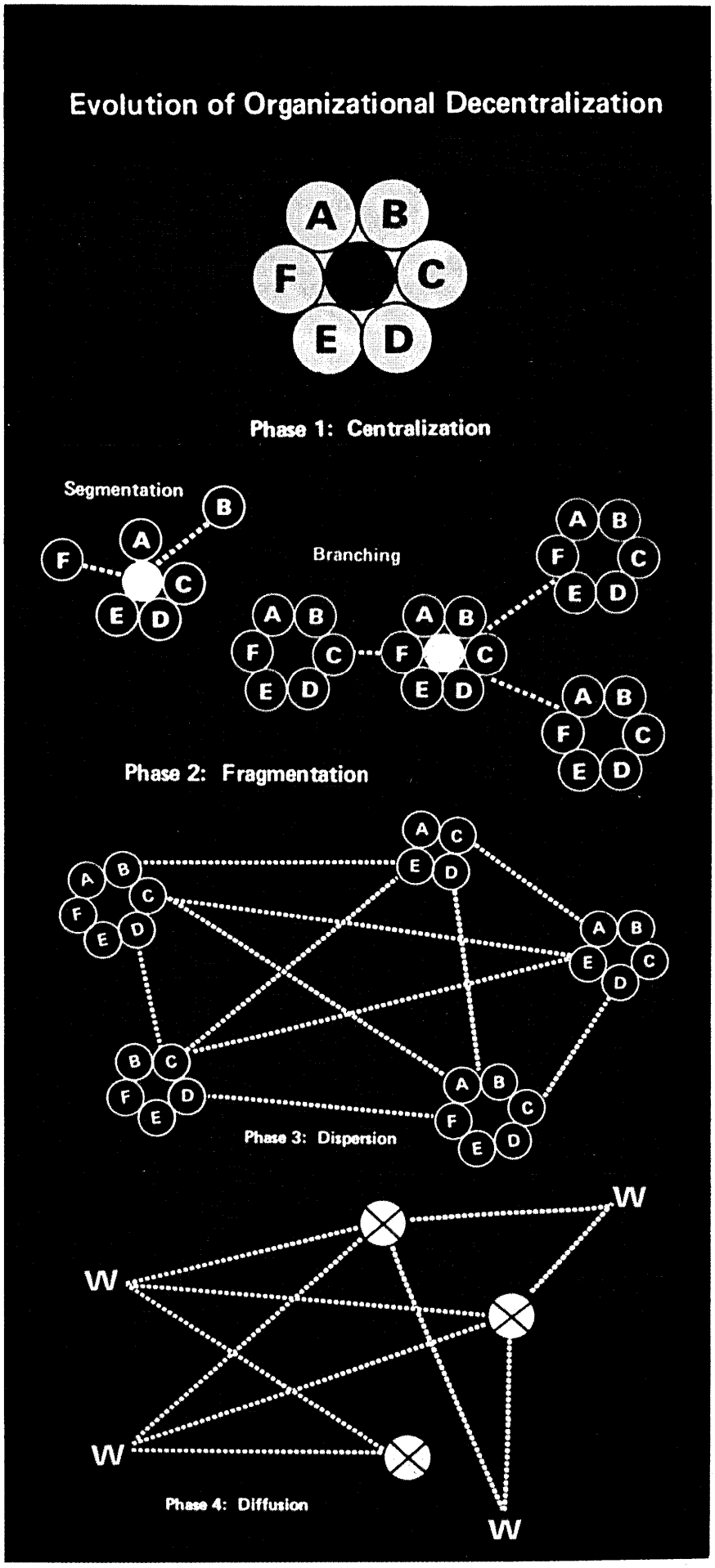


Fig. 3. Business functions are today largely centralized because of the need for each department to communicate with one another, but communication by electronic means can be expected to bring about increased decentralization.

Fragmentation exists today where one function, say data processing, is remote from the administrative center (an example of segmentation), or where the administrative center is duplicated in several locations (branching, as in branch banking).

Dispersion occurs when an employee can report to the work center closest to home, and diffusion occurs when the employee (W) can actually work at home.

Source: The Diebold Research Program

is—obtain a printout via an acoustic coupler and portable terminal. He can make corrections if he wishes, then release the document for routing.

Similar word processing subsystems exist elsewhere on the USC campus. The typical subsystem uses a distribution controller which monitors audio transmissions between executives and secretaries who can communicate with the system from a telephone anywhere and at any time of day. It is possible via interfacing terminals on the main campus to send electronic messages to the Information Sciences Institute or to other locations using the ARPANET mail module.

This system is in full operation today, with existing hardware and software. It has proven to be highly effective, with proper worker training, in performing structured or routine activities; and worker productivity has increased. Technology exists today for a further expansion of the word processing and related executive message transfer activities. When terminals equipped with digital tape cassettes are used, the word processing functions can be accomplished off-line and the information stored on the tape for subsequent transmission to a distribution center. This allows both secretaries and executives to be essentially location-independent.

It has also been found in related research at USC and elsewhere that many management activities can in fact be conducted through telecommunications, especially when they are augmented by occasional face-to-face meetings to refresh verbal and attitudinal cues which are not as effectively transmitted over a narrow-band data link.

Policy lags, not technology

Most of our analysis has been in terms of putting discrete business functions on the computer-communication system: correspondence, records-keeping, invoicing, report generation, and the rest of it. It is beginning to become apparent, however, that by the time we have implemented a substantial amount of this, and are well into the three phases of physical decentralization, that the organizational structure of the corporation has been transformed. We cannot entirely foresee these structures; communications are reframing corporations in forms that we have not yet imagined.

An evolutionary process already taking place in the banking industry suggests the kind of change now possible, or now likely. As remote bank terminals move into more locations and take on more functions—check cashing, accepting deposits, extending credit, and directly transferring funds electronically—the very definition of what is and is not a bank begins to undergo change. Since more checks are now cashed in supermarkets than in banks, are supermarkets now a part of the banking system?

It is difficult to say whether they are, and as a matter of fact regulators and legislatures are wrestling with the problem of defining banking and branch banking right now. Indeed, in many ways, regulators and legislators are going to have as much if not more influence on the future directions of development of corporate data communications as the scientists and engineers.

The technology is here and available *today* to accomplish, not only the kinds of innovation listed here, but some other even more advanced and exciting services.

The delaying factor is not technology; it is policy confusion. Many issues regarding interconnect and the role of the specialized common carriers remain unresolved. The whole philosophy of regulation of cable television systems is unresolved, and as a matter of fact, there are deep divisions over who speaks for the country on communications policy (the FCC? Congress? AT&T?) as well as profound divisions on policy questions of substance.

There is a very exciting potential, however, once some of the problems are overcome, for creating new kinds of businesses and services, in addition to new ways of doing existing business.

Prepare for change

How then are corporations preparing for these changes? Most corporations are not doing enough about the forthcoming information era.

Specifically corporations not only do not have their communications costs under control, the vast majority do not have any sort of an idea of what the costs actually are—or much less what sort of value is being received for the dollars expended. Even the corporations that tightly control dp costs are negligent when it comes to communications costs, preferring to leave far too large a chunk of the total equation to local management. This is particularly true in such areas as local voice services, facsimile transmission, public Telex networks, and other similar services.

Corporations do not yet as a rule put voice and data communications under the same roof. Far too often these are separate roosts and therefore it is not surprising to find line facilities virtually unused between 5 p.m. and 8 a.m. the next day.

Also, while most corporations tightly control selection of central computers, there appears to be considerable hesitation about telling local management what data communications gear to select.

Further, there is no general agreement on how communications costs are to be billed to the using parties, even in corporations which have historically billed back dp services. The same user may receive a free ride on communications, particularly with voice services.

If there is one salient fact that emerges from our research into communications usage among major corporations, it is that a vast majority of corporations do not have a single repository for the facts on communications. The dp group knows everything about data communications but nothing at all about voice, even corporations with central voice departments seem to have little in-depth knowledge of what is happening at local locations. Too often the entire matter is left for the local branch or plant manager, and consequently there is little attempt at achieving corporate-wide economies.

To balance the picture a bit, the record is better in some industries than others. Financial institutions, notably banks, and the airlines—really single product companies—are on the leading edge. However, most corporations are well below the levels where they ought to be when it comes to hard facts regarding communications facilities, usage and costs. And it ought to be clear that without hard and quantifiable data, it is difficult to plan with any degree of intelligence. To plan one must always start from a base of where things are, one must have the foundation firmly established before trying to deal with the more difficult items coming down the road.

Now, what of the future? Where are we going? And how and when will we get there, wherever there may be?

There are some major problems in dealing with a computer and communications based society, not the least of which is attempting to predict the psychology and sociology of the future. Some of the parameters are perhaps dimly known to us. We have suggested several here, but a good part of what we must expect is not yet known as we try to look out 5, 10, and 15 years.

Let's try anyhow. We can do fairly well because there is nothing on the horizon for the rest of this decade that cannot be already seen and touched.

The next five years

The following points appear to be the the most important ones, at least to the corporate computer and data communications planner at present and for the next few years:

First, the wedding, shotgun style, of computers and communications which first began to appear about 1964 continues at a rapid pace. We believe that there will be very few major installations without computer-based communications networks five years from now.

Second, the developments in minicomputers and remote intelligent terminals continues. The spread of these devices opens the door to different kinds of networks—distributive processing is a prime case—and new types of applications.

Third, the user-oriented systems—POS, EFTS, automated tellers, and cash dispensers—are just beginning to take hold but will be an established fact of life by 1980 as the institutions get a better handle on the economies of such systems.

Fourth, the fully wired city will not be immediately forthcoming; costs of laying cable are much too high and there are not yet enough satellites to take up the slack. Fiber optics may first show up as replacements to twisted-pair phone lines in underground cabling.

We must recognize the inevitable, obvious, and natural merger of communications and computing technology.

Fifth, all personnel related costs, such as transportation and mail delivery, will continue to ascend, leaving the door wide open for communications based systems.

Sixth, the demands for service will continue to increase—and it matters little if you are talking about home telephone service, computer related service at 9600 baud, or high speed services for CATV.

Seventh, much of the progress will be a direct reflection of the number of satellite channels made available. It would be curious, five years from now, to go back and plot these curves, because this is the way that much of the new capacity is to be added. In fact, in the less developed countries, this may be the only way to leapfrog transportation barriers in developing health and education systems.

The question which continues to nag at us deals with the mental preparedness of the corporate body to deal with even these small, largely evolutionary changes. We can make the point with a fairly simple example. Some years ago the tv rating services returned their information to the customers weeks after the broadcast date. Today the ratings can be on executive desks the next morning. This speed-up, the reduced information float if you will, enables them to make a decision to continue or kill a series overnight, and has effectively eliminated the time for a groundswell of public opinion to build. Therefore we have changed, without really understanding it, the decision-making time frame.

We may well be ready for communications developments in the technological sense. We are by no means ready in the psychological sense, because we don't really have the foggiest notion of the implications of the technology upon the movement of information. Just because we can make a decision faster does not necessarily mean that it will be made any better, and in fact, it could well be that it will be made poorly.

We can talk about picture phones, tv satellites, wired cities, facsimile transmission, or home banking. What we cannot talk about meaningfully is the ability of the world to adapt to these environmental changes, to learn to ignore minor perturbations in the system, to come to grips with an environment in which a great deal of nonsense as well as intelligent data is being moved about very rapidly. One can almost say that there were some hidden benefits in a high cost of information flow. Perhaps we are on the brink of an era of mass information pollution, with the human animal not mentally equipped to cope with such a broadband input stream.

A public-policy driven future is going to occur when the public policy makers, the politicians, fully realize the impact that telecommunications is having on their world. So they will take whatever actions are necessary to assure that there is an adequate facility over which can flow the maximum amount of information, just the way that governments are today concerned with energy policy, airline policy and highway policies.

Information movement is not well understood, although we have in a physical sense learned how to move a lot of data at a cost that is not unreasonable compared to a few years back. It is safe to say that we must organize for change because it is going to happen and develop structural entities that are sufficiently flexible to cope with information flows far broader and faster than anything with which we now live.

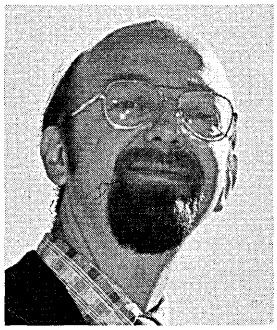
We must begin to live with a regulatory climate far different from today's.

We must come to grips once and for all with the notion that technology, no matter how elegant, is only the servant of the decision-makers, not its master—a problem that the dp world is just beginning to face.

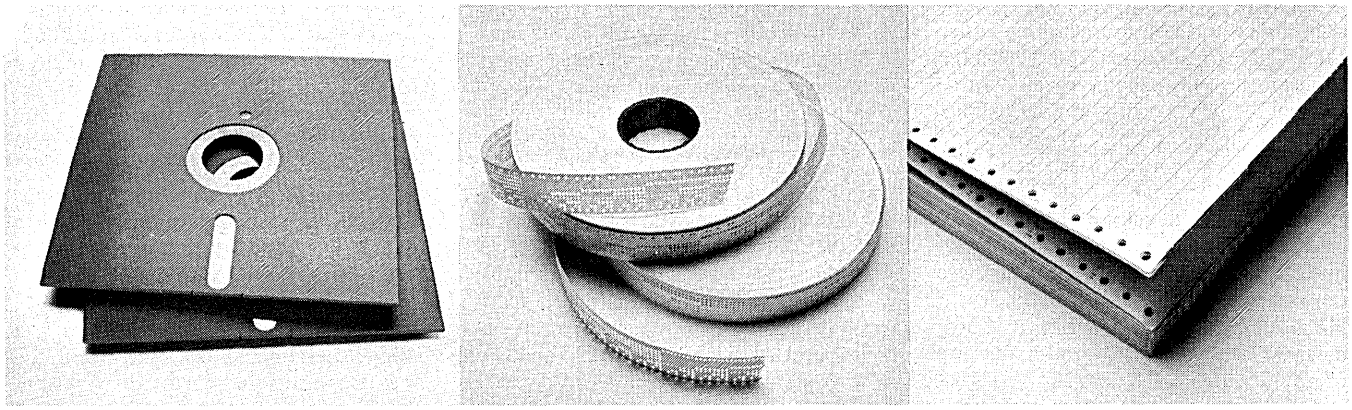
We must recognize the inevitable, obvious, and natural merger of communications and computing technology into a single structure whose purpose is the movement of information in a continuous process from sender to receiver, while recognizing that all detail such as transformations is purely a matter of technology, and consequently is far less important than what we do with the information.

Managers of information and communications technology are faced with a challenge. Are you going to concentrate on providing more cost effective service, a worthwhile objective in itself, or are you going to do more? Are you going to become the architects of the new organizational forms that will enable your corporation to seize the new opportunities of the post-industrial society? ❋

Mr. Ferreira is vice president of the Diebold Group, Inc., and director of the Diebold Research Program for the United States, a continuing study of the impact of future change in information technology which is sponsored by 150 corporations and institutions worldwide. Prior to joining Diebold he was manager of systems implementation for Univac's New York region.



Mr. Nilles is presently the director of U.S.C.'s interdisciplinary program development, where he is responsible for managing research on such topics as transportation, telecommunications, energy, health care, productivity, and urban development. Between 1969 and 1972, he was responsible for developing a major portion of the civil applications programs of The Aerospace Corp. In 1971, he headed a special task force for the prediction of the civil applications of space technology in the '80s. Prior to that he was involved in advanced planning at Aerospace Corp., TRW Systems, the Raytheon Co., and the U.S.A.F.



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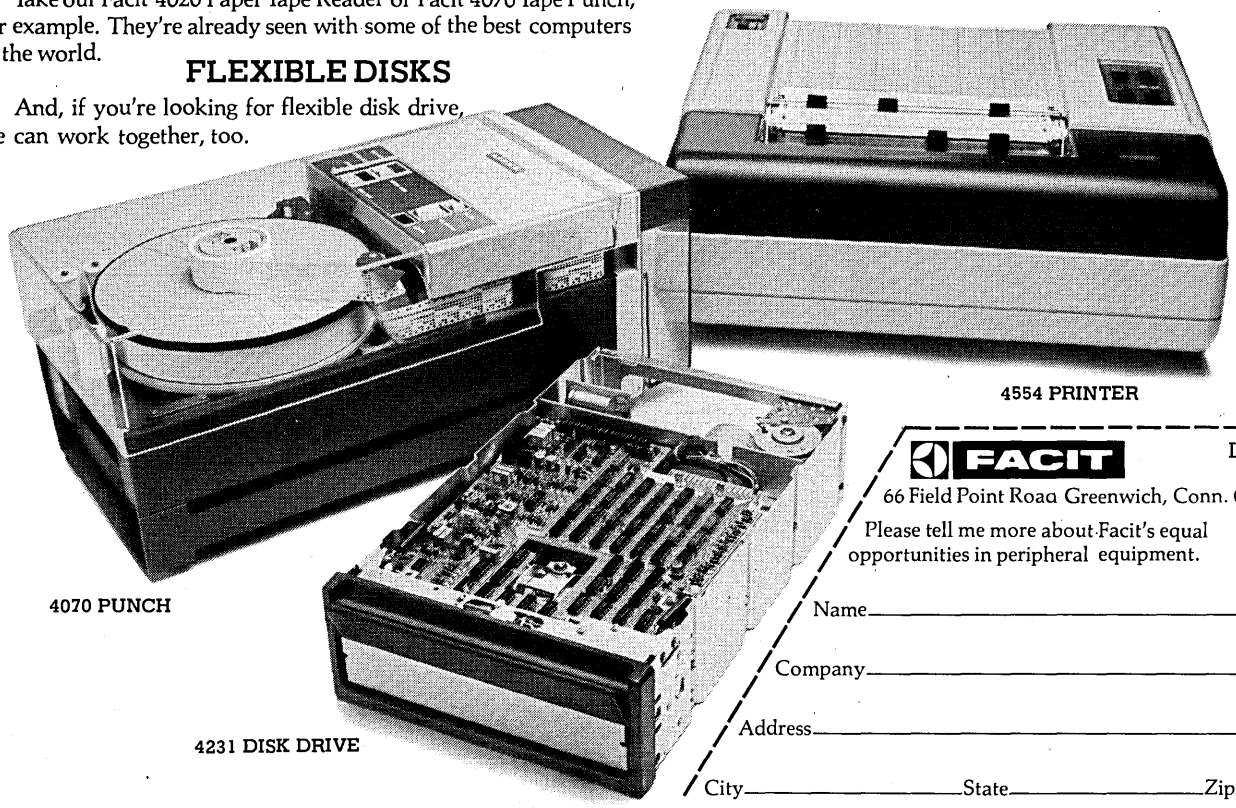

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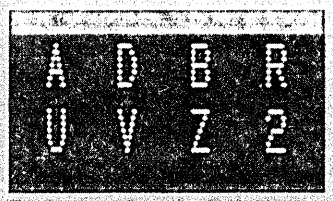

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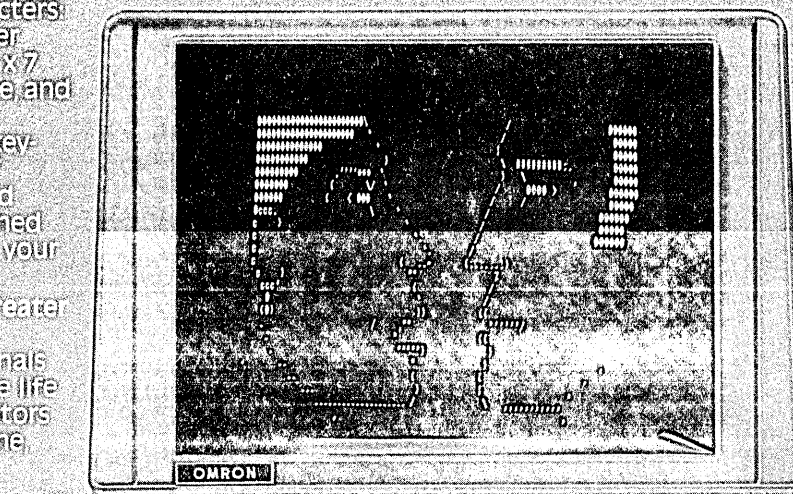

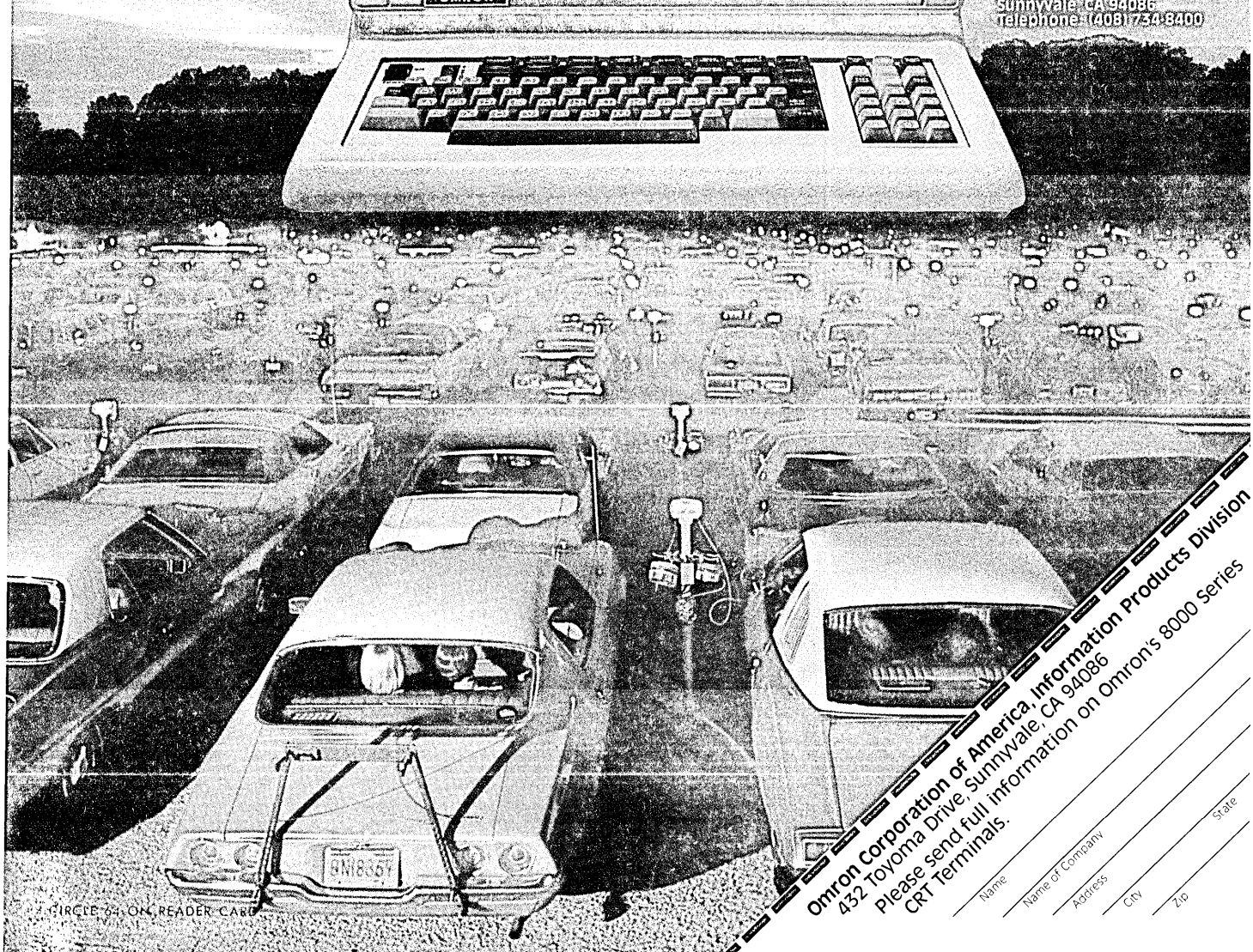

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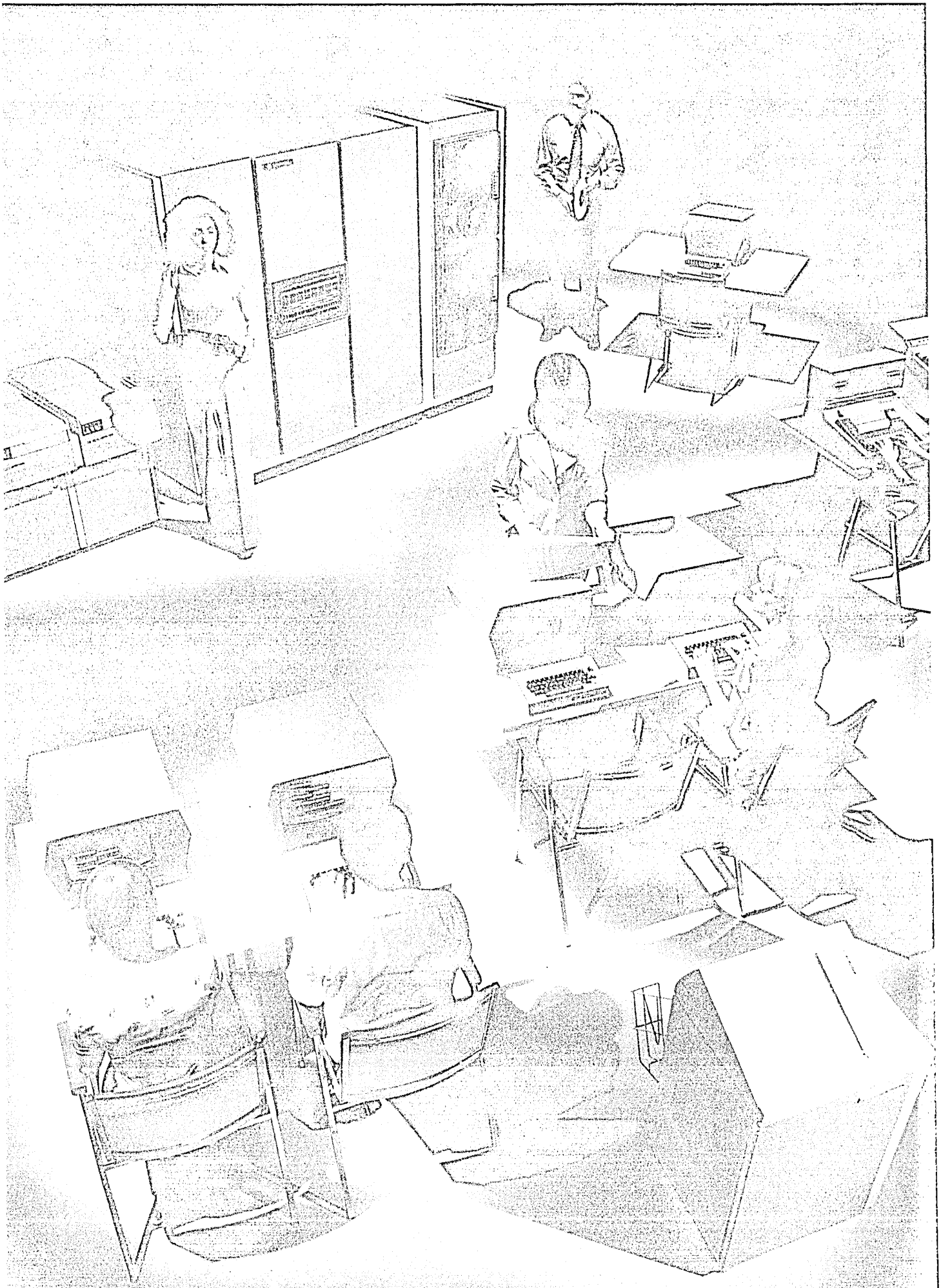

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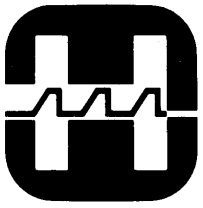


COMMUNICATIONS AND INFORMATION HANDLING

CIRCLE 32 ON READER CARD

info 76

Will it Fly in Chicago?

Still unprofitable, the huge conference continues to offer change. And "Big Ed," its information retrieval system, works better this year. Three hundred speakers scheduled.

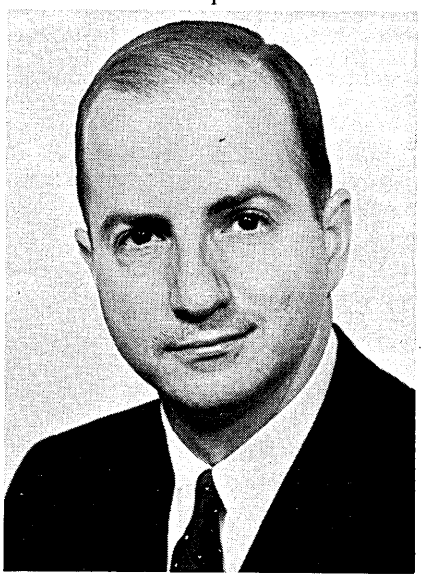
The Third International Information Management Exposition and Congress—Info 76—still is a show looking for an identity. According to its sponsors, the exhibit management firm of Clapp & Poliak, its first two outings in New York's Coliseum drew about 11,000 persons. This year, as it moves to Chicago's cavernous McCormick Place Nov. 8-11, the size of the turnout is anybody's guess—but the sponsors again are hoping for 11,000.

That, plus a turnout of about 150 exhibitors, might put the ambitious alternative to the twice-a-year computer conferences at about a breakeven point in terms of profitability. The Info shows were launched in 1974 after the American Federation of Information Processing Societies replaced the twice-a-year Spring and Fall Joint Computer Conferences with a once-a-year National Computer Conference. So far, they've been unprofitable. And the Info managing director Richard S. Wolcott tells why.

"We're trying to build a new concept of a professional information management conference," Wolcott says. "It's like launching a trade magazine—it takes time, possibly more than three years. Unlike the National Computer Conference, the persons attending Info shows are concerned more with applications and less about the technology of getting it done."

Clapp & Poliak stages some 12 shows a year. Its largest is in the plant engineering field where some 200,000 square feet of exhibit space is sold. Its two smallest in terms of profitability are the Info and pollution engineering shows. "Setting up an identity is taking time," he said, "but we will stay with our original concept."

The conference this year, however, has undergone a few changes. Once billed as a conference for management persons involved in the handling of information—and sponsored by the American Management Associations—it now is divided in interest for both management and the dp technicians. The reason: "a lot of dp technicians show up," said a Clapp & Poliak official. It also includes a series of sessions on "Word Processing" which Wolcott says "may or may not come under computing." But it will get a new crowd—the buyers of text editing systems, the dp people curious to learn if such purchases come under their realm and the clerks and office help wondering how it affects their jobs.



DR. I. EDWARD BLOCK
He's organized program for third annual conference of Info 76

Program of 300 speakers

The program has been put together by Dr. I. Edward Block who is managing director of the Society for Applied Mathematics. Block, as general chairman of the Info conference will preside at a keynote session on opening day: "Information Management: An Old Concept in a New Environment." Paul Schneider, vice president, A. T. Kearney, Inc., Chicago, will deliver the address. A second keynote session on the same day, "Perspective of the Management Information System in the Industrial Organization," will be delivered by Lee J. Pratt, corporate director of management information services, Babcock & Wilcox Co., New York. In all, some 300 speakers will address 91 sessions in 11 major categories as follows: three for those who provide information; 11 for those concerned with dp managment; 14 for those involved in dp technology; and 14 for those who manage office systems. In addition, two seminars are devoted to data processing for small businesses, three on physical distribution management and seven on corporate planning and financial management.

The exhibition

Exhibitors include such well-known companies as Datapoint, General Automation, Hewlett Packard, Honeywell, Burroughs and Sycor in the hardware field and Boeing Computer Services, Cincom, MRI, Pansophic and Cullinane in the software and services business. Wolcott said about 15% of the 150 exhibitors are in the software package business. The turnout of 150 is an improvement over 1975's 110 companies and the 125 who exhibited during the first Info in 1974. Last year's fall-off was attributed to the state of the economy.

In addition to computers and software and services, exhibits also will include communicating typewriters and word processing systems, information retrieval and microfilm systems, as well as dictating equipment and duplicating and copying systems. That's quite a variety of products and services. But the

sponsors are investing $20,000 in a retrieval system that makes it easy for attendees and vendors to get together.

"Big Ed"

It's a minicomputer-based system called "Big Ed" for "Electronic Directory," an on-line minicomputer supplied by Sanders Associates which matches an attendee's buying interests with those supplied by the exhibitors. Clapp & Poliak has been polling exhibitors for information on the hundreds of applications they'll be displaying—or are prepared to talk about—during the four-day exhibit. The information is being compiled on disc at Clapp & Poliak in New York. When it is completed a few days before the show opens in Chicago on Nov. 8, the file will be transferred to tape and shipped to the Sanders Associates model 810 minicomputer-based system at the door of the show.

At the show, the data will be transferred to disc and accessed by attendees. A show visitor, seeking as many as five applications subjects, will present his list to one of five Sanders crt operators who will search the file and present a printout on a 200 lpm printer of all the exhibitors who provide that application, or service, or software package. "It's a move that prevents 'show pollution'—the abundance of signs and literature used by exhibitors to hawk their wares," says Ed Grief, the Clapp & Poliak public relations agent.

The data from "Big Ed" consists of the company, booth number and a five-word description of the product or application.

It's not a new idea. Clapp & Poliak tried the system at last year's Info 75, but it was tied to a remote computer provided by Tymshare, Inc, the national time-sharing network. The on-site Harris minicomputer and printer was hooked to two Tymshare computers, one interpreting the requests, the other providing the information. When one of the three systems broke down, the others went with it. It operated only 20% of the time and caused large lines of frustrated visitors. Recently, Clapp & Poliak tried an improved system at the annual Design Engineering show and had better luck, using a system provided by Service Bureau Corp., a subsidiary of Control Data Corp. However, it was tied to 30 cps terminals which Clapp & Poliak found to be too slow and had to limit attendees to three requests at a time.

It thinks the bugs will be out of the Info 76 system and expects to have about 5 million bytes of information available to visitors to Info 76—or about five or six thousand application packages and the name and booth number of the exhibitor.

Promotion budget

To draw those 11,000 who are expected at McCormick Place, the sponsors are sinking more than $200,000 into a promotion program that includes 23 pages of advertising in 17 business and industrial publications who have a total circulation of more than 1.5 million. It's mailed a 10-page visitor's guide to 420,000 potential visitors and was about to send out a 40-page conference program to 185,000. Tickets for the exposition have been shipped to 750,000 persons through the mail and as inserts in magazines.

The conference is broken down into five "conferences within a conference" along vertical interest lines. For example, 24 sessions are devoted to dp management. These include such subjects as corporate strategic planning for data processing; auditing operations; motivation and management styles in dp projects. Brian Ruder, an information systems analyst at Stanford Research Institute, Menlo Park, Calif., chairs a session on developing a dp security risk management plan. There is a provocative session at 11 a.m. on opening day Nov. 8 covering the subject of why dp projects fail, with seven speakers. And there are such other subjects relating to dp technology as computer networks, data base management, and managing change in data communications.

A session for small businesses discusses the minicomputer in the small business environment. The question is asked: What you need to know before you're committed to one.

A session on office systems discusses applications of word processing. One subject being discussed is: Technologies for information management in office systems. Another covers computer output microfilm trends and applications.

A session on corporate planning and financial management, talks of "what if" planning models and computerized cash management to maximize the return on cash investment.

Sessions on industrial systems approach subjects such as the management information system in the industrial organization and the planning and control systems for small and medium size manufacturing organizations.

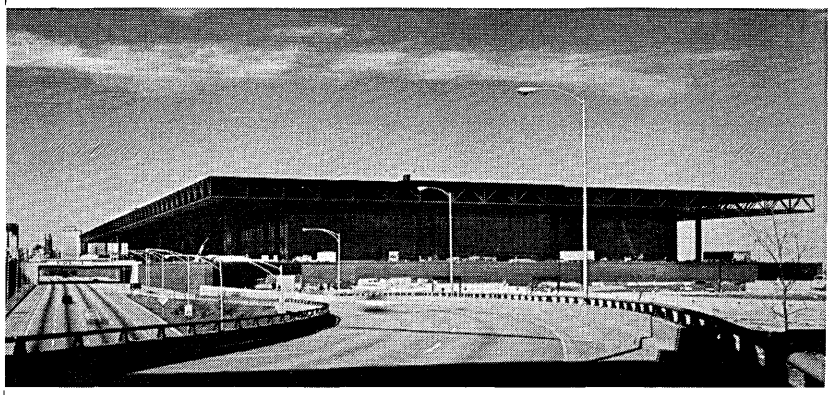
Retailing systems are discussed in another session. One of these, implementing the retail information system and evaluating its effectiveness, features a talk by Jack Hollender of Montgomery Ward.

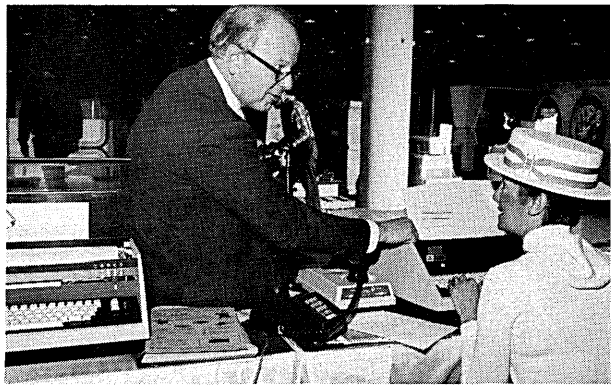
Electronic funds transfer as an opportunity for banks to improve their management and service to the public is a subject to be discussed during a session on banking systems. And John Gould, of First National City Bank of New York, talks of that bank's celebrated use of minicomputers and microprocessors in banking.

Six subjects are devoted to insurance systems, including one on effective planning, implementation and control of the information system in the changing insurance environment.

The expanding hospital market also is being covered in seven sessions one of which includes the question of do-it-yourself or turnkey systems for hospital information systems.

Info 76 fees are $125 for the four days; $75 for two days and $45 for one day. For persons attending the exhibits only, the entrance fee is $1 for persons who have tickets in advance. Drop-in audience pays $5. ✲





SHOW SITE: Huge McCormick Place on Chicago's near south side, looking north to downtown. It's the site of Info 76, Nov. 8–11. Photo at right is from Design Engineering Show, also held at McCormick Place last April when sponsor provided computer listings of exhibitors' products in answer to inquiries by attendees. An improved system is planned for Info 76, says Richard S. Wolcott, shown in photo with data entry clerk.

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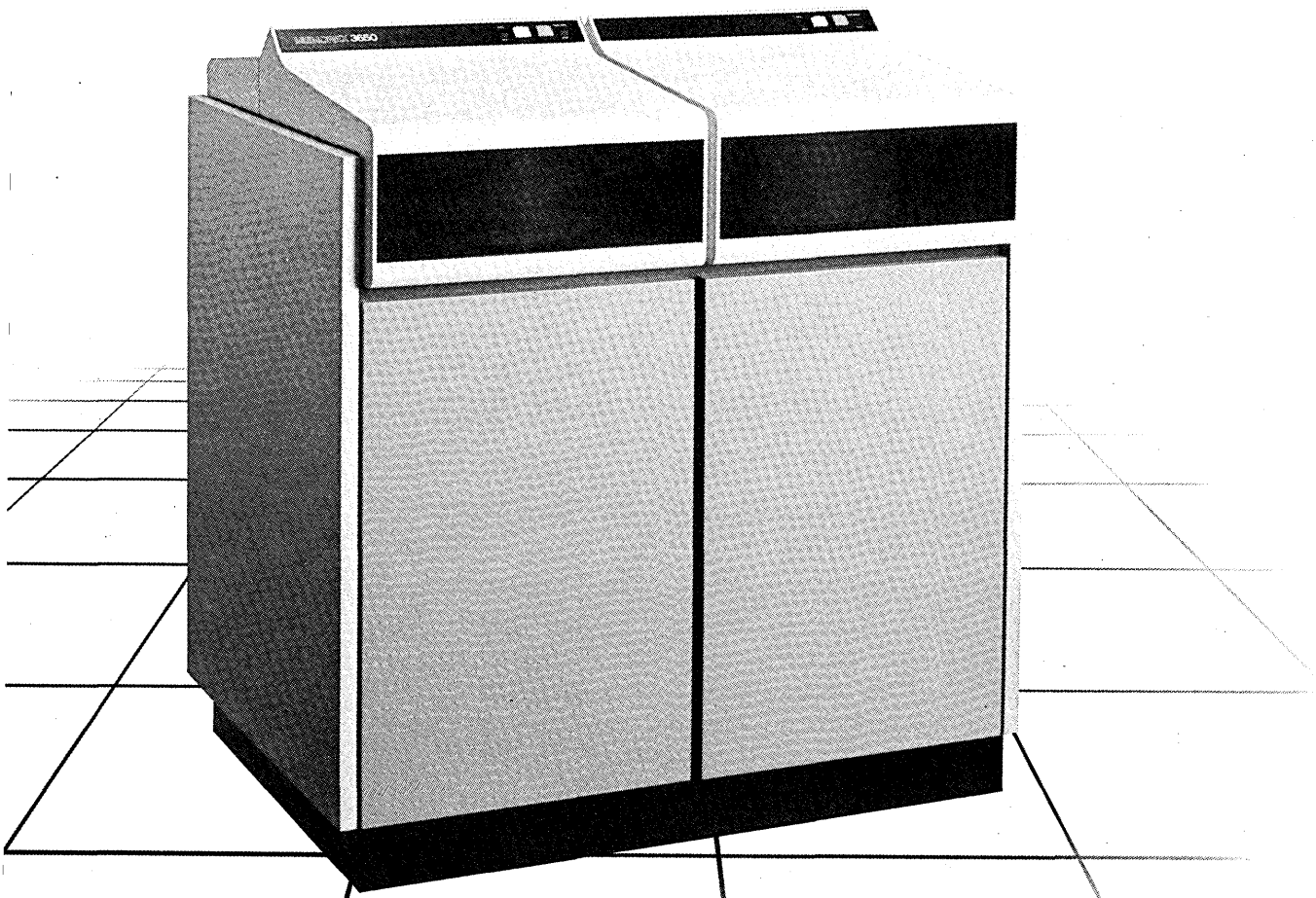

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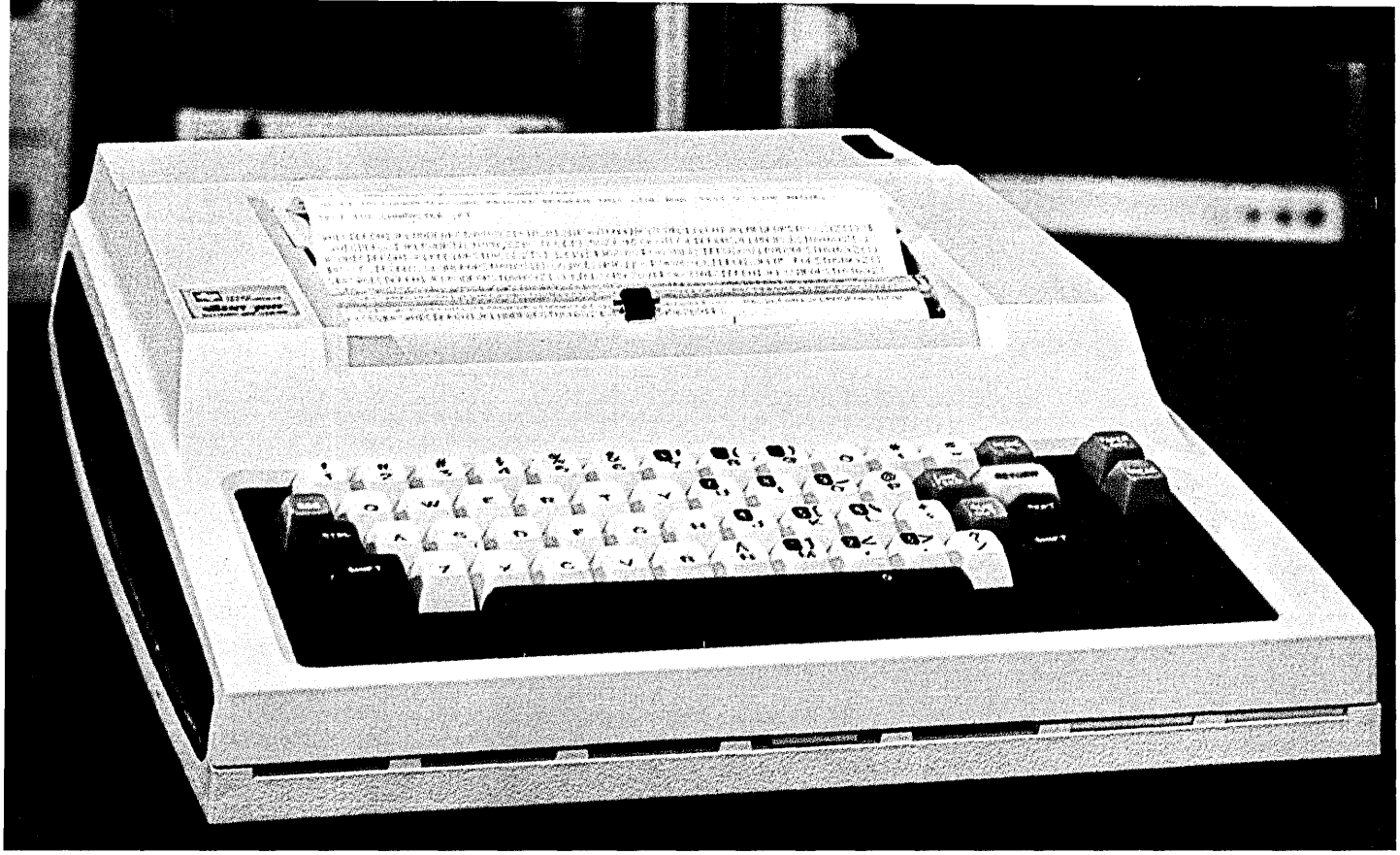

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CIRCLE 39 ON READER CARD

Making Data More Secure

by Rolf Marsh

User-devised security features for 360 OS – also applicable for 370 OS and 370 OS/VS – have achieved much greater control of access to data files than IBM's features.

Software security has come into prominence since the Equity Funding scandal. Management and stockholders alike wonder if their companies are safe from computer "frauds," or if they have systems to catch irregularities as quickly as possible after they occur. While many companies are expert in physical security, software security is another matter. A new look at software security systems is needed to help management detect violations and to make it more difficult, it not impossible, for them to occur.

Currently, these violations can be classified as data set or software related. Unauthorized access to company sensitive data sets obviously would be of interest to competition, or, as in the case of Payroll, could leave a firm open to fraud. In the average company, there are five applications which should, but usually do not, have some form of protection. These are: Accounts Receivable, Accounts Payable, General Ledger, Payroll, and Fixed Assets. Allowing unlimited access to these files, such as testing with production data sets, could invite problems. Testing is more dangerous than most people realize because hardcopy test results are usually left lying about in open view of any person passing by.

The purpose of a security system should be to prevent unauthorized access to these files. Usually such access is not noticed at all, or noticed only after the fact through some method such as SMF accounting data, other accounting routines, etc. The operating system and its components are also vulnerable both to accidental and premeditated destruction. Storage protection hardware features help, but if they are bypassed, there is usually no backup protection. A security system should trap all attempts to get into a storage protect key which bypasses the hardware checking—and hopefully at not too expensive an overhead.

If there is a will to penetrate a security system, there will be a way. There is no certain protection now, for the most part, against such penetration, but protective measures do help. And in general, the more sophisticated the software security, the greater the overhead.

Most auditors will accept a system that provides security and has an audit trail for their perusal. The general feeling among auditors is that "something" is better than "nothing"; that is what a software security system can do—provide *some* protection where there previously has been none.

As long as auditors are satisfied, management can rest easier, but not to the point of dropping its guard. It is entirely possible to find new holes in a security system as soon as previous ones are plugged. Access to company sensitive data, more and more of which is being stored in computers, should be of prime concern to the security conscious manager. For management to act, it should be aware of what is generally being done about security as well as what is available.

Flying Tiger Line, the world's largest all cargo airline, had a problem common to many dp installations. When an audit was held, it was found that an auditor dumped the Payroll master file. On looking into this, we found that *anyone* in the company could access any data set at any time. To further complicate matters, we do the processing for other subsidiaries of our parent corporation, Tiger International, employees at those subsidiaries could also access any data set in our system. Furthermore, there was no "surefire" way to correct the problems immediately.

A project was initiated to examine what was available. Our requirements were that the system chosen have a low overhead, yet protect all data sets. It should be noted that we use COBOL and other high level languages, standard labels on all tapes, and that our programmers, for the most part, are unaware of the inner workings of OS and HASP. Among the systems we investigated were IBM's earlier work.

Resource Security System

Several years ago, IBM contracted with several organizations to look in depth at software security in the 370 operating systems. There is, however, nothing for the 360 series operating systems.

An attempt was made in the late '60s to provide some protection for defense-oriented installations; the resulting system was called Resource Security System (RSS). Not only was this a major change to the components of OS, but it also necessitated the hiring of yet another person, the security officer. In addition, the overhead to accomplish the task of software security has been estimated as from 5% to 20%. This was unacceptable to most installations.

This high overhead can be traced to the basic design and premise of RSS, which had so many modifications to existing code and was designed to fit over OS, not inside it. RSS was an option for OS Release 18, but was pulled from distribution in subsequent releases. Some work was done later by a few installations to adapt the multitude of coding changes to later releases, but as far as this author could discern, no installation was successful.

Software security lay dormant for several years after the introduction of

MAKING DATA MORE SECURE

RSS. IBM never gave OS the security that was needed, and it remained for the user community to devise something that would do a better job.

Security techniques

One of the techniques tried—and probably the most common technique presently used—is encryption. This method of security takes a file, or fields within a file, and translates one set of characters into another. However, there are two drawbacks to this method of security. First, there is the high overhead associated with encrypting an output file and decrypting an input file. Second, if several programs share the file, then the cryptographic algorithm must be available to those programs as well, and the more programs that use the algorithm, the greater the chance it will not remain secure.

Although encrypting is possibly most popular because of ease of use, its overhead is a major drawback along with its failure to restrict access. The latter is particularly dangerous because if access is permitted, a sharp programmer can, with a little effort, break the code—and he would probably use the computer as an aid! Several companies market packages which can be called from a user program to accomplish the encrypting/decrypting of files.

Another method of security is operator monitoring. In a small shop where there are not too many data sets or programmers, the computer operator is given the unpleasant task of guarding the company data sets. However, not only is this not good business practice, it is highly unreliable. Operators normally are rushed and often overworked so that they may miss things that come up, or even inadvertently let something slip in. If there is no reporting system, or if the reporting system can be bypassed, nothing has been accomplished except to give management a false impression that the data sets are secure.

Of course, there is the honor system, whereby management is convinced that everyone who works for the company is honest, and that "it couldn't happen here." Needless to say, such installations are becoming fewer. With rapid turnover, and especially with the growth of most dp installations, it is becoming increasingly difficult to know each employee well.

With all these things in mind, we decided against a security system on the scale of RSS, but rather for something that would protect data sets and would also be expendable. The overhead for encryption was also found to be too high.

We finally decided to design our own system, especially when we found that another installation with a similar problem did so with success. By writing our own, we could tailor the code to our standards and thereby keep the overhead to a minimum.

We used as the basic theory of design a concept developed by Philip Schwartz and Marcus Morgan of the Univ. of Florida, one in which the user and data set are matched within a matrix.

Dataset Security System

As stated, a security system should prevent unauthorized access to software components and critical data sets. In addition, it should note the attempt and identify the perpetrator so that follow-up activity can be initiated by management. One such system, Dataset Security System (DSS), has been designed and implemented at several installations. It uses the 360 OS but is so general in design that it could, with a little effort, be adapted to almost any operating system.

This system does have holes in it, but for the normal business dp installation, where programmers are busy and don't have time to experiment with assembly language code, it will do the job it was designed for. And with a little effort and ingenuity, the holes can be plugged by a capable systems programmer.

The DSS has as its basic premise that to access any data set, the program must supply information and go through OS Open routines. Under DSS, these Open routines are modified to transfer control to the password read routine. This routine now matches the user against the particular data set the program wishes to access. The job is logged and abnormally terminated if access criteria are not met. If the job and program are allowed access, and a logging of the access is requested, then an SMF record is written to notify management of the access.

The necessary criteria of a software security system for data set protection, namely the prevention and notification of unauthorized accesses to confidential data sets, are included in the system. However, we immediately see a gaping hole, that of the OS function called Bypass Label Processing (BLP). The cover for that hole is to change the OS reader procedure to negate BLP.

What we did

The matrix theory that formed the basis for our design had many possibilities: ease of maintenance, expandability to include new data sets with a minimum of overhead, and the capability to be used as a basic building block for further enhancements. In ad-

"True, we don't give out personal information, but every once in a while the computer takes it upon itself to spill the beans."

© DATAMATION ®

dition, if by chance or accident someone discovered how DSS worked, the matrix could easily be modified to challenge any security compromise.

All modifications were made to the OS open routines; SMF exits were taken to create, update, and delete control blocks used for each job for its duration. HASP is used, to provide certain identifying information used by DSS, but it is not a requirement. If HASP is not used, a hook in the OS Reader/Interpreter could just as easily perform the same function.

At the present stage of implementation, we have two OS machines coupled through HASP Shared Spool. Since the modifications reside in OS, DSS is not affected by the method of machine coupling. The code is structured so both tape and disc data sets are protected by the same password read routine. Obviously, this is designed for an installation which uses standard labels. The Open routines can be modified to link to a user-written routine that can validate any user defined criteria regarding the use of each data set. As previously noted, we negate the Bypass Label Processing function because it is the most vulnerable place from which to penetrate the DSS.

The major component of the DSS is a set of two tables and a matrix that reside within the Link Pack Area of OS, a place where it has some protection. These tables are the Dataset Name Table (DSN) and the User Group Table (UGT). The matrix, which is the heart of DSS, is the Data Attribute Table (DAT).

The DSN is a table of data set names to be protected. This table consists of fully qualified names, (e.g., SYS1. PROCLIB) and an offset into the DAT.

The UGT is a table of users who have access to the computer. If a user is not in this table, he may not access any restricted date set. Conversely, a user must appear in this table if he is to access any data set that is listed in the DSN table. Each installation can define its own identification criteria, as long as it is common to all jobs. One method is to use the accounting number, the job card, or the programmer name. Each user has an associated offset in DAT.

The DAT is a matrix, one axis of which is the offset obtained from the Dataset Name Table. The other axis is the offset obtained from the User Group Table. Together these two offsets will point to a particular cell within the DAT matrix. Within this cell are access codes for each unique data set-user combination. The possible accesses are Read, Write, Update, and Fetch. Using the four low order bits of a byte, these can be converted to a mask; the high order four bits of the same byte are used as modifiers such that if a job must be in production status before it can access a particular data set, then the bit which corresponds to production must be a "1" bit. The matrix then is one byte for each unique data set-user combination. To add data sets or users would expand the matrix in proportion to the number of users or data sets respectively.

The above tables and matrix reside in SYS1.LINKLIB, which in itself is a protected data set. The size of the DSN is a function of the length and number of all data set names to be protected. The size of the UGT is a function of both the length of identification criteria and the number of users in the UGT. The size of the DAT is a function of the number of data sets to be protected and the users who are authorized to access those data sets.

Updating the tables requires an IPL, since they are permanently resident, although residency is not a requirement. Since every opening of a data set must access the tables, it is more efficient to have them resident. Overhead has been estimated at approximately 3%.

The DSS is activated as part of the IPL process. The tables are loaded and the address of start of the first table is stored in the nucleus. Within the first table are the addresses of all the remaining tables, as well as any other needed information.

Flow within DSS starts when a job is read by HASP, either from a local reader, a remote reader, or the internal reader. Several restrictions are placed on what type of job can be read on remote readers, (e.g. tests only). The status of the job is thus determined by user defined criteria and the location and type of reader the job is being read from. This status determination is accomplished by changing the first byte of the programmer name field because it can then be submitted to OS with a minimum of effort and overhead.

When OS receives the job from HASP, an SMF exit obtains core and builds the User Accounting Table (UAT) which contains such information as jobname, the current program name being executed, user ID number (obtained from the UGT), accounting number, programmer name, and flags.

As each step is initiated, the current program name is updated in the UAT. A pointer to each job's UAT is kept in its respective Task Control Block (TCB).

When a program opens a data set, the open routines determine how the data set is to be used (input, output, etc.) and calls a verification module. This verification module takes the user ID number stored in the UAT, and checks the data set name to determine if it resides in the DSN table of protected data sets. If it is not in the table, this indicates that this data set is not protected and normal flow continues.

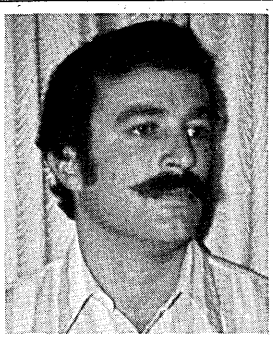
If the data set name does exist in the DSN table, the offset into the DAT is obtained and a computation is made to point to the correct cell in the DAT. The verification module then compares how the data set is requested to be used by this particular user as opposed to how it is supposed to be used. If access is allowed, normal open processing proceeds. If access is not allowed, the user is abnormally terminated, and a record of the entire violation is written to the SMF data set for later reporting to management.

This logging function is controlled by an entry in the matrix and can be used for logging access to certain sensitive files, or for attempting to override the DSS. An override code is built into the DSS to allow one person to bypass the DSS if there are any unforeseen problems in the code or tables. Once this override has occurred, system design forces the responsible person maintaining the DSS to submit a new override code.

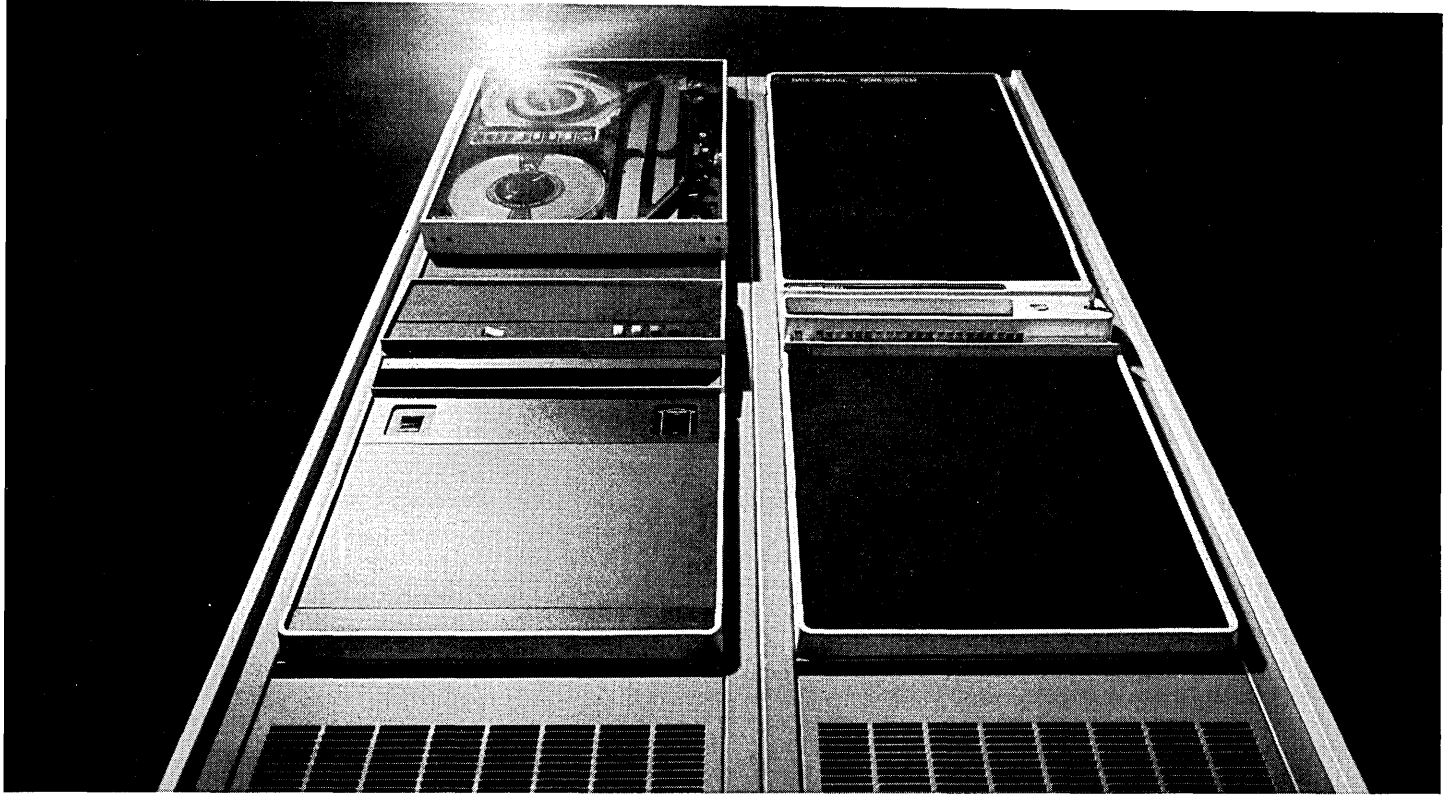
And so . . .

Time to design, write, test, and implement the DSS was less than 30 man days. Initial problems were few, mostly consisting of the omission of data set names or users from one or more tables. The system was well received by management; acceptance by programmers was not quite so good since many had to change their style of testing.

We now believe we have greatly improved control of access to our data files. No longer can someone go to one of our RJE terminals and dump the Payroll master file, which was the act which caused the whole system to be created. Because of this security system, we now can boast of something very few installations have—a method of prevention and detection of unauthorized access to sensitive company data sets. ❋



A systems programmer for ten years, Mr. Marsh is with Flying Tiger Line in Los Angeles. He was previously with United California Bank. Mr. Marsh also teaches data processing courses at Los Angeles Valley College.



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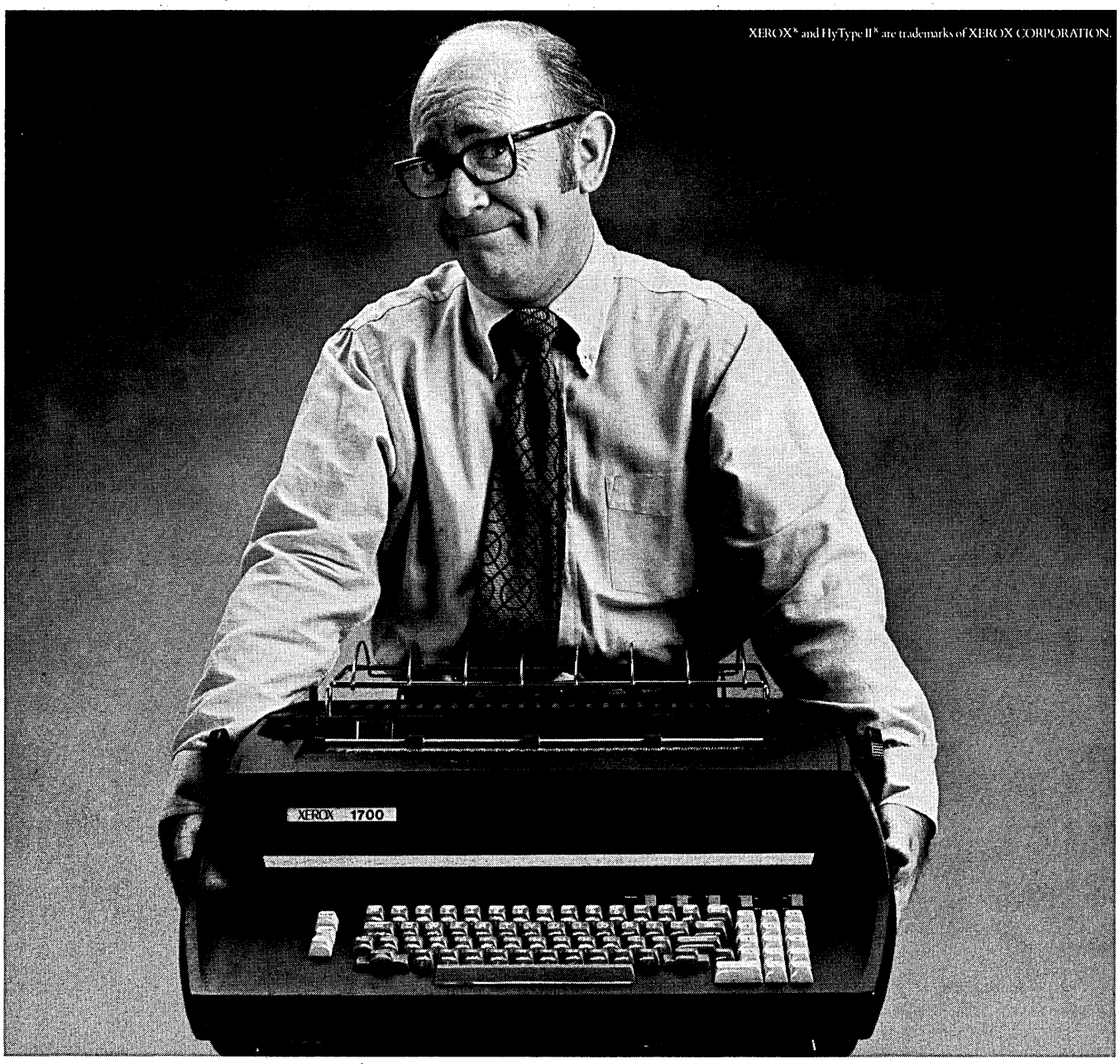

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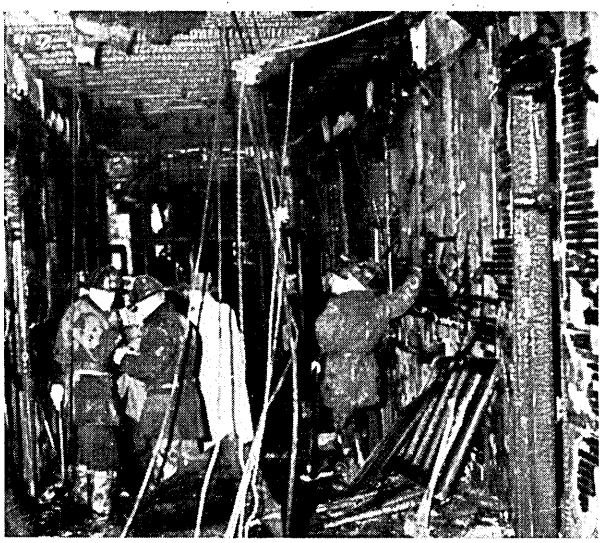

The gloomy fact is, even a minor blaze can cause enough damage and business interruption to close you down for good.

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This all adds up to two very important advantages you don't get with other fire protection methods: 1. A Fenwal system gives you the fastest jump on the flames because you don't have to evacuate the area before it's released.
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We believe our Halon Fire Suppression Systems are the solution to a lot of serious fire problems.

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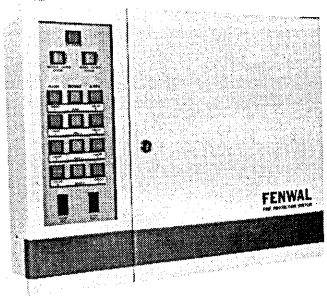

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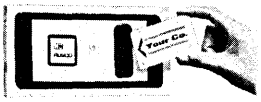

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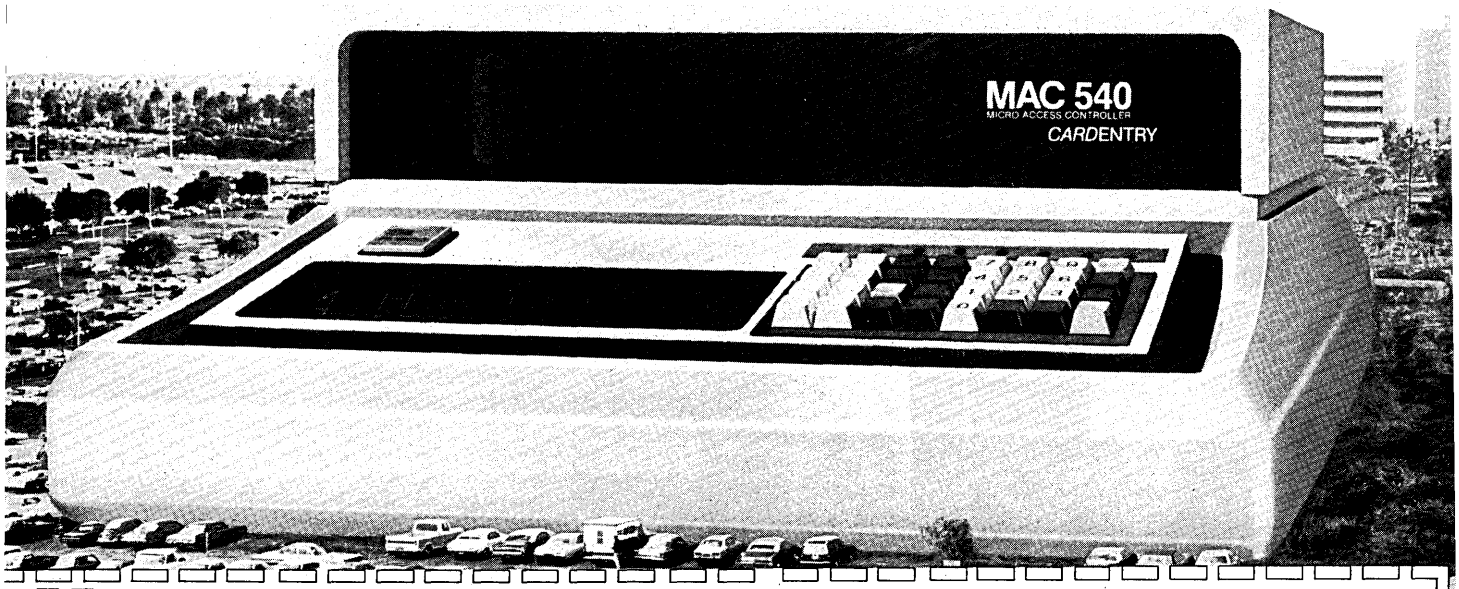

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RAMIS REPORT #4

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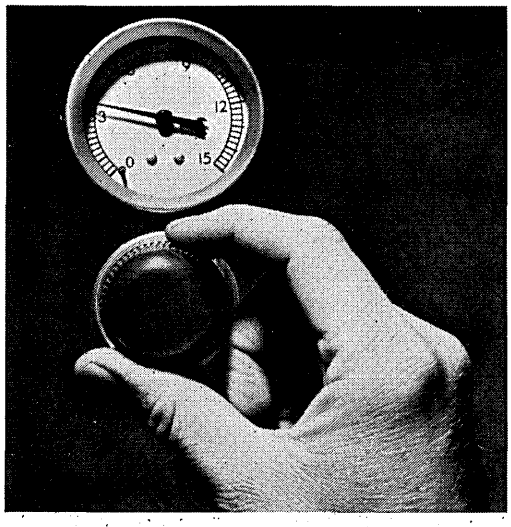

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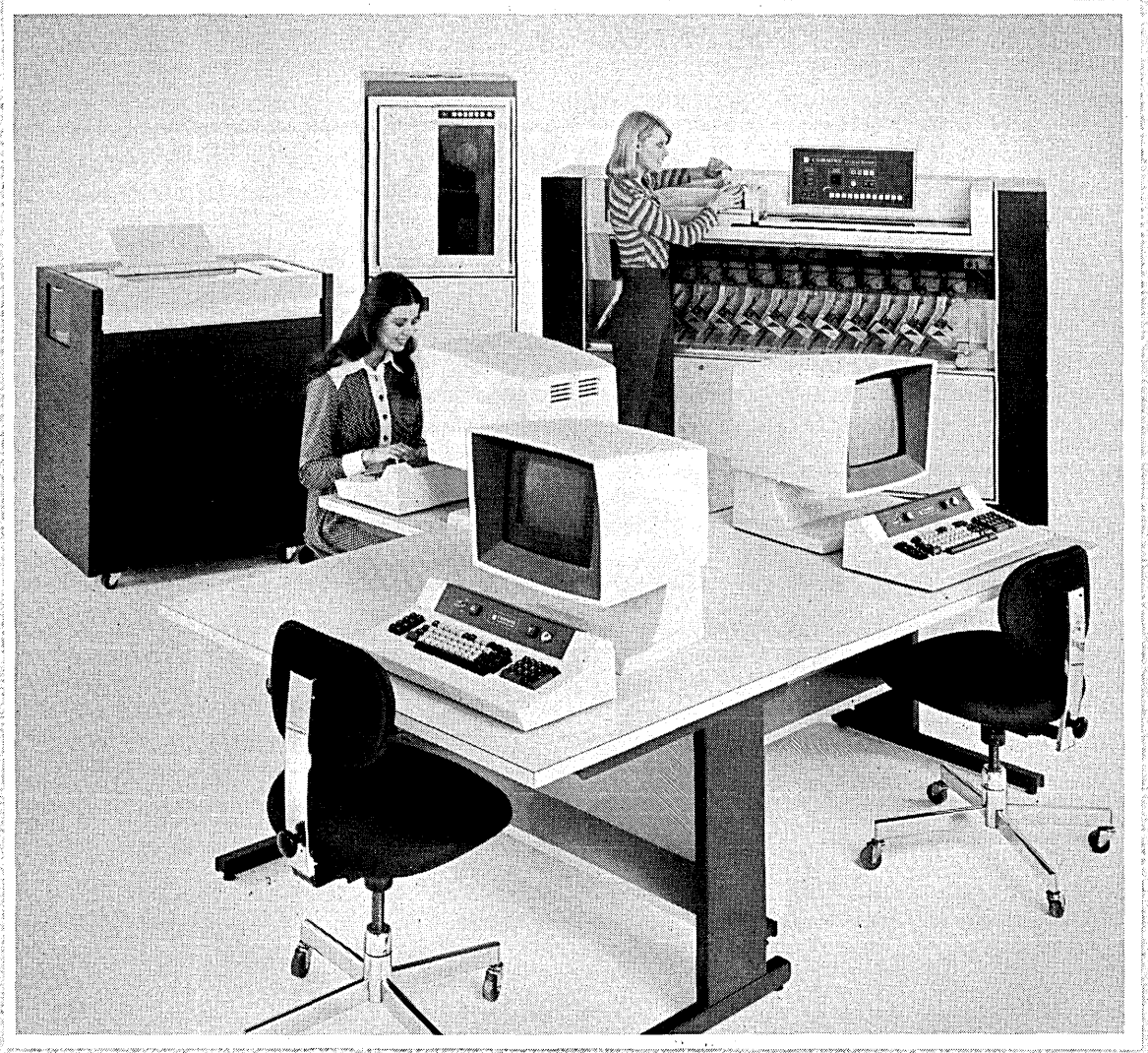

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Converting to a Mini

by David R. Black

Converting 300,000 lines of COBOL was easier than finding a vendor with a straight story and adequate support for a commercial user.

Minicomputers have made COBOL very economical for the small businessman. Using COBOL on a 16-bit minicomputer, it is possible to store a hundred million characters of information on disc, maintain four terminals, and have excellent processing speed for an approximate cost of between $50-$60,000.

But, like all investments in the computer field, there are pitfalls that must be avoided if the COBOL operation is to be implemented successfully. For one thing, the credibility of many vendors of hardware and software is presently very low.

Minis became an absolute necessity in our operation as rising telephone rates increased our time-sharing costs, forcing us to raise prices for services to our customers. Through our subsidiary, Aviation Administrative Services, we provide turnkey administrative and accounting services to various flight service operators in the United States and Canada. These dp services include automatic invoicing, inventory maintenance, billing, ordering, etc., for firms selling aircraft parts, fuel, or service, for instance.

Our original operation involved using a DECsystem-10 at On-Line Systems, Inc., a Pittsburgh time-sharing firm, and multiple terminals at the various airports. On-Line was excellent at providing the support we needed in the early stages of development and implementation. However, as client usage increased to 10-12 hours a day connect time at each location, it became more difficult to maintain an economical operation in the time-sharing environment. The telephone line charges were exceeding the computer costs substantially.

In November 1975, we recognized that a new solution would have to be found if we were to remain economically viable. At the same time our disc storage requirements had increased substantially, creating additional economic burdens which were becoming out of line with the revenues that would be generated. After examining various alternatives, we decided that minicomputers would be our solution if they could be interfaced successfully into the time-sharing environment.

We had two basic requirements. First, the 16-bit mini configuration had to run less than $40,000 in volume. (We expect to use hundreds of systems to justify this price. A list price for a system fitting our requirements would be in the neighborhood of $60,000.) Second, it had to support COBOL. Both requirements sound comparably simple, but as time progressed, the cost turned out to be the simple requirement, and the COBOL requirement much more difficult.

The purchase of the equipment was quickly solved by soliciting bids from several vendors. Configuration requirements were 80 megabytes of disc, 64K of main storage, four to eight terminals, and auto-dialing. The operating system had to provide COBOL support, Record Lockout, and multiprogramming capabilities. This type of configuration was nonexistent in 1974 or even early 1975; but by the fall of 1975, a number of vendors had entered the field with the price performance we were looking for.

With the equipment problem resolved, it became a question of COBOL capabilities. The aviation system has more than 300 COBOL programs. There is a great deal of standardization throughout the programs, and over 40% of each individual program comes out of a COBOL COPY library. The actual numbers of lines of code in the system is slightly in excess of 300,000.

It was apparent to us that a manual conversion would be impossible. We had to find a COBOL which would handle all the functions we had implemented, and have no new data or format requirements that would substantially alter our programming. (We work in almost a subset of ANSI 74 COBOL and do not use any of the powerful table-handling or other complex features. This made the evaluation of the COBOLs and conversion of our programs much easier.)

Immediate delivery is 45 days

By the end of January, we had narrowed our search to two suppliers. An order was placed for immediate delivery of one system from one of them to be used for conversion and testing, with the remaining systems on scheduled releases starting in 90 days. The first development system was to be rented.

The "immediate delivery" date of the system was to be within 10 days but actually took over 45 days. Further, the I/O devices were not to our specification and needs. However, after some initial problems, the hardware was made operational.

Conversion of the existing DEC 10 programs was started in January at the time the selection was narrowed to two vendors. A program was written which would make the changes necessary to the SELECT, DELETE, NOTE, COMPUTATIONAL, ACCEPT, and other statements. The program converted all changes with the exception of the use of a symbolic key on random read statements, which were flagged for manual corrections. The COBOL statements were also converted to card image formats with sequence numbers and identification.

With the hardware operational and programs converted to punched cards, the implementation was started. The first programs converted consisted of several small utilities. These ran suc-

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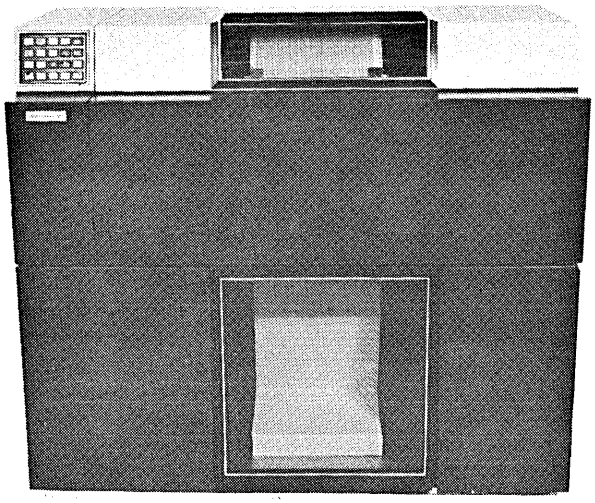

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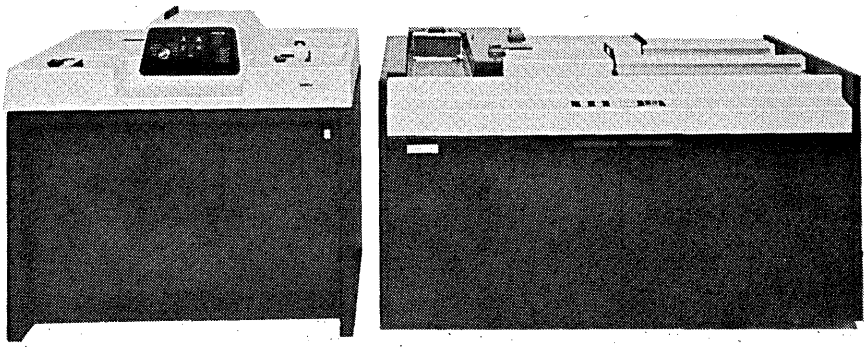

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cessfully. We were feeling very comfortable at that point, but the difficulties were still ahead of us.

On the third day of processing the COBOL compiler destroyed the monitor. By that time we had received some additional equipment from the supplier that was to have been delivered with the original cpu. We attempted to generate a new system monitor for the new configuration from the material supplied us at the time of initial installation. It was impossible to create one based on the manuals supplied us and the initial punched cards supplied by the manufacturer.

Our request for some technical support from the manufacturer was not honored. After four weeks of trying to beg, cajole, and plead with the manufacturer, we were still without support in recreating a monitor. With support problems and no monitor, we elected to cancel our order with that manufacturer. After the cancellation notice was delivered, we were provided with all the support we wanted for the moment. But we had no intentions of continuing with that vendor.

We again returned to the marketplace in search of a system which would meet our initial requirements. By this time several additional vendors had entered the field with COBOL. We chose a new supplier, who again prom-

Checking Out the COBOLs

The accompanying chart is an analysis, based on our experience, of the COBOL*s supplied by several minicomputer manufacturers. The parameters we used in the comparison are explained as follows:*

Manufacturer, model number, and *operating system* are self-explanatory.

Source of COBOL. Quite often the equipment manufacturer did not write the compiler that is implemented on its machine. In several cases the compiler was written by a third party, but maintenance and support is supplied by the vendor. We question, based on our experience, the support that a third party supplier will give a customer without pressures from the vendor.

Multi-Terminal. We required that a minimum of 4 and a maximum of 8 terminals be simultaneously operational under some form of multiprogramming. That is, each location could be executing interactive programs at the same time. We recognize there would be some degredation of processing speed but the low volume and the relative slowness of human interaction at each terminal would not make it noticeable to the user. We have found no problems with any of the suppliers in processing speed for our requirements.

Note that an evaluation, on the part of the user, of the method of assigning devices is necessary to get a true picture of the multi-terminal capabilities.

Time slicing. There are three methods of handling a multi-terminal situation. The operating system can cause the program to execute on a time-slice basis, on an I/O interrupt basis, or a combination. We have found that the time-slicing capabilities provide better user support and a smaller operating system.

Record Lockout. In a multiple terminal interactive environment, several people could wish to update a file simultaneously. Only with record lockout is this possible. With a file lockout, only one person can execute a program at a time.

Overlay. The ability to overlay segments of COBOL programs reduces the amount of core necessary. (Unfortunately, we could not use the overlay facility due to the type of work we were performing, but others have designed their programs so that overlay capabilities would be useful.)

Paging. Program size becomes more critical on a minicomputer. A 16-bit machine has program size limits due to address limitations. In most cases, a manufacturer will supply some method for processing larger programs. This may be a mapping function, a paging function, or some form of virtual storage.

ISAM Support. The Index Sequential Access Method is necessary for our operations. All 16 data bases in our system are interrelated using ISAM. There are ranges of capabilities supplied by the various manufacturers in this area. All manufacturers familiar to us provide random access and sequential access to the various files. Surprisingly enough, the file handling capabilities have not been a problem.

FORTRAN/BASIC. For some of our applications we need to mix FORTRAN with COBOL. We feel an operating system should have the ability to process both FORTRAN and BASIC for other applications within an installation.

Label Size. We were surprised to discover that one supplier only used a 12 character label instead of the normal 30 character COBOL ANSI standard. This created problems at evaluation time in the use and testing of its system.

Compute. One of the most surprising discoveries in our evaluation was that most suppliers did not implement the COMPUTE statement. Implementing COMPUTE is not that difficult. At the same time, the statement eases the programmer's load substantially. In our conversion we wrote a program using the Bauer-Samelson algorithm for converting COMPUTE to a simple multiply/divide, add/subtract capability.

Sort. Most suppliers have not im-

Manufacturer	DATA GENERAL	DIGITAL EQUIPMENT	GENERAL AUTOMATION	INTERDATA	TEXAS INSTRUMENTS
Model Number	NOVA 3/12	PDP-11/34	440	7/16	990/10
Operating System	BLIS	RSTS/E	MTS	OS/16	DX10
Source of COBOL	3rd-party[1]	DEC	GA	3rd-party[3]	TI
Multi-Terminal	yes	yes	yes	yes	yes
Time-Slicing	no	yes	yes	yes	yes
Record Lockout	yes	yes	yes	due later	yes
Overlay	yes	no	yes	yes	yes
Paging	yes	yes	no	no	yes
ISAM Support	no	yes	yes	yes	yes
FORTRAN/BASIC	no	yes	yes	yes	yes
Label Size	12	30	30	30	30
COMPUTE	no	yes	yes	no	no
SORT Verb	no	no	yes	no	no
88 LEVEL	no	yes	yes	due 10/76	no
ACCEPT EDIT	yes	no	no	no	yes
INSPECT/EXAMINE	no	yes	yes	yes	yes
COPY	yes	yes	yes	yes	yes
Interpreter	no	yes	yes	no	yes
Compile Rate (lines/min)	40	200	200	100-150	250
Words Req'd./Source line	30	8	8	13	9
Approx. Hardware $	$42,000	$48,000	$37,000	$26,000	$30,000
Approx. Software $	$ 2,950[2]	$12,000	$ 6,000	$ 7,500[2,4]	$ 7,000[4]

[1]Information Processing Inc., Orlando
[2]with attached sort module
[3]Diversified Data Systems Inc., Tucson
[4]One-time charge for first copy of compiler.

This table is not meant to be all-inclusive. The number of minicomputer manufacturers offering COBOL is changing rapidly. Not included here, for instance, are: (1) Hewlett-Packard, left out since its system price was out of bounds for this application; (2) Modular Computer Systems Inc., which tentatively plans to announce COBOL next year; and (3) Prime Computer Inc., which introduced its COBOL in July, too late to be tested. The data shown, which does not always coincide with claims, is accurate to August 1, 1976.

ised the equipment in a matter of days and who again took an additional 45 days to get all the configuration delivered.

In spite of our start-up problems, the application system is now fully operational. There have been no major hardware problems and only a couple of minor software problems. The supplier of the software has provided quick response for the correction of the errors.

If we had it to do over again, our only change in plans would be to delay until fall 1976 our search for COBOL software. We definitely feel that the capabilities of COBOL for the mini have now been more soundly developed and implemented on a large number of other machines.

Our salesman said that?

To our dismay we have discovered that there is presently a tremendous lack of credibility in both software and hardware delivery expected from the minicomputer vendors. For example, we have found vendor claims covering software capabilities to be inaccurate; some capabilities being claimed as operational by salesmen were not even planned. We have received delivery date quotes for equipment that were never met and which, on inspection, were impossible for the vendor to have lived by.

Our experience in switching to minicomputers interfaced to the time-sharing operation has been educational, even though it cost us more than we had originally budgeted and made us question the credibility of suppliers.

If you decide to go to a mini for COBOL or any other applications, we highly recommend extensive discussions with other users. We found that while most current users are happy with their minis, they can cite a large number of problems they had in working with the supplier in the early stages. To avoid many of these problems, we strongly urge that users demand benchmark runs using their own programs.

We feel that many manufacturers of minicomputers have been slow to recognize that they are no longer selling equipment only to engineering firms which require no support, but in the commercial area where a higher level of system and software support is demanded. These manufacturers do not seem willing to organize their software expenditures to accomplish this. They are spending large sums of money on software but few dollars on software support in the field. A smaller line of software products and increased customer support would make the environment much easier to work in, and, in the long run, more profitable to the vendor. ❋

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plemented the SORT verb. They feel that the space or linkage to a SORT verb is not practical. Instead, there are usually standalone sorts with each of the software packages available. It is possible to modify the programs to work with standalone sorts, but an evaluation should be made of the feasibility of doing that within an installation.

88 Level. The use of the 88 Level value clause simplifies program coding and documentation substantially. We use it in a minor but critical way to assign multiple values to the same term for compares in IF statements. This is an extremely useful feature that we implemented in our COPY library. Extensive use of 88 Levels for assigning values could become a major problem to a user if the function is not implemented.

Accept Edit. A feature on the DECsystem-10 which we used in the time-sharing environment was the ability to use the ACCEPT within the COBOL program to format and edit the data going to the receiving field. This would depict data entered by a user in numeric format, zero fill and decimal align it automatically. It would also confirm that all of the items were input as numerics. In our original analysis we found that only one vendor implemented this feature. We then developed a subroutine which was called at the time each ACCEPT word was used. During conversion, the modification of all ACCEPTS to call the subroutine was completely automatic.

Inspect/Examine. The INSPECT or EXAMINE verb is useful for data handling in any COBOL. A subroutine can be written by the user to accomplish this effectively if it is not made available by the vendor.

Copy. The availability of the COPY clause reduces coding requirements, reduces coding errors, and helps in developing installation standards. Its presence is necessary to effective COBOL programming.

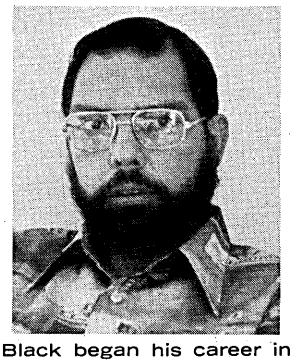
Interpreter. There are two methods of implementing COBOL. The author can write either an interpreter, which is slower but requires less core for processing, or a compiler, which is faster at processing time but does require more core. We have found that several suppliers who have claimed to have written compilers have produced little more than interpreters. The amount of code generated per COBOL source statement is a good clue to whether it is a compiler or an interpreter. (The number should be higher for compilers.)

Compile Rate. We discovered a wide range of compilation speeds in our system evaluation. These ranged from 40 lines a minute to some as high as 200 lines a minute. This is a function of the writing of the compiler which very much affects program development costs.

Words Required/Source Line. Program size is important in determining how much core to acquire, and we have found a relationship between lines of code and number of words generated which seems to help in estimating program size. Certainly there will be exceptions when the program uses a large matrix or a highly-blocked file, but these should be easy enough to calculate separately. Note that a good compiler or interpreter will require less space—generate fewer words—than a poor one.

Approximate Hardware $. The configuration included 80MB of disc, 64K of main storage, four terminals, and auto-dialing. List prices for comparable systems spread from $26,000 to $48,000—higher priced systems were eliminated from the selection. Prices quoted here include peripherals from the mainframe vendor, but users can often cut peripheral prices —especially for disc drives—by dealing directly with distributors or independent vendors.

Approximate Software $. The software price varies substantially between manufacturers and this price is substantially discountable. In most cases, the actual discount given on a total system will be taken out of software rather than out of hardware. There is ample room in most cases to negotiate the software dollars. ❋

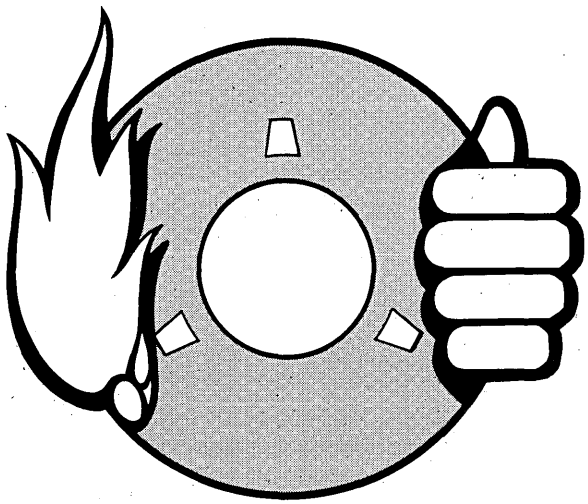


Mr. Black began his career in the data processing industry as an IBM 650 programmer at U.S. Steel in 1954. He has been a Systems Engineer at IBM, and a manager of software at Joy Manufacturing, in Pittsburgh. From 1964 to 1969 he served on the Codasyl Planning Committee. Presently he is president of David R. Black & Associates, which lists Aviation Administrative Services as one of its subsidiaries.

Destruction

Lost Records

Lost Facilities



Fraud

Lost Assets

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Terminal and Network Security—An overview of areas of vulnerability, with recommendations for recovery capability. Making the initial contact for site survey, and pitfalls to avoid. On-site inspection and satisfying user's performance requirements. Asking the right questions to gain pertinent answers. Providing on-the-spot recommendations, and writing the post-evaluation report for feedback to local management. The final analysis and subjective evaluation.

Risk Evaluation—How to identify, quantify and rank potential loss risks due to intentional or accidental abuse of computer applications or stored data. Getting management to understand the extent of controls and the significance of intangible system safeguards. How to establish the proper objectives and approach to a comprehensive risk-evaluation study, with identification and selection of appropriate computer applications. How to determine criteria for a detailed examination, then collect and analyze the data.

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Seminar faculty

Joseph (Joe) R. Aicher
Suntech, Inc.
Joe (BS, University of Missouri—BS & MS, Drexel University) has been manager of Suntech's Data Systems Security Program for the past three years. His duties include responsibility for EDP security and right-to-privacy projects. Prior to that, Joe was manager of Suntech's Data Processing Department.

Ludwig (Lou) Stern
Suntech, Inc.
Lou (BS & MS, Columbia University and Drexel University) was largely responsible for introducing computers to Sun's Engineering back in 1959. He has prepared the specifications for design and construction of Sun Company's new multimillion dollar computer center, and had previously guided the security efforts for the company's numerous computer sites.

Roderick (Rod) M. Fancher, Jr.
Sun Company
Employed by Sun for the past ten years, Rod (BS & MBA, University of Alabama) is currently manager of EDP Auditing for Sun Company. In addition, Rod is engaged in developing risk evaluations and control guidelines. Earlier he had been a Lead Systems Analyst on several systems development projects.

Alan (Al) Douglas
Suntech, Inc.
For the last two years with Suntech, Inc., Al (BS & MBA, Rutgers University) has led physical, and software systems security projects. He also serves as Suntech's representative to an internal Right-to-Privacy Task Force. Previously employed with Exxon Corporation, Al brings with him over fifteen years experience in the data processing field.

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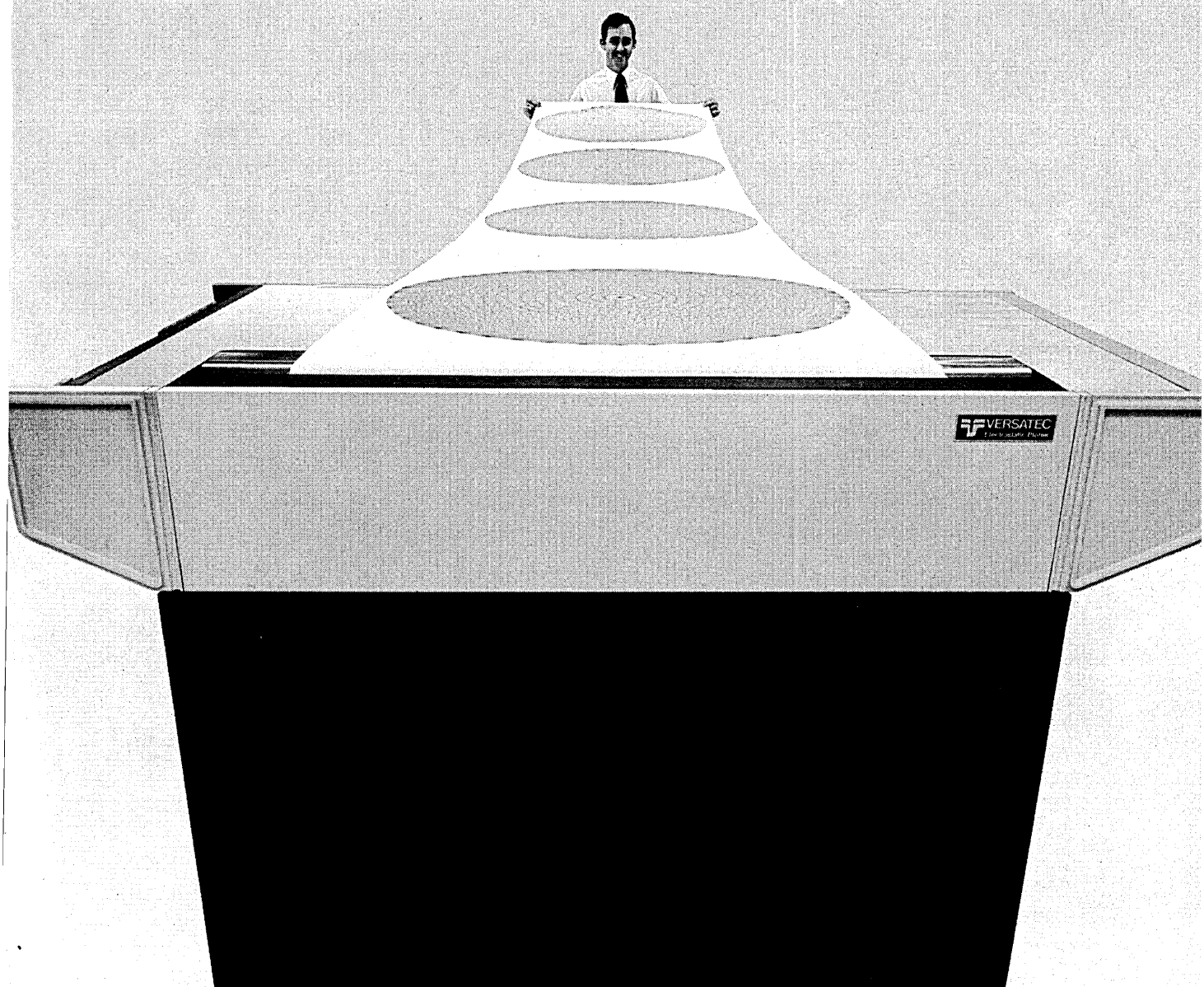

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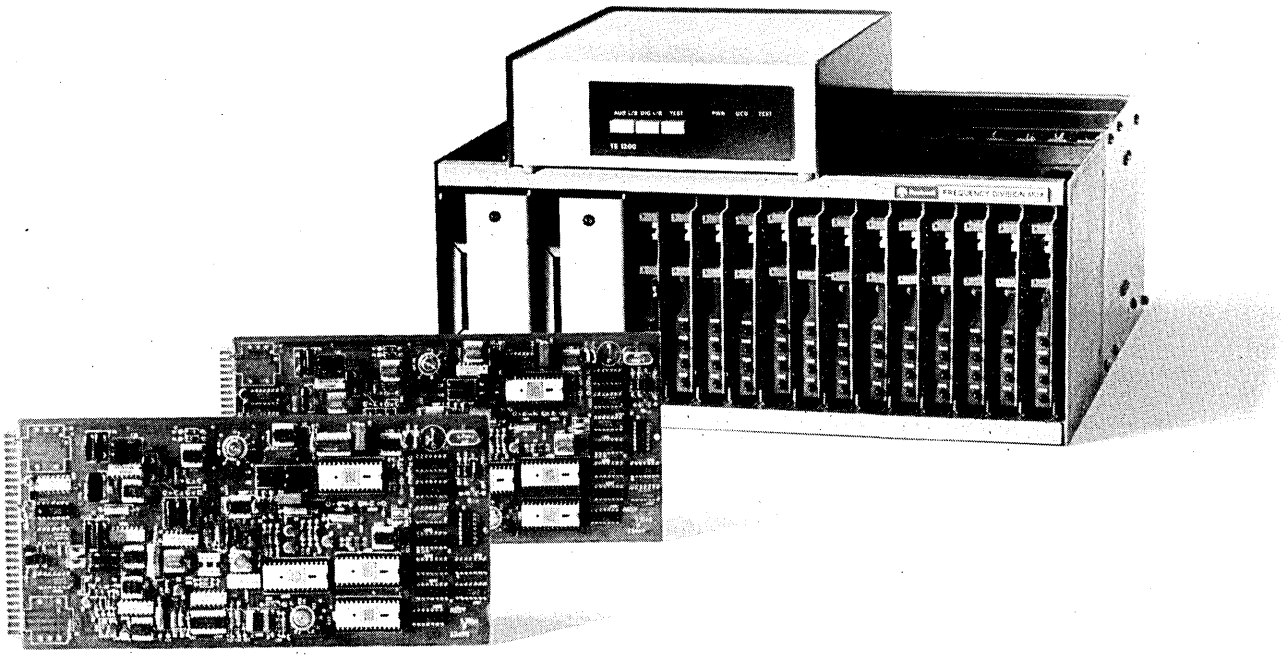

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Survey of Small Business Computers

by Steve A. Bobick, Edmund J. Armon, and Arthur W. Yerkes

Computer systems from vendors make up a menu large enough to satisfy almost any shopper—and the list grows daily.

From their humble beginnings as the electronic accounting machines of the 1960s, small business computers have grown into a $ billion market. Users, who at one time had only a few vendors to investigate, are now faced with a seemingly never-ending list. If the current trends of steadily increasing hardware performance and decreasing price continue, that list could grow even longer.

The installed population of these systems should also continue to increase dramatically.

In price and performance, small business computers span a wide range between conventional accounting machines at one extreme and medium scale computer systems at the other. Though the current systems differ widely in their architecture, data formats, peripheral equipment, and software, they are generally characterized by purchase prices between $5,000 and $100,000 and by a strong orientation, in both their equipment and software, toward conventional business data processing applications.

In its basic configuration, today's small business computer system typically consists of a keyboard/crt for data entry (cards, floppy discs, or cassettes may also be used), a processor with about 8K bytes of memory, a disc for file storage, and a serial printer with a speed of about 30 cps. From there, the only way to go is upward: more memory, additional peripheral devices, faster printers, etc.—as far as your wallet will allow.

The small business computer market is served by four distinct types of vendors. The first is the "Fortune 500" companies such as Burroughs, Honeywell, IBM, Litton, and NCR, all of which have vast product lines and resources. For these firms, the small business computer is just one of a broad line of products (although in the cases of NCR and Burroughs, business minicomputers now account for a sizable portion of total corporate revenues).

A second group consists of minicomputer manufacturers such as Digital Equipment Corp., Data General, Computer Automation, Harris, Hewlett-Packard, Interdata, Microdata, and others. This group has watched the small business computer marketplace mushroom in size, and now wants a piece of the action. Their answer to this segment of the marketplace is a packaged configuration consisting of a minicomputer and associated peripherals from their current product line, usually accompanied by some applications software. Most minicomputer vendors also offer assemblers and compilers for the user who wants to do his own programming or to solve business problems that cannot be handled by packaged software.

System houses or turnkey vendors, such as Basic/Four, Mini-Computer Systems, Qantel, STC Systems, and many others, comprise the third group of suppliers of small business computers. This group is very similar to the second group except that the turnkey vendors generally buy minicomputers and/or peripherals from the manufacturers, then package the configurations and supply their own software.

Semiconductor and microcomputer companies are beginning to appear on the scene as the fourth group of suppliers. Companies such as Applied Data Communications, Applied Systems Corp., System Integration Associates, Wintex Computer Corp., and others are now offering small business systems that sell for $5,000 or less. This group is in its infancy now, but seems destined to be a major force in the marketplace in the near future.

Most of the current members of the last two groups sell small business computers and services exclusively, and in many cases are themselves small businesses. However, what they lack in size and resources is often more than compensated for by their quick reaction to problems, general expertise, and eagerness to satisfy.

This article and the accompanying comparison tables are condensed from material published in *Datapro Reports on Minicomputers*, a loose-leaf information service that includes detailed technical reports on most of the computers listed here.

The 53-page section of that report on which this article is based can be obtained separately from: Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075. The price for that section is $12; postage and handling are free if a check accompanies the order. ❋

The leaders

From the first group of vendors come the leading U.S. suppliers of small business computers, which have long been Burroughs and NCR. It is no coincidence that Burroughs and NCR are also the leading suppliers of conventional adding and accounting machines and of the paper supplies for such machines. Both companies have huge marketing and service organizations and have done an effective job of trading their customers up to progressively more powerful equipment as their data processing requirements expanded in volume and complexity.

Burroughs, the clear-cut leader in recent years, offers the industry's broadest line of business minicomputers, including the recently announced B 80. NCR, whose development efforts

lagged behind those of its arch-rival for several years, has largely closed the gap with the attractive NCR 299, 399, and 499 electronic accounting systems and the Century 8200, a more typical small business computer.

IBM has only recently begun to achieve success in the business computer market proportionate to that it achieved in both larger computer systems and punched card tabulating equipment—but the odds are that it will soon be by far the largest producer of this class of equipment as well.

The dramatic increase in IBM's penetration of this segment of the marketplace hinges largely upon the advent of two highly significant business minicomputers: the System/3 and System/32. The System/3, introduced in 1969, is a strong entry at the upper end of the small business computer market segment. It is now offered in six distinct versions—the multi-user Model 4, the keyboard-oriented Model 6, the diskette-based Model 8, the batch-oriented Model 10, the Model 12 (a MOSFET version of the Model 10), and the more powerful Model 15—at system purchase prices ranging from about $40,000 to more than $300,000. IBM has already completed more than 30,000 installations of the System/3, making it one of the fastest-selling computers in history.

The IBM System/32, unveiled in January 1975, is the smallest and lowest priced general business computer ever announced by the industry giant. All components of the System/32—processor, main storage, keyboard, display, printer, disc, and diskette drive—are housed in a single compact, desk-sized cabinet. What's more, IBM is billing the System/32 as a "programmerless" machine whose software, for most users, will consist entirely of preprogrammed Industry Application Packages supplied by IBM. With equipment purchase prices beginning at $33,560 and monthly rentals (on a 3-year lease) beginning at $680, the System/32 has already convinced thousands of small businesses that it's time to take their first step into computer usage. The availability of the System/32, backed by IBM's powerful marketing forces, has substantially enlarged the total market for small business computers and appears to be generating increased sales both for IBM and for many of its competitors. IBM currently has about 5,500 System/32s installed and another 10,000 or more on order.

Digital Equipment Corp., the leading builder of scientific minicomputers, offers business-oriented users its Datasystem 300 and 500 Series systems based upon the popular DEC PDP-8 and PDP-11 minicomputers, respectively. In January 1975, just 10 days after IBM introduced its System/32, DEC countered with the Datasystem 310, a complete business data processing system priced at just $12,500. The basic Datasystem 310 includes a PDP-8/A minicomputer with 8K 12-bit words of core storage, two diskette ("floppy disc") drives, crt display unit, and typewriter-style keyboard. Options include a printer, a communications interface, and expanded main or diskette storage.

DEC hopes to achieve high volume sales of the Datasystem 310 by selling it in two ways: directly to end users who are prepared to write their own applications programs, and through a distributorship network of software houses that will do the applications programming for less sophisticated users.

Hewlett-Packard, General Automation, Interdata, Computer Automation, and Harris are five more major suppliers of scientific minicomputers that now offer "packaged" hardware/software configurations oriented toward business data processing applications. Numerous other companies (such as Display Data, Dimis Inc., and Martin, Wolfe) produce business computer systems based upon minicomputers manufactured by other firms (Microdata, Modcomp, and Digital Computer Controls, respectively, for these three).

European-made equipment is making a much greater impact upon the small business computer market than in any other segment of the U.S. computer market. Honeywell, International Computers Ltd., Olivetti, Philips, and Nixdorf are marketing equipment which they manufacture in France, Great Britain, Italy, the Netherlands, and Germany, respectively.

All of these firms, plus 80 or 90 others, are represented in the tables included here. In all, the principal characteristics of 152 small business computers from 94 vendors are presented. All of these systems are currently being marketed in the United States. The information reported was supplied and/or verified by the manufacturers or their U.S. representatives during July and August; their close cooperation is gratefully acknowledged.

No report on today's small business computers can be totally complete. The field of suppliers is just too large and growing too fast. We have, however, made every reasonable effort to include all of the major suppliers and a high proportion of the smaller ones as well. The absence of any company's products from these comparison charts means either that the company was unknown to us or that it failed to respond to our repeated requests for information.

Reading the tables

The chart entries require only the following minor explanation:

Number shipped: The dates and figures included refer to U.S. sales and U.S. installations.

Communications: The figure given is for the maximum number of lines; the descriptors are for some of the communications protocols (usually identified by well known IBM numbers) with which the system is compatible.

Word size/add time: Add time was originally intended to be the time required to develop the arithmetic sum of two operands of at least five digits each. Most of the add times actually supplied, however, are for adding two words. (Add time is a widely used measure of computer performance, but a figure of comparatively little importance in the selection of many small business systems. The reason is that the speed of many of these machines is largely determined by the operator's keying rate.)

Peripherals: Not listed in this section of each column is "alphanumeric keyboard," but all of the computers included may be assumed to have one —though sometimes as an option.

Pricing: Base system purchase prices and lease or rental amounts are approximate. They are included only as pointers. Potential customers should contact the vendors directly to discover what features and peripherals are considered optional, what lease contract lengths are quoted, etc.

Some abbreviations used might not be immediately recognizable, including: "seq" and "indexed seq" for sequential and indexed sequential access methods; "cart," "pack," and "fixed" for cartridge, disc pack, and fixed-head disc; "10-key" for numeric keypad; and "ppt" for punched paper tape.

Two other features of the tables require explanation. First, the notation "ng" sometimes appears; it means "not given," rather than something derogatory. Second, the suppliers of these systems often claim a much broader product line than we list; this is because we chose to merge models or series whose features were very much alike.

For more detailed listings—including the breakdown of series into individual models—check the Datapro report from which these tables were derived. (See box on page 91.)

Interested persons may also request additional information or clarification directly from the vendors, either by contacting them at the addresses listed in the vendor index (p. 103) or by circling the appropriate number on the reader service card bound into this issue.

Manufacturer	Advanced Information	Advanced Information	A.K. Industries	A.K. Industries	American Management
Model Highlights	System 3000	System 4000	AKI-90	AKI-91	AMS OE/IC
No. installed/date	20 since Mar 1975	due Oct 1976	10 since Nov 1974	1 since Aug 1976	4 since Jan 1976
Multiprogramming	4 partitions	10 partitions	no	2 partitions	yes
Communications	30 lines (2780', 3780', SDLC)	50 lines (2780, 3780, SDLC)	1 line (2780)	8 lines (2780)	32 lines (own protocol)
Applications	insurance, inventory, distribution, order entry	insurance, inventory, distribution, order entry	inventory	inventory	manufacturing, distribution
Processor	Interdata 6/16 or 8/16	Interdata 7/32 or 8/32	Datapoint	Intel 8080A	Data General Nova 3
Internal storage	64K-1M core (750nsec)	128K-1M core (750-300nsec)	16K MOS (1.6usec)	32K-64K MOS (500nsec)	32K-256K (1usec-700nsec)
Word size/add time	16bits, 1.5usec add time	32bits, 600nsec add time	8bits, add time not given	8bits, add time not given	16bits, 700-950nsec add time
Mass Storage					
Discs	floppy, cart, pack	floppy, cart, pack	floppy	pack	floppy, cart, pack, fixed
Access methods	random, seq, indexed seq	random, seq, indexed seq	random, seq, index seq	random, seq, indexed seq	random, seq, indexed seq,
Mag tapes	reel-reel, cassette, cart	reel-reel, cassette, cart	no	no	reel-reel, cassette
Peripherals	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 1200lpm), mag card, crt	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 1200lpm), mag card, crt	10-key, serial print (165 cps), line print (to 600lpm), crt	0-key, serial print (165cps), line print (to 600lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 300lpm), crt
Software	COBOL, FORTRAN, BASIC, macro assemb, PL/1, APL, acct pkg, dbms	COBOL, FORTRAN, BASIC, macro assemb, PL/I, APL, acct pkg, dbms	BASIC, assembler, Databus, Dataform, acct pkg	BASIC, assembler, acct pkg	FORTRAN, BASIC, assembler
Base Prices					
Software/support	$28,000 ($616/month) soft extra, support incl	$58,000 ($1,200/month) soft extra, support incl	$25,000 ($550/month) soft and support incl	$30,000 ($660/month) soft and support incl	$14,000 ($500/month) soft and support extra
Comments					

Manufacturer	Anderson-Jacobson	Applied Data Commo	Applied Data Processing	Applied Digital Commo	Applied Digital Commo
Model Highlights	Models 1400 & 1500	Series 70	Resource/100	Model 101	Model 201
No. installed/date	250+ since 1970	100 since May 1975	since June 1976	since Aug 1976	not given
Multiprogramming	no	no	yes	no	9 partitions
Communications	8 lines (own protocol)	2 lines (bisynch)	7 lines (2780)	1 line (bisynch 2780, 3780)	8 lines (own protocol)
Applications	public accountants	not given	not given	manufacturing, inventory, food processing	manufacturing, inventory, food processing
Processor	model not given	Intel 8080	Data General Nova	Datapoint 1100	Lockheed II or III
Internal storage	16K-65K core (1.2usec)	16K-65K MOS (2usec)	64K-212K core (1.0usec)	32K MOS (1.6usec)	48K-128K MOS 800nsec
Word size/add time	8bits, 4usec add time	8bits, 2usec add time	16bits, 1.35usec add time	8bits, 16usec (5 digits)	8bits, 8.4usec (6 digits)
Mass Storage					
Discs	floppy, cart	floppy, cart, fixed-head	pack	floppy	cart, pack
Access methods	sequential, direct	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	no	reel-reel, cart	reel-reel	cassette	no
Peripherals	10-key, ppt, card, serial print (45cps), line print (to 600lpm), crt	10-key, acct keyboard, ppt, serial print (to 55cps), line print (to 1400lpm), crt	10-key, acct keyboard, ppt, card, serial print (to 330cps), line print (to 600lpm), crt	10-key, serial print (to 165cps), line print (300lpm) crt	10-key, card, serial print (88cps), line print (to 600lpm) crt
Software	assembler, ESP, acct pkg	BASIC, assembler	BASIC, assembler, Ext BASIC, acct pkg, dbms	BASIC, assembler, Data bus II, acct pkg	(RPG II) (FORTRAN IV), assembler
Base Prices					
Software/support	$16.5K-$19.5K($380-$450/mo) soft and support extra	$4,500 purchase soft and support extra	$39,300 ($865/month) soft and support extra	$29,990 ($690/month) soft and support incl	$39,990 ($920/month) soft and support incl
Comments		up to 16 crts supported			

Manufacturer	Applied Digital Commo	Applied Digital Technology	Applied Systems	J Baker & Associates	Ball Computer Products
Model Highlights	Model 301	not given	ASC 180	Dist Systems 1 & 2	DASL
No. installed/date	5 since Jan 1975	10 since Jan 1972	since 1974	10 since Sept 1975	3, since June 1975
Multiprogramming	yes	yes	not given	4 partitions	16 partitions
Communications	8 lines (own protocol)	4 lines (own protocol)	16 lines (bisynch, others)	16 lines (2780, bisynch)	16 lines (own protocol)
Applications	manufacturing, inventory, food proc industry, control	Property management, accounting	communications	distribution, manufacturing	manufacturing
Processor	Varian V76	GA SPC 16/45 or 16/65	Intel 8080	DEC Datasystem 350 series	Data General Nova 2/10
Internal storage	64K-256K MOS (660nsec)	4K-64K core (1.4-960nsec)	4K-64K MOS 500nsec	32K-64K core (980nsec)	65K core (1.0usec)
Word size/add time	16bits, 10usec (6 digits)	16bits, 1.4nsec-960nsec	8bits, 2usec add time	16bits, 7.0-5.0usec add time	16bits, 1.0usec add time
Mass Storage					
Discs	floppy, cart, pack, fixed	floppy, cart, pack, fixed	floppy, cart	floppy, cart, pack	cart, pack
Access methods	random, seq, indexed seq	direct, seq, indexed seq	random, sequential	direct, sequential	sequential, indexed seq
Mag tapes	no	reel-reel	reel-reel, cassette, cart	reel-reel	reel-reel
Peripherals	10-key, ppt, card, serial print (165cps), line print (to 600lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 600lpm) crt	10-key, acct keyboard, ppt, card, serial print (30cps), line print (to 600lpm) crt	10-key, card, serial print (30cps), line print (to 300lpm), crt	10-key, card, serial print (120cps), line print (to 400lpm), crt
Software	COBOL, RPG II, FORTRAN IV, BASIC, assemb, acct pkg, TOTAL dbms	COBOL, RPG, FORTRAN, Assembler, acct pkg	BASIC, Assembler, PL/M custom acct pkg	DIBOL (COBOL), acct pkg, dbms	FORTRAN, BASIC, assembler, DASL, acct pkg, dbms
Base Prices					
Software/support	$49,990 ($1,150/month) soft and support incl	$50K-$100K (purchase only) soft and support extra	$5,000 ($250/month) soft and support extra	$55K-$70K (purchase only) soft and support extra	$37,900 soft and support extra
Comments		marketed in Chicago area only			price includes inventory control system

Manufacturer	Basic Four	Basic Time Sharing	BDS Computer	Binary Data Systems	Burroughs
Model Highlights	Models 350, 400, 600	4000/15 & 4000/25	BDS-3	UCOM	L 9000 Series
No. installed/date	3,000, since 1971	since Jan 1976	not given	since July 1973	Thousands, 2nd Q 1976
Multiprogramming	8 partitions	no	8 partitions	64 partitions	no
Communications	8 lines (2780)	4 lines (user-prog protocols)	8 lines (own protocol)	256 lines (2780, others)	2 lines (2780, SDLC, BDLC)
Applications	agric, constr, transp, dist, manufacturing, finance	school administration	general business accounting	wholesale, real estate, medical, distribution	accounting
Processor	Microdata	BTI 4020	DEC PDP-11/03	Data General Nova 3	Burroughs
Internal storage	32K-65K core (1.0usec)	64K MOS (650nsec)	40K-64K MOS (690nsec)	64K-256K core (800nsec)	4K-48K MOS (1.5usec)
Word size/add time	8bits, 7.0usec add time	16bits, 20usec (5 digits)	16bits, 4usec add time	16bits, 1.0usec add time	64bits, 1.8usec add time
Mass Storage					
Discs	cartridge	cart, pack	cartridge	floppy, cart, pack	no
Access methods	random, sequential	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	not given
Mag tapes	no	reel-reel, cart	reel-reel	reel-reel	reel-reel, cassette
Peripherals	10-key, ppt, card, serial print (165cps) line print (to 600lpm), crt	line print (to 900lpm)	10-key, line print (to 900lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 1500lpm), crt	10-key, ppt, card, serial print (to 90cps), line print (to 250lpm), mag card, crt
Software	BASIC, acct pkg	BASIC, acct pkg, dbms	BASIC, acct pkg	COBOL, RPG, FORTRAN, BASIC assembler, acct pkg, dbms	COBOL, assembler, acct pkg
Base Prices	$34.4K-$51K($791-$1180/mo)	$36K-$56.3K	$8,495 (purchase only)	$75,000 ($1,500/month)	$16,490 ($561/month)
Software/support	soft and support extra	soft extra, support incl	soft and support extra	soft and support incl	soft and support extra
Comments	service available in 160 U.S. cities	up to 32 user terminals concurrently, or 24 plus 4 commo lines		dual-processor systems available	

Manufacturer	Burroughs	Burroughs	Burroughs	Burroughs	Business Controls
Model Highlights	B 80	B 730/B-720	B 1700 Series	B 1720 Series	System 80
No. installed/date	since May 1973	since May 1973	over 1300 since 3rd Q 1972	over 1300 since 2nd Q 1973	50-100 since 1971
Multiprogramming	3 partitions	see comments	yes	yes	yes
Communications	4 lines (2780, SDLC, BDLC)	1 line (2780, 3780, BDLC)	2 lines (2780, BDLC)	32 lines (2780, BDLC)	128 lines (2780 bisynch)
Applications	wholesale, distribution, medical, financial, mfg	accounting	business, emulation	business, emulation	retailing, wholesaling, manufacturing, list maint.
Processor	Burroughs	B 731	B 1714	B 1720	DEC PDP-8/A
Internal storage	32K-60K MOS (1.0usec)	32K-80K MOS (1.0usec)	24K-128K MOS (1.5usec)	48K-378K MOS (1.0usec)	64K core (6-bit) (1.2usec)
Word size/add time	8bits, add time not given	64bits, 430usec add time	8bits, add time not given	64bits, add time not given	12bits, 3.0usec add time
Mass Storage					
Discs	floppy, cart	floppy, cart	cart, pack, fixed-head	cart, pack, fixed-head	floppy, cart
Access methods	random, seq, indexed seq	sequential	random, ind seq, ind random	random, ind seq, ind random	random, seq, indexed seq
Mag tapes	cassette	reel-reel, cassette	reel-reel, cassette	reel-reel, cassette	reel-reel, cassette
Peripherals	10-key, serial print (180cps), line print (to 250lpm), crt	10-key, ppt, card, serial print (60cps), line print (to 400lpm)	10-key, ppt, card, line print (to 1040lpm) crt	10-key, ppt, card, line print (to 1040lpm) crt	10-key, ppt, card, serial print (180cps), line print (300lpm), crt
Software	COBOL, RPG, Data Control System, acct pkg	COBOL, RPG, AEL, acct pkg	COBOL, RPG, FORTRAN, BASIC UPL (ALGOL), acct pkg, dbms	COBOL, RPG, FORTRAN, BASIC UPL (ALGOL), acct pkg, dbms	FORTRAN, BASIC, Assembler, COM, acct pkg, dbms
Base Prices	$22,010 ($720/mo) with MCP	$20,900 ($598/month)	$22,225 ($735/month)	$87,300 ($1,959/month)	$29,990 ($660/month)
Software/support	soft and support extra	soft and support extra	soft and support extra	soft and support extra	soft and support incl
Comments		AEL programs can execute concurrently with RPG or COBOL programs			

Manufacturer	Cado Systems	Cascade Data	Century Computer	Century Computer	Cincinnati Milacron
Model Highlights	Model 1000	Concept II	Opus III	Century 400	Models 40, 60, & 70
No. installed/date	since April 1976	150, since Jan 1970	over 600 since Feb 1971	117 since March 1975	since June 1973
Multiprogramming	no	2 partitions	10 partitions	10 partitions	2 partitions
Communications	1 line (2770, 2780, 3780)	8 lines (2780 bisynch)	256 lines, (own protocol)	256 lines (own protocol)	10 lines (2780 bisynch)
Applications	dist proc, text editing, data entry	dist, route acctg, medical, banking	accounting, distribution	accounting, distribution	accounting
Processor	Intel 8080A	Cascade	Century Computer 200	Century Computer 400	CIP/2200B
Internal storage	2K-14K MOS (1.1usec)	16K-64K core (1.2usec/byte)	32K-60K MOS (600nsec)	32K-240K MOS (600nsec)	32K-64K MOS (1.1usec)
Word size/add time	8bits, 200usec (9 digits)	16bits, 8.8usec add time	8bits, 2.6usec (5 digits)	16bits, 2.6usec (5 digits)	16bits, 18.5usec (9 digits)
Mass Storage					
Discs	floppy	cartridge	floppy; cart, pack	floppy, cart, pack	floppy, cartridge
Access methods	random, indexed sequential	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	reel-reel	reel-reel	reel-reel, cassette	reel-reel, cassette	reel-reel
Peripherals	10-key, ppt, card, serial print, line print (300lpm), crt	10-key, ppt, card, serial print (55cps), line print (to 600lpm), crt	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 600lpm), crt	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 600lpm), crt	10-key, card, serial print (to 330cps), line print (to 600lpm), crt
Software	BASIC, assembler, acct pkg, dbms	RPG, assembler, acct pkg	BASIC, assembler, CPL, acct pkg, dbms	BASIC, assembler, CPL, acct pkg, dbms	RPG, assembler, acct pkg
Base Prices	$13,950 (purchase only)	$24,900 ($747/month)	$32,070 (purchase only)	$38,920 (purchase only)	$16.1K-$26.1K ($482-$784/mo)
Software/support	soft extra, support incl	soft and support extra	soft and support extra	soft and support extra	soft and support extra
Comments					

Manufacturer	Cincinnati Milacron	Codon	Codon	Complete Computer	Compucorp
Model Highlights	80	CS-12	CS-20	Models II-3, III-3, IV-3	400 Series
No. installed/date	since July 1976	50 since 1975	50 since 1972	due Oct 1976	39 since Jan 1976
Multiprogramming	2 partitions	10 partitions	yes	yes	no
Communications	26 lines (2780 bisynch)	1 line (2780, 3780 bisynch)	8 lines (2780, 3780 bisynch)	17 lines (own protocol)	7 lines (own protocol)
Applications	accounting	distribution	distribution	manufacturing, construction, distribution	agriculture, general business
Processor	CIP/4400	DEC Datasystem 310	DEC Datasystem 340	Data General Nova 3/12	Compucorp 3000
Internal storage	64K-96K MOS (900nsec)	16K-64K core (1.4usec)	16K-64K(6-bit)core(1.2usec)	96K-256K MOS (700usec)	12K-16K MOS (cycle not given)
Word size/add time	16bits, 18.5usec (9 digits)	12bits, 3.0usec add time	12bits, 2.6usec add time	16bits, 700nsec add time	64bits, 80usec add time
Mass Storage					
Discs	floppy, cart	floppy, cart	floppy, cart	floppy, cartridge	floppy
Access methods	random, seq indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	reel-reel	no	reel-reel	reel-reel, cassette	reel-reel
Peripherals	10-key, card, serial print (to 330cps), line print (to 600lpm)	10-key, serial print (to 180cps), line print (to 300lpm), crt	10-key, ppt, card, serial print (to 180cps), line print (to 300lpm), crt	10-key, ppt, card, serial print (165cps), line print (300lpm), crt	10-key, serial print (30cps), crt
Software	RPG, Assembler, acct pkg	RPG, Assembler, DEAL, dbms	RPG, assembler, DEAL, acct pkg, dbms	FORTRAN, BASIC, assembler, CREATE (dbms), acct pkg	assembler, dbms
Base Prices	$42,800 ($1,281/month)	$32,000 (purchase only)	$37,450 (purchase only)	$36K-$64K ($1,786/month)	$11.5K-$18.4K (purch only)
Software/support	soft and support extra	soft and support extra	soft and support extra	soft and support extra	soft incl, support extra
Comments					also being delivered in Europe

Manufacturer	Computer Automation	Computer Covenant	Computer Covenant	Computer Hardware	Computer Hardware
Model Highlights	SyFA	CPBS 1 & 2	CPBS 3	2120	2130 & 3230
No. installed/date	since 1976	since June 1976	due Dec 1976	since 1975	since 1976
Multiprogramming	43 partitions	40 partitions	80 partitions	no	yes
Communications	25 lines (2780/3780, HASP)	40 lines(2780,SDLC,DDCMP)	80 lines(2780,SDLC,DDCMP)	not given	not given
Applications	distributed processing	manufacturing, distribution/ wholesale	manufacturing, distribution/ wholesale	not given	not given
Processor	CA LSI 2/60	DEC PDP-11/04 or/34	DEC PDP-11/70	CHI	CHI
Internal storage	64K-304K core (1.2usec)	56K-248K core (980nsec)	256K-2MB core (980nsec)	16K-32K MOS (1.8usec)	16K-512K core/MOS(800nsec)
Word size/add time	16bits, 76usec (5 digits)	16bits, 3.2usec add time	16bits, 400nsec add time	16bits, 3.6usec add time	16bits, 1.6usec add time
Mass Storage					
Discs	cartridge, pack	floppy, cart, pack	cartridge, pack	pack	pack, fixed-head
Access methods	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	not given	not given
Mag tapes	no	reel-reel	reel-reel	reel-reel	reel-reel
Peripherals	10-key, serial print (to 165cps), line print (to 600lpm), crt	10-key, card, serial print (to 180cps), line print (to 1200lpm), crt	10-key, card, serial print (to 180cps), line print (to 1200lpm), crt	ppt, card, line print (to 600lpm), crt	10-key, ppt, card, line print (to 600lpm), crt
Software	FORTRAN, BASIC, SYBOL	COBOL, FORTRAN, BASIC, assembler, acct pkg, TOTAL, RMS-11	COBOL, FORTRAN, BASIC, assembler, acct pkg, DBMS-11	COBOL, RPG, FORTRAN, assembler, acct pkg, dbms	COBOL, RPG, FORTRAN, assembler, acct pkg, dbms
Base Prices	$45,000 (purchase only)	$24K-$42K($530-$910/month)	$100,000 ($2,150/mo 5 year)	$29K-$39K ($860-$1,230 2-yr)	$60K-$103K($1800-$2600/mo)
Software/support	soft extra, support incl	soft and support extra	soft and support extra	soft and support extra	soft and support extra
Comments	supports up to 24 terminals, FORTRAN and BASIC are unbundled				

Manufacturer	Computer Horizons	Computer Interactions	Computer Technology	Computer Technology	Computer Technology
Model Highlights	CHC Distribution Systems	Compo-II	CTL 8010	CTL 8030	CTL 8050
No. installed/date	not given	50 since 2nd Q 1972	not given	not given	since May 1976 (U.K.)
Multiprogramming	32 partitions	4 partitions	13 partitions	32 partitions	64 partitions
Communications	64 lines (DDCMP, SDLC, etc)	32 lines, (own protocol)	2 lines(2780,HASP,ICL,CDC)	36 lines (2780, ICL, HASP)	108 lines (2780, ICL, CDC)
Applications	inventory, order processing, accounting	wholesale distribution, pharmacy, medical	scientific, engineering, education	transaction processing, business application	time sharing
Processor	DEC PDP-11/34 or/70	DEC PDP-8/E or F	CTL 8010	CTL 8030	CTL 8050
Internal storage	16K-248K (980-490nsec)	16K-64K core/MOS (1.2usec)	16K-112K MOS (cycle ng)	56K-112K MOS (cycle ng)	96K-448K core (cycle ng)
Word size/add time	16bits, 2usec add time	12bits, 15usec (5 digits)	16bits, 2.0usec add time	16bits, 1.3usec add time	16bits, 1.2usec add time
Mass Storage					
Discs	pack	floppy, cart, pack	no	cart, pack	cart, pack
Access methods	sequential, indexed seq	random, seq, indexed seq	not given	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	reel-reel	reel-reel, cartridge	no	no	no
Peripherals	serial print (180cps), line print (1200lpm), crt	10-key, ppt, card, serial print (to 300cps), line print (300lpm), crt	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 600lpm)	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 600lpm), crt	10-key, acct keyboard, ppt, card, serial print (165cps), line print (to 600lpm), crt
Software	COBOL, BASIC, acct pkg	BASIC, assembler, acct pkg	FORTRAN, BASIC	COBOL, FORTRAN, BASIC, CORAL, (Rpt Gen) etc, acct pkg	COBOL, FORTRAN, BASIC, assembler, CORAL, (Rpt Gen) etc, acct pkg
Base Prices	$30,000	$50,000 ($1,200 5-year)	$23,140 (purchase only)	$44,500 (purchase only)	$80,100 (purchase only)
Software/support	soft incl, support extra	soft incl, support extra	not given	some soft extra	some soft extra
Comments		system has paged memory			

Manufacturer	Control Data	Corstar Business	Corstar Business	Corstar Business	Corstar Business
Model Highlights	Cyber 18-10 & 18-20	Corstar 310	Corstar 350	Corstar 534	Corstar 570
No. installed/date	since May 1976	10 since 1972	4 since Oct 1975	14 since Nov 1973	4 since June 1975
Multiprogramming	16 partitions	no	4 partitions	32 partitions	63 partitions
Communications	(2780,3780,HASP,CDC,200)	1 line (2780)	4 lines (2780)	32 lines (2780)	63 lines, (2780)
Applications	manufacturing, distribution	manufacturing, distribution	manufacturing, distribution	agency, financial	financial, publishing
Processor	Cyber	DEC Datasystem 310	DEC Datasystem 350	DEC Datasystem 534	DEC Datasystem 570
Internal storage	32K-256Kcore,MOS(750nsec)	16K-64K core, MOS (1.4usec)	32K-64K core (980nsec)	64K-248K (980-725nsec)	128K-1M core (980nsec)
Word size/add time	16bits, 1.76usec add time	12bits, 2.8usec add time	16bits, 7.0usec add time	16bits, 6.0usec add time	16bits, 2.7usec add time
Mass Storage					
Discs	floppy, pack	floppy, cartridge	cartridge, pack	cartridge, pack	cartridge, pack
Access methods	not given	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	reel-reel	no	reel-reel	reel-reel	reel-reel
Peripherals	10-key, card, line print (to 600lpm), crt	10-key, ppt, card, serial print (180cps), line print (300lpm), crt	10-key, ppt, card, serial print (180cps), line print (300lpm), crt	10-key, ppt, card, serial print (180cps), line print (300lpm), crt	10-key, ppt, card, serial print (180cps), line print (300lpm), crt
Software	FORTRAN, BASIC, macro assemb	DIBOL, acct pkg	DIBOL, acct pkg	COBOL, RPG II, FORTRAN, BASIC Plus, acct pkg	COBOL, RPG II, FORTRAN, BASIC Plus, acct pkg
Base Prices					
Software/support	$27.8K-$30K ($933-981/mo) soft and support extra	$13,000-$23,000(purch only) soft and support extra	$36,000-$65,000(purch only) soft and support extra	$75K-$125K (purch only) soft and support extra	$135K-$250K (purch only) soft and support extra
Comments					

Manufacturer	Data General	Datapoint	Datapoint	Datapoint	Datasaab Systems, Inc.
Model Highlights	Eclipse C/300	1100 Series	Model 2200	Model 5500	D15
No. installed/date	since July 1975	6,000 since Jan 1974	9,000 since April 1972	500 since 1975	not given
Multiprogramming	2 partitions	no	no	3 partitions	16 partitions
Communications	256 lines(2780,3780,HASP II)	1 line (2265,2741,2780,HASP)	8 lines (2265, 2741, 2780)	16 lines (2265, 2741, 2780)	3 lines (own protocol)
Applications	not given	banking, insurance, government, accounting	banking, insurance, government, accounting	banking, insurance, government, accounting	distribution, manufacturing, travel agency
Processor	Data General C/300	Datapoint	Datapoint	Datapoint	Datasaab 5051, 5052
Internal storage	96K-256K (800-700nsec)	16K MOS (3.2usec)	4K-16K MOS (3.2usec)	48K MOS (1.6usec)	16K-64K (1.2usec-950nsec)
Word size/add time	16bits, 6usec (5 digits)	8bits, 4.8usec add time	8bits, 4.8usec add time	8bits, 1.4usec add time	16bits, add time not given
Mass Storage					
Discs	floppy, cart, pack, fixed	floppy	floppy, cart, pack	floppy, cart, pack	cartridge
Access methods	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	direct, seq, indexed seq
Mag tapes	reel-reel, cassette	reel-reel	reel-reel, cassette	reel-reel, cassette	reel-reel, cassette
Peripherals	10-key, ppt, card, serial print (165cps), line print (to 1200lpm), crt	10-key, card, serial print (120cps), line print (to 600lpm), crt	10-key, card, serial print (120cps), line print (to 600lpm)	10-key, card, serial print (120cps), line print (to 600lpm), crt	10-key, ppt, serial print (to 330cps), line print (to 200lpm)
Software	COBOL, RPG, FORTRAN, BASIC, assembler, dbms	RPG, BASIC, assembler, DATABUS, SCRIBE, DATA-FORM, DATASHARE, acct pkg, dbms	RPG, BASIC, assembler, DATABUS, SCRIBE, DATA-FORM, DATASHARE, acct pkg, dbms	RPG, BASIC, assembler, DATABUS, SCRIBE, DATA-FORM, DATASHARE, acct pkg, dbms	Logic-3/Mall, acct pkg
Base Prices					
Software/support	$80,000 ($1,760/month) COBOL and support extra	$7.2K-$12.9K ($165-$214/mo) soft and support extra	$8,571 ($216/mo 2-year) soft and support extra	$33,888 ($855/mo 2-year) soft incl, support extra	$35K-$150K some soft extra
Comments	system includes a 200nsec, 16-word, bipolar cache memory				

Manufacturer	Decision Data Computer	Design Data	Design Data	Digital Computer Controls	Digital Computer Controls
Model Highlights	System/4	N312	EC 300	1500	2500
No. installed/date	15 since July 1975	15 since Jan 1974	5 since Nov 1975	not given	not given
Multiprogramming	2 partitions	2 partitions	2 partitions	5 partitions	16 partitions
Communications	2 lines (2780, 3780)	32 lines (2780, 3780)	256 lines (2780,3780,HASP)	2 lines (own protocol)	16 lines (own protocol)
Applications	distribution	manufacturing, order entry	manufacturing, order entry	business accounting	accounting
Processor	DDC	Data General Nova 3/12	Data General Eclipse C/300	DCC 416	DCC Mod Five
Internal storage	32K-64K MOS (1usec)	64K-256K (1usec-700nsec)	96K-256K core (800nsec)	48K-64K core (1.6usec)	48K-156Kcore,MOS(900nsec)
Word size/add time	8bits, add time not given	16bits, 950-700nsec add time	16bits, 2.4usec add time	16bits, 1.6usec add time	16bits, add time not given
Mass Storage					
Discs	floppy, cartridge	floppy, cart, pack	cartridge, pack	floppy	floppy, cart, pack
Access methods	direct, seq, indexed seq	indexed, sequential	random, seq, indexed seq	seq, multi-key, indexed seq	seq, multi-key, indexed seq
Mag tapes	no	reel-reel, cassette	reel-reel, cassette	cassette	cassette
Peripherals	10-key, acct keyboard, card, serial print (120cps), line print (300lpm), crt	ppt, card, serial print (165cps), line print (to 1200lpm), crt	ppt, card, serial print (165cps), line print (to 1200lpm), crt	10-key, ppt, card, serial print (to 265cps), line print (300lpm), crt	10-key, ppt, card, serial print (265cps), line print (to 600lpm), crt
Software	RPG, phrase, acct pkg	FORTRAN, BASIC, assembler, ALGOL, acct pkg	COBOL, RPG, FORTRAN, BASIC, assembler, ALGOL, acct pkg, dbms	FORTRAN, BASIC, assembler, acct pkg	COBOL, FORTRAN, BASIC, assembler, acct pkg, dbms
Base Prices					
Software/support	$20,000 some soft and support extra	$31,000 (purchase only) soft and support extra	$60,000 (purchase only) soft and support extra	$25,550 soft incl, support extra	$49,900 soft incl, support extra
Comments	marketed only in metropolitan Philadelphia				

Manufacturer	Digital Computer Controls	Digital Equipment	Digital Equipment	Digital Equipment	Digital Equipment
Model Highlights	3700	Datasystem 310	Datasystem 350 Series	Datasystem 530	Datasystem 570
No. installed/date	not given	since May 1975	since July 1975	due Oct 1976	not given
Multiprogramming	32 partitions	no	4 partitions	32 partitions	63 partitions
Communications	32 lines (own protocol)	1 line (2780)	5 lines (2780)	33 lines (2780,SDLC,DDCMP)	64 lines (2780,SDLC,DDCMP)
Applications	business accounting	accounting	accounting	accounting and data processing	accounting and data processing
Processor	DCC 616	PDP-8/A	PDP-11/10 or/40	PDP-11/34	PDP-11/70
Internal storage	64K-1M (800-660nsec)	16K-64K core (1.4usec)	32K-56K core (980nsec)	64K core (980nsec)	128K-2M core (980nsec)
Word size/add time	16bits, 800-660nsec add time	12bits, 1msec (15 digits)	16bits, 7.0-1.07usec add	16bits, 7.3usec add time	16bits, 2.7usec add time
Mass Storage					
Discs	floppy, cart, pack	floppy, cartridge	floppy, cart, pack	cart, pack	cart, pack, fixed-head
Access methods	seq, multi-key, indexed seq	sequential, indexed seq	direct, seq, indexed seq	direct, seq, indexed seq	direct, seq, indexed seq
Mag tapes	cassette	no	reel-reel	no	reel-reel
Peripherals	10-key, ppt, card, serial print (265cps), line print (to 600lpm), crt	10-key, serial print (to 165cps), line print (300lpm), crt	10-key, card, serial print (to 180cps), line print (to 300lpm), crt	10-key, card, serial print (to 180cps), line print (to 1200lpm), crt	10-key, card, serial print (to 180cps), line print (to 1200lpm), crt
Software	COBOL, FORTRAN, BASIC, assembler, acct pkg, dbms	DIBOL (COBOL)	DIBOL (COBOL), dbms	RPG, FORTRAN, BASIC assembler, DIBOL, DECform	RPG, FORTRAN, BASIC, assembler, DIBOL, DECform DBMS-11
Base Prices					
Software/support	$57,000 soft incl, support extra	$12,500 (purchase only) soft incl, support extra	$17.5K-$48K (purchase only) soft incl, support extra	$20,000 soft and support extra	$105,000 ($4,200/mo 5-year) soft and support extra
Comments				Replaces Datasystems based on PDP-11/40 and 11/45	

Manufacturer	Digital Scientific	Digital Systems	Dimis	Display Data	Educomp
Model Highlights	Meta 4 Series	Galaxy/5 Series	Total 100	In*sight	E-100
No. installed/date	over 230 since 1970	since Dec 1975	3 since June 1974	82 since Jan 1974	since 1971
Multiprogramming	32 partitions	yes	yes	6 partitions	yes
Communications	2 lines (2780, 3780, BSC)	120 lines (prog protocols)	32 lines (own protocol)	32 lines (own protocol)	16 lines (2780,3780,SDLC)
Applications	medical, process control, engineering, research	not given	distribution	auto dealers, CPAs, wholesale distribution	education, municipal government
Processor	DSC	Digital Systems	Modcomp II	Microdata 1600/30	DEC PDP-8A
Internal storage	16K-256K core (900nsec)	32K-256K MOS (750nsec)	128K core (800nsec)	32K-64K core (1.0usec)	64K core (1.2-1.5usec)
Word size/add time	16+2bits, 2.9nsec add time	8bits, 20usec (5 digits)	16bits, 800nsec add time	8bits, 4.6usec add time	12bits, 3.0usec add time
Mass Storage					
Discs	cart, pack	pack, plus see comments	floppy, cart, pack	cartridge	floppy, cart, pack, fixed
Access methods	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, sequential	random, seq, indexed seq
Mag tapes	reel-reel	see comments	reel-reel	reel-reel	reel-reel, cassette
Peripherals	ppt, card, line print (to 600lpm)	line print (to 400lpm), crt	10-key, acct keyboard, ppt, card, serial print, line print (300lpm), crt	10-key, serial print (165cps), line print (to 600lpm), crt	10-key, ppt, card, serial print, line print, crt
Software	FORTRAN, macro assembler	RPG, assembler, acct pkg, dbms	FORTRAN, assembler, acct pkg, dbms	assembler, acct pkg	COBOL, FORTRAN, BASIC, assembler, FOCAL
Base Prices					
Software/support	$60K-$100K($1500-$2300/mo) some soft extra	$42K-$160K($550-$3400cpu) soft and support extra	$135,000 soft incl, support extra	$38,000 (purchase only) soft extra, support incl.	$6,000-$40,000 soft and support extra
Comments	runs most IBM 1130/1800 programs	peripherals are not sold by DSC but may be connected through commo ports			administrative and instructional systems built to customer specifications

Manufacturer	Educomp	Financial Computer	Four-Phase Systems	General Automation	General Automation
Model Highlights	E-600	Fedder System III/10	System IV Series	DM-130/2	DM-130 & 140
No. installed/date	since 1972	100+ since Jan 1975	2,300 since Feb 1971	since Jan 1974	since Nov 1974
Multiprogramming	yes	32 partitions	no	4 partitions	4 partitions
Communications	32 lines (2780, 3780, SDLC)	64 lines (own protocol)	(3270, 2260, 2780, 3780)	5 lines (HASP, 2780)	25 lines (HASP, 2780)
Applications	education, municipal government	distribution, manufacturing, construction, accounting	manufacturing, insurance, education, commo, data entry	manufacturing, insurance distribution, medicine	manufacturing, insurance distribution, medicine
Processor	DEC PDP-11/34	Fedder S III	Four-Phase	SPC-16/40	SPC-16/45 or 16/65
Internal storage	32K-256K core (900nsec)	24K-256K MOS (cycletimeng)	24K-96K MOS (2usec)	64K core (1.44usec)	64K-128K core (960nsec)
Word size/add time	16bits, 3.0usec add time	8bits, add time not given	24bits, 16usec add time	16bits, 1.44usec add time	16bits, 960nsec add time
Mass Storage					
Discs	floppy, cart, pack, fixed	floppy, cartridge	floppy, cart, pack	cart	cart, pack, fixed-head
Access methods	random, seq, indexed seq	random, seq, indexed seq	contiguous, chain, ind seq	indexed sequential	indexed sequential
Mag tapes	reel-reel, cassette	reel-reel, cassette	reel-reel	no	reel-reel
Peripherals	10-key, ppt, card, serial print, line print, crt	10-key, ppt, card, serial print (165cps), line print (1250lpm), crt	10-key, card, serial print (30cps), line print (to 700lpm), crt	10-key, card, serial print (165cps), crt	10-key, card, serial print (165cps), line print (to 600lpm), crt
Software	COBOL, RPG, FORTRAN, BASIC, assembler, FOCAL, acct pkg, dbms	BASIC, assembler, CPL, PL/X, acct pkg, dbms	COBOL, RPG, assembler	FORTRAN, assembler	FORTRAN, assemb, acct pkg
Base Prices					
Software/support	$45,000 soft and support extra	$37,500 ($750/month) soft and support extra	$30.3K-$68K($604-$1,432/mo) soft incl	$35,000 (purchase only) soft incl, support extra	$35K-$55K (purchase only) soft incl, support extra
Comments	administrative and instructional systems built to customer specifications	Fedder Data Systems is now a division of Financial Computer Corp		sold as a turnkey system by oem's	

Manufacturer	General Information	General Robotics	General Robotics	GRI Computer	Harris
Model Highlights	GIS-350 ABLE	GRC-11/03	TSS/11	System 99	S110 & S120
No. installed/date	4 since Jan 1976	10 since July 1976	7 since Dec 1975	not given	since 3rd quarter 1975
Multiprogramming	16 partitions	8 partitions	24 partitions	yes	256 partitions
Communications	16 lines (2780)	unlimited (own protocol)	unlimited (2780)	not given	128 lines (2780,3780,HASP)
Applications	CPA's, municipal government, trucking, distribution	engineering	engineering	manufacturing, distribution	not given
Processor	DEC PDP-11/34	DEC PDP-11/03	DEC PDP-11/34	GRI 99/50	Slash 4
Internal storage	32K-256K core/MOS (1usec)	24K-1M MOS (720nsec)	120K-248Kcore/MOS(980nsec)	32K-64K core (1.76usec)	96K-768K (750-200nsec)
Word size/add time	16bits, 3usec add time	16bits, 3.17usec add time	16bits,1.14usec add time	16bits, add time not given	24bits, 750nsec (8bits) add
Mass Storage					
Discs	cartridge, pack	floppy, cart, pack	floppy, cart, pack	cartridge	floppy, cart, fixed-head
Access methods	random, indexed sequential	random, sequential	random, sequential	random, seq, indexed seq	not given
Mag tapes	reel-reel	reel-reel, cassette, cart	reel-reel, cassette, cart	reel-reel, cartridge	reel-reel, cassette
Peripherals	10-key, acct keyboard, ppt, card, serial print (180cps), line print (300lpm), crt	10-key, ppt, card, line print (to 340lpm), crt	10-key, ppt, card, line print (to 340lpm), crt	10-key, card, serial print (to 330cps), line print (to 600lpm), crt	ppt, card, serial print (30cps), line print (300 lpm), crt
Software	COBOL, FORTRAN, BASIC, assembler, DIBOL, acct pkg, dbms	FORTRAN, BASIC, assembler, FOCAL, acct pkg, dbms	COBOL, RPG, FORTRAN, BASIC, assembler, APL, FOCAL, acct pkg, dbms	RPG II, assembler, acct pkg	COBOL, RPG, FORTRAN, BASIC, assembler, dbms
Base Prices	$45,000 ($925/month)	$13,975 (purchase only)	$59,750 (purchase only)	$44,376 (purchase only)	$85K-$119K (purchase only)
Software/support	soft and support extra	soft and support incl	soft and support incl	support and some soft extra	soft and support incl
Comments	software available separately for $12,500				

Manufacturer	Harris	H-P Calculator Products	H-P Data Systems	H-P Data Systems	H-P General Systems
Model Highlights	S210 & S220	9830 A&B	2105A & 2112A	9640A & 9700A	2000 Series Models 30 & 40
No. installed/date	4 since 4th Q 1975	since Nov 1972	3,550 since May 1974	900 since 1972	7,640 since 1969
Multiprogramming	256 partitions	no	64 partitions	16 partitions	yes
Communications	128 lines (2780, 3780 HASP)	1 line (own protocol)	32lines(2780,3780,HASP,ASP)	16 lines (2780, bisynch)	32 lines (HASP, CDC U200)
Applications	not given	real estate, medical engineering	manufacturing, scientific, inventory, order process	material requirements, inventory, order entry	manufacturing, education
Processor	Slash 7	HP	HP	HP 21MX	HP 2108A (M/20)
Internal storage	192K-768K (425-200nsec)	3K-30K MOS (13usec)	4K-512K MOS (650nsec)	64K-608K MOS (650nsec)	96K-128K MOS (650nsec)
Word size/add time	24bits, 400nsec (8bits) add	8bits, 1msec add time	16bits, 1.94usec (5 digits)	16bits, 1.94usec add time	16bits, 1.94usec (5 digits)
Mass Storage					
Discs	floppy, cart, pack, fixed	cart	cartridge	cartridge	cartridge
Access methods	not given	not given	random, seq, linked, keyed	random, sequential, keyed	sequential
Mag tapes	reel-reel, cassette	cassette	reel-reel, cartridge	reel-reel, cassette	reel-reel, cassette
Peripherals	ppt, card, serial print (30 cps), line print (600lpm), crt	10-key, ppt, card, line print (to 300lpm), crt	10-key, ppt, card, serial print (30cps), line print (to 1250lpm), crt	10-key, ppt, card, serial print (to 120cps), line print (to 1250lpm), crt	ppt, card, serial print (to 120cps), line print (to 1250lpm), crt
Software	COBOL, RPG, FORTRAN, BASIC assembler, SNOBOL 4, FORGO, dbms	BASIC, acct pkg	FORTRAN, BASIC, assembler, ALGOL, Micro, dbms	FORTRAN, BASIC, assembler, ALGOL, IMAGE 1000 dbms	BASIC
Base Prices	$149K-$189K (purchase only)	$4,900-$8,350	$5,750-$7,700 (purch only)	$30K-$40K($780-$1036 5-year)	$67K-$75K ($1424-$1598/mo)
Software/support	soft and support incl	soft and support extra	soft and support extra	support and some soft extra	support and some soft extra
Comments					security system for time-sharing environment

Manufacturer	H-P General Systems	Honeywell	Honeywell	Honeywell	Hotel Computers
Model Highlights	3000/II Series	6/06	61/58 & 61/60	62/40 & 62/60	
No. installed/date	225 since June 1976	10 since Jan 1976	90 since Nov 1974	600 since June 1974	since 2nd Q 1973
Multiprogramming	yes	yes	17 partitions	yes	yes, multiple partitions
Communications	63 lines (2780, 3780)	128 lines (own protocol)	17 lines (own protocol)	9 lines (own protocol)	1 line (own protocol)
Applications	manufacturing, education	hospital, manufacturing, inventory, medical	education, hospital, manufacturing, inventory	distribution, manufacturing	hotels
Processor	HP 3000	Honeywell	Honeywell	Honeywell	Varian V72
Internal storage	128K-512K MOS (700nsec)	16K-128K MOS (650nsec)	5K-10K core, MOS (1.2nsec)	64K-256K MOS (1usec/2bytes)	64K-512K core (660nsec)
Word size/add time	16bits, 1.225usec (10 digits)	16bits, 2usec add time	8bits, 115usec (9 digits)	8bits, add time not given	16bits, 7.0usec add time
Mass Storage					
Discs	cartridge, pack	cart, pack, fixed-head	cart, pack	cart, pack	cart
Access methods	direct, sequential, chained	random, seq, indexed seq	indexed random	direct, seq, indexed seq	random, seq, indexed seq
Mag tapes	reel-reel, cassette	reel-reel, cassette	no	reel-reel, cassette	no
Peripherals	10-key, ppt, card, serial print (to 120cps), line print (to 1250lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 1100lpm), crt	10-key, card, line print (to 650lpm), extended memory, 3rd party crts	10-key, card, serial print (30cps), line print (to 1600lpm), 3rd party crts	10-key, serial print (165cps), line print (300lpm), crt
Software	COBOL, RPG, FORTRAN, BASIC, assembler, dbms	FORTRAN, BASIC, macro assembler	COBOL, BASIC, acct pkg	COBOL, RPG, FORTRAN, acct pkg	RPGII, FORTRAN IV, assemb, acct pkg
Base Prices	$110K-$190K($2338-$4038 5yr)	$7,900	$20.6K-$25.4K ($418-$611/mo)	$52K-$75.4K ($1,107-$1,697)	$125,000 (purchase only)
Software/support	soft incl, support extra	soft and support extra	soft and support extra	soft and support extra	soft incl, support extra
Comments	3000 Series II is upgrade from previous 3000CX Series	microprogrammed to emulate the Honeywell 716			interfaces for hotel switchboard and in-room vending devices available

Manufacturer	IBM	IBM	IBM	IBM	IBM
Model Highlights	5100	System/32	System/3	1130	System/360 Model 20
No. installed/date	since Sept 1975	5,500+ since Feb 1975	30,000+ since Dec 1970	4,000 since 1965	15,000, since Nov 1964
Multiprogramming	no	no	3 partitions	no	no
Communications	1 line (2741)	1 line (SDLC)	8 lines (SDLC)	16 lines (bisynch)	1 line (bisynch)
Applications	financial analysis, statistics	distribution, medical, manufacturing, word process	distribution, medical, manufacturing, education	engineering, manufacturing, distribution, medical	manufacturing, distribution, education, government
Processor	IBM	BM	IBM	IBM	IBM
Internal storage	16K-64KMOS(530nsec/2bytes)	16K-32K MOS (600nsec)	8K-256K core, MOS (1.52usec)	8K-64K core (2.2-3.6usec)	4K-32K core (see comments)
Word size/add time	8bits, 1msec add time	8bits, 150usec (5 digits)	8bits, 24usec (5 digits)	16bits, 4.9-8.0usec add	8bits, 209usec (5 digits)
Mass Storage					
Discs	no	floppy, non-removable cart	floppy, cart, pack	cartridge, pack	pack
Access methods	sequential	random, seq, indexed seq	not given	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	cartridge	no	reel-reel	reel-reel	reel-reel
Peripherals	10-key, serial print (80cps) crt	10-key, card, serial print (to 80cps), line print (to 155lpm), crt	10-key, card, serial print (85cps), line print (to 1100lpm), crt	ppt, card, serial print (15cps), line print (to 1100lpm), crt	card, serial print (15.5cps), line print (to 1100lpm)
Software	BASIC, APL	RPG II, macro assemb, acct pkg	COBOL, RPG II, FORTRAN, BASIC, acct pkg	RPG, FORTRAN, macro assemb, acct pkg	RPG, macro assemb, acct pkg
Base Prices	$8,975 ($450/month 3-month)	$33,560 ($680/month 3-year)	$22,430 ($674/month)	$14.2K-$18.9K ($826/month)	$13,040 ($529/month)
Software/support	support and some soft extra	soft and support extra	soft and support extra	soft and support extra	soft and support extra
Comments	portable computer weighing 50 lbs, RS-232C interface available	approx 10,000 more System/32's are on order	six different models	cycle times vary with processor model	low end of 360 Series; cycle times vary with processor model

Manufacturer	Information Associates	ICL	ICL	International Computing	IST Datasystems
Model Highlights	TIS	2903	2904	System 95/99	TPS
No. installed/date	5 since September 1974	16 since July 1974	not given	9 since Oct 1972	not given
Multiprogramming	6 partitions	4 partitions	4 partitions	17 partitions	no
Communications	# lines ng (own protocol)	4 lines (ICL 7181, IBM 2780)	6 lines (ICL 7181, IBM 2780)	16 lines (2780 bisynch)	256 lines (own protocol)
Applications	order entry, distribution, metal service inventory	manufacturing, retail, distribution, data entry	manufacturing, retail, distribution	wholesale, distribution, accounts payable, inventory	not given
Processor	Data General Nova 830	ICL	ICL	Data General Nova 2/10	Data General Nova 3/12
Internal storage	32K-256K core (1.0usec)	64K-256K MOS (1.14usec)	128K-384K MOS (1.14nsec)	32K-64K core (1.00nsec)	96K-256K core (800nsec)
Word size/add time	16bits, 1usec add time	24bits, 17.7usec (12 bits)	24bits, 11.8usec add time	16bits, 1.3usec add time	16bits, 800nsec add time
Mass Storage					
Discs	floppy, cart, pack	cart, pack	cart, pack	floppy, cart, pack	floppy, cart, pack, fixed
Access methods	random, seq, direct, ind seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq
Mag tapes	reel-reel	reel-reel	reel-reel	reel-reel, cassette	reel-reel, cassette
Peripherals	10-key, ppt, card serial print (165cps), line print (to 600lpm), crt	10-key, ppt, card, line print (to 1500lpm), crt	10-key, ppt, card, line print (to 1500lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 600lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 1200lpm), crt
Software	BASIC, macro assembler, acct pkg, dbms	COBOL, RPG, FORTRAN, BASIC, acct pkg, dbms	COBOL, RPG, FORTRAN, assembler, acct pkg, dbms	RPG, FORTRAN, BASIC, assembler, LOGOS, acct pkg	COBOL, FORTRAN IV/V, BASIC, assembler, ALGOL, acct pkg
Base Prices	$47,000 (purchase only)	$85,000 ($2,200/month)	$135,000 ($3,500/month)	$24,000 (purchase only)	$25,000 (purchase only)
Software/support	soft and support extra	soft and support extra	soft and support extra	soft and support extra	support and some soft extra
Comments			firmware-enhanced version of 2903		

Manufacturer	IST Datasystems	Jacquard Systems	Litton/Sweda Intl	Lockheed	Logical Machine
Model Highlights	BPS	J100 Video Computer	1300 Series	Systems II & III	ADAM
No. installed/date	due September 1976	since Aug 1975	1,050 since Sept 1974	300+ since late 1973	75 since March 1974
Multiprogramming	2 partitions	256 partitions	no	not given	no
Communications	256 lines (own protocol)	62 lines (2780, 3780)	none	none	none
Applications	not given	distributed processing	distribution, accounting	insurance, others by contract	business accounting, filing
Processor	Data General S/200, C/300	Jacquard	Sweda	Lockheed Sue	LOMAC ALP
Internal storage	32K-256K core (800nsec)	32K-128K core (1.5usec)	16K-40K core (1.2usec)	6K-64K core (800nsec)	32K-64K MOS (550nsec)
Word size/add time	16bits, 600nsec add time	16bits, 7usec add time	16bits, 225usec (5 digits)	16bits, 2.79usec add time	16bits, 1.5usec (5 digits)
Mass Storage					
Discs	floppy, cart, pack, fixed	floppy, cart, pack	floppy	cartridge	cartridge
Access methods	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	indexed sequential
Mag tapes	reel-reel, cassette	reel-reel	cassette	reel-reel	no
Peripherals	10-key, ppt, card, serial print (165cps), line print (1200lpm), crt	10-key, serial print (166cps), line print (300lpm), crt	10-key, serial print (140cps), crt	10-key, card, serial print (88cps), line print (to 600lpm), crt	10-key, serial print (165cps), crt
Software	COBOL, RPG II, FORTRAN IV/V, BASIC, assembler, ALGOL acct pkg, INFOS dbms	BASIC, assembler	BASIC, assembler, acct pkg, dbms	RPG, FORTRAN, assembler, acct pkg	ADAM English, acct pkg, dbms
Base Prices	$40,000 (purchase only)	$14,900 ($525/month)	$15.5K-$19.3K (purchase only)	$21,950-$68,520	$39,995 (purchase only)
Software/support	support and some soft extra	support incl, some soft extra	soft and support extra	soft and support extra	soft and support incl
Comments				this system with insurance software is called Servus 80	self-organizing, no software aids other than English vocabulary reportedly required

Manufacturer	Lucero Systems	Lucero Systems	Lucero Systems	Martin, Wolfe Inc.	Med Scientific Intl
Model Highlights	Model 310	Model 350	Model 500	Mesa Two Series	
No. installed/date	since June 1976	since June 1976	since July 1976	140+ since Dec 1971	not given
Multiprogramming	no	4 partitions	yes	2 partitions	no
Communications	1 line (2780)	4 lines (2780)	63 lines (2780)	16 lines (3780, HASP)	64 lines (own protocol)
Applications	distribution, CPA's, word processing, wholesalers	distribution, manufacturing, auto dealers, CPA's	distribution, manufacturing, auto dealers, time-sharing	distribution, broadcasting, auto parts, medicine	pharmacy
Processor	DEC Datasystem 310	DEC Datasystem 350	DEC Datasystem 500	DEC 116	Data General Nova 3
Internal storage	16K-64K core (1.4usec)	32K-128K core (980nsec)	64K-2M (980-725nsec)	32K-128K core (960nsec)	32K-256K (1usec-700nsec)
Word size/add time	12bits, 2.8usec add time	16bits, 7.0-1.0nsec add time	16bits, 6.0-2.7usec add time	16bits, 1usec add time	16bits, 700-950nsec add time
Mass Storage					
Discs	floppy, cartridge	floppy, cart, pack	floppy, cart, pack	pack	cartridge
Access methods	random, sequential	random, seq, indexed seq	random, seq, indexed seq	random, seq, indexed seq	indexed sequential
Mag tapes	no	reel-reel, cassette, cart	reel-reel, cassette, cart	reel-reel	reel-reel
Peripherals	10-key, serial print (180cps), line print (to 300lpm), crt	10-key, card, serial print (180cps), line print (to 1200lpm), crt	10-key, card, serial print (180cps), line print (to 1200lpm), crt	10-key, card, line print (to 600lpm), crt	10-key, ppt, card, serial print (to 165cps), line print (300lpm), crt
Software	BASIC, assembler, DIBOL, acct pkg	BASIC, assembler, DIBOL, acct pkg, dbms	COBOL, RPG, FORTRAN, BASIC, assembler, DIBOL, acct pkg, dbms	RPG, FPG, acct pkg, dbms	assembler
Base Prices	$22,695 ($500/month)	$29,023 ($638/month)	$39,875 ($877/month)	$54.1K-$62.1K (purch only)	$110,000
Software/support	soft and support incl	soft extra, support incl	soft extra, support incl	soft incl, support extra	soft incl, support extra
Comments					similar system for medical laboratory is available at $140,000

Manufacturer	Medical Computer Sciences	Microdata	Microdata	Midas Systems	Mini-Computer Systems
Model Highlights	System 2000	Express I & II	Reality		MICOS
No. installed/date	15 since Oct 1973	due Dec 1976	500+ since Nov 1973	6 since March 1976	over 250 since March 1973
Multiprogramming	no	yes	yes	no	yes
Communications	64 lines (own protocol)	32 lines (3780, bisynch)	32 lines (2780)	not given	1 line(2780,HASP,CDC200UT)
Applications	hospital	distributed processing, order entry	engineering, education, time-sharing, accounting	accounting, medical, bowling establishments	municipal government, education, fuel, apparel, etc
Processor	HP 2108	Microdata 32/S	Microdata 1600	Datapoint 1100	Data General Nova 2/10
Internal storage	4K-384K MOS (650nsec)	64K-1M MOS (400nsec)	16K-128K core (1usec)	16K MOS (1.6usec)	65K-130K core(1usec-800nsec)
Word size/add time	16bits, 1.94usec (5 digits)	16bits, 2usec add time	16bits, 5usec add time	8bits, 4.8usec add time	16bits, 1.2usec add time
Mass Storage					
Discs	floppy, cart, pack	cart, pack, fixed-head	cart, pack, fixed-head	floppy, cart, pack	cartridge, pack
Access methods	sequential, indexed seq	random, seq, indexed seq	random, sequential	not given	random, sequential
Mag tapes	reel-reel, cassette, cart	cartridge	reel-reel, cartridge	reel-reel, cassette	reel-reel
Peripherals	10-key, line print (to 1200 lpm), crt	10-key, card, serial print (165cps), line print (to 600lpm), crt	10-key, card, serial print (165cps), line print (to 600lpm), crt	10-key, card, serial print (to 240cps), line print (to 600lpm), crt	10-key, card, serial print (to 330cps), line print (to 600lpm), crt
Software	FORTRAN, BASIC, assembler, ALGOL, acct pkg, dbms	COBOL, FORTRAN, BASIC, EPL	RPG, BASIC, assembler, English, acct pkg, dbms	acctg pkg	BASIC (extensive), acct pkg
Base Prices	$150K-$550K($2500-$7500/mo)	$19,950-$27,650 (purch only)	$33,900 (purchase only)	$22,000 (purchase only)	$49,900
Software/support	soft extra, support incl	soft incl, support extra	soft and support incl	not given	soft and support extra
Comments	systems for on-line admissions and charge collection also available	designed for oem and large-volume users who can provide own application software	marketed through dealer network		

Manufacturer	Minuteman Computer	MIS International	Mylee Digital Sciences	NCR	NCR
Model Highlights	1770 Series	4501-0502	3056 & 3088	299-100 & 200	499
No. installed/date	80 since 1973	since May 1976	18 since May 1976	15,000 since Jan 1974	300 since Feb 1976
Multiprogramming	no	7 partitions	12 partitions	no	no
Communications	1 line (own protocol)	7 lines (SDLC)	16 lines (own protocol)	1 line (own protocol)	2 lines (bisynch)
Applications	distribution, manufacturing liquor wholesalers	warehousing, distribution	distribution, inventory, accounting	retail, financial, manufacturing, wholesale	business accounting
Processor	Data General Nova 2/10	NCR 8200, others	Mylee 3G	NCR 299	NCR 605
Internal storage	32K-64K core (1usec-800nsec)	32K-158K core(1.2usec/2bytes	88K-152K MOS (800nsec)	8K-16Kbits core (7usec/bit)	12K-32K core (1.2usec)
Word size/add time	16bits, 2.7usec add time	8bits, add time not given	16bits, 125usec (5 digits)	64bits, 220msec add time	16bits, 1.7msec (5 digits)
Mass Storage					
Discs	cart, pack	cart, pack	cartridge	no	cartridge
Access methods	random, seq, indexed seq	not given	indexed sequential	not given	random, sequential
Mag tapes	reel-reel, cassette, cart	cassette	no	cassette	cassette
Peripherals	10-key, ppt, card, serial print (165cps), line print (to 900lpm), crt	10-key, acct keyboard, ppt, card, serial print (to 300cps), line print (to 1200lpm), crt	10-key, card, serial print (165cps), line print (300lpm), crt	10-key, ppt, serial print (15cps), mag card	10-key, ppt, card, serial print (to 130cps), line print (to 300lpm), mag card, crt
Software	COBOL, FORTRAN, BASIC, assembler, acct pkg, dbms	COBOL, Text Editor, acct pkg	ACE, acct pkg, dbms	assembler, acct pkg	NEAT/AM, acct pkg
Base Prices	$39,995 (purchase only)	$40,000 ($1,200-$3,000/mo)	$37.5K-$40.8K (purchase only)	$7,250-$9,300 (to $310/month)	$17,900 (purchase only)
Software/support	soft and support extra	soft and support extra	support incl, some soft extra	soft and support extra	soft and support extra
Comments		pricing depends on cpu selected: NCR 8200, Interdata 8/32, or Data General Eclipse	user has choice of 1 of 8 inventory management packages included	user-programmed through optically read coding sheets	replaces NCR 399 (6000 sold)

NCR	NCR	NCR	Nixdorf	Nixdorf	Norfield Datasystems
8200 300-400 since Sept 1974 7 partitions 7 lines (2780, bisynch) hospital accounting, gov't, distribution, wholesaling	Century 75 50 since May 1976 no 10 lines (2780, bisynch) business applications	Century 101 1,200 since Aug 1972 9 partitions 255 lines (2780, bisynch) business applications	System 8870 since 1975 yes 9 lines (own protocol) distribution, medical, garment	System 840 3,000 since Nov 1973 no 1 line (2260,2740,DCT2000) mortgage, automobile, general accounting	System 1 over 20 since June 1973 2 partitions 32 typical (2780,SDLC,HASP automated reporting, order entry
NCR 605 32K-128K core 1.2usec 16bits, 2.4usec (8 digits)	NCR 615-950 16K-64K core 1.2usec 8bits, 28.8usec (5 digits)	NCR 615-952 16K-128K core (1.2usec) 8bits, 25.2usec (5 digits)	DCC 116-H 64K core (960nsec) 16bits, 1.0usec add time	Nixdorf 154 6K-24K core (2.0usec) 12 bits, 8.0usec add time	Data General Nova 32K-256K core (800nsec) 16bits, 800nsec add time
cart random, seq, indexed seq cassette	pack random, seq, indexed seq cassette	cart, pack random, seq, indexed seq reel-reel, cassette	cart random, seq, indexed seq reel-reel	pack random, seq, indexed seq reel-reel, cassette	cart, pack random, seq, indexed seq reel-reel, cassette
10-key, card, serial print (175cps), line print (to 300lpm), crt	card, line print (to 450lpm), crt	10-key, ppt, card, serial print (6cps), line print (to 3500lpm), crt	10-key, ppt, card, serial print (165cps), line print (to 600lpm), crt	10-key, ppt, card, serial print (to 165cps), mag card	ppt, card, serial print (to 420cps), line print (to 600lpm), crt
COBOL, assembler, NEAT/3, acct pkg	COBOL, RPG, FORTRAN, BASIC, assembler, NEAT/3, acct pkg, dbms	COBOL, RPG II, FORTRAN IV BASIC, assembler, NEAT/3, acct pkg, TOTAL dbms	BASIC, assembler	assembler, BOSS, acct pkg	BASIC, assembler, dbms
$33,420 ($945/month) soft and support extra	$56,850 ($1,650/month) soft and some support extra	$69,520 ($2,005/month) soft and support extra	$39,990 ($851/month) soft and support extra includes NIDAS distribution accounting system	$22,490 ($485/month) soft and support extra	$35,000 ($1,250/month) soft incl, support extra

Norfield Datasystems	Northrop Data Systems	Olivetti	Olivetti	Pako	Philips
System 2 not given yes 128 typical(2780,SDLC,HASP) automated reporting, order entry	BDS 1000 & 2000 50 since June 1972 7 partitions 8 lines (own protocol) hospital, medical, furniture manufacture	A5 & A6 Series since Feb 1975 no 1 line (2848, 2260, 2780) credit union, education distribution	A7 Series since March 1975 2 partitions 1 line (bisynch) credit union, education, distribution	Pricing/Invoicing System since June 1975 15 partitions 1 line (2780) photofinishing	P310 & P320 300 since June 1975 no 1 line (2780) banking, insurance, medical, utilities
Data General Eclipse C/300 32K-128K core (800nsec) 16bits, 600nsec add time	Microdata 1600 16K-64K core (1usec) 8-32bits, 9.68usec (7 digits)	Olivetti 5000 Series 0.5K-4K, MOS (1.5usec) 64bits, 10usec add time	Olivetti 7000 Series 16K-48K MOS (900nsec) 8bits, 6.1usec add time	Computer Automation LSI 2/20 32K-64K core (1.2usec) 16bits, 25usec(8digits) add	Philips 8K-16K core (1.5usec) 8bits, add time not given
cart, pack random, seq, indexed seq reel-reel, cassette	cart random, seq, indexed seq reel-reel	floppy random, seq, indexed seq cassette	floppy, cart, fixed-head random, seq, indexed seq cassette	cart random, seq, indexed seq reel-reel	no not given cassette
ppt, card, serial print (to 420cps), line print (to 600lpm), crt	10-key, card, serial print (to 120cps), line print (to 600lpm), crt	10-key, ppt, serial print (16cps), line print (to 300lpm), mag card	10-key, ppt, card, serial print (to 175cps), line print (to 600lpm), mag card, crt	10-key, ppt, card, line print (to 300lpm), crt	10-key, ppt, card, serial print (50cps), mag card
COBOL, RPG, FORTRAN, BASIC, assembler, dbms	BASIC, assembler, acct pkg, dbms	assembler, APCO, acct pkg, dbms	RPG, assembler, PL/1, acct pkg, dbms	dbms	assembler, acct pkg
$75,000 ($3,000/month) soft incl, support extra	$49.3K-$62.6K (purchase only) soft and support extra	$4.9K-$8.8K ($177-310/mo) soft and support extra mag cards used for program storage and data I/O	$15.5K-18.5K ($542-$645/mo) soft and support extra	$69,745 (purchase only) soft and support extra 10-key based system also available at $32,370	$7K-$15.2K ($160-345/month soft and support extra another 700 P300s installed worldwide

Philips	Programmed Control	Programmed Control	Qantel	Q1 Corporation	Randal Data Systems
P 350 2,000 since June 1970 no 1 line (2780) banking, insurance, medical, utilities	Prophet 21 Model 1 15 since 1972 22 partitions not given distribution, beverage manufacturing & wholesale	Prophet 21 Model 2 due Jan 1977 128 partitions not given distribution, beverage, manufacturing & wholesale	Systems 800 through 1300 470 since 1st Q 1974 30 partitions 32 lines (2780) wholesale, distribution, medical clinics	Q1/LMC 200 since 1975 yes 8 lines (3741) accounting, credit union, word processing	Link-100 100 since Oct 1975 2 partitions 8 lines (2780, DCT 1000) lumber industry, medical, dental management
Philips 600-1200words core (1.5usec) 64 bits, add time not given	Texas Instruments 960B 32K-128K MOS (700nsec) 16bits, 3.6usec add time	Texas Instruments 990/10 32K-2M MOS (700nsec) 16bits, 2.8usec add time	Qantel Q7 or Q7.5 32K-128K MOS (1.5usec) 8bits, add time not given	Intel 8080 8K-64K MOS (500nsec) 8bits, 2usec add time	Randal-100 32K-64K MOS (600nsec) 16bits, 2.4usec add time
cart random, seq, indexed seq cassette	cart random, seq, indexed seq no	cart, pack random, seq, indexed seq no	cart, pack random, seq, indexed seq reel-reel	floppy, cart random, seq no	floppy formatted, text, ind seq, seq reel-reel
10-key, ppt, card, serial print (40cps), line print (to 600lpm), mag card	10-key, serial print (10cps), line print (250lpm), crt	10-key, serial print (10cps), line print (250lpm), crt	10-key, ppt, card, serial (165cps), line print (to 1200lpm), crt	10-key, serial print (to 200cps), line print (300lpm), crt	10-key, ppt, card, serial print (to 180cps), line print (to 600lpm), crt
assembler, acct pkg	Prophet 21, acct pkg, dbms	Prophet 21, acct pkg, dbms	assembler, QIC (BASIC), acct pkg	assembler, PL/1, acct pkg, dbms	BASIC, acct pkg
$15,500-26,500($350-600/mo) soft and support extra	$42,500 (purchase only) soft and support incl	$42,500 (purchase only) soft and support incl	$32K-$42.5K (purchase only) support and some soft extra	$17,950 (purchase only) soft and support incl	$12,000 ($273/month) soft and support extra
another 18,000 P 350s installed worldwide	marketing is primarily in northeastern U.S.	marketing is primarily in northeastern U.S.		up to 4 workstations per system	

Manufacturer	Randal Data Systems	Randal Data Systems	Raytheon	STC Systems	STC Systems
Model Highlights	Link-200	Link 310 & 410	PTS/1200	Ultimacc 2000	Ultimacc 3000 & 3370
No. installed/date	since Aug 1976	100 since June 1974	50 since Nov 1974	not given	not given
Multiprogramming	16 partitions	9 partitions	20 partitions	8 partitions	50 partitions
Communications	8 lines (2780, DCT 1000)	8 lines (2780, DCT1000)	1 line (2780)	not given	not given
Applications	lumber industry, medical, dental management	lumber industry, medical dental management	transportation, insurance, finance	manufacturing, banking, government, dist process	manufacturing, banking, government, dist process
Processor	Randal-200	Data General Nova 2/10	Raytheon	Data General Nova 1200	Data General Nova 830
Internal storage	32K-64K MOS (600nsec)	32K-64K core (1.0usec)	48K-128K MOS (1.28usec)	32K-64K core (1.35usec)	32K-256K core (1usec)
Word size/add time	16bits, 1.2usec add time	16bits, 1.2usec add time	16bits, 2.8usec add time	16bits, 1.35usec add time	16bits, 1usec add time
Mass Storage					
Discs	cart	cart	cart	floppy, cart, pack	floppy, pack
Access methods	formatted, text, ind seq, seq	formatted, text, ind seq, seq	random, seq, indexed seq	direct, random, seq, ind seq	direct, random, seq, ind seq
Mag tapes	reel-reel	reel-reel	cassette	reel-reel	reel-reel
Peripherals	10-key, ppt, card, serial print (to 180cps), line print (to 600lpm), crt	10-key, ppt, card, serial print (to 180cps), line print (to 600lpm), crt	10-key, card, serial print (to 165cps), line print (300lpm), crt	10-key, ppt, card, serial print (to 165cps), line print (to 600lpm), crt	10-key, ppt, card, serial print (165cps), line print (600lpm), crt
Software	BASIC, acct pkg	BASIC, acct pkg	MACROL, dbms	COBOL, FORTRAN, BASIC, assemb, acct pkg, dbms	COBOL, FORTRAN, BASIC assembler, acct pkg, dbms
Base Prices	$20,000 ($450/month)	$33.5K-$35.5K($762-808/mo)	$30,580 ($830/month 3-year)	$41,000 (purchase only)	$87,000 (purchase only)
Software/support	soft and support extra	soft and support extra		soft and support incl	soft and support incl
Comments				company formerly called Ultimacc Systems, Inc.	company formerly called Ultimacc Systems, Inc.

Manufacturer	Tal-Star	Tri-Star Inc	Tri-Star Inc	Vanguard Computer	Vanguard Computer
Model Highlights	TDMS System	TTK-10	TEK-80	V500	V400
No. installed/date	since 1972	1 since May 1976	5 since April 1975	2 since March 1976	not given
Multiprogramming	2 partitions	no	2 partitions	variable partitions	variable partitions
Communications	15 lines (own protocol)	64 lines (2780)	64 lines (2780)	64 lines (own protocol)	none
Applications	graphic arts, newspapers	business accounting, inventory	data base management	not given	not given
Processor	General Automation 18/30	Data General Nova 3/12	Data General Eclipse S/200	Raytheon RDS 500	Raytheon RDS 500
Internal storage	32K-64K core (1.2usec)	64K core (1usec)	128K-256K core (2usec)	65K-131K core (700nsec)	65K core (900nsec)
Word size/add time	16bits, 2.4usec add time	16bits, 6.8usec add time	16bits, 6.6usec add time	16bits, 1.4usec add time	16bits, 1.8usec add time
Mass Storage					
Discs	floppy, pack	floppy, cart, pack	cart, pack	floppy, cart, pack, fixed	cart
Access methods	random, seq, indexed seq	indexed sequential	indexed sequential	direct, seq, linked, ind seq	direct, seq, linked, ind seq
Mag tapes	reel-reel	reel-reel	reel-reel	reel-reel	no
Peripherals	10-key, ppt, card, serial print (10cps), line print (240lpm), crt	10-key, ppt, card, serial print, line print (200lpm), crt	10-key, ppt, card, serial print, line print (to 900lpm), crt	10-key, card, serial print (to 330cps), line print (to 1250lpm), crt	10-key, serial print (330cps), crt
Software	COBOL, RPG, FORTRAN assembler, acct pkg, dbms	COBOL, FORTRAN, BASIC assembler, acct pkg	COBOL, FORTRAN, BASIC assembler, acct pkg, dbms	COBOL, SPL, dbms	SPL
Base Prices	$73,600 (purchase only)	$66,000 ($1,518/month)	$167,930 ($3,863/month)	$55,000	$45,000
Software/support	soft and support extra	soft incl, support extra	soft incl, support extra	soft and support extra	soft incl, support extra
Comments					

Manufacturer	Wang	Wang	Warrex Computer	Wintex Computer
Model Highlights	PCS	2200 Series & WCS Series	Centurion Series	200NS
No. installed/date	since April 1976	since April 1975	due 4th Q 1976	since Jan 1975
Multiprogramming	no	no	yes	no
Communications	1 line (2780,3780,2741,3741)	1 line (2780,3780,2741,3741)	8 lines (own protocol)	1 line (own protocol)
Applications	education, laboratory, engineering, management	manufacturing, distribution, banking, insurance	oil/gas, medical, banking, accounting, distribution	distribution, professional service
Processor	Wang 2200	Wang 2200	CC-200 Series	Wintex microprocessor
Internal storage	8K-32K MOS (1.6usec)	4K-32K MOS (1.6usec)	24K-252K (800nsec)	8K-64K MOS (650nsec)
Word size/add time	8bits, 800usec (13digits)	8bits, 800usec (13digits)	16bits, add time not given	8bits, 1.5msec add time
Mass Storage				
Discs	no	floppy, cart	cart	floppy, cart, pack
Access methods	sequential	random, seq, indexed seq	random	key seq, seq, indexed seq
Mag tapes	cassette	reel-reel, cassette	reel-reel, cassette	no
Peripherals	10-key, serial print (200cps), line print (250lpm), crt	10-key, ppt, card, serial print (200cps), line print (250lpm), crt	10-key, ppt, card, serial print (175cps), line print (to 600lpm), crt	10-key, line print (66lpm), crt
Software	BASIC, acct pkg	BASIC, acct pkg, dbms	FORTRAN, BASIC, assembler CPL1, CPL2, acct pkg, dbms	assembler, acct pkg
Base Prices	$5,400 (purchase only)	$2.4K-$30.4K ($207-$1,034)	$20K-$35K (purchase only)	$11,880 ($280/month-5 year)
Software/support	soft extra, support incl	soft extra, support incl	support and some soft extra	soft and some support extra
Comments	portable computer weighing 57-lbs			

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For additional information regarding the products in this survey, please contact the vendors directly, either at the addresses listed below or by circling the appropriate number on the reader service card bound into this issue.

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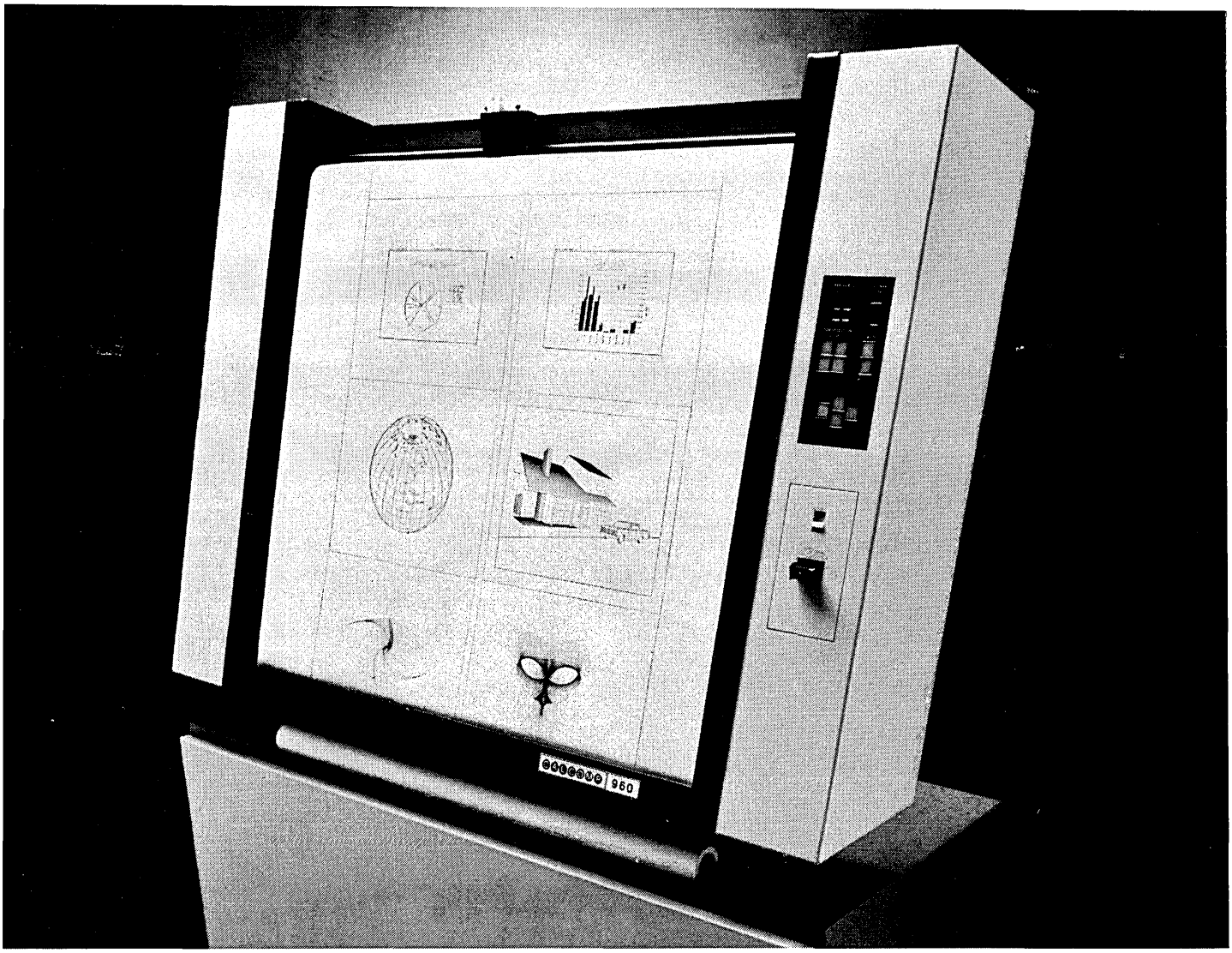

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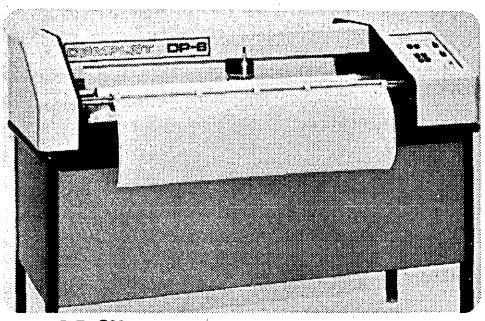

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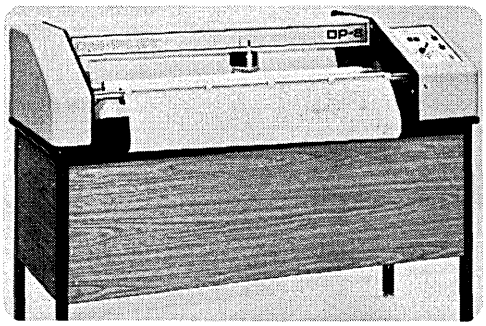

DP-8S 4.5 IPS, Single pen,
9 switch-selectable step sizes
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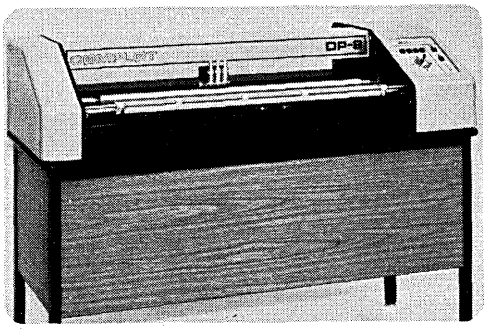

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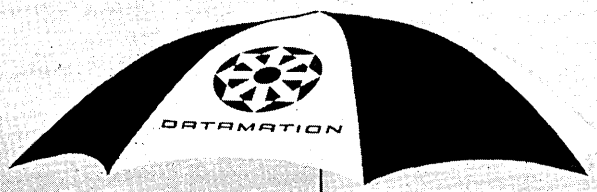
Mr. Armon is an associate editor of "Datapro Reports on Minicomputers." His past experience includes nine years as assistant director of the Institute of Computer Sciences in Philadelphia, where he developed the school's curriculum and directed its in-house computer operation.

Mr. Yerkes is also an associate editor of "Datapro Reports on Minicomputers." Previously he served as a senior instructor in the programming and maintenance of front-end processors with GTE Information Systems, as a senior technical writer with Burroughs, and as a computer maintenance instructor with the RCA Service Co.



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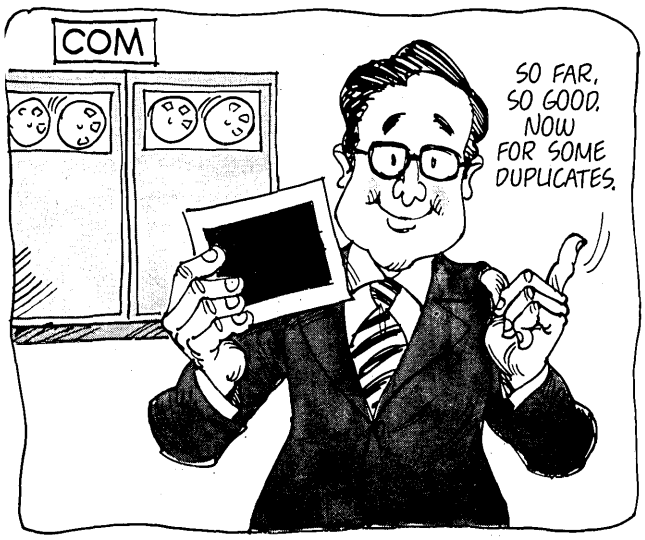

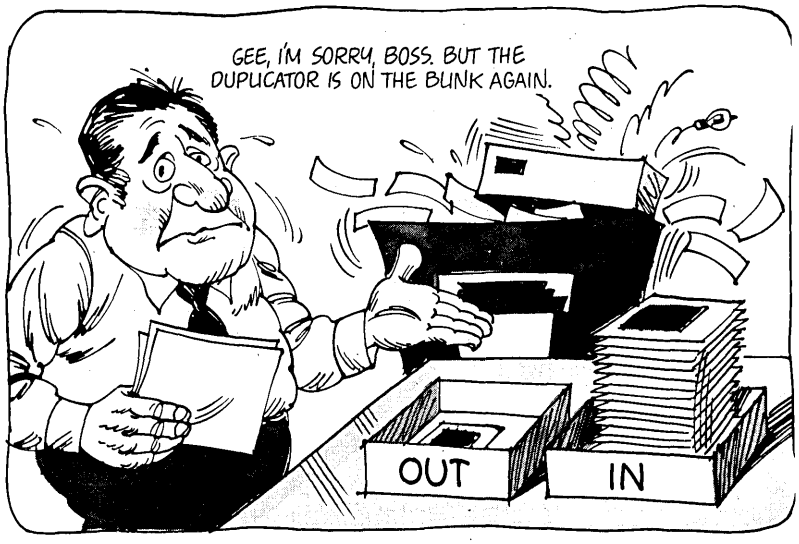

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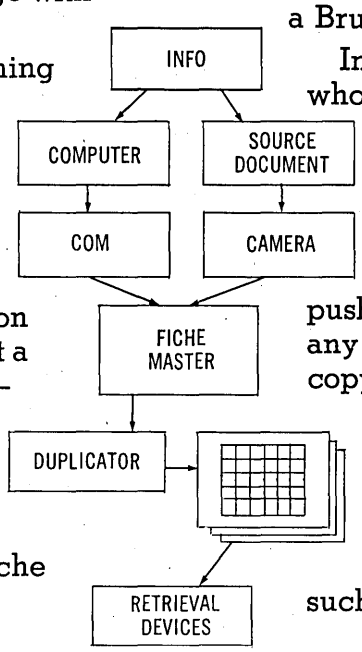

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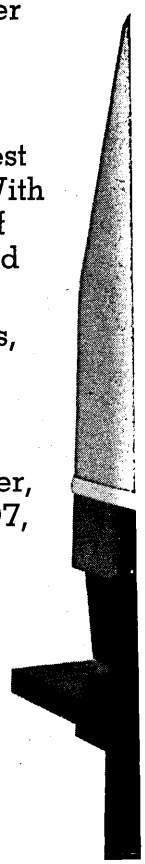

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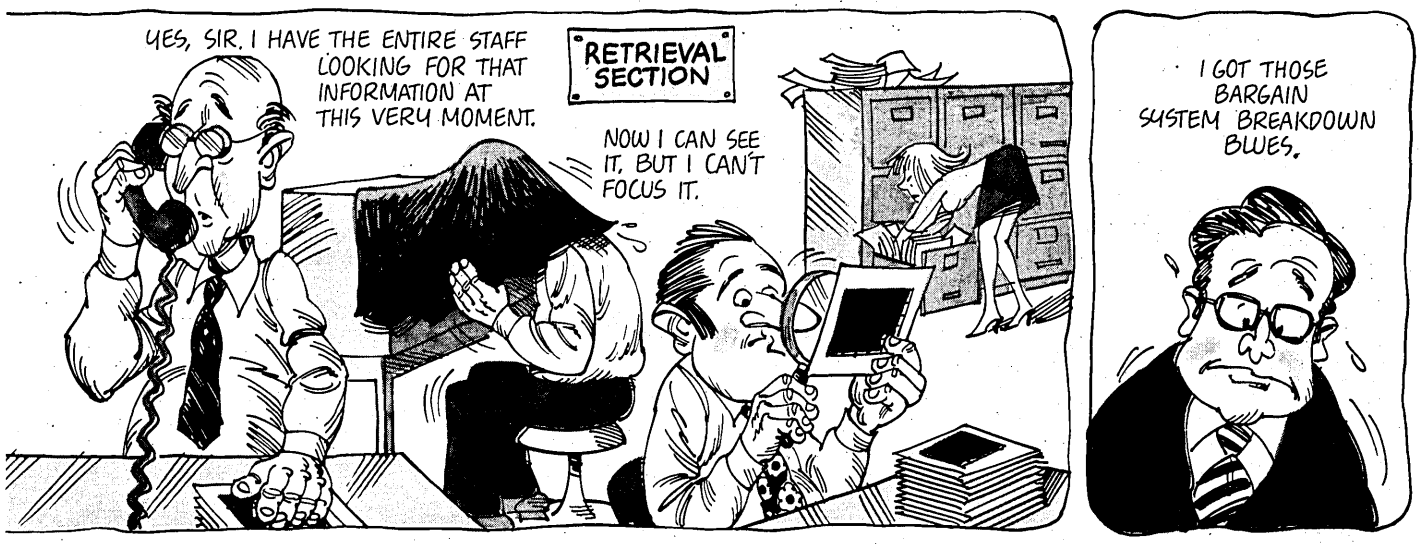

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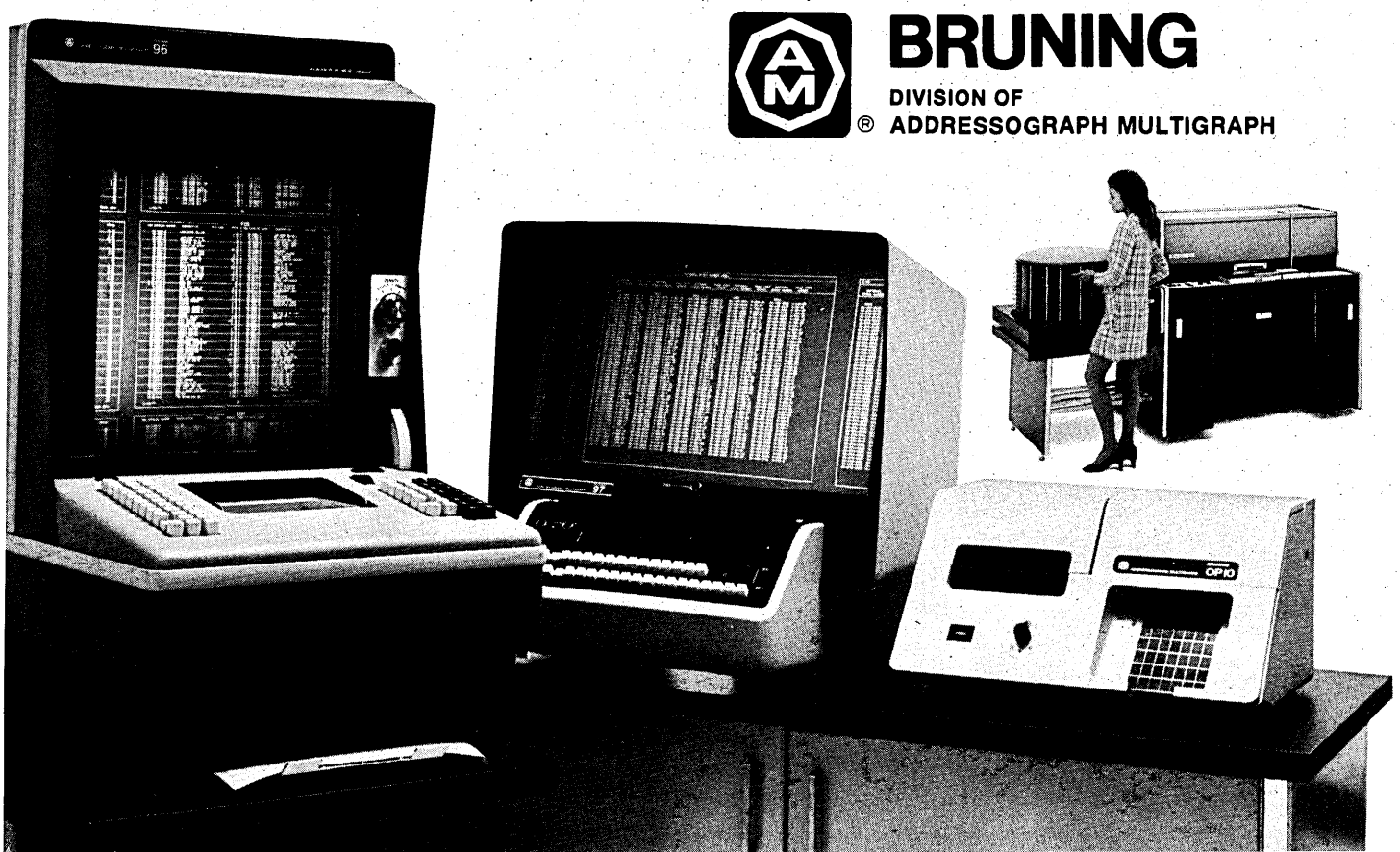

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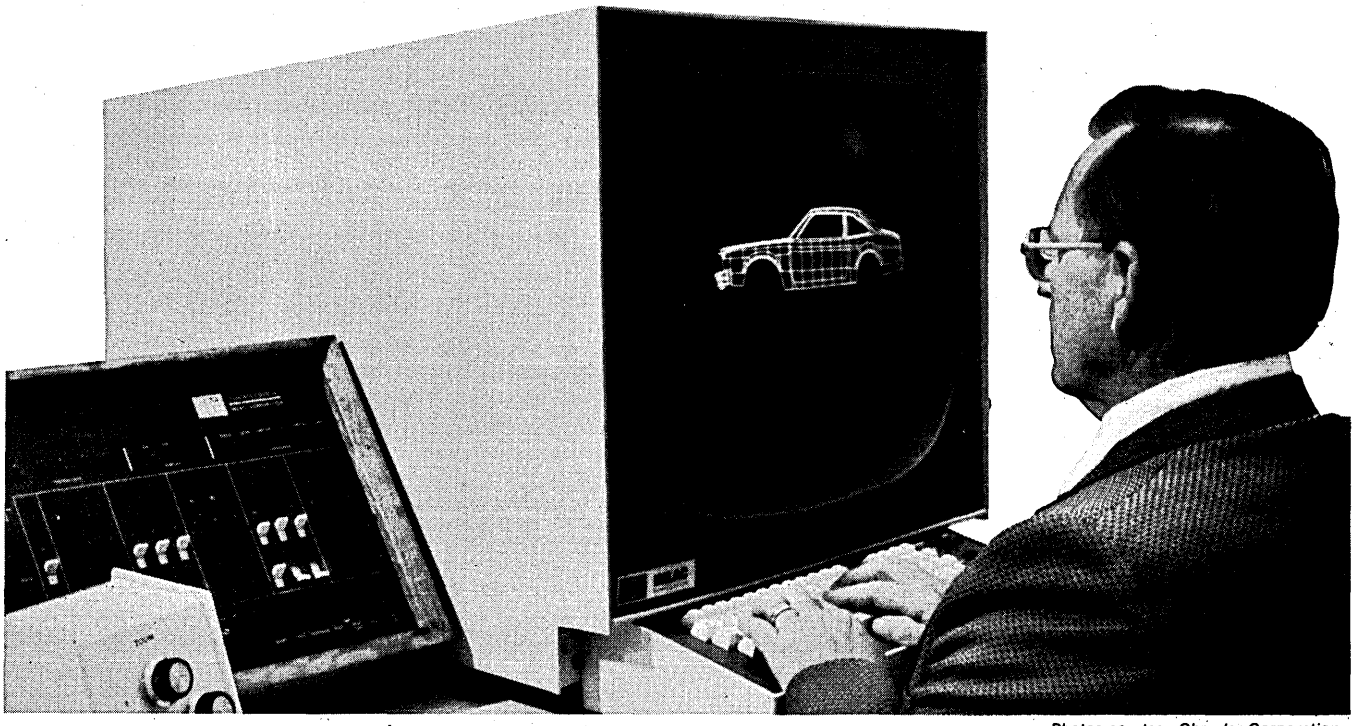

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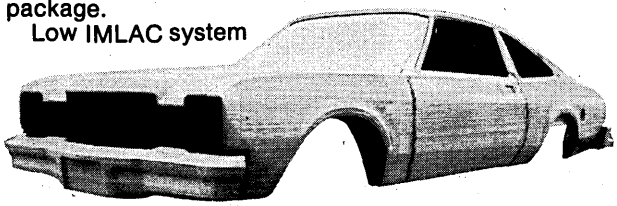

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Managing Change

by Philip H. Braverman

Some changes are unavoidable. Some are desirable. Some come down as edicts; others just sneak in. Set up ways to handle them before they happen.

Most project managers would agree that "change" is the major factor influencing the success or failure of a dp development project. It's as simple as this: Changes that occur during the course of a project are not only unavoidable, but are often desirable if the application produced is not to be obsolete or irrelevant by the time it is installed. Uncontrolled changes, on the other hand may adversely affect schedules, costs, productivity, rework and morale.

> Observe always
> that everything is the
> result of a change and get
> used to thinking that there
> is nothing Nature loves so
> well as to change existing
> forms and to make new ones
> like them.
>
> Marcus Aurelius, *Meditations*

Change must be an orderly, controlled process if project disasters are to be averted. This requires a fundamental understanding of the origin of change and some tools and techniques to assist project management. A procedure for controlling change must be a formal part of every project plan, and an accepted standard in the organization's dp user management system.

Let's define what we mean by "change" in the context of a dp development project:

- Change is any event, action, or edict which may affect the scope of a project, the schedule of a project, or the resources planned for the project.
- The net effect of the change to the scope, schedule or resources could be zero—but that is usually not the case.
- The normal case is that the change will add more function, lengthen the project schedule, and cost more. Changes are, therefore, the enemy of those who get committed to a project with fixed schedules and resources, in an environment where change can foster defensive behavior and reduce cooperation between the users and dp.

> He that
> will not apply new remedies
> must expect new evils.
>
> Bacon

Change is usually described as stemming from "internal" or "external" forces.

Internal changes are derived from events such as:

- reorganizations
- new products to be produced
- policy of business practice changes
- requirements for new information
- misunderstood requirements
- departmental cutbacks

External changes may come from:

- competitive pressures for increased service
- federal or local legislation
- union contract conditions
- changes in capability or availability of hardware or software

Any of these (and this is by no means an exhaustive list) can have an effect on the project—usually a substantial effect. And of course, the longer the project, the more likely that these events will occur.

Any one of them may be a showstopper and wreak havoc on a project at any stage, causing a major change of direction or even the demise of the project. However, these sources of change are usually not very subtle. They come crashing down, often as not, as directives or edicts. They are widely known and easily explained to executive management and to the users, who may not like the effects on the costs or schedules, but can at least understand why things have changed.

A project change control system should be able to handle these situations nicely so that resulting changes to the job definition schedule and resources will be tolerated by management. It's not all that easy. You still have to know what you are doing and have some procedural tools to deal with change. Unfortunately, few projects or installations have an adequate way to control project change.

Project assumptions and management and user expectations are much more subtle and difficult kinds of "change" to deal with, ones that can cause the most aggravation and frequently can cause unpleasant surprises toward the end of the project.

Assumptions and expectations —"theirs" and "ours"

As project managers and good estimators we build a set of plans for each subphase of the development process. Besides the overall detailed work plans and schedules there are plans for: testing, training, documentation, conversion, financial reviews, project reviews and more. Each plan is based on a certain set of assumptions which incorporated the best (at the time) knowledge available.

Plan assumptions fix such project variables as resources, skill levels, productivity, decision and approval times, available hardware, test time, systems programming support and dozens more. That's what goes into the project plans. Our expected output is what we assumed about the product we pro-

duce: the functions that are implemented, the quality of the documentation, ease of use, amount of implementation support required, reliability of the code, system performance, and so forth.

Now the problem is that unless all of the plan assumptions are quantified and well documented at the beginning of the project, there may be little basis for empathy and a lot of nonproductive explaining to do when a schedule slips or a cost overrun occurs because an assumption turned out to be miles off. For example, test time requirements should have been specifically set as a plan assumption, such as "two turnarounds per day per programmer during prime working hours and an overnight shot." If you were counting on decisions being made within "five working days" by the users, this should have been documented. If a certain release of a systems software product was "needed prior to systems test entry," that milestone should have been built into the project plan and put on the critical path.

The list of plan assumptions, which is really a list of dependencies for a successful project, must also be subject to change control. Unless the assumptions are well documented to begin with, there are no formal reference points from which to measure changes. The project manager has to rely on memory and often vague commitments, "but I thought that was your responsibility." Or, "Well, I really didn't actually commit that resource, I thought it was still an open issue."

Is it possible to "manage" management and user expectations? Controlling change becomes difficult, to say the least, if management and the users had widely differing expectations from the project manager in the first place. If there is no uniform basis of understanding, there really is no baseline from which to measure change and the project may have very little chance for success. How often have you heard comments like these from users well into a project?

I thought that transaction would be in the system!

Everyone knows it should work this way.

You should have known we can't go on-line in that month.

I thought you got all the bugs out while you were testing!

My people weren't consulted before you made that change.

What do you mean my data files need cleaning?

I expected response time to be much faster than that.

These examples may reopen old wounds for many of us. Unfortunately they occur much too often in developing complex on-line application systems. Now expectations are not 100% manageable, but here are some ideas which may be useful:

Management and user expectations should be fully understood before the start of the project. This can be accomplished with pre-project reviews of the project goals, project plans and assumptions. The project planners should educate the users and management as to what the product will look like, how it will be developed, and when it will be installed and tuned. Differences in perception about the project or the system should be sought out and promptly resolved. When management and user goals are aligned with the project team goals, you can proceed with more confidence.

The outcome of these sessions should be documented to reflect a common understanding of the major schedule milestones and assumptions. Feasibility studies or other project documentation generated thus far should be updated. A simple example might be the preparation and distribution of a list of functions to be included in the system and specifying also the function that will not be included in the first version. (If this sounds like I am suggesting user-oriented requirements and general design documentation, I certainly am.)

The system performance issue should also be addressed at an early stage. Even though there may be little basis for precise performance statements at this time, project management should understand what the user requires and what he perceives to be "good" or "bad" response time. Early user education is required regarding

PROJECT CHANGE REQUEST

PROJECT TITLE _____ PCR NUMBER _____

INITIATED BY _____ DATE SUBMITTED _____

DESCRIPTION OF THE CHANGE (Add Attachments if necessary) _____

FUNCTIONS, PROGRAMS OF FILES AFFECTED _____

DOCUMENTATION AFFECTED _____

HARDWARE OR SYSTEMS SOFTWARE IMPACT _____

CHANGES TO BE IMPLEMENTED BY _____

PLANNED START _____ PLANNED COMPLETION _____

APPROVED BY _____ TITLE _____ DATE _____

RESOURCES AFFECTED	YES	NO	SUMMARY OF EFFECT
MANPOWER	___	___	_____
SCHEDULE	___	___	_____
OTHER	___	___	_____

ADDITIONAL APPROVALS APPROVED BY _____ DATE _____

APPROVED BY _____ DATE _____

A change request form is first submitted to the project manager for evaluation and approval. If no resources are affected, the approved form may be used to communicate the change and initiate the work. If the change impacts resources, additional approvals may be required from management, the users, or a change board.

the factors that affect system performance, as many are user influenced design alternatives as well as management hardware expenditure decisions.

A lack of a clear definition of the user and management responsibilities during the project causes many project problems. The user must be told to expect that he will have to fund and provide the resources for such tasks as design reviews, file cleaning, training, and methods and procedures if those were the plan assumptions. A project manager needs a firm commitment for these resources before the project starts —rather than waiting until the last minute and invariably being caught short.

. . . especially for **small** projects, where sometimes the effects of change are felt more violently . . .

To summarize, managing project changes that will ultimately affect the original expectations of the users and management can only be accomplished if there is a baseline of understanding and assumptions, documented and free of technical jargon, to which normal change control procedures can be applied.

Necessary, nice to have, and "nonsense"

Proper management of change requires a written, widely understood, enforceable change control standard or procedure. A procedure once developed and proven workable should become the standard for all projects and one that management expects will be applied consistently. Vital components of a procedure for controlling change include:

- a way to detect change—what is under change control?
- initiation of a request for a change
- a change evolution scheme
- a management decision process
- incorporation of the change into the project plan

As a project manager, I tend to hold every member of the project team responsible for an awareness and feedback to me of any event or problem that may impact our schedule, workscope or resource requirements. Ultimately, I suppose, the project manager bears this burden, but everyone on the project should be properly educated and motivated to contribute. In order to help the project manager, the team must be thoroughly familiar with those items under change control such as: the requirements and design documentation, the project plans, estimates, assumptions, personnel assignments and commitments. That puts the team in an excellent position to detect subtle changes, and the side benefits of this level of orientation are obvious.

If you can create an environment in which each team member understands the reason for controlling change and is motivated to use your change control procedures, you have a much better chance of making your project a success.

A useful mechanism for introducing a change into your change control system is a Project Change Request notifier (see Fig. 1). The request can be filled out by anyone associated with the project including the user groups. It is a project management control document, not a technical document. It should contain a certain minimum amount of information:

- statement of a problem or a need to change a specification
- some priority indication of importance or business impact
- the date requested or required for the change to be incorporated

When the change request is given to the project manager, it should be logged and the originator given some idea as to when the change will be evaluated. The originator may be asked to provide further information or clarification which will assist the personnel who are assigned to evaluate the change.

Changes fall rather neatly into three categories: necessary, nice to have, and nonsense. Then there is a time dimension—whether to make the change immediately or perhaps in a later version of the system. If the change evaluation committee (or change review board) has a good mix of users and technical people, management ought to receive a sound recommendation as to the importance of the change and the probable effect on workscope schedule and project resources.

Somebody in the management system must then make a decision. Often top management is involved if the change is of sufficient magnitude or highly controversial. But probably most changes will be approved or disapproved, depending upon some predetermined criteria, by the project manager and his user counterpart. The recommendations of any change evaluation, however brief, should become a part of the ongoing project documentation.

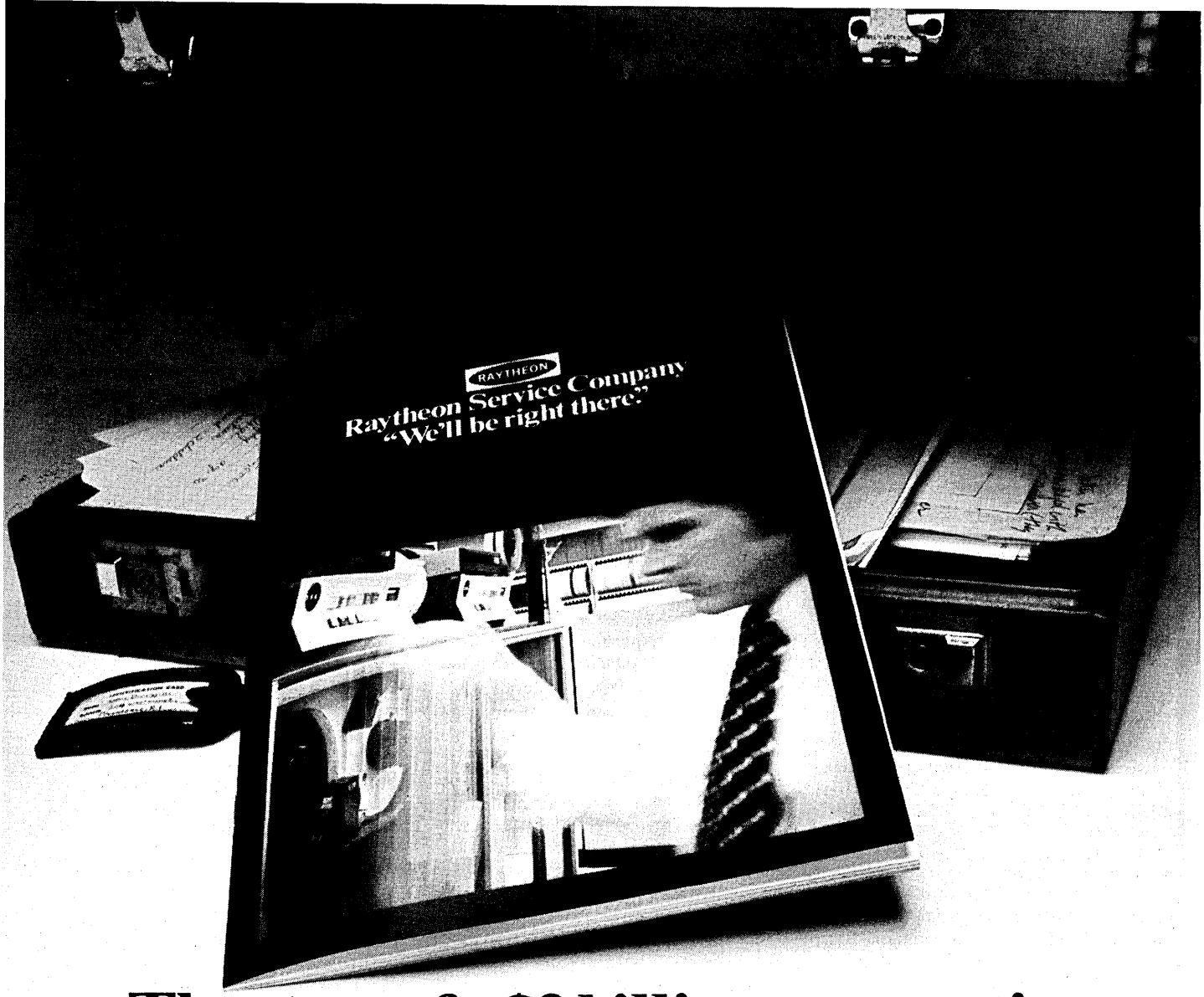
If approved, the new effort must be incorporated into the project plans and schedules. This is a crucial step which should be done promptly, and even for small changes. Otherwise the sum total of a lot of small changes may look like a large overrun by the end of the project. The old saw that projects slip a day at a time is mostly a reflection of project changes of many varieties that just didn't get properly documented when they occurred.

Project personnel must be made aware of approved changes and adjust their schedules and priorities accordingly. In fact, change control is an excellent tool to communicate new information to the project team. It's what can keep everyone working to common goals and eliminate expensive misunderstandings. By the way, don't forget to include some time in the original project estimate for change evaluation. On a long, large project, this task can consume a substantial number of man-weeks. The results of change control activities should be reported upward on a regular basis along with other aspects of concern to management and the users.

A "must" for management

A system for managing change is a "must" for project management, *especially* for small projects, where sometimes the effects of change are felt more violently than on projects of greater size. A good system can help a project stay on course and provide an audit trail of all the events and decisions that may have caused changes to the schedules and resource requirements over the life of the project. (Changes weren't just allowed to "happen," they were always under control.) However, to control change, you must establish and maintain a base from which to measure change. This means good documentation of: system requirements, specifications, and system design, as well as project plans and estimates, assumptions, and expectations. Get started! Good management control of change will begin with change request #001. ❋

Mr. Braverman is manager of San Francisco area projects for IBM's dp services organization, a contract programming group. For the past six years he has been responsible for numerous dp development projects in San Francisco and in Havant, England. Prior to entering project management, he was district education manager for IBM in San Francisco.



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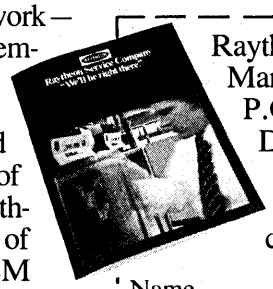

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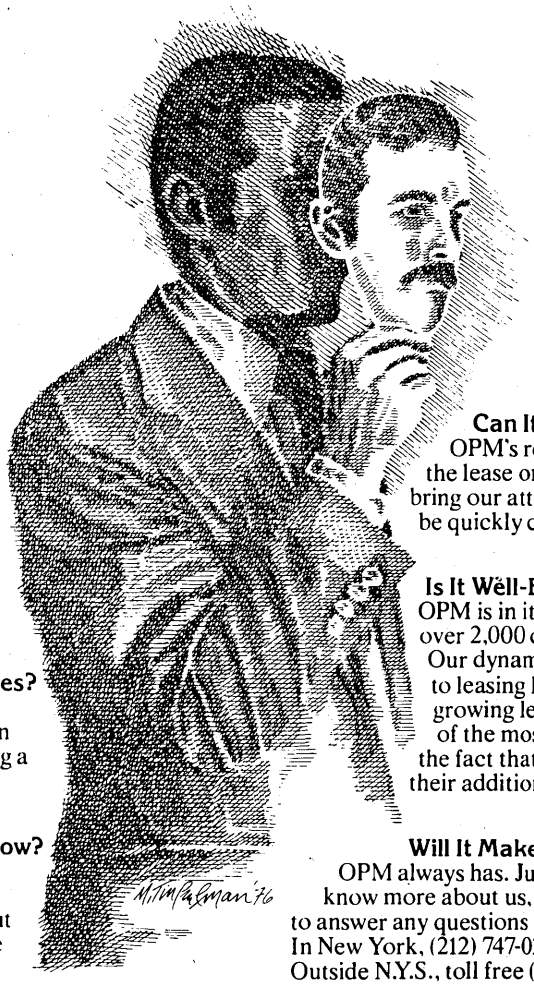

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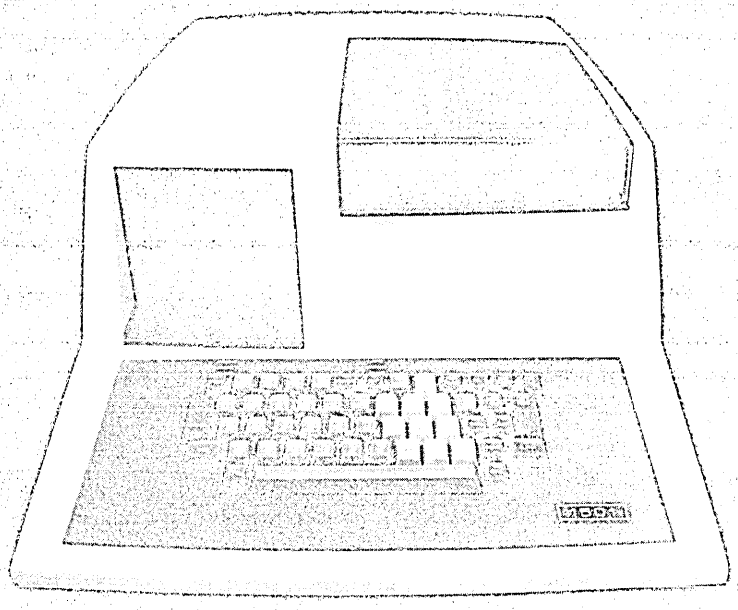

Complete Validation • Simple Operation • Minimal Installation

The package includes a programmable intelligent terminal, with an advanced data entry program designed specifically for business transaction entry and validation.

It's designed to provide accurate output from your source department so you get accurate input to data processing.

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Can you believe a price as low as $5,100?* Or you can lease it for only $140* per month.

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Of course it has simple keyboard entry, CRT display and fill-in-the-blanks formatting. So forget about training new operators. Because it's designed to communicate with your clerical staff in people language, an hour or so of familiarization with the terminal is all that is usually required.

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The Advanced Data Entry program contains format and validation checks which ensure the input of reasonable, accurate transaction data. Errors detected during the entry of a transaction are corrected immediately in the source department.

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To speed the flow of data, the 700 provides from 4 to 16 CRT terminals. Spooling software enables efficient line printer operation and binary synchronous communications. To handle a growing data base, an intelligent disc storage subsystem, controlled by its own bipolar LSI processor, stores and manages data, freeing the CPU for other processing. Ask about EASY, our report generator/inquiry capability for fast exception reporting.

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DP Dialogue

Notes and observations from IBM that may prove of interest to data processing professionals.

The brass foundry is one of more than 100 separate work zones at Price Pfister monitored by the online production control system.

It's a DL/1 World at Price Pfister

When the Price Pfister Brass Manufacturing Company moved its "chained" data files to Data Language/1 or DL/1 recently, it also moved into a new world of flexibility and economy of operation.

And for the Pacoima, California, company, it was a move that has made a world of difference in controlling manufacturing and distribution operations to help maintain profit and customer service levels.

Price Pfister is a subsidiary of Norris Industries, Inc., and a major supplier to plumbing wholesalers and contractors, with a nationwide network of five regional warehouses. Its catalog of fittings, faucets and fixtures contains some 4,000 finished items—which incorporate 10,000 separately identified parts and subassemblies.

At the company's headquarters facilities, order entry and production and inventory control are handled online by an IBM System/370 Model 145, using 3277 Display Stations for direct entry of orders and shipments. At four remote warehouses, data is entered through 3735 Communication Terminals.

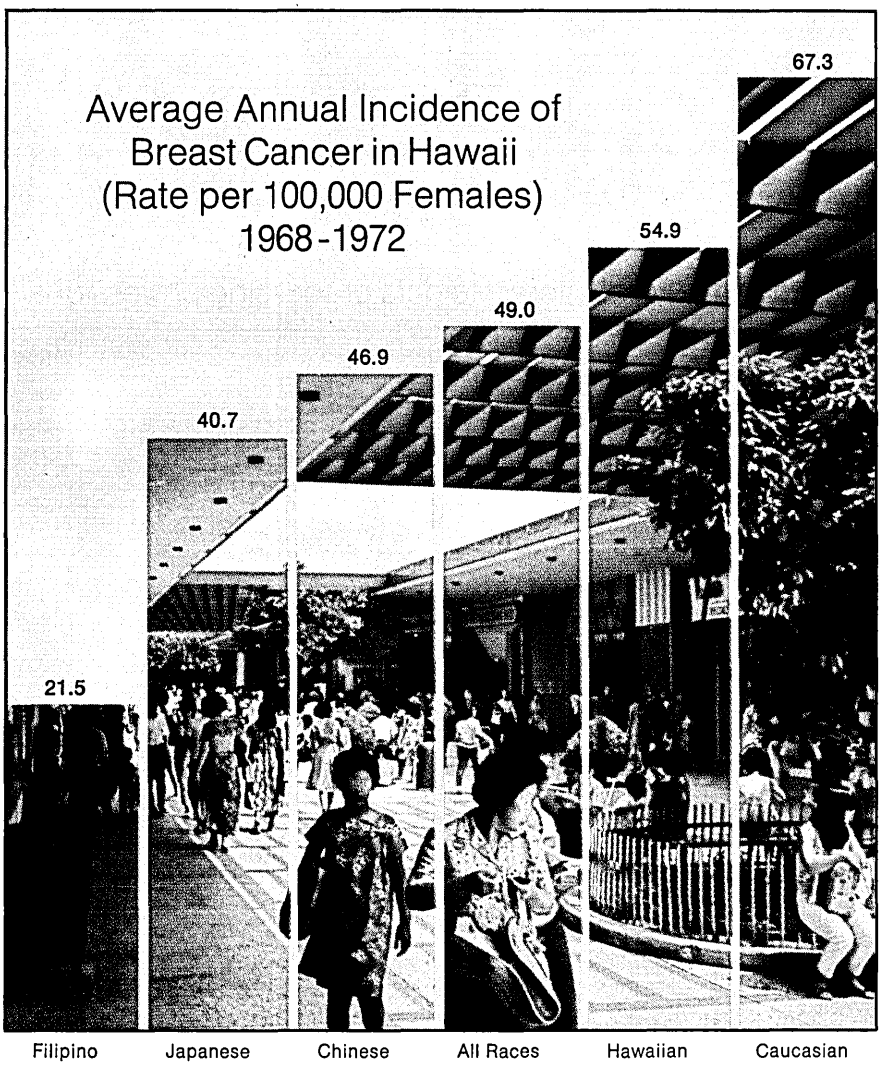
"Under DL/1," says Joel Brust, director of information systems, "we can easily add a new data field or change the data structure in other ways without affecting any of our 1,100 sales and manufacturing programs except the ones that directly use the revised data.

"In our online order processing system, for example," Brust continues, "we can tailor the content and format of the 3277 display to suit our needs. One feature we've added to the system is order inquiry by the customer's own order number as well as by name; this has proven to be very helpful in getting the right answer to the customer, fast."

DL/1 will enable Price Pfister to maintain a complex file structure that relates every finished item to all its parts and subassemblies, and—in the other direction—each inventoried part to all the finished items on which it is used. DL/1 is an IBM program that organizes such "chained" files, and permits user programs to access the data through a simple interface.

Price Pfister converted to the 145 in

(Continued on 4th page)



The unique racial mix in Hawaii gives researchers an opportunity to study the environmental and genetic factors which may influence susceptibility to various forms of cancer. This graph is based on 910 cases of intraductal breast carcinoma reported to the Hawaii Tumor Registry from 1968-1972.

Computerized Data Base Aids Cancer Researchers in Hawaii

Is there any relationship between a woman's height and weight and the possibility that she may contract breast cancer? Or between racial origin and the tendency to get a specific form of cancer? Could diet or occupation have any influence on a person's susceptibility to cancer?

These are all questions currently being researched at the Cancer Center based at the University of Hawaii. Scientists and doctors trained in a wide range of disciplines including biology, chemistry, genetics, epidemiology, biophysics, immunology and virology are studying the correlation among many factors which may be related to causing cancer.

The Center, funded largely by the National Cancer Institute, maintains a large computerized data base stored in the University's IBM System/370 Model 158. It includes information such as the birth and marriage records and ethnic backgrounds of over 200,000 families living in Hawaii.

Many Factors Involved

"We begin with the belief that there is more than one condition which can influence susceptibility to cancer," explains Dr. Lawrence H. Piette, Director of the Cancer Center. "These conditions may include exposure to or the presence of a specific virus, the existence of a particular carcinogen in the environment and/or a genetic predisposition to the disease. Any one of these factors alone will not necessarily cause cancer, but in combination they are more likely to increase the probability the disease may occur."

Hawaii provides an excellent "laboratory" for studying cancer because of the unique racial mix of the population. Data collected by the Tumor Registry program, part of the state's Department of Health, indicate that the seven major racial groups in Hawaii – Japanese, Filipino, Chinese, Korean, pure Hawaiian, part Hawaiian and Caucasian – have different incidences of cancer at different ages, despite the similarity of environment.

Heredity or Environment?

"We want to determine the relationship between the environmental and genetic factors in connection with the disease," says Dr. Piette. "For example, we know that the incidence of breast cancer in Japanese women who have migrated to Hawaii is higher than for those who have remained in Japan. On the other hand, the propensity of the offspring of Hawaiians of Chinese ancestry to get a rare form of cancer called nasal pharangeal carcinoma seems only slightly affected by environmental change. In both cases, we'd like to find out why, now that we have identified broad correlations."

For instance, the data base has been used to test the validity of the hypothesis that women who are taller and heavier relative to the average for their race show a higher risk of getting breast cancer. First postulated by a team of Dutch researchers, this theory appears to be substantiated for the women whose records form the Hawaiian data base. However, Dr. Piette cautions that simple correlations only tell part of the story. Many other factors, such as the age of a woman during her first pregnancy and her estrogen profile, may also be very significant in determining susceptibility to breast cancer.

"We were fortunate that Hawaii already had good record keeping programs," says Dr. M. P. Mi, a geneticist and director of data communications. "Our goal now is to incorporate additional kinds of data such as blood type and fingerprints. Most people aren't aware that fingerprints can help determine racial origin, a significant fact in a population with extensive intermarriage.

"Most of our work is still in the preliminary stages," comments Dr. Mi. "As we move into multivariate analysis—correlating many factors—we will be able to get increasingly specific results. We feel our work can help develop hypotheses which can be followed up in later studies. The more we know about the disease, the better our chances will be for earlier diagnosis by identifying high risk groups and, in many cases, effecting cures."

Putting the Computer Where the Users Are

Interactive computing is making data processing and problem-solving power directly accessible to end users and programmers alike. End users can engage in personal computing to solve specific business, financial, engineering, design or similar problems. DP professionals can work interactively for faster creation and testing of programs.

And with facilities now available from IBM, interactive computing is easy to use, powerful in developing solutions, and adaptable and economic to implement.

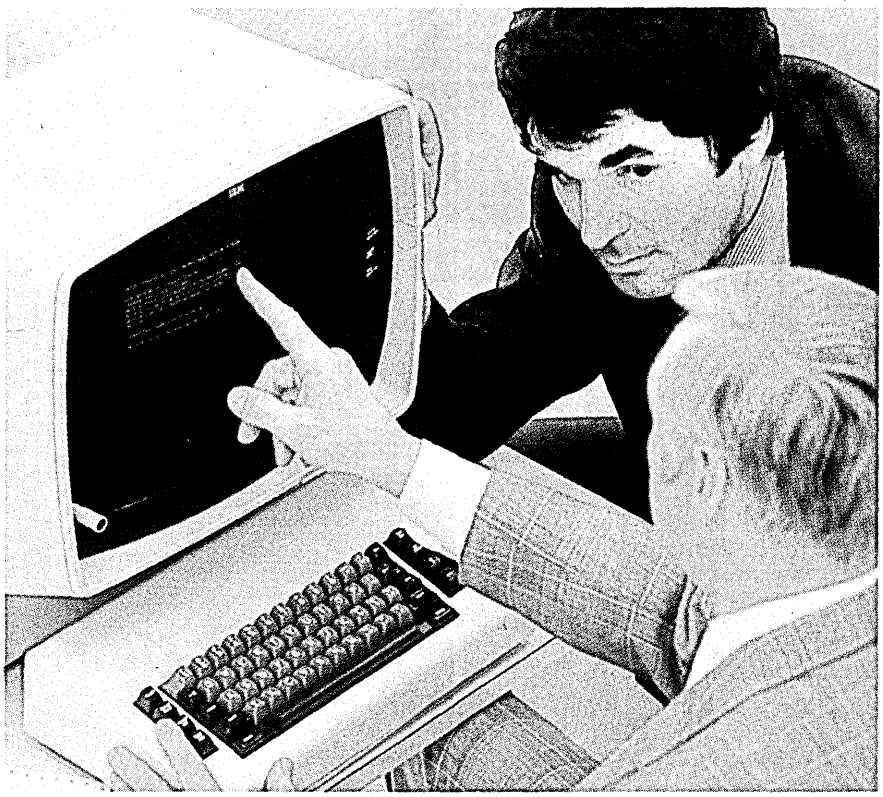
End User Computing

For the end user—the financial planner, engineer, marketing specialist —personal computing provides simple procedures for using the computer to solve spur-of-the-moment or one-time problems. Each user gets his results promptly at his terminal.

A financial planner can make cash flow projections. A marketing man at a terminal can structure a new type of sales analysis for a sales program. An engineer can solve an equation or try alternative approaches to a design problem, working creatively and interactively with the computer.

A computation can be of any size. Applications which are too small to put through the program development cycle may be entirely feasible when implemented directly by the user.

For the user who wishes to solve unique problems, three user-oriented IBM languages are easy to learn and simple to use at a terminal (see box). And a constantly growing set of IBM prepackaged interactive programs supports such applications as economic analysis, simulation and modeling, statistics, forecasting, project management and data base access.



Financial planners and other professional people can solve problems and test alternatives, using VSPC to interact directly with the computer.

Developing Applications

For the programmer, interactive computing provides a new level of productivity. He can submit programs for test directly and receive results back promptly. Working interactively, he receives immediate indication of any coding errors rather than, as in the past, waiting to obtain a test run.

DP managers have found that interactive application development has greatly increased productivity. At Playtex Inc., for example, programmers who had been putting an average of seven lines of code per day into final form were able to produce 70 final lines a day. This significantly shortened application development time, and the resulting programs proved more reliable and easier to maintain.

Use of interactive computing by professionals throughout the organization relieves the programming staff of work which users can now do for themselves, and greatly reduces the cost of developing small-scale or occasional-use programs.

At the same time, this use of personal computing frees programmers to focus on more demanding, production-oriented applications. Similarly, computer operators are relieved of queuing the unscheduled jobs, which users can now enter directly, and of delivering printouts of results which can be received directly at the terminal.

With interactive computing, the organization and its people make use of the full power of multiprogramming. Professionals can access the system simultaneously without interfering with ongoing batch or scheduled work. Programmers can increase productivity. And both can develop new approaches to the computer and better understanding and use of its potential.

IBM Facilities for Interactive Computing

Three IBM languages are designed specifically for problem-solving under Virtual Storage Personal Computing (VSPC):

1. *VS BASIC.* Powerful, yet simple to use, it is adaptable to a wide range of business and general applications.
2. *VS APL* is a broadly applicable interactive language particularly well suited to the creation of business and commercial programs.
3. *VSPC FORTRAN* is an interactive version of FORTRAN, the established language for mathematical and scientific programming. It is designed specifically for use under VSPC.

Professional programmers using IBM interactive computing under the Time Sharing Option (TSO) or the Virtual Machine/Conversational Monitor System (VM/CMS) for application development may work in any of the standard IBM programming languages: COBOL, PL/I, FORTRAN, APL, RPG II, or Assembler.

Advertisement

New Techniques Aid John Hancock Programmers

Two years ago, John Hancock Mutual Life Insurance Company became one of the first users of the Improved Programming Techniques. Now it is reaping benefits in more orderly application development, program quality and maintainability, lower development costs, and schedule adherence.

"We find the six techniques to be synergistic," says Robert C. Volante, vice president for systems and programming. "You get the most benefit by introducing them early in program development—at the level of analysis and design—and all together."

Using the techniques, each development step is a group operation rather than an individual activity. One of the techniques is *Team Operations*, under which a project is organized into groups, each with a chief programmer, a backup programmer, and a team librarian who keeps track of source code and manages documentation.

During *Top-Down Development*, detail program design and coding proceed from the top or control portions of the program down to the finest levels of detail. Under *Structured Programming* certain architectural forms are adhered to in writing the program, making it more regular in form and simpler to read and interpret.

A program is developed as a group product, "publicly owned" rather than proprietary to individuals, by conducting *Structured Walkthroughs:* formal group procedures for verbally analyzing and validating programs and modules.

"You see the real beauty of these methods when a specification change pops up half way through a major project," says Volante. "When the customer asks for a change, we can rapidly find every affected point in the system with a look at our HIPO diagrams and structured code." *HIPO* (Hierarchy plus Input-Process-Output) *Documentation* is used to describe small, functionally defined modules, serving first as a tool for design of the program and then as permanent documentation.

"Our users are happier too," Volante says. "One, after attending a structured walkthrough, told us: 'Now I understand what I'm getting before the system is installed.'"

EDP education at John Hancock is directed by Nancy Bern (right), assisted by senior instructors (left to right) Cindy Gasik, Jack Grady, Ted Pierce and Dan Steele.

Notes Nancy Bern, director of EDP education: "The intrinsic discipline of the walkthrough," she adds, "prevents errors. People get oriented to doing the job correctly."

The *Development Support Library* and the team organization, Bern says, relieve programmers of clerical work, making better use of their time.

"When IBM presented the techniques to us in early 1974," Volante says, "there was an intuitive reaction here that this addressed important issues for us. We started people through the two-week IBM course on the techniques, and launched three pilot projects."

"Two of the projects are now complete," Volante continues. "In spite of the 'learning curve' effect, they were finished within our time and cost estimates. But the real benefits came in testing and maintenance. With top-down design and programming, integration testing proceeds in parallel with development. We find that our systems are better tested, and that new programs run correctly from the start.

"About 60% of our programmer-analyst time goes into maintenance," Volante says, "and the techniques are especially helpful there. Programs are easy to read and people have little trouble picking up one another's work.

"Once people get accustomed to the methodology," he adds "they don't want to go back. We've now trained 200 EDP people and more than 50 end users, and the people who haven't been through the course yet are eager to go. Now we've moved up on the learning curve, and projects are beating their schedules."

There are about 12 projects in various stages under Improved Programming Techniques, he says, including a very large online system. "Our efforts have really paid off," he asserts; "we won't turn back."

It's a DL/1 World...

(Continued from first page)

October 1975, and at that time started to shift its chained files from DBOMP (Data Base Organization and Maintenance Processor) to DL/1. "The 145 easily handles DL/1 and teleprocessing under CICS/VS (Customer Information Control System/Virtual Storage)," Brust says, "and the increased capacity permits us to do material requirements planning and production scheduling on a weekly cycle, rather than on a monthly one.

"The online system continuously tracks some 11,000 items of work-in-process inventory through 100 work zones. By revising the production schedules weekly, we've been able to hold down inventory imbalances and avoid uneven loading of the work centers. Switching to a weekly cycle enabled us to cut work-in-process inventory by six percent."

DP Dialogue appears regularly in these pages. As its name suggests, we hope DP Dialogue will be a two-way medium for DP professionals. We'd like to hear from you. Just write: Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

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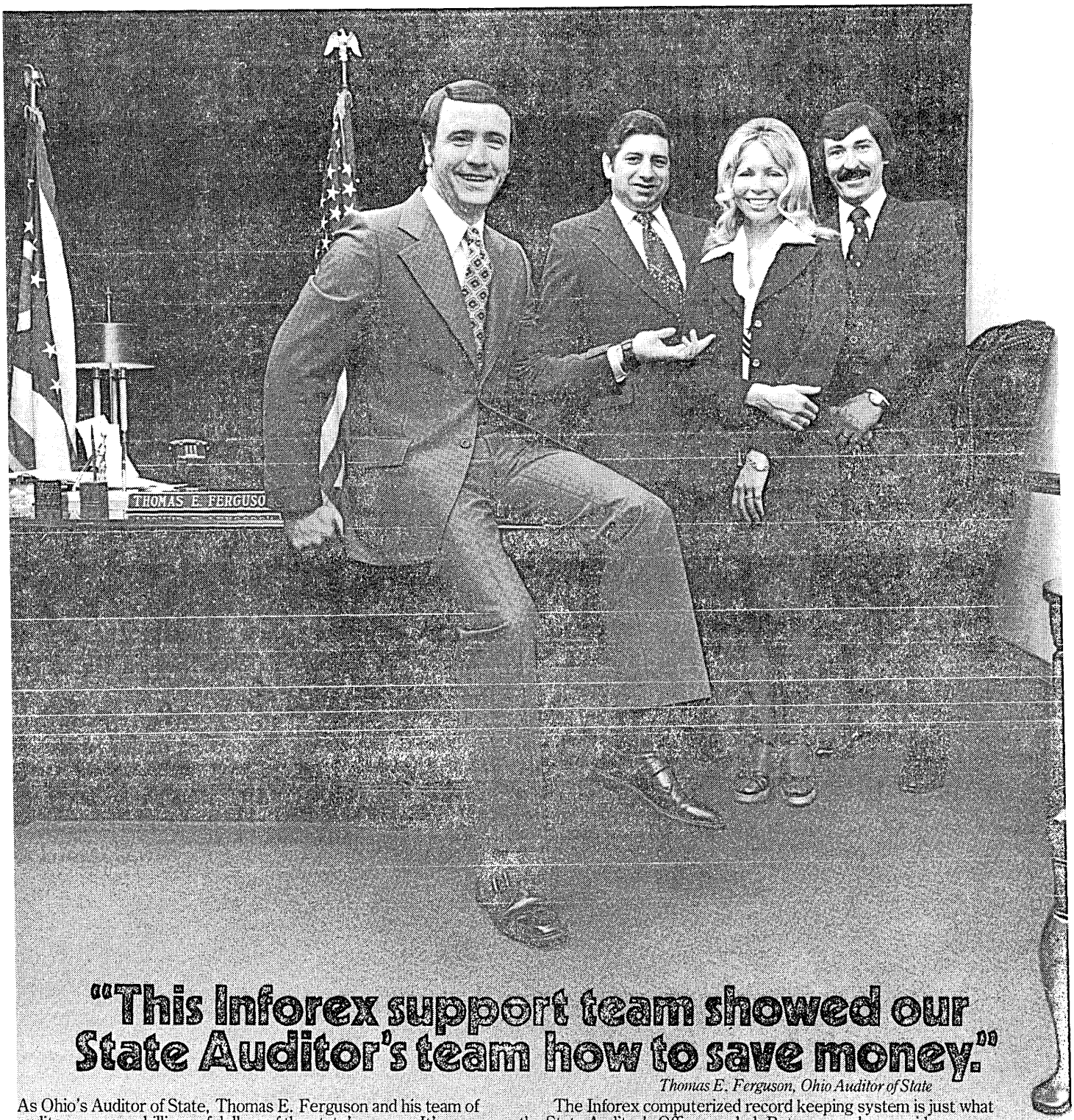

"This Inforex support team showed our State Auditor's team how to save money."

Thomas E. Ferguson, Ohio Auditor of State

As Ohio's Auditor of State, Thomas E. Ferguson and his team of auditors oversee billions of dollars of the state's money. It's a tough job. But thanks to an Inforex Support Team, it's a lot less tough than it used to be.

And a lot less costly, too.

The team helped the Auditor's Office select, set up, and train operators to run a computerized record keeping operation based on the Inforex System 5000.

This mini-computer based system replaced a keypunch operation where cards had to be punched for coding and sequencing in order to access information. It was a costly and time consuming operation.

But now, with the pre-programmed Inforex system, file data can be retrieved, created, updated and deleted from a number of different locations. Which means a closer watch over the state's money. And a sizable savings in cards, paperwork and time.

System 5000 is presently being used for a number of different tasks. Updating all physical property inventories and land records, for example. And most importantly, progress checks of audits.

System 5000 has proven so flexible and so easy to use (non-technical staff quickly learned how), the Auditor's Office has plans for lots of other applications. Like maintenance schedules for state-owned equipment. A land file based on deeds, not just reports. And personnel and payroll files.

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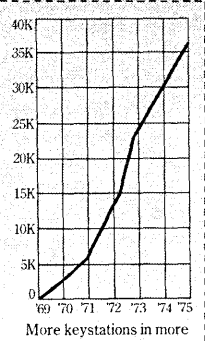

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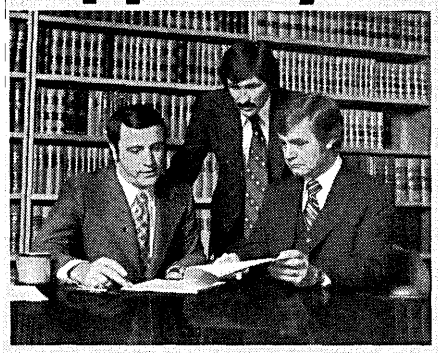
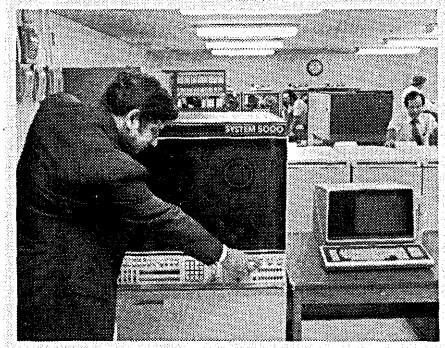
How the Inforex support team supports you.



When you need a computerized record keeping system, a Branch Manager like Harland La Vigne or an Account Representative such as Les Davidson will analyze your requirements and help you tailor a system that will fit your needs exactly.



Next, a Systems Engineer with the savvy of an Elwood Kissell will oversee the installation and ongoing service of your new system. He'll do it fast, efficiently, and with a minimum of interruption. And he'll make sure you're properly set up for the applications you have in mind.

Once a system is selected, a Sales Service Representative of the caliber of a Patricia Dickey will begin training the people who'll use it. It won't take long. Because all Inforex systems are designed to make the operator's job easy.

INFOREX

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source data

(Continued from page 30)

Data Communications Product Catalog

The latest in this vendor's data communications interface performance evaluation and fault diagnostic equipment are described in a catalog. Included are equipment for protocol testing, network polling, character trapping and logging, error rate testing, transmitting test messages, distortion measurement testing, EIA/v.24 access/breakout, and signal interface testing. ATLANTIC RESEARCH CORP., Alexandria, Va.

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Computer Power Center

A mobile, totally modular, flexible computer power system is described in a 4-page illustrated brochure. The operation, application, and installation of the system, and its ability to allow relocation or reconfiguration "without incurring the high labor and material costs of electrical work" are discussed. COMPUTER POWER SYSTEMS CORP., Costa Mesa, Calif.

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Laser Line

A 16-page brochure describes this vendor's commercial laser product line, which includes standard helium-neon laser products and accessories, as well as laser subsystems for the oem market and custom laser development capabilities. Guidelines for choosing a laser, and information for incorporating lasers into various applications (information handling, construction, medical instrumentation, process control) are included. HUGHES AIRCRAFT CO., Carlsbad, Calif.

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Programmable Terminal

This company's PTS-100 programmable terminal system is described in a 12-page brochure. The hardware and software, including emulation packages for the IBM 2260/2848, 3270, 2946/4505 or 2948/2915 (PARS and IPARS), and Uniscope 100 display systems, are discussed. The vendor's PTS/1200 distributed processing system is also featured. RAYTHEON CO., Lexington, Mass.

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Management Control System

MACE (Management Applications in a Computer Environment) is an integrated management/control system composed of more than 1,500 programs, service tested, and built around a comprehensive data base in nine modules, "capable of sophisticated control of virtually any business enterprise." The vendor can provide remote computer service through a teleprocessing network to its computer center, or it will license or sell the system. A brochure describes the system's capabilities. MID-AMERICA COMPUTER CORP., Chicago, Ill.

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Portable Computer System

This vendor's 2200 Portable Computing System is self-contained: cpu, power supply, 9-inch upper/lower case 1024-character crt video display, 8K bytes of user accessible memory, tape cassette drive, and BASIC/alphanumeric keyboard. Optical features and peripherals are available, and all this is described in a 4-page brochure. WANG LABORATORIES, INC., Tewksbury, Mass.

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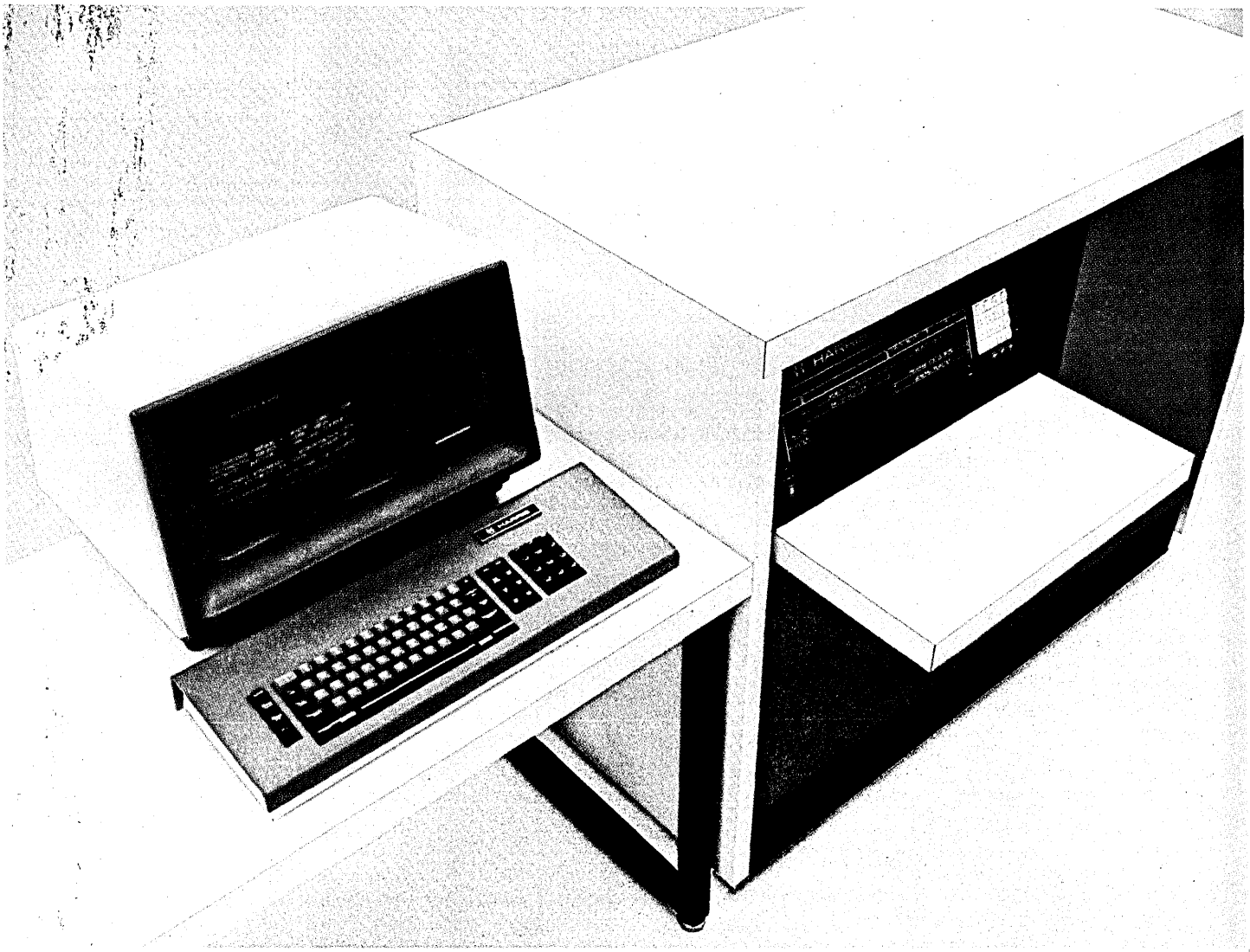
courses

Yourdon Courses

A full array of courses are scheduled for the fall. A 5-day *Structured Analysis/Design Workshop*, is scheduled for New York (Oct. 18-22), Chicago (Nov. 29-Dec. 3), and Washington (Dec. 13-17). A 2-day course, *How to Manage Structured Programming*, is scheduled for Chicago (Oct. 19-20), San Francisco (Oct. 28-29), New York (Nov. 11-12), Dallas (Nov. 18-19), and Washington (Dec. 7-8). The 2-day *Structured Programming in Cobol* will be held in New York (Oct. 14-15), Houston (Oct. 21-22), Denver (Oct. 28-29), Los Angeles (Nov. 11-12), Atlanta (Nov. 15-16), Boston (Dec. 9-10), and Chicago (Dec. 13-14). Many other courses will also be given in various cities. Price for the 5-day course is $700; for the 2-day course, $350. YOURDON INC., 1133 Ave. of the Americas, New York, N.Y. 10036.

Minicomputers

Commercial Application of Minicomputers, a 3-day course, is designed for directors of MIS, user managers, systems personnel, and executives of small to medium sized companies considering computerization for the first time. Basic definitions, minicomputer characteristics, case histories, selection and evaluation criteria, using minis in networks and distributed processing, implementing mini systems, and small group workshops comprise an outline of the course. To be held in Chicago (Oct. 27-29) and New York (Nov. 3-



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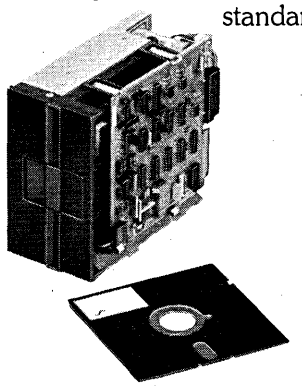

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periodicals

Japan Computer News

Keeping up with what is happening on the Japanese computer scene should be made easier with the monthly newsletter, *Japan Computer News.* A mixture of short news items and longer pieces comprise the makeup. The first issue contains new hardware announcements, including some specs on the large-scale ACOS Series 77 system from both Nippon Electric and Toshiba, a new ocr machine from Mitsubishi, and the "world's largest bubble memory device developed by Hitachi"—a 6,000 kilobit chip. There are also statistics on computer installations, a discussion of the growth of on-line systems, and the announcement of new presidents at four major mainframe manufacturing companies. (The publisher is the mainframe leasing firm established by the six mainframe vendors of Japan.) Subscription: $60/yr. (single issue is $6). Research Dept., JAPAN ELECTRONIC COMPUTER CO., LTD., New Kokusai Bldg. 4-1, Marunouchi 3-chome Chiyoda-ku, Tokyo 100, Japan. ❋

Hughes' low-cost C-9 display terminal makes a minicomputer work like a giant.

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The architecture of the terminal embodies a micro-processor driven by micro-programs contained in read-only memories. A serial interface connecting the detached keyboard to the CRT display eliminates restrictions imposed by parallel interfaces used in other models.

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You can extend the C-9's capability even further with options like enhanced graphic hardware package with rotations, reflections, and line-texturing features or programmable gray levels for graphics (16 levels) and digital raster continuous tone images (256 levels). We also offer parallel interfaces for a variety of minicomputers and interfaces to popular digitizers for local data input and control of the interactive CRT cursor.

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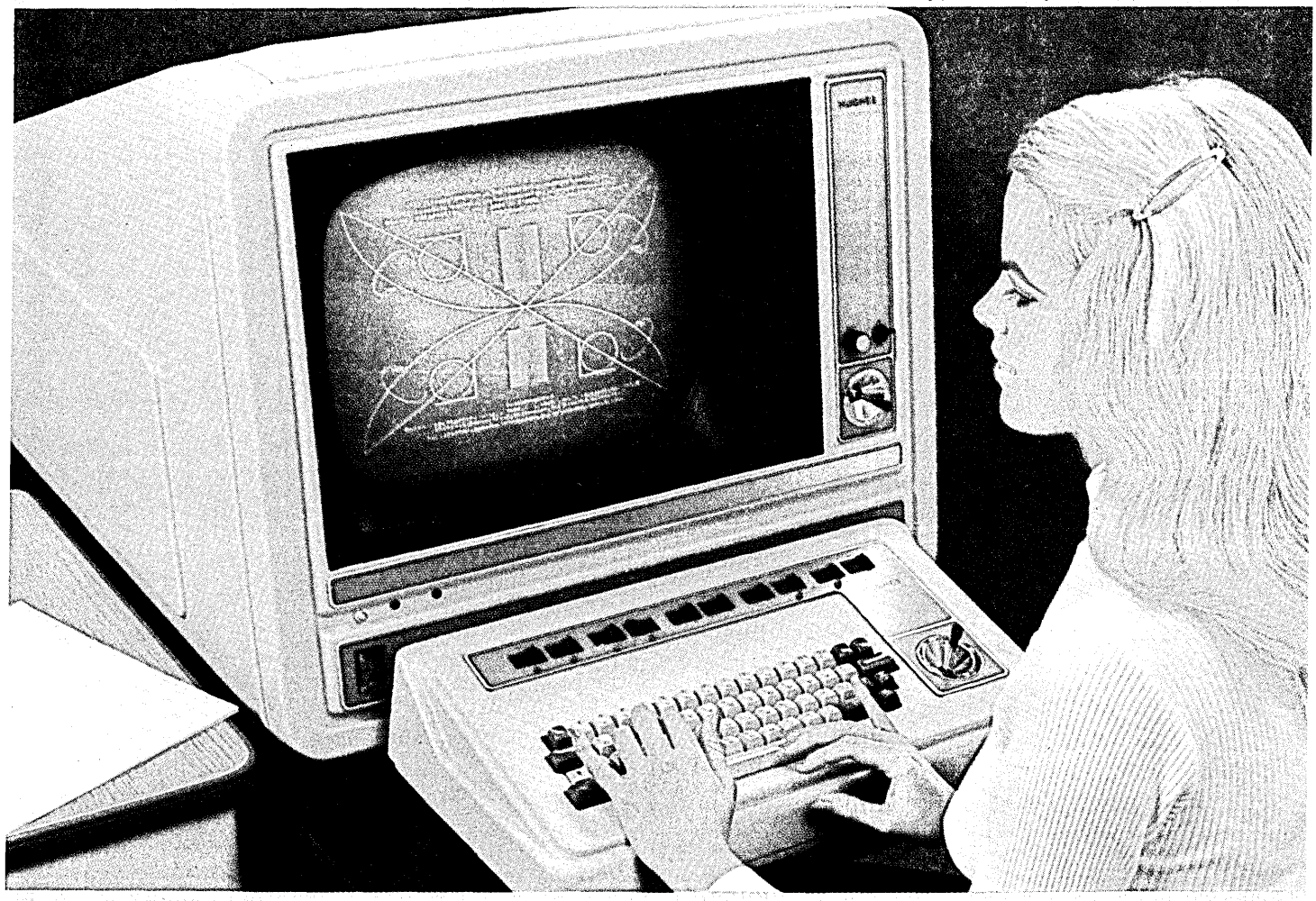

HUGHES

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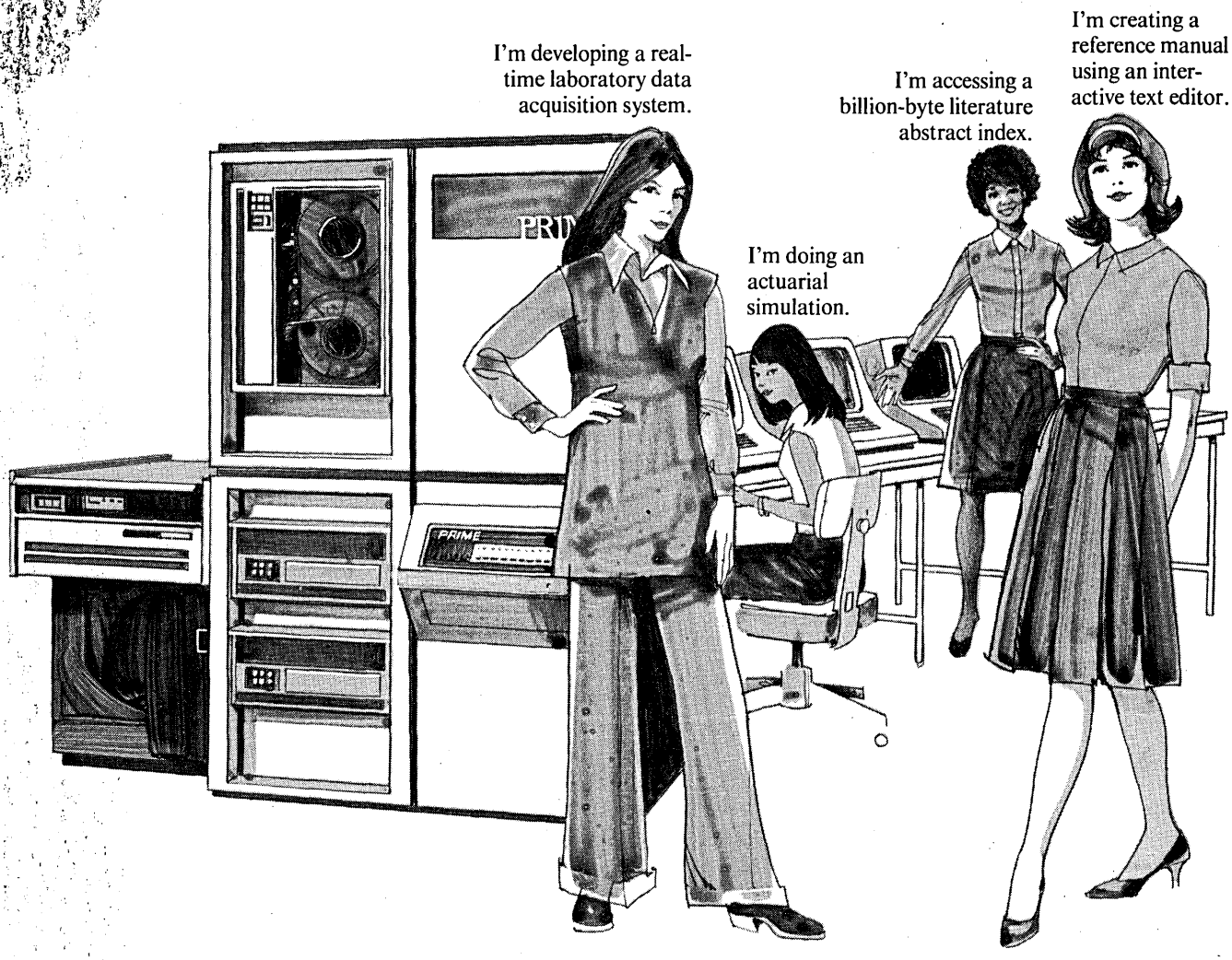
CIRCLE 33 ON READER CARD



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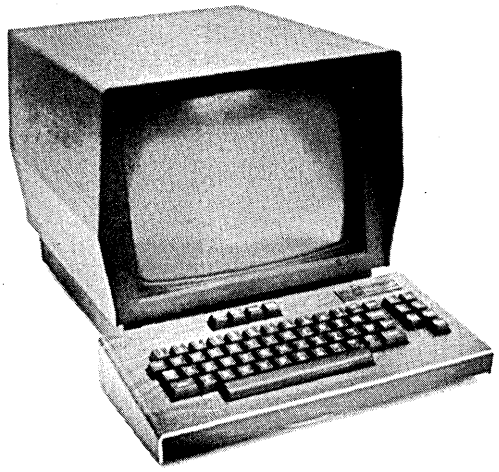

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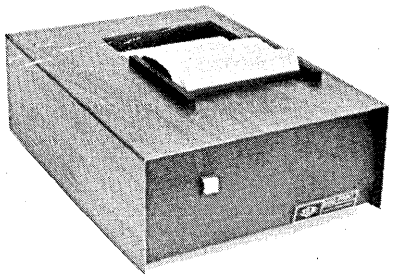

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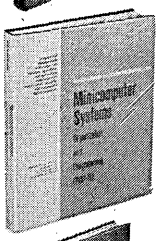

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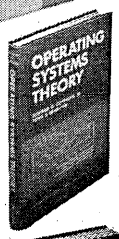

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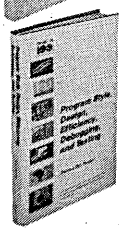

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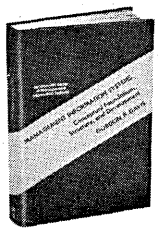

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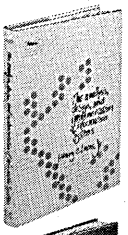

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Mainframers

New IBM Pricing Moves: Savings For Users and Profits for IBM

Three months later, IBM 138-148 announcement viewed as boon for users and bad news for other mainframers.

At first glance, the announcement from White Plains on June 30 seemed routine.

"Two new computers," read the IBM press announcement, "that bring improved performance and economy to the mid-range of the System/370 family were announced today by International Business Machines Corp."

What quickly became evident and continues to sink in during the weeks and months following the announcement, was that the "economy" of the new machines—the models 138 and 148—was such that it sent shock waves through the computer community that promised to reverberate for months in the future.

Looking for a precedent, the first that comes to mind is the IBM 1970 announcement of the 2319 and 2319B disc drives, which were sharp price cuts compared with the 2314, the disc drive upon which the new disc enhancements were based.

Like the disc drives, the 138 and 148 represented an immediate boon to users, but hinted at disaster not only for plug compatible competitors but for mainframe suppliers as well.

No hard across-the-board figures on user savings can be given, because of the differences in individual configurations, but savings to be realized by the 138 and 148 compared with the 135 and 145 generally range between 20 and 50%. Generally speaking, the higher the configuration, the higher the percentage of savings expected to be realized.

One user, the dp manager of a large New York financial institution, was ecstatic over the IBM announcement. "I'm still trying to recover from the shock," he said. "The new pricing is so good that we signed up for two 148s on the day of the announcement. I think the net beneficiary of all this is the user."

That user, who currently has two 145s and one 135 on IBM's monthly availability plan, estimated that his cpu charges will drop from $64,500 to $48,500 a month by moving up to two 148s and one 138. "And, I'll get more horsepower too," he said.

One user saves $12,000 a month with more horsepower.

RCS hits competition

The most important aspect of the IBM announcement, however, is the fact that the company increased its reloadable control storage (RCS) by more than 400% for each new machine and then buried key operating system functions in RCS. This move, coupled with the price cuts, could spell anathema for manufacturers and would be manufacturers of plug compatible cpu's like Amdahl, Cambridge Memories-Control Data and National Semiconductor-Itel.

"Each machine," said IBM, "incorporates a reloadable control storage of 131,072 characters, five times the standard capacity of the model 135 and four times the standard capacity of the model 145. This portion of the processor stores programs that control the sequence of operations, as well as emulation and diagnostic routines.

"The large control storage also accommodates standard and optional features available with the models 138 and 148, allowing users to expand easily their system configurations."

Essentially, RCS is IBM's term for firmware or microcode—the step between hardware and software. With the announcement of the 138 and 148 IBM has indicated that it intends to place in RCS the more heavily executed supervisory components of OS like, for instance, dispatching routines. Previously, these functions resided in the executable code of main memory.

The problem, then, for the plug compatible mainframe manufacturers is this: The cornerstone of their equipment is that IBM's OS operates on their plug compatible machines, but now that IBM is placing key OS functions in RCS, then the plug compatible manufacturers must eventually find a way to make those functions operate on their machines too.

Aggravated with passage of time

The necessity on the part of the plug compatible mainframe makers to solve this problem will increase with the passage of time, as IBM announces new hardware and peripherals that need new IBM OS and RCS releases and improvements to function.

Many users want to know that their equipment will be able to operate new and future IBM hardware and software offerings, and in this regard IBM has subtly informed users with the 138-148 announcement that they should beware of the plug compatible cpu offerings.

The move is not without some risk on the part of IBM, since the spectre of antitrust is raised by the new machines. The plug compatible makers are said to be following IBM's moves in this area closely with an eye cocked to the antitrust ramifications of the new machines.

In IBM's antitrust defense, however, it should be noted that the 138 and 148 represents substantial financial savings and technology improvements for users in the short run at least, and, further, that the machines represent attractive profits for IBM. Furthermore, the spate of IBM antitrust cases in the past few years makes it clear that antitrust suits offer little chance of relief in the near term for parties who feel they have been damaged. When computer antitrust cases are resolved, the issues at hand tend to be ancient history in the fast moving and rapidly changing industry.

One observer who thinks the 138 and 148 machines will be beneficial to users is Marvin L. Silverman, president of the OS Eastern Region Systems Group in New York city. The organization represents some 120 IBM installations and watches developments in IBM's OS very closely.

"I can't express my feelings in 25 words or less," says Silverman, "but I think that the new machines and the expansion of the reloadable control storage and the extension of control program support represents an improvement in machine performance characteristics and in improved throughput."

Silverman suggested that if IBM unbundled OS completely, then it could open up a market for others to develop specialized software packages. However, Silverman thinks the trend of placing more supervisory components in RCS could make it difficult for designers of software packages and for users to modify IBM software and OS themselves.

The other shoe?

Now that IBM has dropped one shoe with the 138-148 announcement, the industry is waiting for the other shoe to drop—this one up in the 158-168 area.

Industry now awaits other shoe to be dropped—up in the 158–168 area.

That, of course, is where Amdahl resides and most computer professionals believe it will be just a matter of time before IBM announces new equipment in the high end that—like the 138 and 148—will drop prices and put more OS functions in microcode.

In addition to Amdahl, another effort is underway to produce a plug compatible mainframe in the high end—a joint endeavor by National Semiconductor and Itel Corp. An effort by Cambridge Memories-Control Data Corp. to make a 145-compatible machine was stalled when Cambridge Memories' banks called the firm's loans after IBM announced the 138-148.

Amdahl has been immensely successful at replacing IBM 168s and a new IBM offering, the 168 Attached Processor System (APS), has not been successful in stemming the Amdahl tide, which increases speculation that IBM will soon announce new high end equipment.

At the same time, users of Amdahl machines say they have been told by Amdahl employees that the firm intends to keep pace with any IBM attempt to restrict OS by doing its own work on operating systems and then offering the results to users.

IBM's 138-148 announcement also made waves in the used computer market for 135s and 145s, dropping the value of the latter machines.

"The prices of both models dropped slightly with the announcement of the 138 and 148," says Harry E. Goetzmann Jr., president of Continental Information Systems of Syracuse, a computer brokerage that specializes in IBM equipment. "But prices of 135s and 145s won't drop to their new market value until the 138s and 148s are delivered. Eventually, I look for the 135 to sell for about $100,000 less and the 145 about $200,000 less."

The 138-148 announcement also appears to have had particular ramifications for the European market, which has been slow to abandon the 360 series and move to the 370 machines. The 138 and 148, which are being manufactured in Germany and France, as well as Endicott, N.Y., are expected to be attractive lures for 360 owners to move up.

The end of the line

There are also hints contained in the 138-148 announcement that indicate IBM is nearing the end of the line with the 370 series and is anxious to position users for the next generation of IBM equipment. IBM is encouraging purchase of the new machines—a sure sign that the 370 generation is coming to the end of its marketing life. It has made purchase more attractive by a variety of methods including reduction of sales/lease multipliers, extension of purchase option credits on leased machines, and other price adjustments. In addition newly announced 15% maintenance increases for 370 equipment will spur users to give up their old equipment.

The 138-148 announcement also created low priced incremental memory

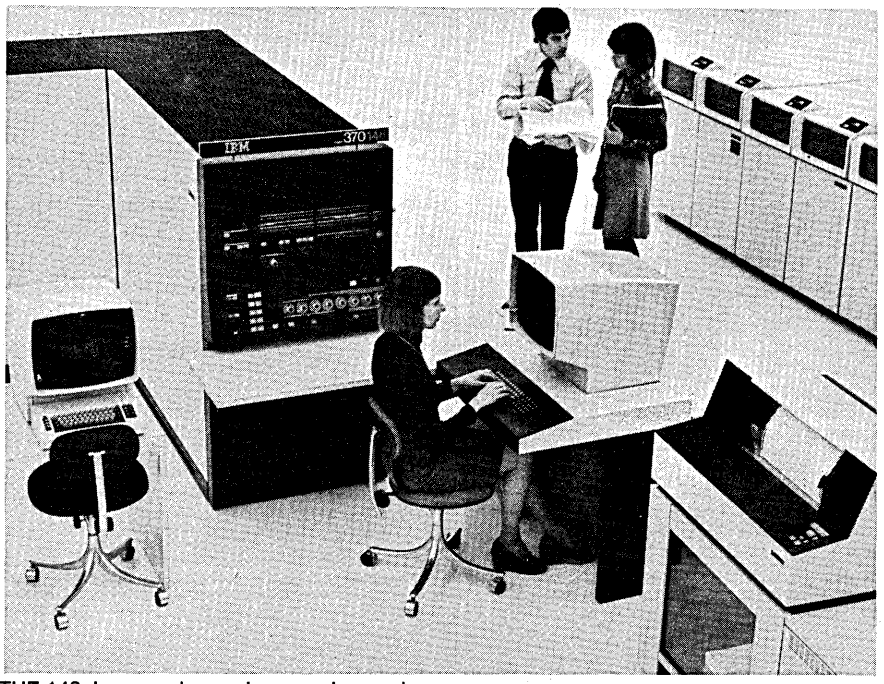
IBM is nearing the end of the line with the 370 series.

that should make life difficult for add-on memory makers, who had been making significant penetration of the 145 market. IBM found something of a bonus here because it went from bipolar memories to MOSFET memories. The latter are a cheaper technology.

While a cynic might speculate that IBM threw up some competitive hurdles for add-on memory makers and plug compatible cpu makers, it is becoming evident that the first to trip over the new announcements were the dp mainframe manufacturers. A similar situation occurred a few years ago when IBM aimed competitive announcements at plug compatible peripherals manufacturers but ended up hitting mainframe manufacturers—particularly RCA—very hard.

Mainframe manufacturers like Burroughs and Univac have responded with memory price cuts and NCR appears to have anticipated the IBM pricing in its Criterion series. As this is written, Honeywell had not responded with any major memory price cut. One thing was clear however: any mainframe makers that wish to stay competitive with the 138-148 have had to cut prices of their competing equipment drastically.

—W. David Gardner



THE 148: Lower price and more microcode

news in perspective

Antitrust

Two Groups Watch Antitrust Action

"There are two groups of companies closely following the IBM antitrust cases. Those currently being burned and those with a long range worry."

Dr. Walter Bauer, president of Informatics, Inc., counts himself in the latter group and bemoans the fact "there are too few of us. I keep warning my service brothers that their days are numbered." He referred to the fact that the agreement IBM signed with Control Data

In antitrust the secondary question is violation of the laws. People change the mood of courts.

Corp. when the latter took over Service Bureau Corp. as part of an out of court antitrust settlement, that it (IBM) wouldn't go into the service business for six years, runs out by 1978.

"IBM isn't hurting Informatics at this time," said Bauer, "but we exist from year to year by the grace of IBM. We gotta change the ground rules.

He believes IBM's apparent moves toward unbundling operating software are "cosmetic to make them look good to the Justice Department." He doesn't think these moves are going to make "all that much difference" to software companies whose primary business is the development and sale of operating type software although "some of them think so." He feels IBM eventually will "mechanize (their operating software) in firmware." But, he feels software companies can have a place in the regime of firmware.

"There is no reason why software companies can't purchase the semiconductor hardware and offer it as a hardware/software add-on. the product would have to be hardware compatible as well as software compatible, electrically compatible as well as program compatible. With IBM the dominant figure in this industry, this could only happen if IBM either allowed it to happen or were required by law to allow it to happen."

Increasing role for IBM

Bauer feels "there is no question that IBM will become increasingly active in software products in future years and may even come to regard software products as an important business in its own right, more than just an adjunct to the sale of hardware."

Thus, he said, "it is easy to conclude that the current and pending litigation against IBM and the government and other organizations is important to the future of software products. If a consent decree is negotiated it will undoubtedly have the provision that IBM must provide software interface specifications on a complete and timely basis. This would go a long way toward insuring a continuing good marketplace for software products and a continuing attractive atmosphere in which the user can select those products which he regards most highly."

Bauer thinks IBM "will take some bruises from the West Coast suits. IBM's chances of being defeated in the West Coast cases is greater than most people believe." He was referring to cases in which IBM is charged with antitrust violations by West Coast competitors (July p. 110). He is a member of the board of directors of California Computer Products, litigant in the first of the cases scheduled to come to trial. It has

DR. WALTER BAUER
More action from IBM in software field

been set for November and Bauer feels it could end by the end of this year but "most likely will end early next year."

Getting to the people

"It's a public relations thing," Bauer said. "People change the mood of the courts. If we could get enough people to encourage them (the courts) to worry about fairness it would help. In antitrust the secondary question is violation of the laws. They're ambiguous laws. What is important is that there is not as much competition as there should be in the industry which is bound to hurt the industry and the country."

One reason he feels IBM stands a chance of defeat in the West Coast cases is that "the anti-IBM forces are very much stronger now," than they were in the days of the Telex case. He was referring to the "assemblages of lawyers. They learned a lot from Telex mistakes."

He also cited the fact that the West Coast cases are going before juries instead of a judge as in the Justice Dept.'s case.

Bauer feels "IBM tries to behave but it can't. If IBM categorically wins all its lawsuits and no consent decree is negotiated, it would seem that the orderly and competitive marketplace for software products might well be greatly compromised. In this case there will be serious implications of all kinds to the data processing industry from both hardware and software standpoints. Indeed, it is difficult to perceive in this case how a data processing industry can exist."

—Edith Myers

Vote Counting

More Computers For Fewer Voters?

Opinion has it that there'll be fewer voters participating in next month's presidential election than in those of the recent past.

Maybe so but there definitely will be more computers than in any earlier election. We're a long way from crt's in every polling place and voting from home by telephone but in the mundane arenas of campaign mailings and vote counting, computers will see wide use this year.

David Dunbar, president of Computer Election Systems, Inc., Berkeley, Calif., producer of most of the punch card voting equipment in use today, said 17 to 19% of registered voters will "have the opportunity to use punch card voting this year assuming they turn out" compared to 14% two years ago. He said 35 stages now permit punch card voting, up from 28 in 1974.

The candidates are hoping computers can help them see to it that those registered voters who favor them will turn out no matter how their votes are counted. Campaigners don't have quite the capability to do this that they had in 1972. Then fresh census data was massaged to help politicians to target potential supporters and to uncover nonregistered voting age citizens. The '70 census data is now stale and there won't be another census until 1980.

But the candidates are working hard

Both Carter's and Mondale's planes are equipped with crt's

with what data they have. At the Atlanta, Ga., headquarters of candidates Jimmy Carter and Sen. Walter Mondale, a dp staff of varying strength "because most of us do other things too," is using computers to develop and maintain a number of lists. "We get inquiries from people who want to do volunteer work," said Steve Slade, head of the Carter/Mondale dp effort. "We sort

these by state and zip within the states and send them to state coordinators."

Communications link

The Carter/Mondale people also use computers as a communications link between headquarters and the traveling candidates. Both Carter's and Mondale's planes are equipped with crt's. "We use them for issuing information, editing speeches, providing press information and scheduling information and for personal memoranda," said Slade.

An important use of computers in the Carter/Mondale campaign, Slade said, is strict cost accounting. "We have a tight $22 million budget. Four years ago Nixon spent $60 million and McGovern $35 million." He said dp expenditures for the campaign amount to "only several thousand a month." They have no in-house computers. "We use several different time-sharing companies but the General Electric network mainly."

Carter/Mondale headquarters do all the data processing for the campaign. The democratic contenders are autonomous of the Democratic National Committee which makes no use of computers.

The Republican National Committee, on the other hand, has a data processing staff of eleven. Murray Dickman, head of the committee's data processing efforts, said "we are doing all of the Ford campaign processing although the Ford people do a lot of their own accounting." Like the Democrats, the Republicans mainly use outside services although they do have a Microdata Reality system for in-house accounting.

Dickman said the major focus since the campaign was kicked off over Labor Day weekend, has been telephone calling. "We have 750 phone banks around the country and expect to have made 43 million phone calls by election time." They obtain names from voter registration lists and match these against phone lists purchased from national services which sell such things and provide the lists to the phone banks. "Those called who seem favorable are re-called shortly before election to make sure they know where their polling places are. We also print out lists in walking order for door to door canvassing."

Private firms too

It's not just the candidate's organizations that are campaigning by computers. There are private organizations doing it too. Jim Martin of Jim Martin Advertising Agency Inc., Falls Church, Va., is producing computer letters and labels for Congressional candidates. Martin is a former executive of Richard A. Viguerie Co., also of Falls Church, probably the biggest company in direct mail campaigns for politicians, generally those "right of center." Martin said the Viguerie organization will be producing ten million letters in this campaign.

One firm which was active in computer based campaigning four years ago is trying to back away from elections now. "We decided we wanted to make an honest buck," said Murray Roman, president of Campaign Communications, Inc. which specializes in telephone marketing "segmenting and fracturing lists to rifle a telephone campaign onto a known target." Roman said he still does some political work for friends but he doesn't like it. "I just lost a Surrogate and I felt awful."

A big impetus to computer use by political campaigners was provided by the financial reporting requirements prescribed by new federal election laws. Carter/Mondale headquarters uses computers to generate reports for the Federal Elections Commission and to apply for matching funds. "We also keep a record of disbursements for the commission. We have to itemize all expenses greater than $100," said Slade.

Dickman said the new reporting requirements had a lot to do with President Ford's decision to work through the Central Committee. "Expenses can be shared, allocated over a number of candidates."

As for vote counting, costs are coming down and hardware is proliferating, at least in the punch card area. Optical scanning systems seem to be on their way out. One, a laser system developed by Control Data Corp. for Washington D. C., never got in. It was ordered for a primary four years ago but never used.

The last Gyrex

Orange County, Calif., is the last remaining jurisdiction using the granddaddy of all scanning systems, Gyrex (formerly Coleman) and it may not be using it much longer. "We don't have enough of it," said Al Olsen, the county's registrar of voters." The county has expanded the system "to some extent" since the 1972 election. "We have the same number of ballot readers, four, but now they're independent of each other," Olsen said. He explained that they were used in pairs before with one reader being unloaded and loaded while the other was reading. "We've cut some of the dead time."

He still feels the county's returns will be late "probably way into the morning of the next day." He likes the Gyrex system and says voters like it. "They like seeing the marks they make." But, he said, an upgrade is needed and "I can't see them (county supervisors) wanting to acquire any more of this."

California's Alameda County switched this year from a scanning system, Cubic Corp.'s Votronics, to a punch card system, Computer Election Systems Inc.'s Votomatic. "We switched to save money," said Jim Riggs of the Registrar/Recorder's office. "The initial cost, $997,000 was higher but the savings in printing and procedural things is $250,000 net each year." He said the Cubic system used 80 special purpose minicomputers, second generation with transistors, used only occasionally, which required considerable maintenance and space. Maintenance was running close to $100,000 a year. With the CES equipment, he said, maintenance is $1,500 a year.

Alameda County used the CES equipment for the first time in the June primary. Riggs said the conversion was smooth with "only the usual kinds of problems you have when you start things up." He had one problem which wasn't so usual. A general county employee strike was called one week before the election and he was without 18 programmers on election night.

Riggs said Alameda County had considered Datavote, a system produced by Diamond International, Inc., but had decided against it because Alameda is a bilingual county (one in which more than 5% of the population is Spanish speaking) and required by law to print bilingual ballots. With the Datavote system, names are printed right on the ballot cards, not in an accompanying book as with Votomatic. Riggs felt this would mean excessive printing costs and an unwieldy number of cards to be handled at the precinct level.

A general county employee strike was called one week before the election.

Not so

Jack Buker of Diamond International said a recent judicial decision in Washington, D. C., has rendered this reasoning invalid. He said the interpretation of the law now is that bilingual information has to be provided only on the sample ballot.

Buker feels the fact that names and issues are printed on the ballots with Datavote is a plus for his system as is the fact that "we use a mechanical punch which produces a positive hole with no possibility for chad." He said Datavote systems are in 40 jurisdictions now and 40-45 more are considering it. California's San Luis Obispos and Imperial counties recently switched from Votronic to Datavote. Multinomah County in Oregon switched to Datavote from Gyrex. The Diamond International equipment was used for the first time in Multinomah in this year's primary. "We counted 1.6 million ballots in 2 1/2 hours," Buker said, "in spite of problems caused by Jerry Brown's write-in campaign." Datavote is in use statewide in both Hawaii and Alaska.

Still the clear leader, Computer Election Systems is in some 350 jurisdictions this year and is continuing to add to its line of vote-counting equipment. At the

low end is a new microprocessor based precinct ballot counter, the size of a small adding machine. It comes in an aluminum case and is a hand fed card reader which produces tape for reading by a summary computer. These are in use in 150 jurisdictions. Then they have a family of mini-based systems for smaller, centralized counties. CES uses Data General minis and Intel microprocessors in these systems.

Further up the list are large card to tape units incorporating four card readers. Dunbar said 20 of these are out. Los Angeles County has six of them.

Newest of the CES systems is its Election Management system introduced this year. Dunbar said it handles all administrative functions associated with an election including: vote counting, voter registration, a continually updated inventory of voters, re-precincting when boundaries change, candidate filing registration, and the newly required federal election reports. The system is based on Hewlett Packard minicomputers and incorporates crt's and printers. Dunbar said two jurisdictions are using the system this year "but they don't want to say who they are." He described them as medium jurisdictions, "like 100,000 voters."

Price range

The systems range in price, depending on file size, from $60,000 to $250,000. Dunbar said the average target price is from $75,000 to $125,000.

He said CES' major competition continues to be the large voting machines and paper ballots, in part because of the restrictions against automated voting which still exist in 15 states, among them Florida, Ohio, New Jersey, and North Carolina. CES employs one full time lobbyist to work on this problem.

"It's just a general resistance to change and, to some extent a fear of computers," said Dunbar. He feels the fear part is aimed at reliability questions and not at security. He feels security concerns have pretty much abated in recent years.

The National Bureau of Standards came to the same conclusion last year when it issued proposed guidelines for computerized elections following a year long study of same. But NBS did recommend that the public be made aware of the security precautions that election administrators are taking to assure an accurate vote tally.

This might ease the mind of Bill Thornton of California Data Processors, Los Angeles. Four years ago, as a data processing election observer in Los Angeles County, he'd developed a plan for tampering with the vote count he was sure would work with a little collusion. He still thinks it could work and may already have been used. "All we know for sure is that no election tamperers have been caught."

Thornton continued a discourse with state and county election officials for four years but it's getting less lively now. "All I get is lip service. I'm still not going to miss any opportunity to present my theories but now I'm waiting for the opportunities to present themselves to me."

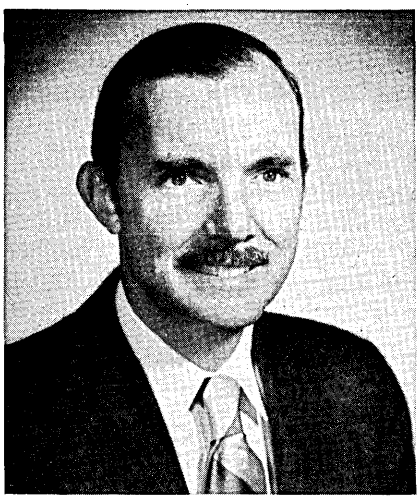
—Edith Myers

Politics

IBM's Branscomb on Carter Science Team

Four months ago Presidential candidate Jimmy Carter began brainstorming his science strategy. A key person in that strategy is Dr. Lewis McAdory Branscomb, vice president and chief scientist for IBM.

Branscomb was asked last June to coordinate Carter's science game plan. In the works since last summer, the new



DR. LEWIS M. BRANSCOMB
IBM's chief scientist coordinates Carter's science policy program

science policy task force is one of 18 special task groups set up to feed specialized information into the Carter campaign machinery.

Carter strategists, anxious to play up their candidate's scientific bent as a nuclear physicist in the Navy, began headhunting for task force members in early August. By early September, a total of 24 science and technology researchers and policymakers had signed up for Carter's science team. Another dozen or so were expected to fill out the membership roster by the end of last month.

IBMer Branscomb is expected to play a pivotal role in policy formation on the new science squad. Defining the scope of the fledgling task force, Branscomb explains the group "will not meet as a body or sit down and pontificate on big national policies."

What it will do, he says, is help identify science and technology issues of national importance—their pros and cons—and come up with recommendations on what Carter's position on certain issues might be. "Needless to say," he notes, "these general scientific policy questions are not the most gripping political issues as far as the public is concerned. I have a feeling the principal value of this effort is to help Carter and his people have a broadly-based view of some of the concerns of the scientific and technical community."

Some of these concerns, Branscomb says, deal with basic science matters, the future of the newly-created White House Office of Science and Technology Policy and the issue of technology policy and the economy. "The computer industry," according to Branscomb, "is an important piece of that since it's one of the industries in which the innovation rate is highest. Therefore, it's a good example of how the science and technology community creates employment."

Shy on technology

Branscomb has very carefully avoided involving the task force in computer technology questions, saying he's "a little reluctant to" since it "would be misinterpreted and wouldn't be quite fair."

The Branscomb-Carter connection appears plausible. Both men come from old, well-respected Southern families, Branscomb having been born in Asheville, N.C., and Carter coming from the now-famous Plains, Ga. Branscomb's father, a man of distinction in his own right, was chancellor of Vanderbilt University for 17 years, from 1946 to 1963.

Politically, both have liberal leanings, a fact that caused Branscomb some trouble when he was director of the National Bureau of Standards under the Nixon Administration. But Branscomb also had some earlier ties to Nixon. Before coming to NBS as director in 1969, he served as a member of President-elect Nixon's task force space program in 1968.

Met at ACM meeting

Branscomb first met Carter at the Association for Computing Machinery's national meeting in Atlanta in August 1973. Branscomb gave the keynote speech at that meeting and Carter, then governor of Georgia, presented a welcome address in which he declared "Computer Week in Georgia."

Branscomb remembers Carter's introductory remarks at the ACM meeting and claims they were "awfully good and apparently extemporaneous. I thought he demonstrated a good deal of interest in science and technology matters." And so

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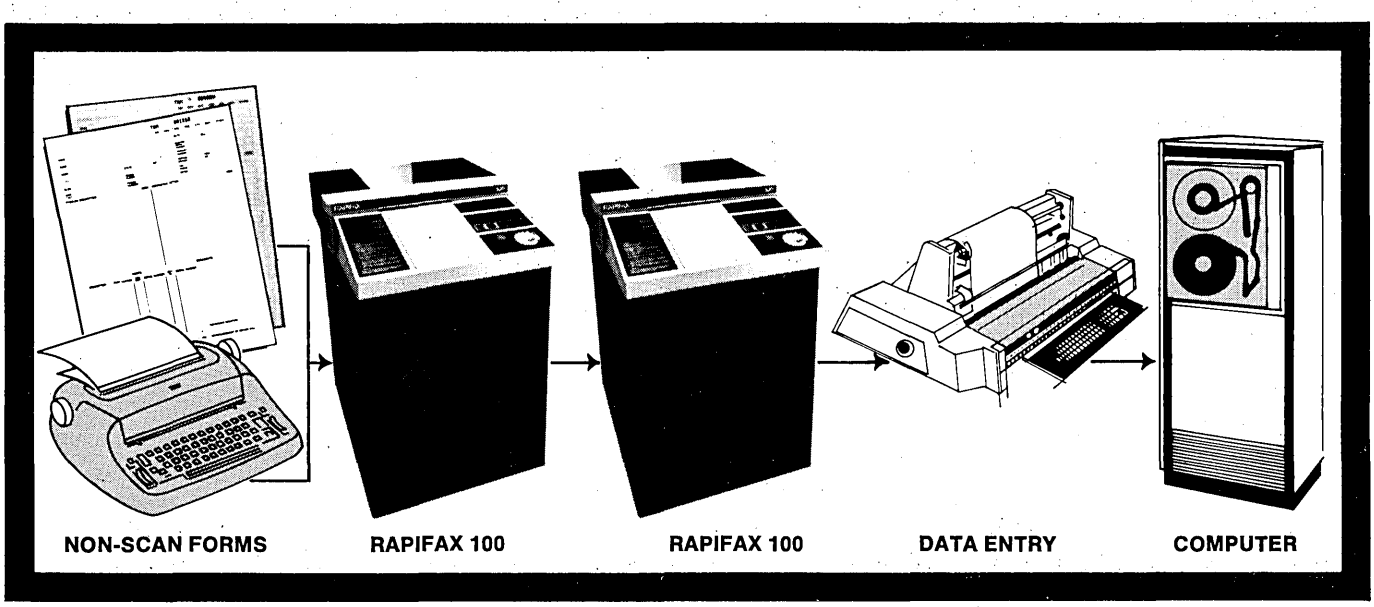

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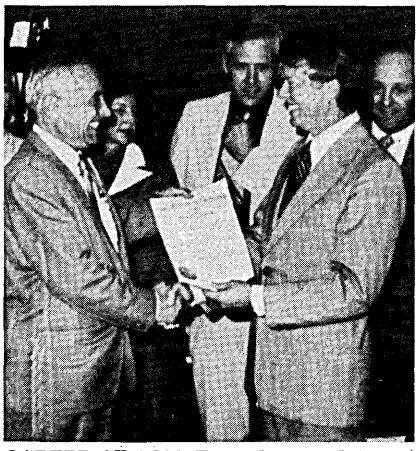
did other ACMers. ACM president Dr. Herb Grosch recalls Carter's speech as "meaningful. He evinced some knowledge of the data processing and computing community and its importance."

Branscomb, apparently impressed by Carter's dp know-how, says that ACM address "is really what stimulated my interest." However, their paths didn't cross again until last December when Branscomb says he had a conversation with Carter "about general science policy questions." At the meeting, Carter also asked the 50-year-old IBM vp for some help in the science field.

Disavowing any job aspirations,



CARTER AT ACM: Then Gov. of Georgia, he presents proclamation declaring the week in which ACM held annual meeting in Atlanta as Computer Week in Georgia. Receiving it is Dr. I. E. Perlin, professor of Information and Computer Science at Georgia Institute of Technology.

Branscomb claims he's had enough of the government. "At this stage of the campaign," he comments, "there are all sorts of people who cover their bets with both sides and try to position themselves for jobs. And that's the last thing I'm interested in. I've got a super job right where I am. I'm really not looking for a position in the Administration. I've served my 20 years in government and I got great personal satisfaction out of it and felt I was doing some good."

Meanwhile, at the White House

While Carter's alliance with top IBMer Branscomb was viewed as a good move by political observers, the Ford Administration's hand-picked choice of another IBM man to fill a new consumer post at the Treasury Dept. was thought to be a major blunder by consumer crusaders in Congress. At the center of this controversy is Dr. John Webster who left IBM's public affairs staff on a one-year "personnel interchange" program to serve as special assistant to the Secre-

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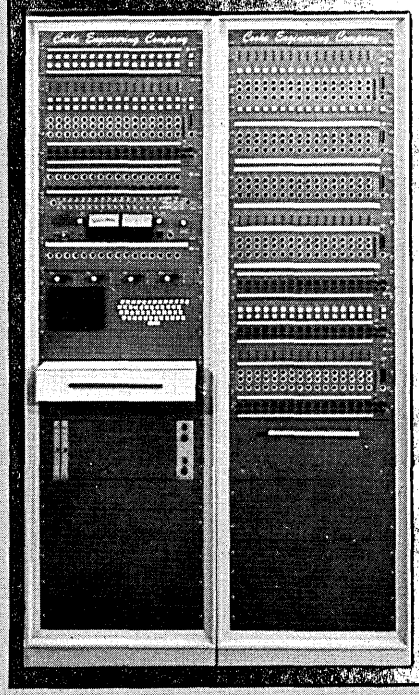

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CIRCLE 95 ON READER CARD

tary for Consumer Affairs at the Treasury. His appointment became effective Sept. 1.

He's characterized by a Treasury spokesman as an "able, energetic, motivated citizen with a high interest in consumer affairs." Webster did his Ph.D. thesis on "Environmental Influences on Business" with a dissertation on "Corporate Social Policy."

But Rep. Charles A. Vanik (D-OH), an outspoken critic of the IBM nemesis in the Administration's consumer advocacy programs, finds Webster's consumer credentials more than dubious. "A citizen with an 'interest in consumer affairs,' " Vanik argues, "is not the same thing as the zealous advocate for consumer rights that the American people need to represent them in the Treasury Department."

He blasted the Administration for its insensitivity to consumer needs and said "IBM is not the American consumer who needs representation in government. I seriously question whether an individual with no background in consumer advocacy, who comes from and will return to what is essentially a p.r. position at an immense and powerful corporation, can fulfill President Ford's stated goal of making the Treasury Department responsive to consumer concerns."

A big booster of the consumer protection agency legislation killed by President Ford, Vanik believes the Webster appointment clearly points up the underlying weaknesses in Ford's system of ad hoc consumer rep appointments. "The appointment of persons such as Dr. Webster from the world of giant p.r. offices," he charges, "is one further argument for the enactment of true consumer protection legislation."

—Linda Flato

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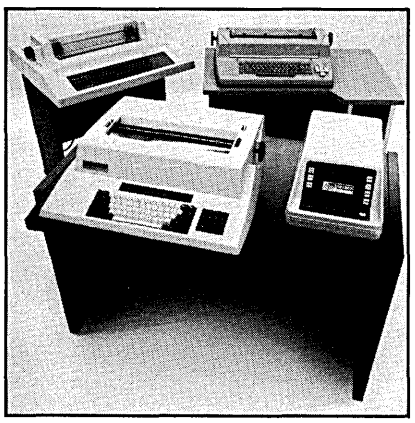

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Companies

The Liquidation of Wyly's Datran

Wyly Corp.'s Data Transmission subsidiary (Datran) still is for sale, but with its 198 customers gone to other carriers this alternative is a moot question, although the company has received an offer from an unnamed overseas prospective buyer. "The ideal time to buy would have been the day after we filed bankruptcy and still had customers," says Ray Hannon, a Wyly spokesman.

Unable to keep up with the continual cash drain and unable to find further financial support, Datran filed bankruptcy late in August shortly after agreeing to defer shutdown of its network until Sept. 15 to give its customers time to find alternate suppliers.

At press time there was no breakdown of how the company's traffic had been divided, but AT&T had picked up about 70% of the business with the rest shared by MCI Telecommunications Corp., Southern Pacific Communications Co. and Tymshare. Tymshare operates a data communications network called Tymnet. It said the first Datran customer is PolySystems, Inc., a Chicago-based company that provides actuarial software to the insurance industry. PolySystems had planned to convert to the Tymnet network in October and the demise of Datran hastened the move.

MCI question

The big question generated by Datran's collapse is whether it will cause the other specialized carriers to go down the drain. Pessimists point out that MCI, the major remaining supplier of specialized services, lost nearly $28 million during its last fiscal year, ending March 31, 1976 (vs. $39 million during the previous year), and has accumulated total indebtedness of $140 million. Since the end of May, however, MCI is reported to have been earning enough to pay its monthly operating expenses, and the company expected August revenue to cover its interest payments as well.

The outcome of the Execunet fight (see following story) now raging at the FCC may be the key to MCI's future viability. Chief executive William McGowan said the Execunet service currently accounts for about 40% of MCI's revenue.

Two users, meanwhile, were asked how they view the idea of doing business with specialized carriers in the wake of Datran's demise.

Tom O'Toole, manager of CCSA operations for Westinghouse, said, "Our company believes competition is necessary in the telecommunications marketplace, so we intend to continue using specialized carriers. Our chief supplier in this area is MCI. We've been watching them closely and are convinced they're getting stronger—financially and operationally—every month."

A source within the General Services Administration said he didn't believe the federal government would reduce its reliance on specialized carriers because of Datran. "So long as the other specialized carriers can satisfy our stated requirements—including those for financial responsibility—they'll receive the same consideration accorded the long-established carriers."

The next major step in Datran's dissolution will be to sell the company's assets in hopes of raising enough money to pay off the debts. A company spokesman said the liabilities total $20-25 million. The sale, conducted by a court-appointed receiver, probably will begin within a few months, but may not be completed "for years." The book value of the company's assets was estimated at $60 million. Proceeds from the sale will be far less than that, "but more than sufficient to pay off all of Datran's vendors," a spokesman said.

Court-appointed receiver will conduct sale of Datran's assets to pay off debts.

Under the National Bankruptcy Act, employee claims of up to $600 each are paid first. Remaining funds then are disbursed to secured creditors, lien holders, unsecured general creditors, bond/debenture holders and stockholders, in that order.

$100 million investment

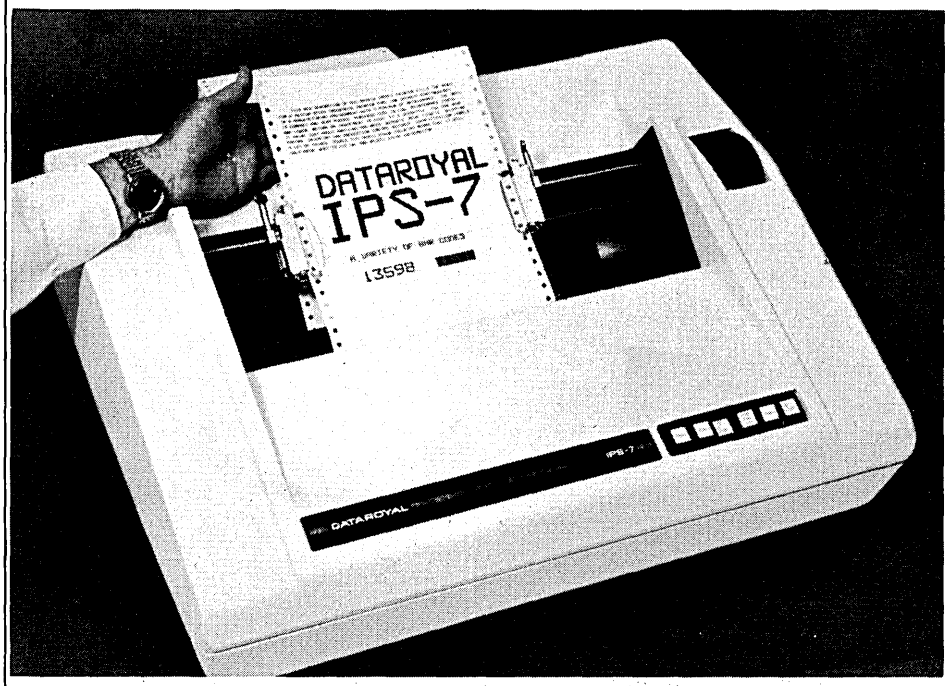
The total investment in Datran is about $100 million. Bechtel Corp., a supplier, put up $2 million while the remainder was contributed about equally by Wyly Corp. and Swiss industrialist Walter Haefner. Wyly has announced a plan for exchanging these obligations for equity securities. The plan must be approved by the Securities and Exchange Commission before it can be implemented.

Possibly the most valuable Datran asset is a computerized switching complex built to the company's specifications by Comten Corp., of Minneapolis, and Stromberg-Carlson. "We don't expect to lose much," said a spokesman for Comten, which supplied the processors and software. "The hardware was leased, so we'll get it all back. Finding new users shouldn't be a problem." The software development has been paid for, he added.

A Datran spokesman said the company owns a patent on its switched digital network, of which the Comten-Stromberg-Carlson equipment is the key element. Asked whether any other carrier might buy the patent, he indicated Southern Pacific Communications is "the most logical" purchaser. It owns several of the Datran network's microwave towers and has been supplying some circuits to the company on a lease basis. AT&T has leased others.

Shortly before it threw in the towel, Datran filed a $285 million treble-damage antitrust suit against AT&T, alleging a number of predatory and anti-competitive practices. Said board chairman Sam Wyly: "Our efforts to continue Datran were made impossible by a series of AT&T actions arising from AT&T's determination to eliminate competition in telecommunications."

Datran was organized in 1968, received its FCC license in 1972, and began commercial operation in 1973. The present nationwide Datran network has been in service about a year. ✲



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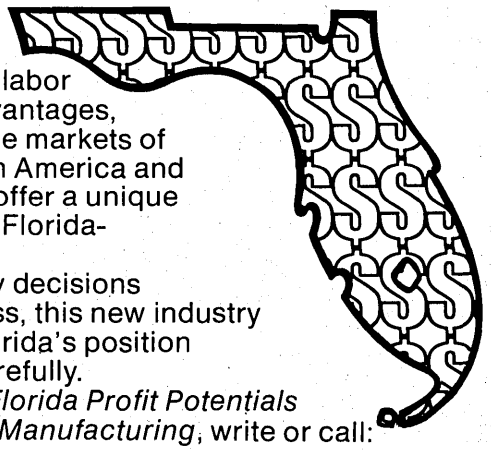

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news in perspective

Carriers

Maneuvering to Save Execunet—and MCI

MCI Telecommunications Corp. said it is willing to revise its Execunet service "to comply with" a recent FCC decision. but the revision isn't likely to be any more acceptable to AT&T than the present offering and the Federal Communications Commission almost certainly will continue to be confronted with a controversial decision.

The collapse of Wyly Corp.'s Data Transmission Corp. (Datran) subsidiary makes the decision even more difficult and last month the FCC went to the U.S. Court of Appeals for help.

In 1975, the FCC decided that Execunet—a low cost telecommunications service for businesses—should be terminated. MCI then took the decision to the federal court and won a stay. Subsequently, the court remanded the decision back to the commission for further consideration and that proceeding led the FCC, last May, to disapprove Execunet for the second time. This latter order, however, can't be executed until the court decides whether the commission acted properly.

The FCC asked the court that the stay of execution of its order be vacated. If not, it wanted MCI to stop expanding the network which since July '75 has grown in revenue from $25,000 a month to more than $2 million a month this summer. At that hearing the Justice Dept. testified in favor of MCI. It said "there is substantial reason to fear that any action which results in the elimination of limitation of MCI's role in providing services contemplated by the specialized carrier division could have a significantly adverse effect upon the level of competition in such services."

Out of business

And MCI chairman William McGowan made it clear that removal or curtailment of the existing stay "would put MCI out of business." He said the company has not yet attained a positive cash flow and that curtailment of its Execunet service would place the company in default of a credit agreement in which it must meet specified cash flow targets to avoid default.

That, said McGowan, would harm MCI's 10,000 Execunet customers, the users of the company's other services and throw 700 persons out of work.

MCI is the major remaining specialized carrier, now that Datran is out of

business. Thus if the FCC rejects the revision offered by MCI or wins its request to vacate the stay, it may also destroy the specialized carrier industry and thereby erase whatever competition has been injected into the telecommunications marketplace in the past several years. But accepting a revised Execunet could also create serious problems—for the commission as well as AT&T.

The commission decided that Execunet is a dial-up toll telephone service, and thus beyond MCI's charter as a specialized carrier, because Execunet customers can use dial-up access lines, can share intercity trunk facilities with other types of users, and can call any dial-up telephone in any of the remote exchange areas with which the service interconnects.

Death of MCI would affect 10,000 users and 700 employees.

Leased lines to be used

MCI is saying that if the appeals court upholds this interpretation, Execunet's architecture will be altered. Leased access lines will replace the dial-up facilities and Execunet customers who wish to communicate with a remote local exchange will have to designate specific telephone exchange offices. They won't be able to communicate, as they do now, with *any* telephone in the exchange area. Also, the intercity trunks used for Execunet will be dedicated solely to that service.

These changes will increase Execunet rates, the company adds. Local access facilities will cost more in most cases, while the restructuring of the remote access charge "may" make it more expensive to reach—or be reached by—a large number of telephones within each exchange area.

Once configured along these new lines, Execunet will be virtually identical to Sprint, a service proposed recently by Southern Pacific Communications Corp. Since AT&T already has told the commission what it thinks of Sprint, it isn't hard to guess the phone company's reaction to a reconfigured Execunet.

Essentially, AT&T says the SPCC offering fails to satisfy two requirements for private line service which have been enunciated by the FCC: the service must limit the customer's access at the remote end to a specific location, or to specified telephone central offices, and the message path must consist of facilities "set aside for the exclusive use of a particular customer and authorized users during stated periods of time."

SPCC insists Sprint meets these criteria because the intercity circuits will be dedicated exclusively to Sprint customers and each such customer who contracts for remote local exchange service will have to specify *which* offices within the exchange area he wants to talk through.

If the hassle between AT&T and the specialized carriers were just a matter of semantics, as suggested above, the commission probably could find an acceptable compromise. But MCI looks at Execunet as the key to its survival, and SPCC —although not as vocal—probably feels likewise about Sprint. AT&T almost certainly agrees with those estimates, which is one reason for the phone company to oppose the two offerings as vigorously as it can. But there's also another reason.

AT&T alluded to it late this summer in opposing the commission's recent resale/sharing decision which, if it's ever implemented, will legitimize offerings like Execunet and Sprint:

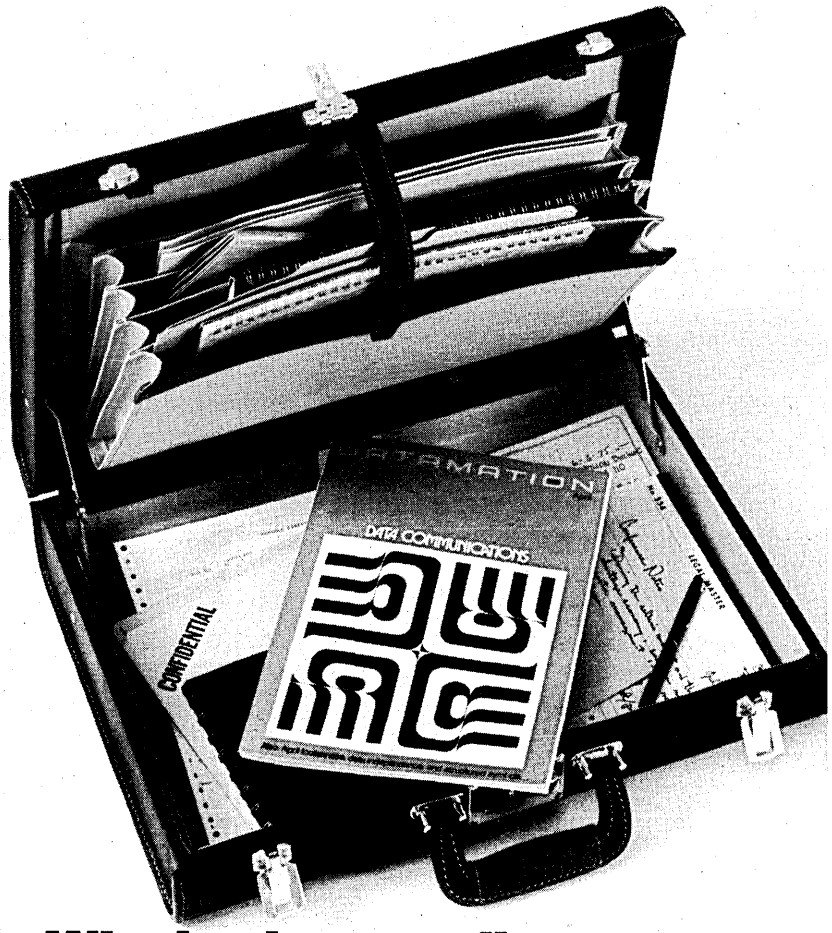
". . . the sharing of FX and CCSA services envisioned by the (resale/sharing) order could be interpreted to permit the creation of numerous networks and services duplicative of MTS and WATS . . . For example, a hotel could permit its guests the use of 'shared FX' as an MTS substitute; a chain of hotels or other multicity businesses could utilize 'shared CCSA' to establish their own subtending MTS network. Department stores, grocery stores, and other national retail chain outlets could permit their customers' use of a 'shared CCSA' arrangement as an MTS substitute. Such possibilities are limited only by one's ingenuity."

Whether this threat is real or imagined is probably less important than whether it's believable—to Congress, the FCC, and AT&T investors. If it is, the investors are likely to find other places to put their excess capital, and the FCC is likely to begin re-thinking its whole pro-competitive policy—realizing that if it doesn't, Congress will. ✲

Distributed Processing

Evaluating and Selecting Hardware For Remote Sites: It's No Easy Task

The idea of distributing processing power to users at remote sites appeals to many people who now have a centralized dp system. But the job of evaluating and selecting the hardware for those distant locations is no easy task. "There are many bad pieces of equipment for this type of application," says systems analyst William E. Neu. "And when you get to the right pieces of equipment, there's no software or there's no adequate support."



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news in perspective

Earlier this year, Neu completed a seven-month evaluation effort for a distributed processing system recently inaugurated by Chanslor & Lyon Co. Inc., a Brisbane, Calif., automotive parts wholesaler. He says it got to the point where they wanted the hardware from one vendor, the software from a second, and the support from a third. "The best system in the world is no good when the machine goes down," he observes. He finds it incredible how a company obviously puts all its effort in developing a great piece of hardware, totally overlooking the software—or vice versa.

Other users contacted for this report indicate that a wide variety of applications are destined for distributed processors. Hospitals are thinking of jobs such as admissions and scheduling, medical records and patient index, in addition to placing dedicated processors in the pharmacy and laboratory. Local governments look to law enforcement jobs, vehicle maintenance, tax assessment and collection, the usual assortment of accounting applications, school district dp, and information systems for the highway and social services departments.

Educational institutions and scientific laboratories are talking about data gathering and on-line experiments. Computer-assisted instruction appears destined for dedicated processors, while student registration, the maintenance of student records, and student program compilations are other applications mentioned. At larger campuses and among local school district offices, the idea of sharing the workload for academic computing seems to jibe with the concept of distributed processors.

Manufacturers apparently are looking forward to such applications as bill of materials processing, job reporting, production control and scheduling, forecasting and modeling, and even product design and costing, in addition to the normal accounting functions, inventory control, order entry, receiving and shipments, and new material and finished goods control. Here, too, graphics is mentioned. Those in the distribution business list order processing, shopping-document production, inventory management, and freight payment.

The real motivation

It is hard to uncover the real motivations behind the decision to disperse processing power. Clearly the hardware vendors stand to gain from a proliferation of minicomputers and the like, requiring as they do a certain complement of peripheral equipment at remote sites.

Give imaginative people a small computer and they'll soon find the need for a larger model. And more peripherals. Thus the interest of hardware suppliers in promoting this concept is understandable.

But even within an organization we find varying viewpoints. One dp manager told us he was going to distribute his processing, and even related applications that would be placed on the remote processors. The organization was

Give imaginative people a small computer and they'll soon find the need for a larger model.

contacted again two months later, by which time a change in managers was made. The dp manager today says he can't understand why his predecessor would even consider altering that firm's centralized dp operations. He has no intention of going distributed.

The motivations, then, can be left for head-scratching by the same researchers who are trying to figure out why buyers favor small cars one year and large ones the next, even though the price of gasoline continues to rise.

Not much clearer at this point is where people will get the software that will enable them to go to distributed processing. Users tell DATAMATION, in some instances, that they're not sure. Very few say they will go outside, to a contractor or to a software house. Most of them intend to get the software from the vendor of their central or remote-site systems. But a significant number say they will do at least part of this task in-house, relying in part also on the vendor of their remote processors and/or the supplier of their central dp mainframe.

No need to change

Not surprisingly, there are some outfits that can't see any justification for a change to distributed processing. Take CR Industries, for example. This manufacturer based in Elgin, Ill., has a manufacturing plant in Chicago, one in South Dakota, and a third due to become operational early next year in Kansas. In addition, it has a division that distributes its own products and those of other manufacturers. The parent firm has its dp centralized in Elgin, running on a 750K IBM 370/145 under DOS-VS.

Users in the South Dakota facility are using an IBM 3775 for data input, and have status reports shipped back to them. Current plans are to begin transmitting to them action-type reports, paychecks, and the like, and to allow them to get status information by making inquiries. The set-up is sufficient for their needs, says the dp manager, D. Belin. And because things like inventory control are centralized, they didn't feel they could reduce the data transmission load generated by inquiries and data input.

"I've seen it over and over again," says Belin. "Any time you get a processor anywhere, small or large or medium or whatever, the thing just proliferates. They find all kinds of other good gadgets and pretty soon you must have a whole operational staff to run the damned thing. Then pretty soon you're going to have programmers out there." In the interest of retaining central control over system development, and to keep down the dp operational costs, he adds, they'll stay centralized for now.

The same applies to a manufacturer in Massachusetts that didn't wish to be identified. This firm recently replaced an IBM 360/30 with a Digital Equipment KL-10 processor and finds it has more than sufficient capacity to handle the data processing for a nearby manufacturing facility and that of two subsidiaries.

The exception

A service company based in a suburb of Washington, D.C., has no problem of capacity, as such, as its central dp site. But it services a number of intelligent terminals at remote locations. And at certain periods each month, such as the end of a month, it tends to become overloaded. By going to distributed processing, says the dp manager who requests anonymity, "we'll probably be able to flatten out our workload. At least I hope so."

This organization currently is communicating with terminals at 25 locations in the U.S. and Canada. These stations transmit to headquarters during the second shift and receive, in return, their daily reports during the central facility's third shift. Next year mini-based systems are scheduled to be installed at some of those locations, enabling the branch offices to run many of their own applications.

Benefits that people foresee from going to the distributed processing environment vary as much as the approaches they take to it. One can picture a manufacturing firm that must acquire and store raw materials, run them through the manufacturing process, then store and distribute the finished goods. And one can imagine the job of tracking those goods—where they are stored, where they are in the manufacturing process and the subsequent warehousing stage, and where to ship them in their correct quantities. The ability to disperse the myriad of data processing responsibilities can sound appealing, and the benefits that can be derived appear almost limitless.

Auto parts of 100 vendors

The same can be said for a distribution company such as Chanslor & Lyon, an automotive parts wholesaler that takes over where the manufacturers

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leave off. It handles auto parts from more than 100 vendors and, through seven warehouses in the state, serves some 1,000 local auto parts stores. Currently it has a 128K IBM 360/40 that performs the accounting for 126,000 separate parts numbers, their inventories, and their rate of sales in each part of the state.

Last month the company began installing a distributed processing system. It placed a minicomputer-based system that will support 10 terminals into its San Diego warehouse. But even with all that this can mean for that facility, the major benefits appear to accrue to corporate management in the form of an improved upward flow of information.

"Daily operation summaries, performance reviews, zone analysis, and line movement analysis reports are really the issue," says Larry Payne, the firm's director of management information systems. "And that's where we think the value of distributed processing lies."

Chanslor & Lyon's William E. Neu points out that the system allows corporate management to react more quickly to changes in the marketplace—to the acceptance by the buying public of a new product or the switch of allegiance from one product to a competing brand or an unexpected interest in, say, home tune-ups of a car. Changes of these sorts, says Neu, can affect the company's purchasing activities, the inventory levels it maintains at ware-

Management reacts more quickly to changes in the marketplace.

houses and at retail outlets it services, and its sales promotion activities—the types of events that management must be prompt in reacting to.

Their business, Payne notes, is based on efficiently moving products through those warehouses. Accordingly the firm has developed the ability to produce inventory forecasts for specific sites, based on the historical knowledge of slow- and fast-selling items, buying patterns in various parts of the state, and related information. At the central site, it performs the purchasing of some 10,000 line items daily, as well as the accounting functions, in addition to maintaining an inventory count for each warehouse. And for each class of items, a low-quantity level triggers a reordering or restocking signal. It produces an analysis of sales by product and an analysis of the performance of the stock personnel at the remote sites.

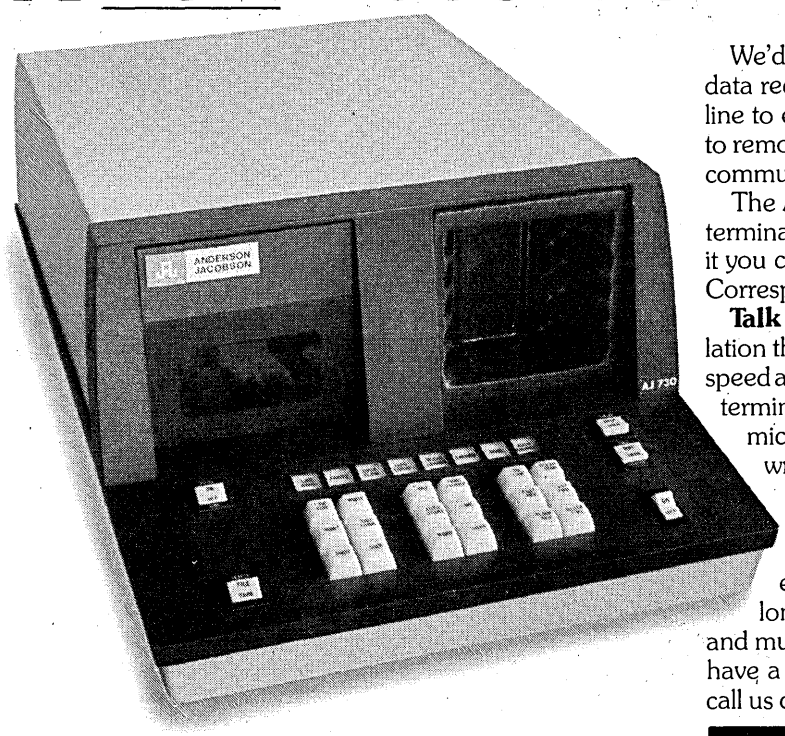
Will use Cyber 17

It now will begin using a distributed processor configuration that includes a 32K-word CDC Cyber 17 mini, a 20-megabyte disc, 300-lpm printer, 10 crt terminals, and an auto-dial/auto-answer 4800-baud line. The latter will permit each remote site to be polled at night.

"These machines have to run unattended on an auto-answer basis," says Payne. "The programs are set up to do the file maintenance so we don't have people down there who have to mount tapes or anything else. That way we have a better chance of assuring us of a certain amount of data base integrity."

The data base at each site will include line-item prices, customer list, credit status, and the stock status. Data on the inventory levels at each warehouse will continue to be maintained at the central facility, and the data base at the warehouse need not jibe 100% with the home office version. "As long as it's 95% or above, the reason for having that data base at the warehouse is satisfied," says Payne. This is because the remote data bases will not be involved in the corporate inventory accounting job. "If it's out of synch on one or two parts, the world doesn't come to an end." It is used primarily, he explains, to allow the

A new Recorder to talk about



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people at the warehouse to know whether a particular part is in stock and whether there's a part number that has superseded an older number.

"We have a rather unusual on-line application," says Payne. "Usually people go on-line to cut down on time delays. But our customers don't pay on the basis of invoices; they pay on the receipt of a statement. The average auto parts store pays only once a month." What's important, he adds, is that the daily deliveries to a customer be accurate and that they keep to a minimum the delivery of only a portion of an order because a part is out of stock or, even worse, because a part number had changed and the stock clerk couldn't find the specific part the dealer had ordered.

Backup is remote

Perhaps of greater significance, the remote processors are backed up by similar systems at other warehouses, all of which can talk to each other. Indeed if, say, the San Diego system should go down, the Los Angeles warehouse will have the ability not only to take over but also to ship merchandise it has in stock that San Diego lacks in sufficient quantity.

There are six applications programs in the remote systems for things like order entry and inventory accounting, but a total of 26 programs are involved, including communications handlers and report generators. There will be a facility to download the object programs, as when a change is made. But all applications programs will emanate from the central site, the users being allowed to do no programming of their remote processors.

There is no hard-and-fast answer as to whether users should be allowed to program their own systems. As noted in a September issue article (p. 160) it depends on circumstances. Users at warehouses are different from users out at autonomous profit centers, so the argument goes, and should be treated differently.

Something that is not disputed is Bill Neu's point earlier about the importance of support at each of the remote sites in a distributed system. Speaking to those who already have dispersed the processing capability, one hears many war stories about the time it took to get a system back up and the thin veneer of patience shown by users who are unable to communicate with their central system. As far as those users are concerned, of course, the blame for all inconveniences caused by downtime lies not with the hardware vendor but rather with the people at the home office who came up with the goofy idea in the first place.

—Edward K. Yasaki

Facilities Management

A Contract That Didn't Work Out

The pros and cons of facilities management likely will get a thorough airing in a lawsuit filed by the F. M. Schaefer Brewing Co. of New York against Electronic Data Systems Corp. of Dallas. The latter firm, which operated Schaefer's data processing facility for several years, is the best known of U. S. firms specializing in facilities management.

The suit, filed in U. S. Federal District Court in New York, seeks $45 million in actual damages and $70 million in punitive damages for a total of $115 million. In its suit, the brewery company charges EDS with fraud, negligence and breach of contract.

When it was informed of the suit, an EDS spokesman said the firm was "unaware of any basis for the claims described by Schaefer."

The case filing contained a copy of

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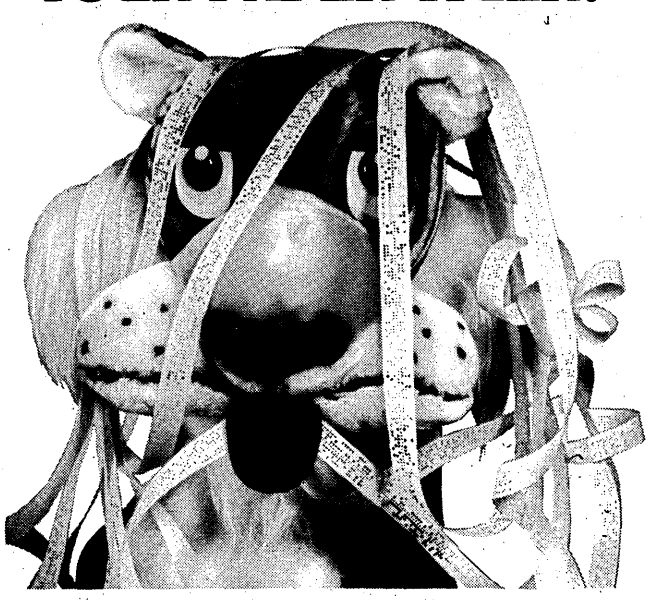

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a 1969 "systems contract" between the two litigants and the document is interesting in that it reveals some of the business practices contained in a facilities management contract.

For one thing it revealed that EDS moved to bar the brewery firm's employees from the data processing facility itself and further that the brewery agreed. The systems contract states: "As an additional safeguard to Company (Schaefer), its personnel and employees shall not operate the electronic data processing equipment to be utilized by EDS hereunder, shall not enter any room where any such equipment may be located and shall not assist EDS in any manner therein without the prior approval of EDS."

The Schaefer installation appears to have been a large one. In 1968, before EDS took over the installation, Schaefer had 24 dp employees working there on two leased 360/30s. The equipment utilized by EDS at the Schaefer site was not identified but the legal brief says that 36 EDS employees were working there.

From '69 to '74

"In May 1969," the suit states, "Schaefer turned over to EDS sole and exclusive control and custody of all of its data processing facility, data base, files, and information and EDS immediately commenced the running of Schaefer's existing data processing system." According to the court filing, EDS and Schaefer began discussions to terminate the contract "on or about May 1, 1974" and that actual severance of the relationship took place over several months.

It was during this period apparently that Schaefer began to become disillusioned about some of the information it learned about EDS' operation of Schaefer's dp installation. One entry in the Schaefer brief states:

"On or about March, 1976 Schaefer personnel discovered that EDS had been maintaining a report since 1971 which indicated that amounts of goods sold under the load-balance subsystem did not equal amounts of goods sold as shown by the order entry subsystem and demonstrating discrepancies of balance between the two systems on a daily basis since initial operation of said subsystem during 1971."

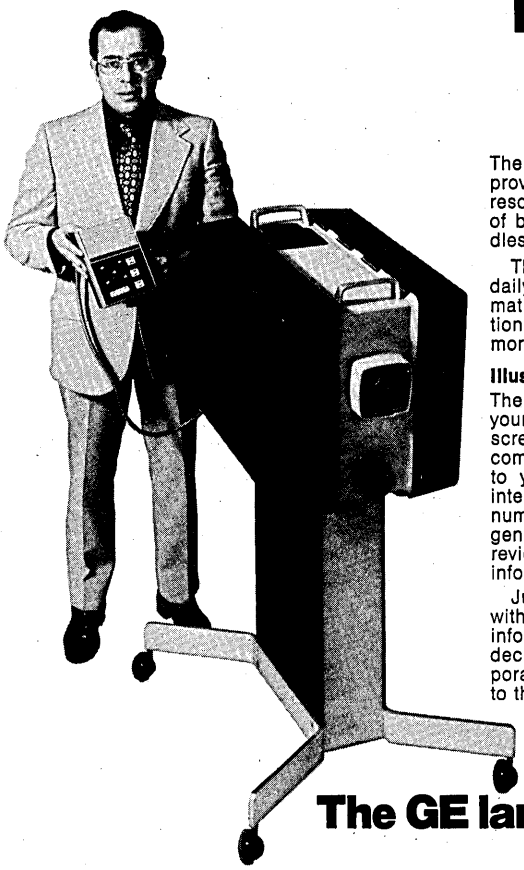
Schaefer maintained that EDS' operation of an "inadequate and undocumented system" resulted in many problems including, "W-2 forms were produced incorrectly, payroll systems could not process 40-hour weeks or add hours accurately, instructions for sequence of loading trucks were received late . . . figures for the operating budget did not balance . . . the computer deducted excessive Pennsylvania State taxes from Schaefer Pennsylvania employee checks . . . sales histories of certain accounts were destroyed with resultant loss of valuable past customer data . . . customers were incorrectly defaulted for non-payment and reported to the applicable State Liquor Authority or Liquor Commission with a resultant loss of the right to buy alcoholic beverages on credit . . . in a separate report overtime was overstated by $6 million . . . deliveries were not credited to customers' statements such that customers were not billed for goods delivered . . . and various other discrepancies, inaccuracies, and misleading information were produced by the computer system which made it difficult for Schaefer to remain in business."

EDS said it "used the filing of the litigation as a tactic to attempt to avoid the payments to (EDS) of an amount exceeding $1.2 million owed by Schaefer," and the Dallas firm indicated that it intends to pursue its own litigation against Schaefer" in an effort to collect all amounts owned by Schaefer."

EDS is also prominent because of the high visibility of its chairman H. Ross Perot. While Perot is not mentioned by name in the Schaefer suit, EDS president Milledge A. Hart III, is cited in the brief as having been involved in some of the dealings between EDS and Schaefer.

Schaefer is represented by attorneys Thomas R. Nelipowitz and Thomas K. Christo of Boston. Christo represented Catamore Enterprises, a Rhode Island

The computer data visualizer



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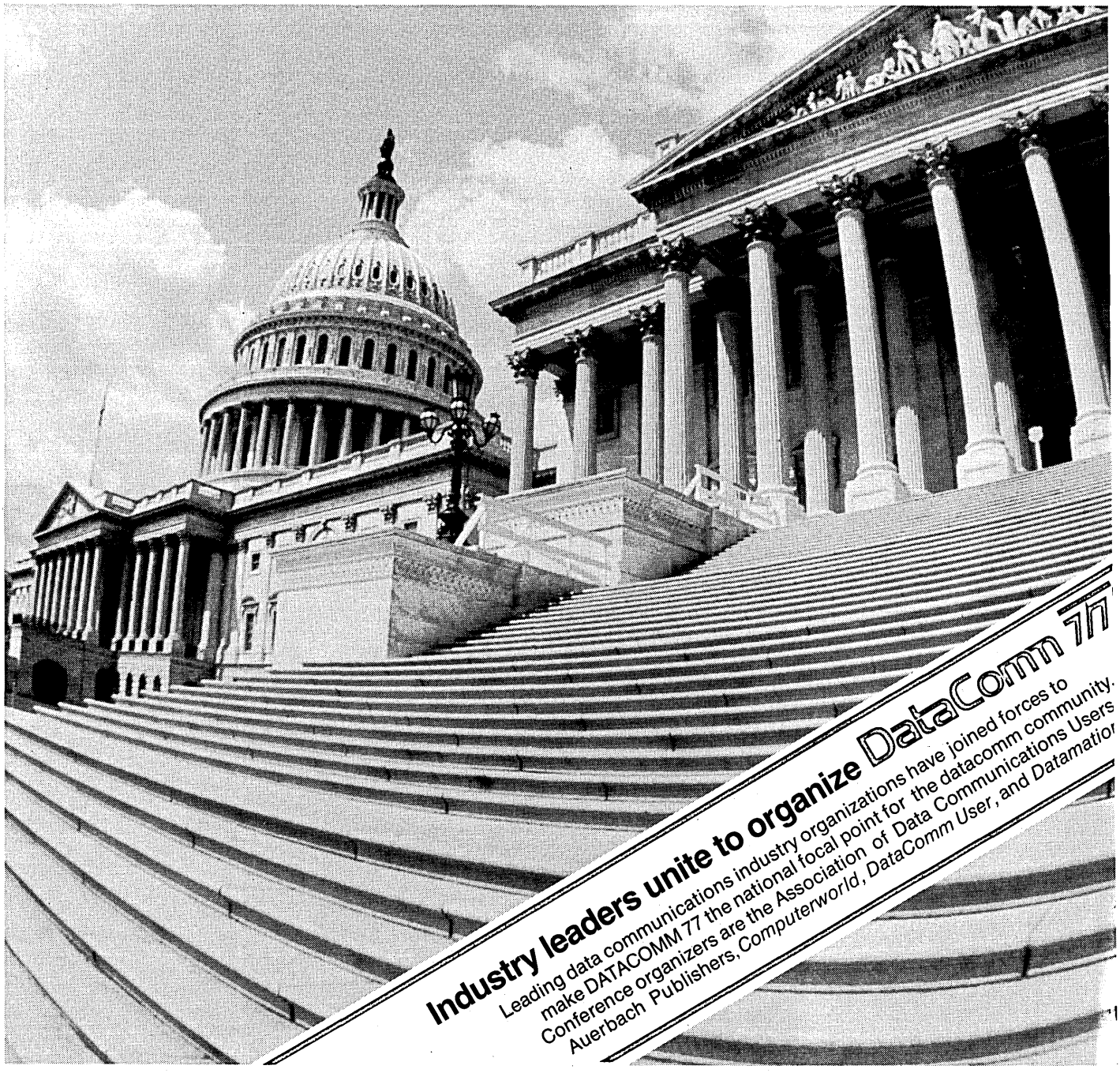

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Conferences

Wescon: A Mature 25 Years Old

The Western Electronic Show and Convention (WESCON) last month observed its 25th birthday with a bit of something old and a bit of something new.

It was reminiscent of the WESCONs of old with its attendance of 36,000 plus exceeding the 30,000 to 35,000 expected by organizers and a "sell out" of exhibit space with some 400 companies occupying 725 exhibit spaces, capacity for the Los Angeles Convention center for a show of WESCON's general description.

New was the pervasiveness of microprocessors and microcomputers and the accompanying descent of hobbyists and talk of what used to be considered blue-sky applications that are here now.

Keynoter Dr. R. F. Mettler, president of TRW Inc., made note of the fact that low-cost synthetic intelligence, in the form of microprocessors and microcomputers, "is helping American industry increase its efficiency (and hence productivity), and is therefore a powerful counter-inflationary force on the American economic scene.

"Today, for example," he said, "electronic devices are bringing added intelligence and efficiency to the combustion process in the engines of automobiles. They help monitor and control equipment at the refineries which produce oil, and even make the oil exploration process more effective by analyzing data from oil wells."

For '77 cars

In a press conference conducted by participants in sessions on microprocessors and microcomputers, it was brought out that most 1977 automobiles are likely to have experimental microprocessors. Paul Terrell, president of The Byte Shop pointed out that at least one is already here. It's called the Miser and is being installed in some 1977 Oldsmobile Toronados. It will be used to adjust the car's timing for better fuel economy and pollution control.

The popular LSI processors of today are the forerunners of LSI computing systems which will rival the largest systems we now have.

In a presentation titled, "Next Generation—the LSI Computer System," William Thomas, Four-Phase Systems, Inc., Cupertino, Calif., predicted that the popular LSI (large scale integration) processors of today are the forerunners of LSI computing systems which will rival the largest systems we now have."

In the same session, Robert F. Wickham, Vantage Research, Los Altos, Calif. said the semiconductor LSI technology is producing major changes "not only in the cost of computing power but in the way in which computers are designed and built. The microprocessor and memory devices now being used are just the beginning of the widespread use of LSI in implementing computer designs."

One highly probable scenario for the evolution of the technology/architecture of future systems, Wickham said "is based on the on-going interaction between semiconductor supplies and their customers and the inevitable movement of the semiconductor firms into the computer business.

"The primary areas of product concentration to data have been the processor and memory devices. The area which is currently the limitation for the small

CIRCLE 102 ON READER CARD

CIRCLE 103 ON READER CARD

and medium systems is input/output. This should lead to a wide variety of programmable interface/control devices for such things as memory control, communications, encrypting of data, error checking and correcting, peripheral control, and high level language translation."

10,000 personal computers

In another session, Wickham talked of the proliferation of computer hobbyists. "By mid 1976," he said, "an estimated 8,000 to 10,000 personal or hobby microcomputers were in use or under construction, with annual unit sales into this market expected to be at the rate of 10 to 15 thousand per year for the next three years."

He said there are some 200,000 to 300,000 potential owners of hobby microcomputers. "Cost is a major factor in this market where a basic kit sells for $200 to $500 and assembled units retail for $1,000 up. Although the LSI chips keep getting cheaper, the items like power supplies, cabinets, and front panel hardware are not on such a steep price curve.

"In addition to price, programming expertise is a critical factor in market growth. The availability of BASIC for use with the 8080 has been a boon to the market. A surprisingly large number of people, both technical and non-technical, have learned BASIC in either high school or college classes."

There was much speculation as to who the computer hobbyists really are and there was general agreement that most of them today are programmers and engineers. Carl Helmers, Jr., editor of Byte Magazine, feels the majority are programmers "who have been programming for the last 10 years, have never seen hardware, and now they have a chance."

Byte magazine is aimed at hobbyists. It was started in September 1975, currently has a paid circulation of 55,000, and, says Helmers, probably should have a 100,000 circulation in another year.

Wickham sees another type of computer hobbyist waiting in the wings. "He is waiting for the software to become easier to use, the interface problems overcome with standard boards and the computer costs to drop even further."

SILVER CELEBRATION: For WESCON's 25th birthday, it was business better than usual.

> By mid 1976, an estimated 8,000 to 10,000 personal or hobby microcomputers were in use or under construction.

No end in itself

This group, Wickham said, "are the people who want the computer as an integral part of some other hobby or personal professional activity, not as an end in itself." He cited as examples radio hams, artists, musicians, model builders, and game enthusiasts who are starting to use the microcomputer as an extension of these well established hobbies.

Terrell opened his first Byte Shop computer store in mid-1975. Now he has eleven. He said his goal by year end is 50 Byte Shops and 200 more in 1977.

Who are his customers? "Ten percent of the people that come into the store are there to sell me, not to buy. They represent themselves, and what they have to offer is a better widget, designed in their back bedroom or garage. And, be it hardware or software, until the day of the retail computer store, they had no outlet for their creativity. Two hours worth of programming effort on our store demonstration computer netted a local programmer over $100 sales of his program to date, at $15 a copy."

Terrell said the other 90 percent of his customers "come from all walks of life: a housewife buying a Christmas present for her husband in real estate;

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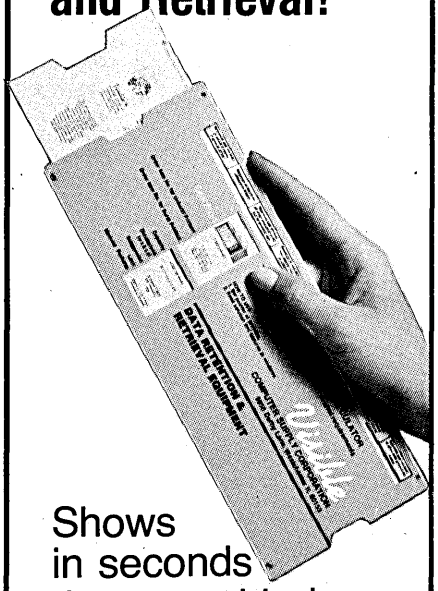

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a college student; a programmer who always wanted to own his own machine; the guy who has everything and the girl who is giving up boys for toys."

There was talk of the home computer and the computer "appliance." One such "appliance" was an attention getter on the exhibit floor. It was an exerciser exhibited by Rockwell International. It's an exercising bicycle equipped with a device based on a Rockwell microprocessor. You key in your age, weight, and sex then ride. The device displays your pulse and the number of calories you are consuming. The units are now selling in Germany for between $900 and $1,000 apiece and soon will be sold in the U.S. A likely candidate for Neiman Marcus.

Battle with the big ones

There were some who questioned the value of using the word "computer" in marketing to the home user because of an innate distrust of computers by some segments of the public. Terrell offered the notion that the public might feel that if they have their personal computer they can do battle with the big ones. This led Helmers to suggest marketing of a "master charge duplicator algorithm."

There was general agreement among speakers talking about microprocessors that software is becoming increasingly important. "Regardless of your application, don't forget the software," admonished Thomas J. Coughlin, Product Engineering Manager, Test Systems Div., GenRad, Inc.

"As microprocessor power increases and semiconductor memory prices plummet, the role of software engineering is rapidly increasing in importance. Now engineers must be comfortable in both software and hardware. There is increased emphasis at the universities to produce the firmware engineer with a more mathematics and computer-science orientation," Coughlin said.

Duane Dickhut, Digital Equipment Corp,, warned users to consider software in considering price. "Microcomputer software development systems vary in price today from about $3,000 to $10,000," he said, "and it is very difficult to quantify a price/performance ratio. Associated with the system price is the explicit cost of training courses plus the potential implicit and hidden costs due to poor software design. While a low purchase price by itself is initially attractive, users, especially new to the industry, must be careful not to naively plunge ahead without seriously considering all factors and weighing them against the price."

All in all, WESCON's "Silver Celebration" was a serious event. There was a notable absence of things like magicians, scantily clad young ladies conducting demonstrations and other gimmicky attractions. Well laid out, and with every aisle carpeted, it was an attractive and appropriate back drop against which to discuss business. And that's what people seemed to be doing.

—E.M.

Communications

Early Support Grows For the 'Bell Bill'

More than three-eighths of the House of Representatives—170 members, 102 Democrats and 68 Republicans—have now endorsed the proposed "Consumer Communications Reform Act of 1976." In the Senate, there are 15 sponsors. First hearings on the measure were scheduled at the end of September by a House Commerce subcommittee on communications. Action in the Senate isn't likely until next year.

There the legislation will be considered by a Senate Commerce subcommittee whose chairman likely is to be Vance Hartke of Indiana, one of the bill's sponsors.

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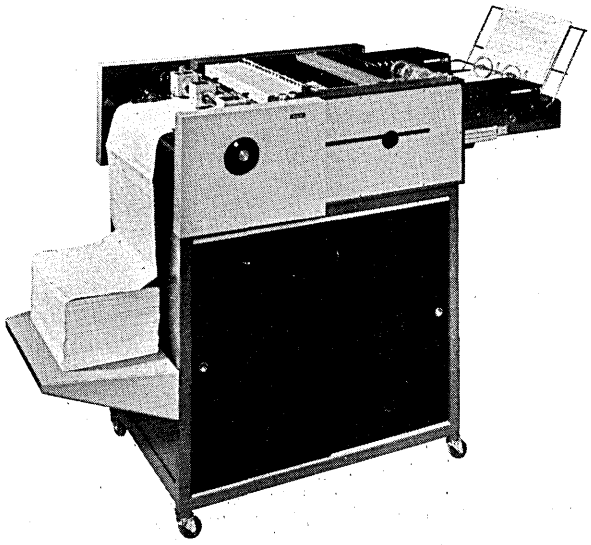

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The "Bell Bill," as it's often called, was introduced in March and contains language drafted largely by the telephone carriers. Basically, the original version of the bill—sponsored by Rep. Teno Roncalio of Wyoming—would: give the states rather than the federal government jurisdiction over interconnection of terminal equipment to the dial-up network; require telecommunication charges to be based on incremental rather than fully-distributed costs; sharply restrict the FCC's power to authorize new or expanded specialized carrier services, and permit acquisition of one domestic common carrier by another (for example, AT&T) if the Federal Communications Commission decided it was "in the public interest."

Other versions

Since Roncalio's bill was introduced, additional versions have been submitted to Congress. Sen. Hartke's bill does not include the provision allowing carrier mergers. Rep. Albert Quie of Minnesota introduced a bill that deletes the language giving the states control over terminal interconnection. A bill by Rep. Andrew Jacobs of Indiana eliminates both the merger section and the one restricting the commission's power to authorize new or expanded specialized carrier services. Legislation by Rep. Christopher Dodd of Connecticut would allow the FCC to authorize acquisition of one carrier by another, but would permit Congress to overturn such a decision. Also he would allow the FCC to authorize new or expanded specialized carrier services in the public interest.

Most of the other bills require the FCC to allow additional specialized carrier services only if it finds they will not cause "wasteful duplication" of existing common carrier facilities, won't be like the existing services of these carriers, and can't be provided by "available communications facilities."

The Act, of course, has run into opposition. Jack Biddle, president of the Computer and Communications Industry Association, says that when the bill (which he calls the "Bell Monopoly Preservation Bill") finally gets serious consideration in Congress in about two years, the public will have tired of the issue.

"The only counter pressure to insure that the Congress and the President will truly act in the public interest will be the public itself," Biddle wrote recently in the association's newsletter. But at that time there will be no vehicle to reach the public because the press will say, "That's old news—we carried it last year."

"I fear the silence will be deafening," Biddle says, urging those opposed to "hold our fire" until the "final and most important battle." ✲

Consumerism

Consumer Involvement In Systems Urged

The Ford administration's chief consumer crusader thinks the computer industry has been "bull-headed" in its approach to supermarket checkout systems.

Virginia H. Knauer, 61, launched her own probe into such systems when they were in their infancy five years ago. Won over by the speed and efficiency of the systems designed to scan the then-new Universal Product Code (UPC) she decided they represented "twentieth century technology that would benefit the housewife."

But her enthusiasm quickly soured. The retail food industry, encouraged by the systems manufacturers' cost cutting claims, she charges, "either got careless or greedy and ignored consumer concerns although they were laid out for them."

Knauer, a native Philadelphian, has been touting the consumer cause since the '60s when she served as director of the Pennsylvania Bureau of Consumer Protection. On April 9, 1969, former

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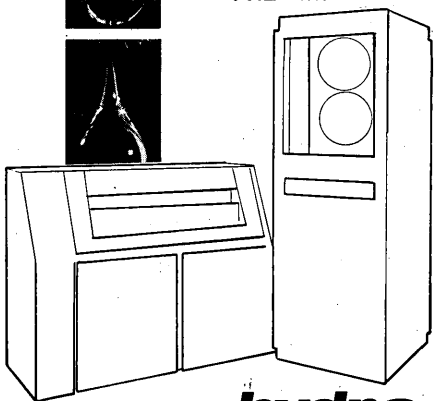

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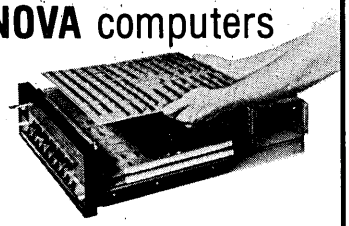

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CIRCLE 108 ON READER CARD

news in perspective

President Richard M. Nixon appointed her Special Assistant to the president for Consumer Affairs. Also as part of that job, she ran the Office of Consumer Affairs which is bundled into the Department of Health, Education and Welfare. Under Ford she continues her dual roles.

Her concerns about grocery store systems center around the controversial price marking issue—whether to leave the prices on or off UPC marked grocery items. Some stores decided to leave them off to save labor costs. This, Knauer said, hampers customers in their cost comparison shopping and started the consumer revolution.

Removed the crutch

"The manufacturers never involved consumers in the planning period. They boasted of their beautiful new systems and what they could do for the stores. But they forget that they had taken the crutch away from consumers who are used to making their decisions at the shelf."

Knauer said the "consumer's little revolution" has caused the grocery industry to backtrack on the price marking issue. Last spring the industry's Ad Hoc Committee on UPC issued a new policy statement urging scanner stores to retain item pricing.

The consumer crusader is hoping that data processing firms involved in electronic funds transfer systems (EFTS) have learned a lesson from the UPC consumer controversy. "I urge the EFTS industry," she stresses, "not to be as pigheaded as the Universal Product Code systems manufacturers, and to involve consumers through a learning process before these products and services are rejected out of hand.

A great boon

Personally, Knauer believes computers will be "a great boon to consumers." In a speech last April before the Texas Credit Union League in Houston, the consumer affairs chief referred to the electronic revolution that's "creeping up on the consumer." But are consumers really aware of how fast that "electronic revolution" is creeping up on them?

Knauer says they aren't. To the unsophisticated and nontechnical public, computers are still mysterious boxes, she says. The public has seen "computers put us on the moon. And they've seen them doing unbelievable things. Any of them who have watched computers at work are awed. It's magic. It's Merlin coming out of his cave.

"On the other hand," she adds, "when it impacts on them directly, as in the case of EFT controlling all their financial transactions, this is going to wake them up to the dangers." While sold on the convenience benefits of EFT systems, Knauer is also aware of these "dangers."

VIRGINIA H. KNAUER
consumer crusader

In her Houston address she spelled out consumers' privacy fears: "If practically all of a person's financial transactions are handled by one computerized system, the person's life will be available at the push of a button. With the use of point-of-sale terminals, a person's movements from place to place could be traced as well as what he spent at each. Consumers legitimately fear a system that can keep tabs on their life styles and use the information without their permission."

Putting the onus

These potential privacy problems bother Knauer who was an active member of the now-defunct Domestic Council Committee on the Right of Privacy. Putting the onus on the computer industry, she contends "it would be much faster" if the manufacturers built privacy protection into their systems on a competitive basis. "Congress can surely mandate these system safeguards, but I'm afraid if Congress begins to put down hard and fast laws, it will bind the industry so that any future creative and innovative changes will run headlong into Congressional legislative restraints."

A staunch supporter of Ford's deregulation policies, consumer boss Knauer discourages regulation that would "kill the innovation on this (computer) industry. In a competitive marketplace, IBM and its rivals are going to come up with all sorts of innovations," she optimistically predicts. And all those innovations, she hopes, will prove advantageous to the consumer.

But first, computer makers have to

start listening to consumers. "Manufacturers," she admonishes, "are not in touch with consumers. But they better get in touch because time's running out and if they don't shape up they'll find themselves so legislated they won't be able to move."

Too much emphasis, Knauer explains, has been put on the "razzle-dazzle" technological issues. "Though EFTS is the child of our technology, the issues it presents to society," she argues, "are as much social as they are technological." This downplaying of the social questions in EFTS development, she blames once again on manufacturers "who tend to stress this space age technology and forget that it's for the benefit of humans."

Without consumer input, she warns, the cashless society will never become a reality. "There will be general acceptance of these new products and services only if there are vigorous consumer education-information programs. And I think it has to start," she maintains, "with the manufacturers who understand the hardware and can translate it for the banks."

Knauer's consumer troubleshooters also are taking a hard look at the Consumer Communications Reform Act, introduced last spring by Congressional AT&T boosters. While Knauer admits she hasn't developed a formal stand on the Bell bill, she also concedes the legislation is "clearly misnamed."

She also denies that the Administration has taken any particular position on the controversial bill.

Unlike the more vocal "Nader's Raiders," Knauer's band of consumer zealots are laying low on the AT&T bill. But not that low. The office already has met with some of AT&T's adversaries.

"Certainly there's a widespread feeling," she said, "that there should be less regulation by government to allow the forces of the free marketplace to take command. This bill seems to go in the opposite direction.

Cleverly packaged

Mike Sterlacci, OCA deputy director, feels the bill has been "very cleverly packaged" by Ma Bell, AT&T's competition-thwarting theory, he says, may "work well" in terms of producing better, low cost consumer products and services. "But the other side of the coin," he cautions, "is once a firm controls the market, will it continue to act in the best interest of consumers or resort to avariciousness?"

Knauer said she's troubled by Bell's motives in cutting off competition. "I worry a little about the difficulties of entry into the communications market by smaller companies. It's a terribly complex thing. But let's face it, she forcefully adds, "most of the great discoveries have occurred outside Ma Bell."

—L.F.

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CIRCLE 110 ON READER CARD

BENCHMARKS

Split the Prices: In its new 3344 and 3350 disc drives, IBM bolts its disc packs to the drive elements unlike its previous products, the 3330, 3330-2 and 3340 in which the disc packs are removable. Memorex Corp., a large supplier of such media, said this causes "irreparable harm to Memorex and other competitors" who can't sell their disc packs to buyers of the IBM equipment. It asked a federal court to order IBM to at least separately price its disc drives and disc packs. Memorex said it has determined that the disc pack can be removed and replaced by field service personnel, but that IBM prices them as a single unit. (An IBM spokesman said the claim "has no merit whatsoever.") Memorex said, "If IBM is successful in tying together the pack and the drive, it will reestablish its monopoly in disc packs and will eliminate all of its disc pack competition on future products."

Univac Sued: Arber Industries, Inc., Torrance, Calif., disc pack maker, has filed a seven-count suit against Sperry Rand Corp. claiming its Univac division violated antitrust laws when it acquired Information Storage Systems and Caelus Memories, Inc. The suit, filed in U. S. District Court in Los Angeles, said the acquisition of the two companies substantially lessened competition in the disc pack and compatible disc pack lines. It said Arber is the only alternative supplier to Univac for packs on the 8416 and 8418 disc drives. The suit charges that in addition to defaming, disparaging and otherwise maligning the Arber products, Univac forbade the use of such disc packs on its leased 8416 and 8418 drives. It asks damages of $27.5 million.

West Coast Cases Delay: Federal Judge Ray McNichols said there will be a delay in the trial of Memorex' $3.15 billion antitrust suit against IBM and IBM's trade secret theft case against Cal Comp probably will take six months instead of four as previously projected. Those suits are to go to trial in Los Angeles Nov. 8. The Memorex case would follow. Meanwhile, the Memorex chairman and president, Robert C. Wilson, said he doesn't expect a resolution of the Memorex antitrust suit against IBM before the year 1982.

ACCT Opposition: The Ad Hoc Committee for Competitive Telecommunications (ACCT), a group of small competitive specialized common carriers, has issued a "Statement of Principles" in opposition to legislation now pending which it says would entrench AT&T's monopoly position. ACCT president, C. Gus Grant, president of Southern Pacific Communications Co. said "the telephone industry monopoly wants to turn the clock back by turning competition out. AT&T and its industry allies have proposed legislation that asks the Congress to confer a statutory blessing upon them by eliminating all competition and making the established industry the sole provider of domestic communications services." Other ACCT members are MCI Telecommunications, Inc., and United States Transmission Systems, Inc. Datran had been a member prior to filing bankruptcy.

Only One CIA Again: The Computer Industry Association (CIA) became the Computer and Communications Industry Association (CCIA) late this summer, to reflect "the growing interdependence" of the two industries. President Jack Biddle said it also avoids confusion with that other CIA. Biddle reported the CCIA dues structure has been reduced about 30% to attract small and medium sized companies. Meanwhile, Computer maker Gene Amdahl of Amdahl Computer Corp., has been named CCIA's board chairman.

Unhappy DP Spenders: Less than a third of 147 computer users surveyed by Peat, Marwick, Mitchell & Co. are satisfied with the return on their data processing investment. More than a third are dissatisfied and the remaining one-third don't know. The survey, conducted during a seminar held for client executives, also found that fully 90% of the users expected their dp resources to be more important than ever before in the next five years in terms of the organization's profitability or performance. Yet, only 46% had some form of computer performance evaluation effort, while 44% said theirs did not and 10% didn't know. But 39% had a formal plan to increase data center performance. The responses came from presidents, financial vice-presidents, controllers and heads of dp departments within the using organizations.

Computer Profit Increase: Sperry Rand Corp.'s Sperry Univac Div. expects its computer business to increase its profits by 15% over the next five years, division executives told securities analysts last month. The projected increase is about in line with the growth of Univac's computer business over the past five years, during which computer profit, revenue, assets and installed product base more than doubled. In the fiscal year ended March 31, Univac's revenue from computers was $1.43 billion, 44% of diversified Sperry Rand's total revenue of $3.2 billion. Net income before taxes of the division, which also makes some other unprofitable business equipment, was $78.2 million, or 28% of the Sperry Rand total.

$1.9 billion Semiconductors: U. S. based semiconductor manufacturers shipped $1.9 billion worth of equipment in the first seven months of this year. Of this $1.1 billion was integrated circuits and $800 million was discrete devices. These figures were compiled by WEMA based on data supplied by 49 semiconductor manufacturers. July shipments, said the trade association, totaled $262 million, reflecting the normal slowing of shipments during summer vacation months. WEMA predicted that the U. S. semiconductor industry probably will exceed the 28% gain it predicted early this year.

Outlook for RJE: The market for services in the remote job entry field will grow tremendously over the next eight years, but the future for these vendors still is "chancy," says a study by Frost & Sullivan, Inc., the New York market survey organization. The company said that in 1975 there were 25,000 clients for remote job entry services and they spent $360 million. By 1984, 115,000 clients will spend about $1.3 billion. Greatest growth will be from health care applications, increasing fivefold, while revenues from banking and finance will quadruple. Scientific applications, currently accounting for 25% of the market, will decline to about 20% by 1984. The study says, however, that RJE industry profitability will decline from 11.5% in 1975 to less than 5.5% by 1984 and the number of vendors will shrink by a third—due mostly to the increased complexity of software packages and their specialized nature. It noted that major RJE vendors offer seven related services: interactive time-sharing, consulting, contract programming, facilities management, application packages, technical support, training, and data base management systems. Many will no longer develop software, instead purchasing it from third parties and serving as a marketing agent. Stiff competition also is faced from small business systems and minicomputers, whose costs keep coming down. ✲

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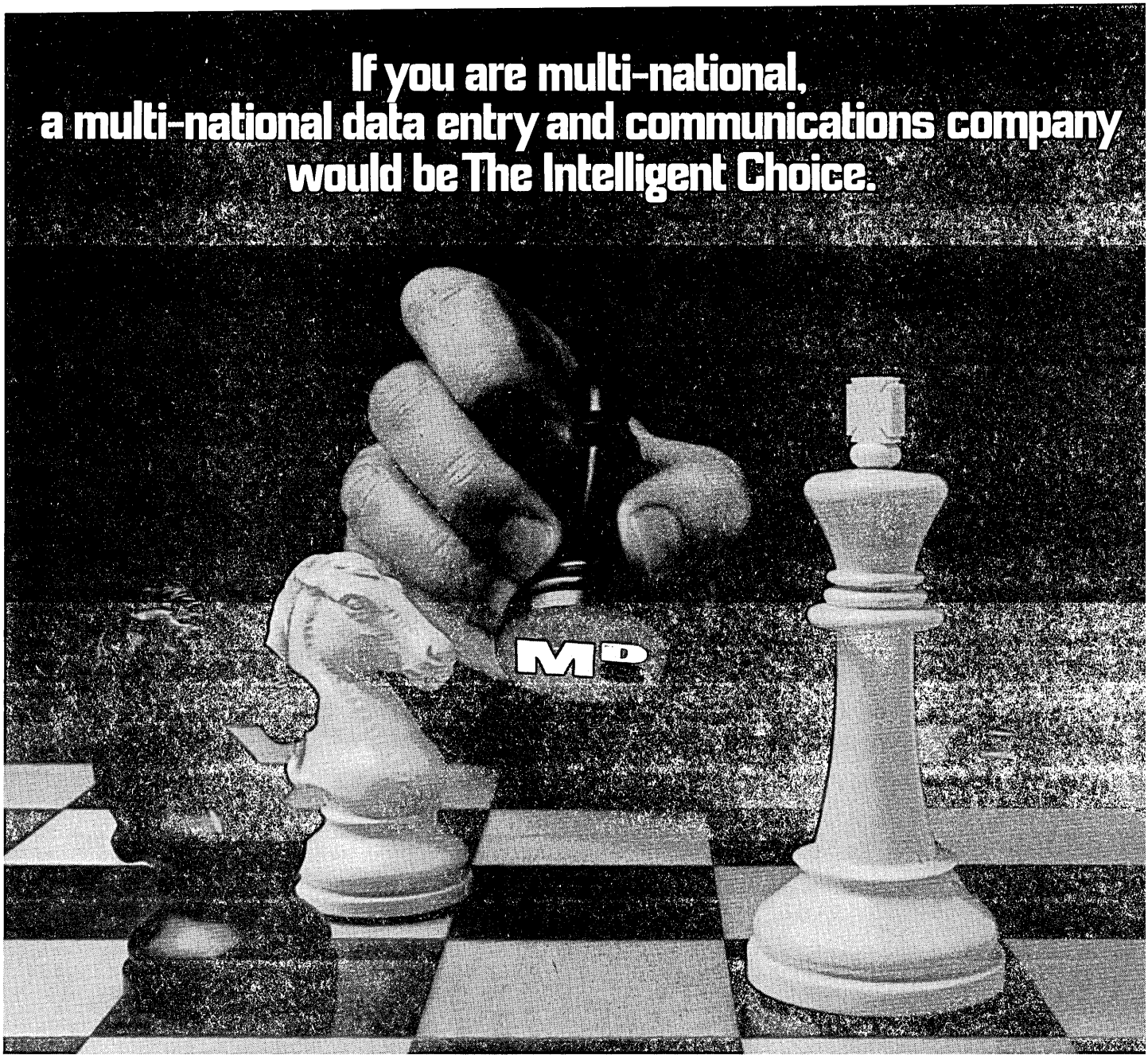

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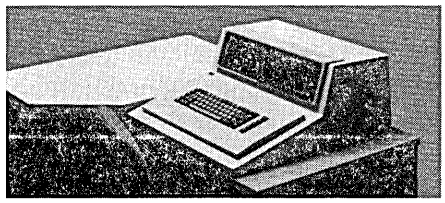

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LOOK AHEAD

(Continued from page 18)
interface which would enable a variety of peripherals to be used with HP calculators. "A complete data acquisition system could be put together for $15,000," said a Neff representative who expects "a formal agreement for quantities" of the 620 will be signed soon. The 620 already is used with a variety of minicomputers but this would be the first time with a calculator. The Neff rep said it's possible the device ultimately will be sold to end users who want to put together their own calculator based systems.

ANTHONY CONRAD: TO THE TOP AND OUT VIA COMPUTERS

In a way, Anthony L. Conrad owed his job as chairman and president of RCA to computers and, in a way, he may have lost that job because of computers. Conrad, who had headed RCA's Service Company for years, was catapulted into RCA's top echelon after former chairman Robert Sarnoff botched RCA's high stakes thrust in computers. Conrad suddenly lost his job at RCA last month when it was revealed he had neglected to file his income tax for five years. Although details of the matter are still unclear, an Internal Revenue Service spokesman suggested that Conrad may have been tripped up by computers at the IRS' National Computer Center in Martinsburg, West Va. There was one mitigating aspect about the whole incident: at least the IRS installation isn't an RCA site. It is an IBM operation.

GONE BUT NOT FORGOTTEN

Xerox may wish it had never heard of Scientific Data Systems, but SDS' former employees still remember the company with fondness, nourished no doubt by the happy memory that Xerox gave them more than $900 million for SDS. A few weeks ago, for instance, former SDS principals Max Palevsky, Arthur Rock and Robert Beck threw a dinner party for scores of former SDS employees at Palevsky's spectacular new estate at Malibu in California. Palevsky even keeps an old SDS DES-1 operator's console in the foyer of his new house. The festivities were topped off by a fireworks display featuring a grand finale that spelled out the "SDS" logo.

RUMORS AND RAW RANDOM DATA

Data General is working on a multiprogramming operating system for its Eclipse line that would enable some configurations to operate in different software languages simultaneously. That's the story told by one user pitched by Data General. The new OS has a code name of Advanced Operating System...NCR this month raises rental prices 10-20% on its highly successful 8200 series and at the same time is unbundling the simulator that allows the 8200 to run Century series programs. Purchase prices remain the same. Since the first unit was shipped in September '75, NCR has installed about 1,000...Data Devices International, Inc., Woodland Hills, Calif., is field testing a printer ribbon re-inker it probably will introduce in mid-December. David Partridge, chairman, said it incorporates a hole scanner, a picking brush for dust and chad and an automatic turn-off, and is desk-top sized. It will sell at "prices substantially lower than for currently available equipment"...Wang Laboratories, Inc., Tewksbury, Mass., will add a telecommunications capability in January to its new family of word processing systems--the models 10, 20 and 30--introduced in June and for which the company claims several times the throughput of IBM's Mag Card II. The systems now will transmit asynchronously or bisynchronously using ASCII or 2780 and 2741 compatible languages...A top secret IBM r&d team working on data base systems has made a preliminary commitment to a new system that would replace IBM's time-worn IMS. The IBM team is working on a relational approach as opposed to the hierarchical approach of IMS. The debate within IBM over the direction of data base systems is intense, but nearly everyone involved agrees with the idea that more functions should be included in microcode. Don't hold your breath for the outcome, though. The system isn't expected to be released until 1980...Before John Ackers moved up at IBM, he agreed to a whopping step-up in quota--maybe as much as 30% for the Data Processing Div. When he did it, many IBMers thought Ackers made a gutsy move, but now he has no responsibility for making it happen...Dick Brandon, president of ACT-Brandon, talking at an ACM meeting the other night about the state of the computer industry said, "At our company the programmers get no coffee breaks because we can't afford the retraining time."

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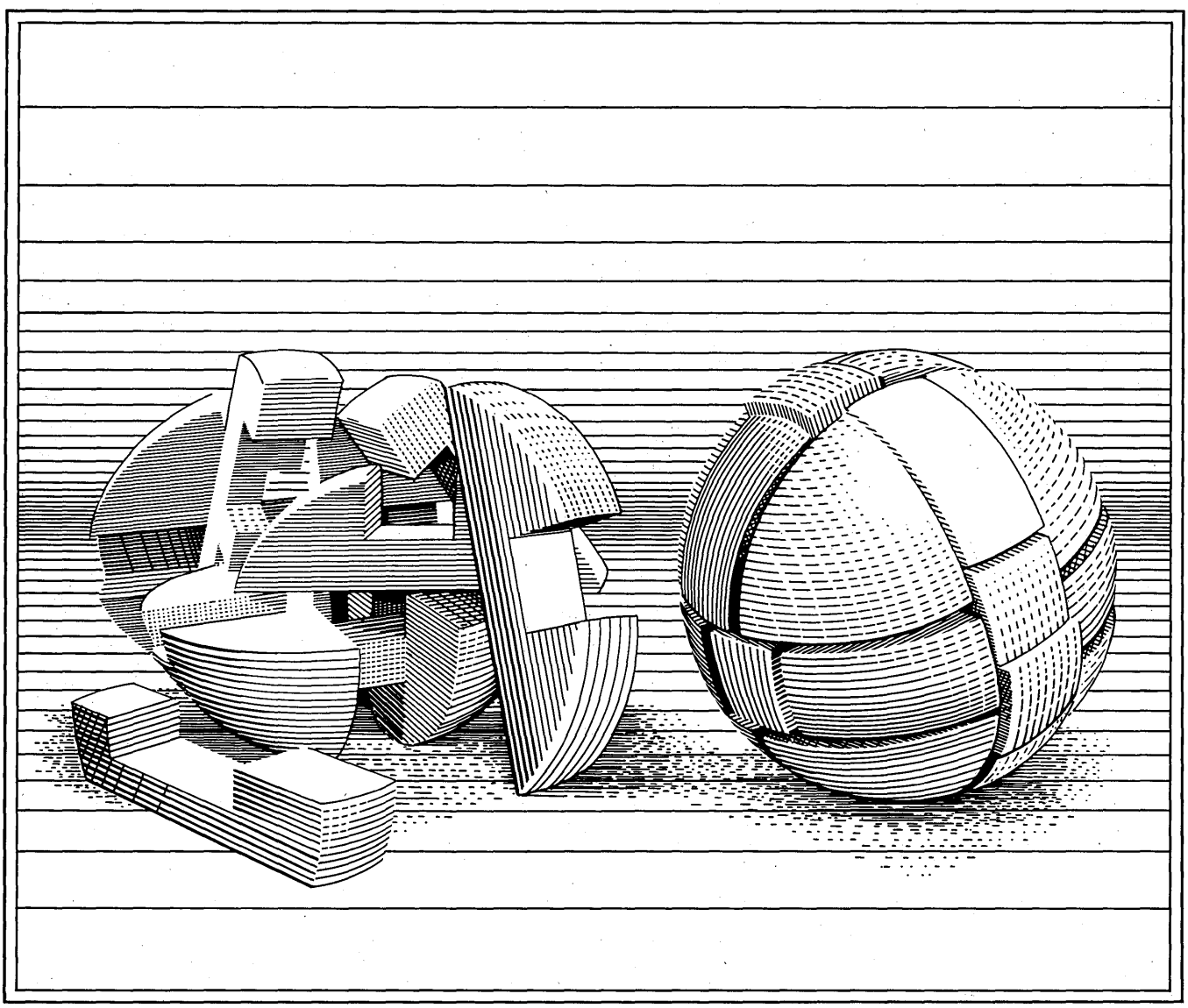

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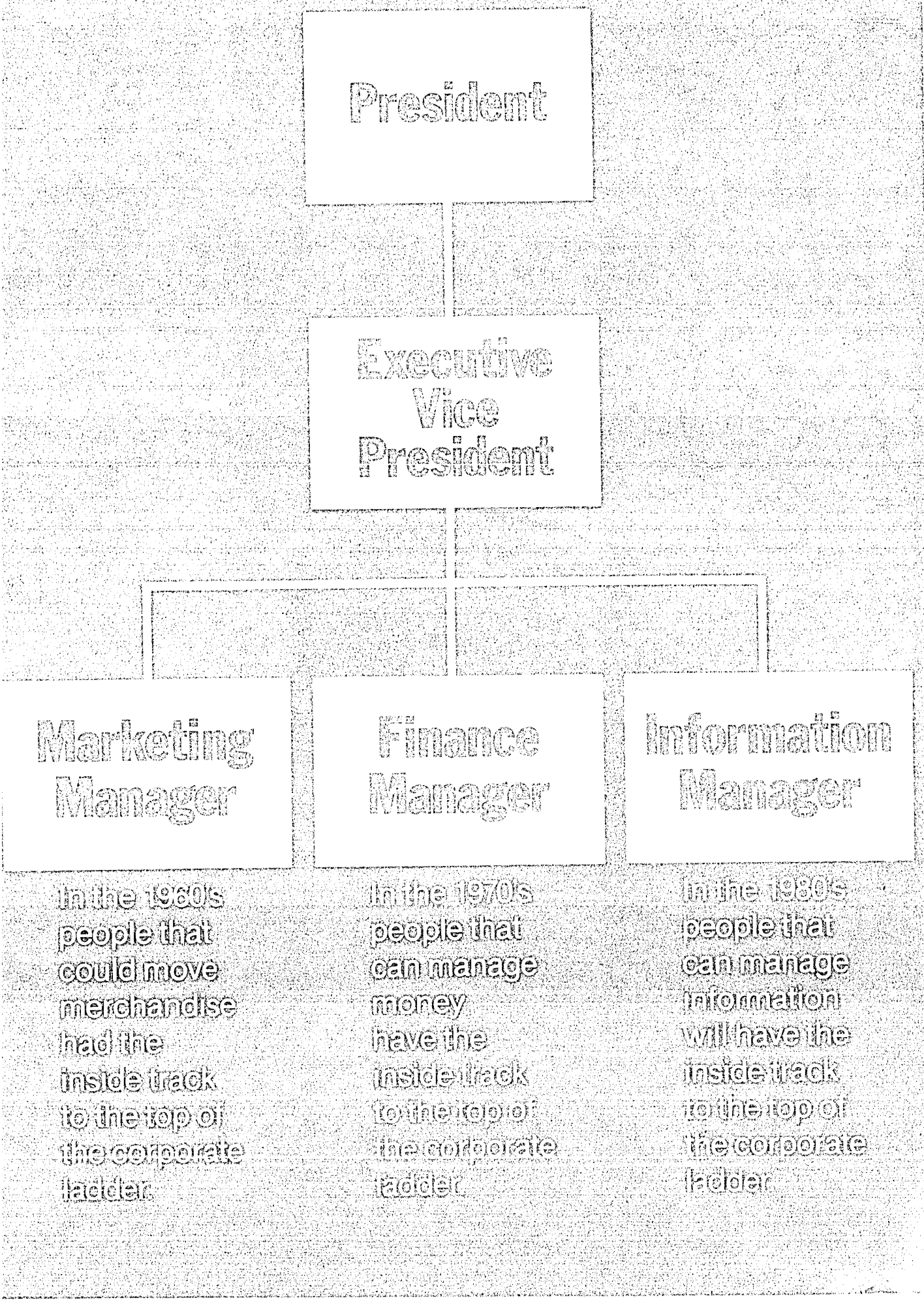
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hardware

Off-line

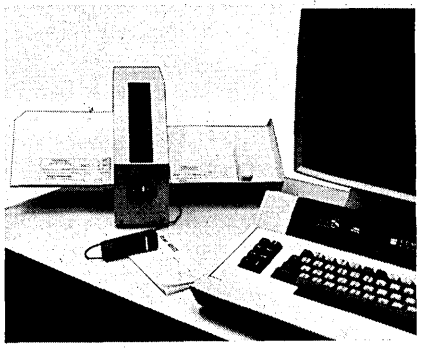
The Computer Tree, an illustration of the growth of the computer industry over the last three decades, is now available from Management Information Corp., Cherry Hill, N.J. Used in a smaller version on the firm's brochures over the years, the version offered measures 14 x 18 inches and is designed to fit a standard 18 x 24 inch picture frame. The roots of the tree represent developments or individuals responsible for the evolution of the digital computer (from the Abacus to Von Neumann), with the branches representing major development lines that either fizzled or are still on the market today. Concentric semicircles through the branches date the product developments.

Soon you'll have to be a computer expert to buy a new car. The 1977 Oldsmobile Toronado contains the equivalent of 20,000 transistors and electronic devices in the form of a 10-bit microcomputer. The read-only memory for the processor contains specially developed data curves in three-dimensional format together with instructions for controlling the cpu. The microcomputer takes into account a number of variables (temperature, load, speed, etc.) to solve the problem of when best to ignite the engine's spark plugs thousands of times each second. The microcomputer is made for General Motors by Rockwell International.

The digital cassette will retain its leadership position as the most popular low-cost magnetic data storage medium through 1980 says a study of the data recording industry just completed by Venture Development Corp., Wellesley, Mass. Accounting for 73 percent of world-wide, low-cost data recording devices in 1975, this percentage will slip to 52 percent penetration by 1980 despite a 16 percent annual growth rate. The cassette's principal competitors, the floppy disc and the cartridge, will be responsible for whittling down the cassette's market share. From a 1975 penetration of 5 percent, the cartridge will nearly double to 8 percent. Same for the floppy: from 22 percent share last year to 40 percent in 1980, if VDC is correct. The 8 and 40 percent figures are actually even better than they look since they are of 1980's "bigger pie."

OCR Reader

DocuScan might be the lowest priced optical character reader to come to our attention with so many features. Items as small as 2½ x 1-inches or as large as 8½ x 6-inches are accommodated, and a second read head can be added. The unit reads OCR-A numeric, OCR-B numeric, OCR-A alphanumeric, 7B, E-13-B, 407 (1403), 12F, 1428 and numeric hand print. With manual feeder the DocuScan has a throughput of 2,500 documents per hour, with the

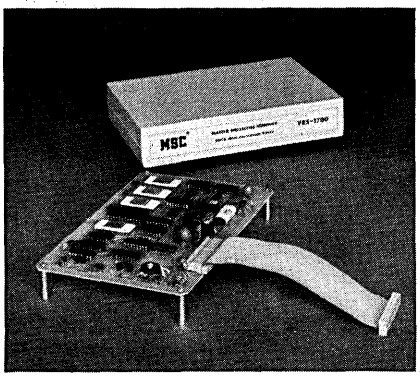


speed doubling when an automatic feeder is ordered. DocuScan operates in conjunction with a keystation/crt and any documents containing non-machine-readable characters are processed in the same mode of operation that is used for rejects off the high-speed reader/sorter. All rejects are automatically flagged. Prices start at $25,525, or $592/month including maintenance. CUMMINS-ALLISON CORP., Glenview, Ill.

FOR DATA CIRCLE 325 ON READER CARD

Voice Readout

Most voice response systems have always seemed relatively expensive considering the limited capabilities they had, but that's not the case with the

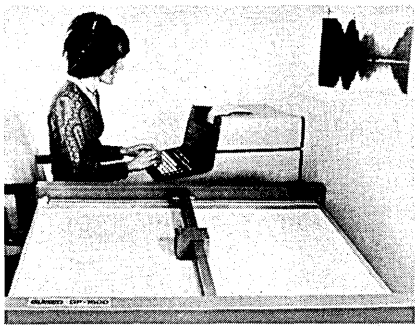


model 1700: a 10-word starter system, that can be expanded to 32 words, is priced at approximately $500. Each word is stored in a read-only memory, and it's claimed that the voice output is so natural sounding that it is difficult to distinguish it from the original recording. A second circuit board can be added to the system to increase the vocabulary. Standard words include the digits zero through nine, as well as the words: plus, minus, times, divide, and equal. Additional words require a one-time, non-recurring set-up charge. The 1700 accepts either binary addresses or 10 mutually exclusive switch closures for the first 10 numeric words. Additional words after the first 10 require binary address only. MASTER SPECIALTIES CO., Costa Mesa, Calif.

FOR DATA CIRCLE 326 ON READER CARD

Calculator Plotter

Hewlett-Packard's 9800 series of desktop calculators are capable of computer-like output that is best represented in graphical form, and this manufacturer has developed a plotter for the 9800. It's plug-to-plug and logically compatible, and comes in three sizes, the largest of which (at 44 x 34



inches) is capable of generating standard E-size drawings. The drawing speed is 800 increments (.004-inches) per second. Preprinted forms and a variety of drawing materials can be used on the plotters for different applications. Prices start at $11K and go to $18K for the largest model. GLASER DATA CO., Palo Alto, Calif.

FOR DATA CIRCLE 327 ON READER CARD

PDP-11 Add-on Memory

Yes, there is still some add-on memory activity, but most of it has switched away from IBM, with DEC currently receiving the most attention. An example is the ECOM®70, which can be used as either an add-on or a replacement for PDP-11 memories. It's packaged in a 12¼-inch high rack mount chassis assembly that can house up to 16 memory modules, each with 32K words, giving a maximum of 256K. The full read/write cycle time is 800 nsec. Included with the core memory

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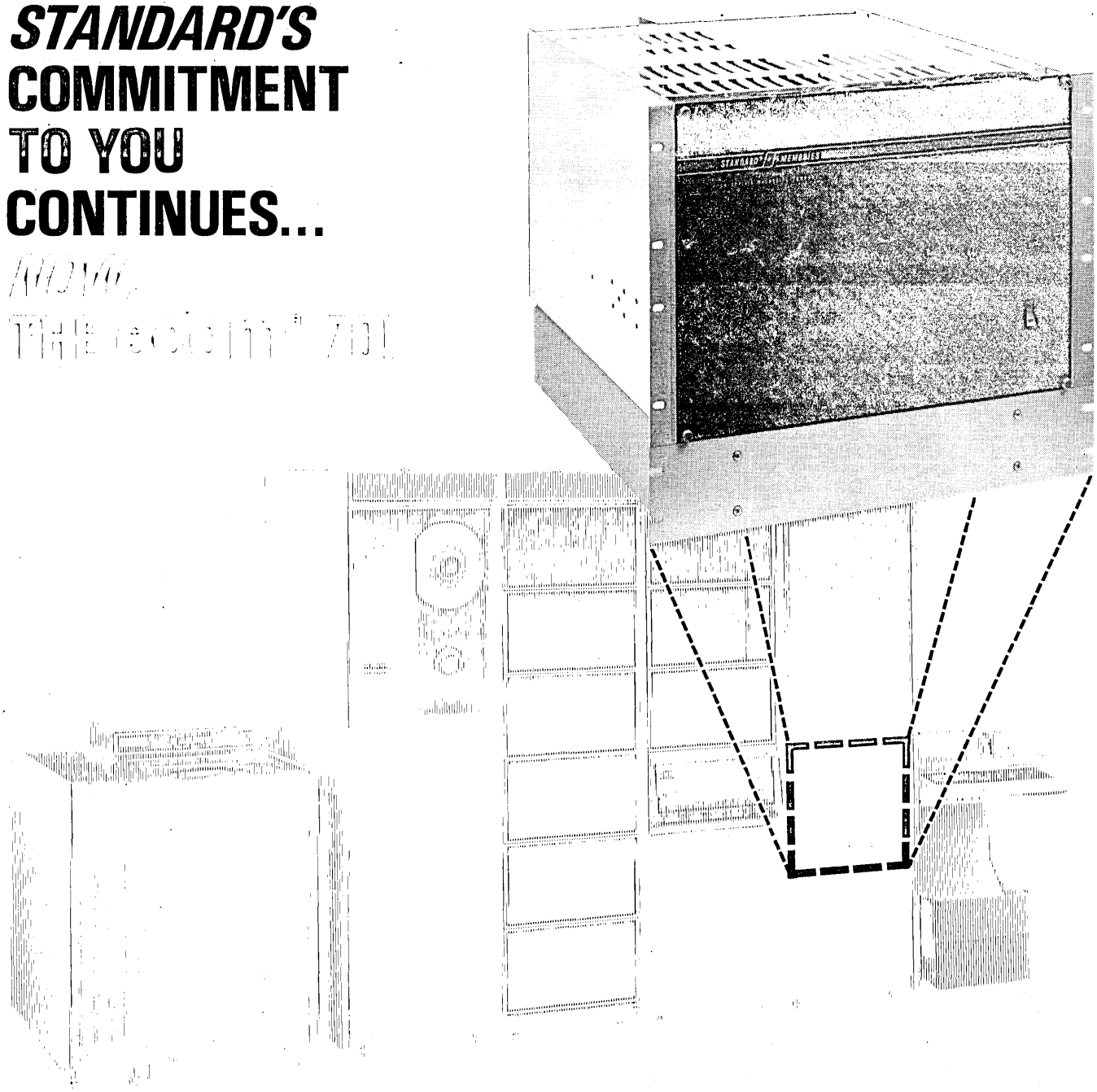

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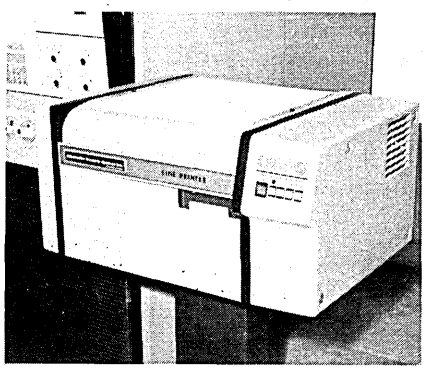
CIRCLE 90 ON READER CARD

system is the remote programming box, a 5¼-inch box that fits directly under the enclosure chassis and makes it possible to reconfigure the ECOM® 70 and a downgrade switch to totally disconnect the memory from the PDP-11. Including the remote programming box, a 32K word system is priced at $7,100. The basic 32K expansion kit is priced at $4,400. Installation and service contracts are available in major cities. STANDARD MEMORIES, Newport Beach, Calif.

FOR DATA CIRCLE 328 ON READER CARD

Electrostatic Printer

The model 8000 series of electrostatic printers has been designed for compatibility with IBM 360/370 series systems and feature 2400 lpm performance. It would seem that the unit should be more reliable than most mechanical printers for the 8000 contains only three moving parts. Also featured are a full line-width buffer for accepting incoming data at channel speed, thus reducing channel I/O loading; 7x9 dot-matrix characters, roll and/or fanfold paper usage, etc. The



2400 lpm performance is based on the 80-column width, with performance at 1,400 lpm for a full 132-column machine. Custom character sets are optional and include scientific, mathematical, and foreign language fonts. An optional off-line print station utilizing a microprocessor and floppy disc can provide the user with programmability for special formatting and multiple copy generation. Prices begin at $12K, or $420/month for 36 months. INFORMATION PRODUCTS SYSTEMS, INC., Houston, Texas.

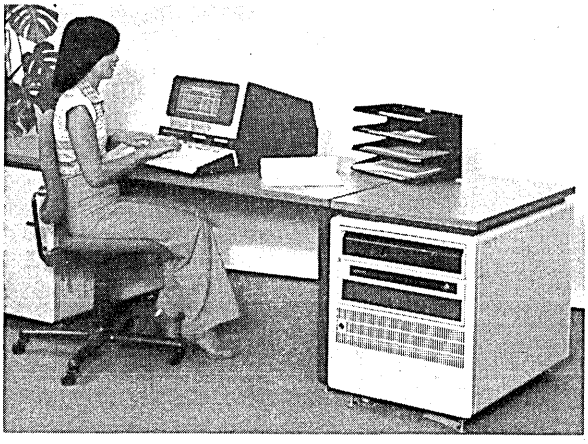
FOR DATA CIRCLE 329 ON READER CARD

Programmable Controller

The model 8500 is a programmable controller that operates with IBM 360/-370 equipment and allows direct interfacing of minis, terminals, data acquisition equipment, and non-standard peripherals to the system. Since the interfacing to the peripherals is done in local emulators, no changes to IBM software are required. The 8500 connects to either the byte multiplexor, block multiplexor, or selector channel, with connection to external equipment made through current loop, RS232C asynchronous and synchronous serial interfaces, or high-speed parallel interfaces. Standard units include the IBM channel adapter, a 16-bit parallel processor with up to 64K bytes of memory, a diskette drive for loading software and diagnostic routines, a control panel, and separate maintenance panel. Supplied as a turnkey package, prices begin at about $24K but vary depending on specific interface requirements. Delivery also takes somewhat more time because of special needs and can run from 90-120 days ARO. AUSTRON INC., Austin, Texas.

FOR DATA CIRCLE 331 ON READER CARD

product spotlight



Small-scale Systems

Although the series 1000 systems are intended for computational and instrumentation applications, the key to their success might very well be the third target audience; what H-P calls operations management. Many sophisticated end user shops are tending to place powerful, small mini-based systems throughout the organization to provide more immediate—and closer—control, especially in manufacturing applications. The 1000 should do well in these shops, where there is resident programming talent to help develop the application programs. Oem system houses are also offered the 1000 systems.

Four models comprise the mini-system line. The model 30 contains 64 KB of semiconductor main memory, a 15 megabyte disc with 25 msec average access time, a 9600 baud communications-oriented crt display console, and two built-in mini-cartridge drives (a scaled-down version of the popular 3M cartridge), and a real-time executive. This configuration manages to fit into desk-style cabinetry. The model 31 is a cabinet configuration, but curiously the disc it comes equipped with is a smaller, 5-megabyte unit. The prices on these two configurations are $37,500 and $33,500, respectively. The model 80 is a desk-mounted configuration and comes with 128 KB of storage, the same crt console as the model 30, but adds a 200 lpm printer and a 1600-bpi tape drive. Its price is $62,600. The model 81 is an upright cabinet version and costs $1K more.

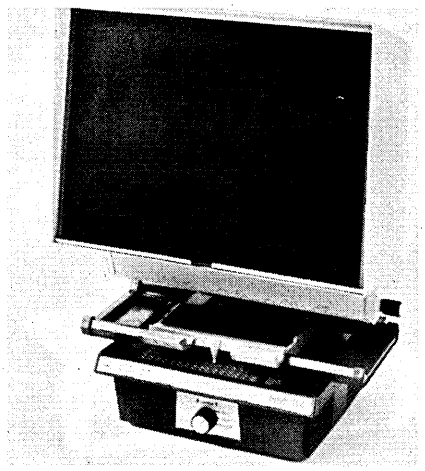
A new processor design is at the heart of the 1000 systems and will soon be sold as a separate product. A true asynchronous processor, add times on the new processor are 1.12 usec, compared to 1.9 usec on the 1000 system's predecessor, the 9640. Floating-point operations are said to be 2½ times faster on the 1000 than the 9640. Most operations are accomplished in 175 nsec, with some of the more complex instructions run at a slower 280 nsec rate. The memory cycle is 550 nsec. A control processor is available for the 1000s allowing users to have up to 8.5K 24-bit words of PROM and writeable store so the user can run his own microprogrammed routines.

A subset of H-P's IMAGE data base management system is standard on the larger 1000 systems, and optional on the smaller ones. IMAGE/1000 is augmented with QUERY, an English-like inquiry procedure requiring no programming exerience that guides users through prompting to enable easy access to its features. For engineering applications, H-P lists more than 40 standard products that are programmable via the H-P interface bus, including counters, multimeters, printers, scanners, network and spectrum analyzers, synthesizers, and tape recorders. Current delivery on all models of the 1000 systems is 8-12 weeks. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 324 ON READER CARD

Microfiche Reader

The NMI-114 projects an 11 x 14-inch image from COM-generated fiche in 24, 42, and 48x magnifications. A 90-watt quartz halogen lamp with dichroic reflector is the power source. One nice feature is a removable, interchangeable



electronic component drawer to speed maintenance should any be necessary. The reader is priced at $229. NORTHWEST MICROFILM, INC., Minneapolis, Minn.

FOR DATA CIRCLE 330 ON READER CARD

Interactive Terminals

CDC still likes to do things big when it can, as its latest announcement shows. The new products include an interactive display terminal, impact and non-impact printers, and single- and dual-cassette tape data storage units.

The 751-10 display terminal is controlled by an Intel 8080 microprocessor and displays 24 lines of 80 characters (1920) in 7x9 dot-matrix fashion. The terminal displays the full 128 character ASCII complement, including representation of 33 control codes. The detachable keyboard can be located up to two feet from the display to provide configuration flexibility. The 751-10 connects to an external, asynchronous modem and supports RS232-C or CCITT V24 communications interfaces. Half- and full-duplex operation at speeds ranging from 110 to 9600 baud are switch selectable. The microprocessor gets involved in permitting odd, even, mark, or space parity to be selected by the operator, as well as transmission modes of character, line or block. An optional plug-in module allows the 751-10 to operate in a polled, multi-drop terminal environment with up to 95 other devices on a single line. Additional modules provide current loop operation and answerback capability. The 751-10 is priced at $3,150 or can be rented for $93/month on a three-year contract.

The 753-10 non-impact printer is a tabletop unit used with the display and controlled by the display's microprocessor. Single copies of data transmitted from various external sources under the direction of the processor are printed at up to 30 cps across 80-column lines. The 753-10 is priced at $2,540 or rents for $74/month on a three-year lease.

For higher speed, multi-form printing, the 755-10 impact printer is offered. Up to five-part, 4- to 16.75-inch forms are accommodated by this unit, which prints at approximately 180 cps. A full line, 132-character buffer memory and a 1000-character buffer for multiple, shorter lines of data are also standard. The purchase and lease prices for the 755-10 are $4,370 and $126/month, respectively.

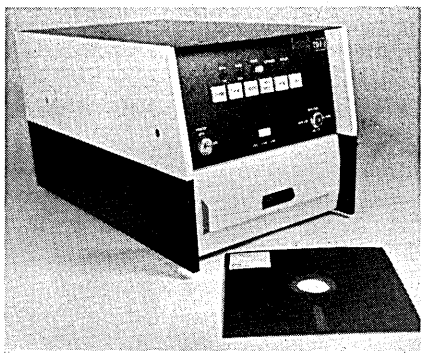
The cassette drives are available in single (288,000) and dual-cassette (576,000) versions and operate at 7½-inches per second. They are priced at $2,200 and $2,520, respectively, or $70/$79 per month. First deliveries are scheduled for this month. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 332 ON READER CARD

File/Data Manipulation

The TD-1 TermiDisk is capable of performing so many assorted functions that it's hard to pin a generic name on it—a problem neatly sidestepped by its developers, too. What it is is a collection of one to four standard IBM-compatible floppy discs and a microcomputer. It is intended as a peripheral accessory for either on-site or remote data terminals. The microprocessor makes it possible to do the file handling and data manipulation on ordinary terminals without integral processors.

The operator is provided with resident programs for file management and editing. The programs operate with full editing power on any number of the discs and up to a megabyte of storage. All files are identified by

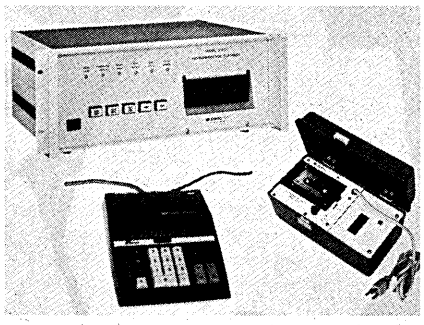


name, and all operations, including creation, accessing, listing, editing, copying, appending, communicating, or deleting of files is done by specifying the file name. Unattended operation can also be performed with the TermiDisk. Communication is through the RS-232 or current-loop interfaces. Two ports are provided on the unit, each capable of communicating with 5-, 6-, 7-, or 8-bit data at baud rates from 50 to 19.2 KB. Prices start at $2,400 and the product is offered both end users and oem's. INTERNATIONAL COMPUTER PRODUCTS, INC., Dallas, Texas

FOR DATA CIRCLE 333 ON READER CARD

Key-to-tape

If you have a high-volume numeric input application and don't want to spend very much to organize the input in machine readable form, the EDMAC key-to-tape system might be the lowest-cost solution to the problem. A keyboard, resembling a small calculator, is the "terminal," and up to 11 characters can be entered through the buffered unit onto a cassette. Each entry is displayed prior to recording to permit verification. Up to 90,000 characters can be recorded on each cassette. The system can run off of a standard 115/230, 50/60 Hz wall plug, or a 9 volt battery. The price is under $1K. EDMAC ASSOCIATES, INC., East Rochester, N.Y.



FOR DATA CIRCLE 334 ON READER CARD

Data Entry

The Tycom 3741 consisting of an IBM Selectric typewriter, floppy disc unit, and an electronic console makes it possible to collect and record data on a disc that can then be retrieved from the Selectric, a crt, a "true" IBM 3741

hardware

data entry station, or the 5100 desktop and System/32 computers. The Tycom 3741 uses ASCII formats, is tty-compatible, and has an RS232 asynchronous interface for operation at selectable speeds ranging from 110 to 9600 baud. Any ASCII terminal that is tty-compatible can be connected directly to the system and can command the disc file. A special program sequence can be written for the IBM 5100 to output data continuously from tape cassette to the disc through the serial I/O adaptor. The Tycom 3741 is priced at $7,750 (or $6,995 for customers who can supply their own Selectric typewriter). TYCOM SYSTEMS CORP., Fairfield, N.J.

FOR DATA CIRCLE 335 ON READER CARD

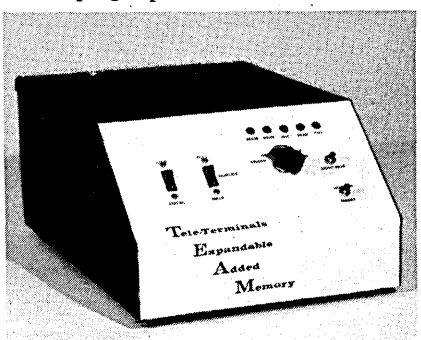
DG Multiplexor

For communications applications on Data General systems, this manufacturer has developed a single pc board that allows for the installation of up to 64 asynchronous channels inside the DG processor. Eight different rates, from 110 to 9600, are jumper-selectable. The board contains the channels, a line printer controller, and a real-time clock. The printer controller interfaces with Dataproducts, Centronics, and Tally line printers. The real-time clock operates under program control and provides crystal controlled interrupts of 1000, 100, and 60Hz. Cabling from the back plane of the processor to a connector junction panel is provided with each board. The circuit board is priced at $2,995. STC SYSTEMS INC., Maywood, N.J.

FOR DATA CIRCLE 336 ON READER CARD

Paper Tape Replacement

Even though we're told that more paper tape units are being sold nowadays than ever before, companies keep developing replacements for them. The

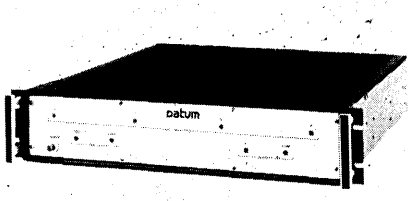


Tele-Terminals Expandable Added Memory (TEAM 8000) is the latest. The unit has an RS232 I/O interface for connection to any crt, printer, or other peripheral. The fully editable memory stores 8000 characters from either the terminal keyboard or from data received from a remote source. Single units go for $1,495. TELE-TERMINALS, INC., Brooklyn Park, Minn.

FOR DATA CIRCLE 337 ON READER CARD

Tape Controller

Any seven- or nine-track IBM-compatible tape transport can be interfaced to Harris Corp. Slash 4, Slash 5, and Slash 7 model minicomputers. The 5191H controller provides multi-transport operation for up to four parallel drives with speeds from 12.5 to 200



ips, 200, 556, 800, or 1600 bpi recording densities. The controller/formatters fit into 19-inch racks and are 17.79 inches deep. Prices range from $4,100 to $9,710 depending upon the tape format and cabling required. DATUM INC., PERIPHERAL PRODUCTS DIV., Anaheim, Calif.

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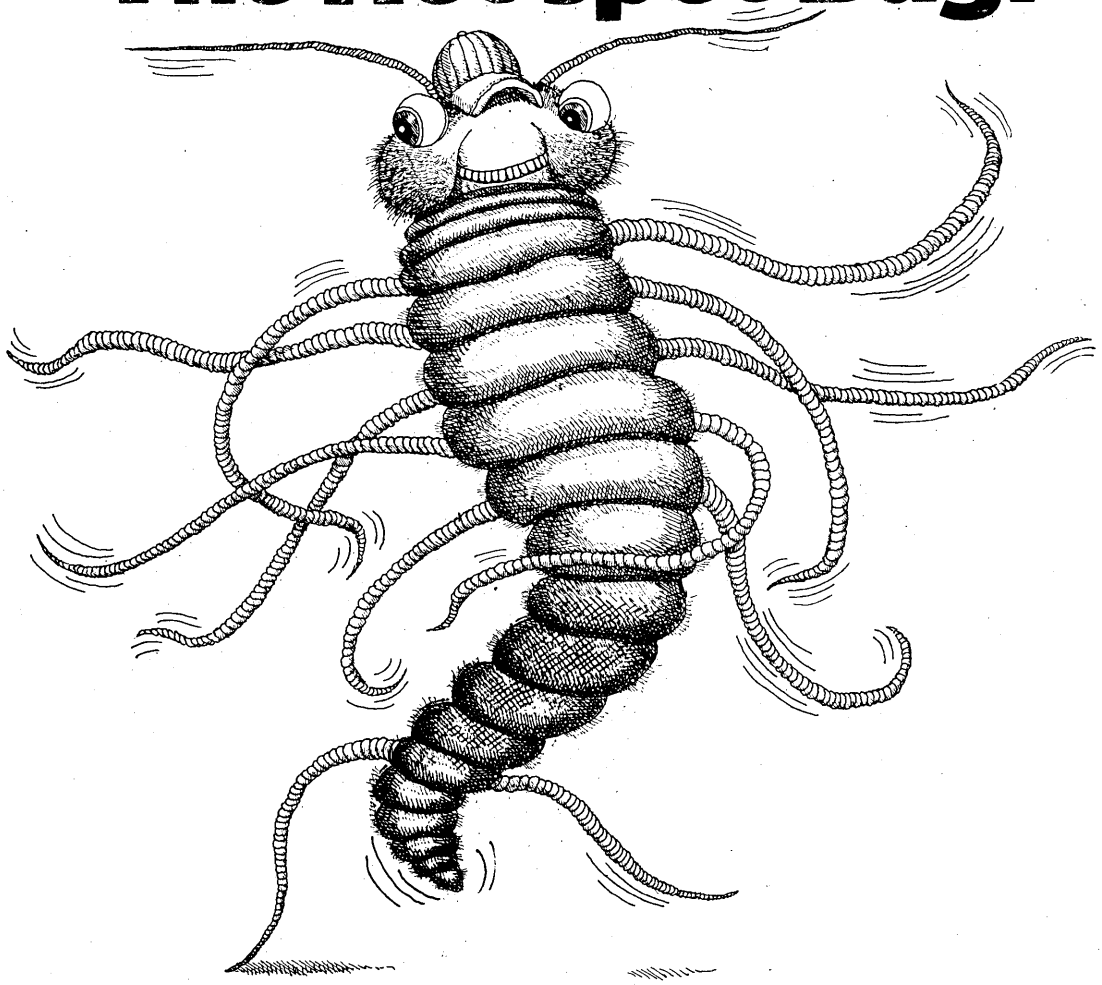
CIRCLE 91 ON READER CARD

The Hot Spot Bug.



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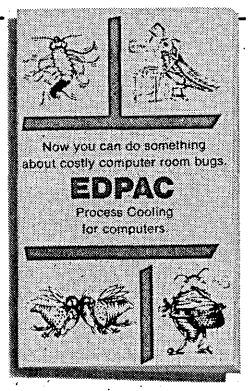

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Updates

Sometimes it almost appears that the Feds really are trying to save some of our hard earned tax money. Two federal agencies have teamed up to reduce software costs by establishing the Federal Software Exchange Center (FSEC). It's a joint venture between the General Services Administration's Automated Data and Telecommunications Service and the Commerce Department's National Technical Information Service. Federal agencies using the center will have access to systems support programs, simulators, and business management applications software. Classified, proprietary, and incomplete programs are excluded. Also, no information files, data bases, private or personal data will be included in the new set-up.

In November of 1971, we opined that if Whitlow Computer Systems' claims for its then newly developed SyncSort were true, many IBM users wouldn't be able to afford not to buy it. That is in fact what has happened, as the Teaneck, N.J.-based firm's European representative, Gemini Computer Systems, GMBH in Düsseldorf, Germany recently delivered the 999th and 1000th packages to Holland's KLM Royal Dutch Airlines. Improvements in sort throughput times, cpu usage, disc utilization, and I/O are the principal features of SyncSort.

Enviroline is a new data base operational under Lockheed's DIALOG information retrieval service. It's hoped that the information contained in Enviroline, a broad range of technical and socio-economic literature, will provide an interdisciplinary approach to a field that crosses the boundaries of science, technology, politics, sociology, commerce and law.

Boole & Babbage, the Sunnyvale (Calif.) software performance measurement outfit has formed an Operations Division to develop and acquire products which might provide day-to-day solutions to IBM installation problems. The new emphasis will be to solve problems with IPLs, queue conflicts, page thrashing, reserve lockouts, job looping in wait state, and other similar problems.

Software Analysis

Two highly topical services are offered by this new firm. One is called fraud deterrence and detection, and the other an in-depth review of software packages to detect inefficient or downright bad coding procedures.

The manner in which the services are performed is as unique as the services themselves. In order to protect the confidentiality of the people doing the reviewing, their names are not revealed, but the vendor claims that they are all highly respected members in the field and have a minimum of 10 years experience in it. Higher level languages are the specialty, and the reviewers, even considering their credentials, aren't interested in tackling a mass of assembly language code. Reviews are conducted both in the vendor's headquarters and at the user's site.

Fees for the services are arranged on either a daily consulting basis or a yearly retainer based on the number of programmers in the client organization. Daily rates are typically $250 plus expenses, and it can take up to 10% of the time originally required to create the program to completely analyze it. SOFTWARE REVIEW CORP., York, Pa.

FOR DATA CIRCLE 314 ON READER CARD

Terminal Program Generation

The premise behind the development of the Terminal Applications Program GENerator (TAPGEN) is an interesting one—that the current demand for programmers who "speak" CICS (IBM's Customer Information and Control System) is greater than the supply partly because of CICS' complexity. Whether that's true or not, TAPGEN just seems like a good idea. The package automates the principal functions of programming screen-oriented programs. An "easily-learned" input language generates a complete, diagnostic-free CICS program, even for programmers with little or no teleprocessing experience. Documentation is completely handled by the package: with the COBOL-CICS program comes a TAPGEN listing, a COBOL-CICS listing, and several documentation listings. TAPGEN supports IBM 2260, 2741, 3270, and 3284 terminals and their compatible equivalents. A perpetual license is priced at $24K, or $1,800 a month, and while that might seem steep, the developers claim that the 50-75% reduction in the time necessary to generate these programs could make the package very cost effective, if true.

C-S COMPUTER SYSTEMS, INC., New York, N.Y.

FOR DATA CIRCLE 315 ON READER CARD

Program Maintenance/Security

The highly successful PANVALET program management and security system is now available in an on-line version, reflecting increasing user interest in the advantages of on-line system operation. It is now possible to edit and update 370 programs from 3270 terminals through IBM's Customer Information and Control System, CICS. For those not familiar with PANVALET, the product is used to establish, maintain, and protect a control library of source programs, JCL, and card image data files. Central library storage on a direct access device (usually a disc) gives immediate access for maintenance and processing, and better protection against theft, disaster, or other possible catastrophies.

There is password protection, and all changes must be verified before they are actually implemented. There's an audit trail that is not accessible to the programmer, and reports to keep management apprised of the status of the system. PANVALET/ON-LINE is priced at $7,500 for IBM 360/370 OS data centers, with OS PANVALET ($5,580) a prerequisite. A DOS version is scheduled for release in the near future. PANSOPHIC SYSTEMS INC., Oakbrook, Ill.

FOR DATA CIRCLE 316 ON READER CARD

PDP-11 Compatibility

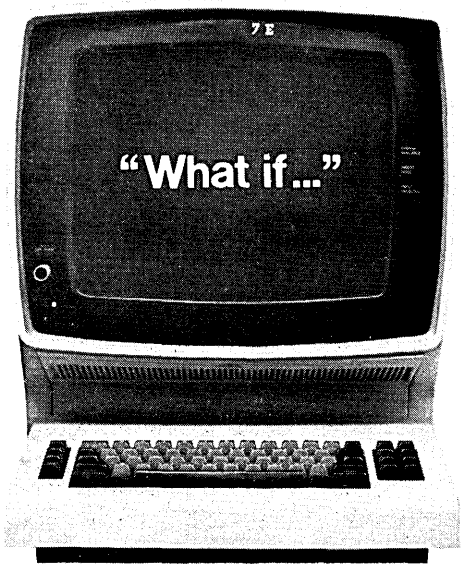
DEC has quietly announced enhancements and extensions to its DATASYSTEMS line that make all of the PDP-11-based systems compatible at the language and data management levels. There are now two new business-oriented operating systems, CTS-500 for the DATASYSTEM-500 series, and CTS-300 for the smaller DATASYSTEM-300 range. This means that there is now an upward path for users of systems that range in capability from a $27K entry level system to a very capable $300K medium scale system that compares favorably in performance with some of the lower/middle members of IBM's 370 line.

The Commercial Transaction System, or CTS-500 as it's called, extends the previous commercial time-sharing system by adding transaction processing features, languages and language options. Also featured is both single-

asi/inquiry

The IMS DB/DC QUERY LANGUAGE

USED BY MORE IMS INSTALLATIONS THAN ANY COMPETING PRODUCT



ASI/INQUIRY is an IMS DB/DC query language that operates completely as an interactive Message Processing Program. The design of ASI/INQUIRY is such that the *structure of the data base is transparent to the user*. Moreover, one need not have familiarity with DL/1 segment logic or the complexities of multi-pathing. Extremely rapid response time is assured.

MAJOR HIGHLIGHTS

- ☐ End-user oriented
  - —Easy-to-use language
  - —Requires no knowledge of IMS
  - —Comprehensive diagnostic messages
- ☐ Rapid response time for even the most complex queries
- ☐ Dynamic priority scheduling to maximize system performance
- ☐ Availability of default as well as user-defined screen formatting

Recently delivered, Release 2 of ASI/INQUIRY contained a number of major enhancements, including:

- Development of a TSO-supported version
- Full support of IMS/VS secondary indexing
- Open-ended computational facilities
- Ability to SORT display output

In summary, ASI/INQUIRY represents the state-of-the-art product in an IMS DB/DC or TSO-supported IMS environment. It is the only system combining an easy to use language, complete user flexibility, and rapid response time in a single package. If you want to start answering "What if . . . . " immediately, call or write today for further information.

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and multiple-keyed indexed-sequential access methods for data management flexibility, and there's a new data entry model called DECform that allows a user to design data entry formats, run predetermined edits, and process data immediately or store them in system files. DIBOL-11 is now available under CTS-500 in addition to the standard BASIC-Plus. There are other languages available, too, including level 1+ ANSI 1974 COBOL, ANSI FORTRAN-IV, BASIC-Plus-2, and RPG II. The CTS-500 package is scheduled for release in December, with the CTS-300 version available next month. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 317 ON READER CARD

NCR Program Generation

Any NCR Century installation with at least 32K words of memory can take advantage of the Programming and Analysis Support System 3, or PASS/3. The generator creates NEAT/3 source programs from system level definitions and has been in development for five years. While the package can't generate an entire program, 85 to 95% isn't bad and can lead to considerable savings in the creation of typical business applications.

PASS/3 deals in three levels of logic: fixed logic, the type of program being generated; specific logic, logic that is produced based on input forms designed for a specific type of program; and common logic, which is above the level of present compilers and is available to all program types. When generating a program, the analyst determines the logic to be generated, starting with the highest level (fixed) and ending with the lowest levels. In the pilot installation of PASS/3, 12 capture, update, reporting, and user-defined programs were generated from a total number of 599 input lines, which generated 5,401 statements, a reduction of 89% in coding effort.

Billing for PASS/3 is determined on the basis of how many lines of code are generated and it costs 10¢ per line. While a Century 101 or larger machine is required to generate the programs, finished programs can run on any of the Century series systems, from the model 50 on up. CENTURY ANALYSIS, Concord, Calif.

FOR DATA CIRCLE 318 ON READER CARD

Law Firm Ware

Lawyers are notoriously delinquent in accurately logging the time they spend working on individual cases—which might explain why fees so often end in long strings of zeros. IBM might be doing both counsel and client a favor with the introduction of the latest software routines for the System/32 office computer, for the intent is more accurate recording of time, expense, and accounts receivable data. A by-product of this information is a number of reports to help the law practice better manage its business activities.

Offices using the system can retain "most" of their established documents for recording attorney time and disbursements, it's claimed. (The system had to be organized that way—everybody does it so differently.) In addition to time entries, disbursement entries, billing information, disbursement transfers, cash receipts, accounts receivable journal entries and A/R write-offs are accommodated. Reports show detailed time and disbursement data for preparing billings; missing time reports that identify unreported, possibly overlooked, billable time; unbilled time/disbursements summarized by attorney or client; accounts receivable reports; and variance reports showing the time investment for a given bill compared to actual amount received. Data for the system can be entered either through the System/32's keyboard or through an IBM 3740 data entry system. The initial charge for the Management System for Law Firms is $2,640 with a monthly license charge of $120, exclusive of the hardware required. First deliveries are slated for January. IBM GENERAL SYSTEMS DIV., Atlanta, Ga.

FOR DATA CIRCLE 319 ON READER CARD

Microprocessor Language

microFORTH isn't exactly new, its bigger brother having been introduced several years ago to the minicomputer community. The language is probably best used in on-line equipment control, data analysis and graphics generation, and now it's available for use on the Intel MDS 800 and RCA CDP 1800 development systems. In benchmarks against other high-level microprocessor languages PLM and BASIC, it's claimed that microFORTH reduced execution times by as much as a factor of 10. It's also claimed that applications that might require 2K of assembler code to implement can be done with this higher level language in 1K or less, with larger applications showing even greater ratios.

The standard package sells for $1K and includes a disc operating system, macro assembler, the FORTH compiler and interpreters, a text editor, and interactive debugging aids. Documentation includes a self-teaching primer and technical manual. Extended math, BCD I/O and other functions are available. You'll need 6K bytes of memory, a diskette and a terminal. Programs written in microFORTH are transferrable between most manufacturers' microprocessor systems, we're told. FORTH INC., Manhattan Beach, Calif.

FOR DATA CIRCLE 320 ON READER CARD

Text Editing

TEXT was designed to be used by secretary/typists and provides for standardized production and maintenance of documents and form letters. Lines of text are entered from interactive

software spotlight

OS Modification

Users are often loathe to alter the IBM OS/360 software because it usually leads to unforeseen problems. However, this analyst has developed and installed a "Superzap" that only changes one byte of coding in OS and it's estimated that it will save the user upwards of $1K/year. If that isn't enough incentive, consider that the instructions on how to implement the software fix are being distributed for the best possible cost: free of charge. "I can't see charging for something so trivial," says your benefactor. Just send him a stamped, self-addressed envelope.

What the fix is is a change to the amount of output that is generated automatically by OS. Whenever a reader, writer, or other catalogued procedure is started by the operator, a five or more page JCL listing is produced. These standard listings don't usually vary from day to day, but in some shops it's estimated that the printer time necessary to generate the output runs to nearly one hundred hours per year. The "Superzap" changes this procedure, causing it to be written to SYSOUT class Z, where it accumulates. Executed once or twice per shift, the new procedure uses the regular OS writer to write this output to a dummy dataset rather than to the printer. Only operator-started procedures are affected, not regular JCL, dumps, or program output. The JCL listing from any particular operator-started procedure can still be retrieved, on demand, by one command. Doubtless, many shops could make use of the small fix. Remember, just send the stamped, self-addressed envelope. CHARLES A. MILLS, 1517 Josephine Street, Berkeley, Calif. 94703.

FOR DATA CIRCLE 313 ON READER CARD

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By Cecil Wright, Assistant Director of Operations and Academic Services, Computer Services
Laurentian University
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"On the academic side, we're doing things like multi-lingual technical dictionaries — a natural task for MARK IV. The text processing features are particularly useful. I plan to teach MARK IV to a number of the people who are doing research. No longer do I have to concern myself with the fact that it takes four months for a trainee to become productive in PL/I. I've brought MARK IV students to the same level in six weeks.

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terminals, (ASCII capability is necessary for full capability), with proper capitalization and punctuation, but without regard for line or page spacing, margins, etc. Each line is inserted immediately below the preceding line unless one of the editing commands has been used to alter the current file position. After editing the material to correct keyboarding and spelling mistakes, the sequence is reorganized to insert references and notes. When the page editor prints the document, it scans the text in one of two modes, formatted or unformatted. In the unformatted mode, each line is printed without alteration, while in the formatted mode, lines are streamed together to achieve paragraphing and right-hand margin justification.

For limited character set devices without ASCII control characters, operation is limited to upper case characters only. EXEC 8, level 31 or later software on a Univac 1100 series machine having a minimum of 35K words of storage available is required. TEXT is written in assembler (97%) and the balance in FORTRAN IV. There are approximately 18,555 source statements in the program. It's priced at $890 and the documentation is $6.50. COSMIC, Athens, Ga.

FOR DATA CIRCLE 322 ON READER CARD

Binary Search Routines

This product, an assembler macro for the generation of customized binary search routines, is the first product to be marketed by this firm. The developers admit that they don't know a lot about the costs of distributing the program, and are hoping that the $35 price won't lose them money. The low price is mainly due to the fact that the package really wasn't designed as a commercial product and is used extensively by the developers.

The macro generates a routine said to have complete flexibility in table format and exit specifications. The generated code is serially reusable and can be made reentrant by proper specification of macro parameters. It's further claimed that a complete customized binary search routine can be coded in five minutes. The routine can be used with any IBM 360 or 370 assembler. The $35 includes the documentation and machine readable source code. PHI DG DEVELOPMENT CORP., Brooklyn, N.Y.

FOR DATA CIRCLE 323 ON READER CARD

Fortran Evaluation

The Fortran Automated Code Evaluation System (FACES) was developed to detect coding errors and unsound coding practices in ANSI FORTRAN source code. The system is comprised of a preprocessor, a processor, and a report generator. Either unit modules or interrelated modules can be run as a data set for FACES. FACES is organized into a driver section with three subsystem components. The main driver is responsible for file manipulations and interpreting user commands. One of the components is called the Automatic Interrogation Routine. Its purpose is to examine tables generated by a front-end portion of FACES, and look for types of coding constructions selected by the user. If the specified constructions are found, diagnostic messages are recorded on the Flag file. A report generator generates user reports. Areas of coding that cannot be effectively evaluated are also reported to the user.

Three disc files are required on IBM 360 and 370 series cpu's, and as much as 260K of main storage can be used up. The package is written in FORTRAN and assembler and is priced at $1,590. Documentation is priced at $16. COSMIC, Athens, Ga.

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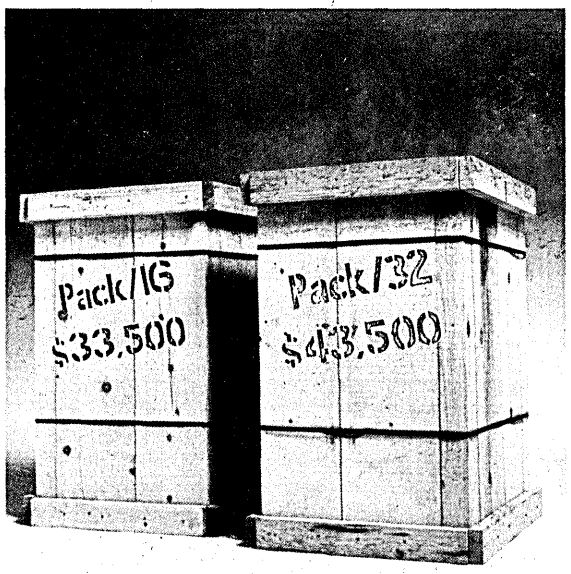

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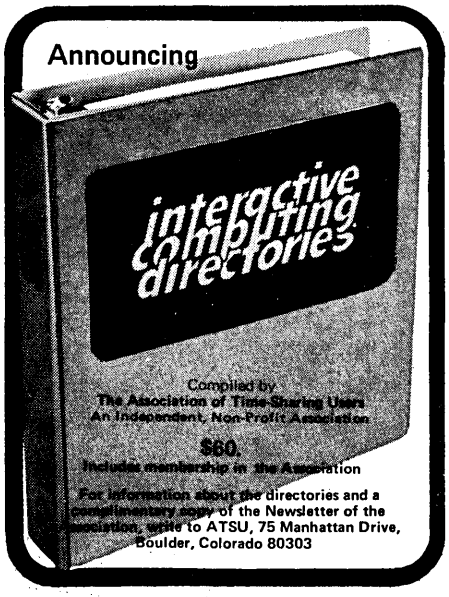

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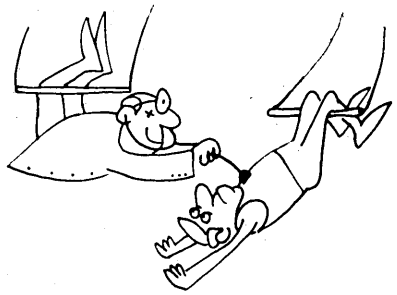

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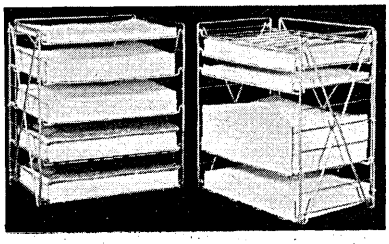

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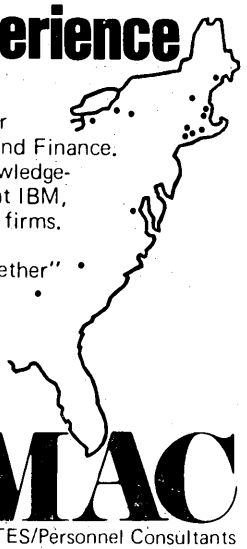

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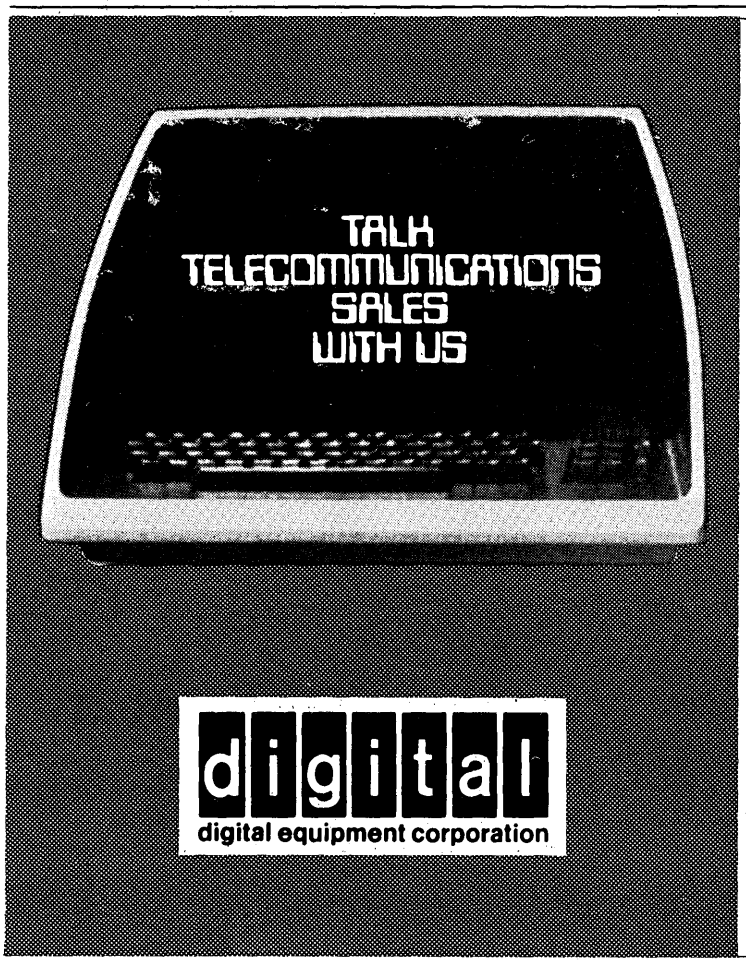

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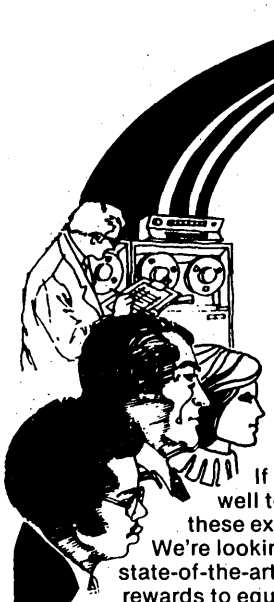

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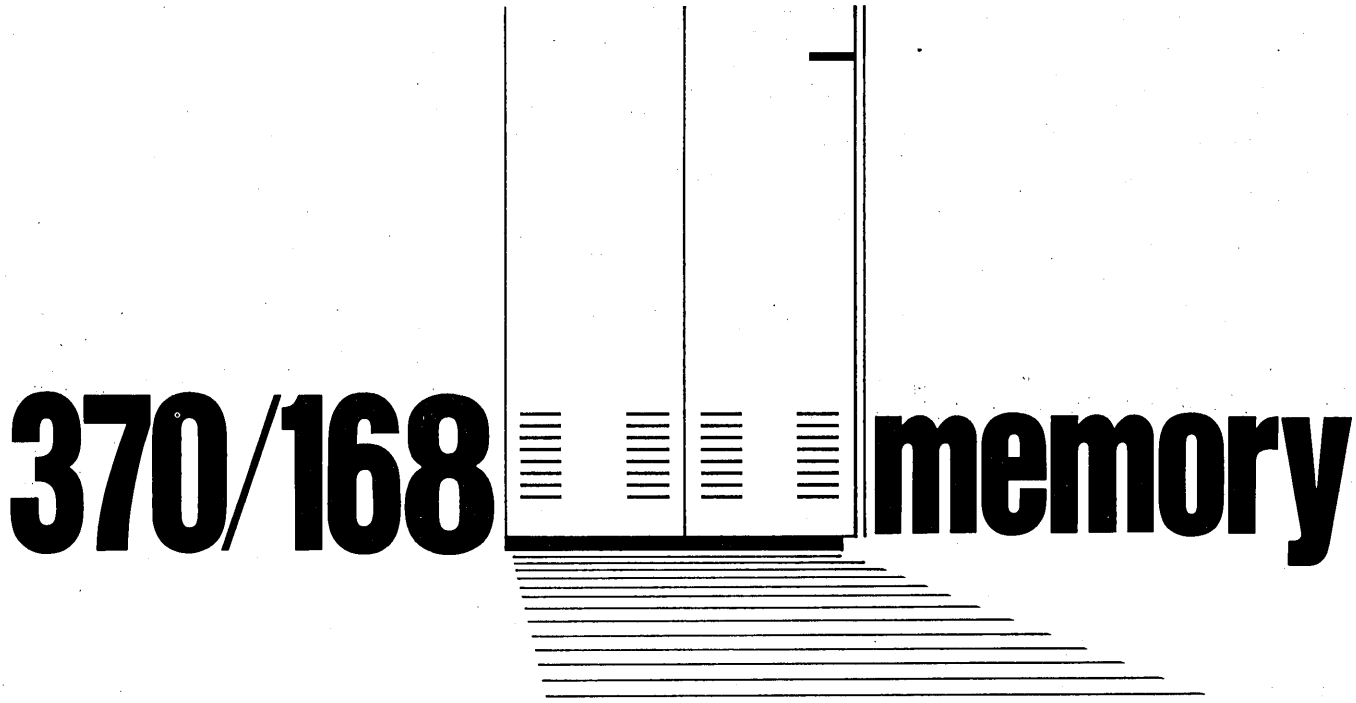

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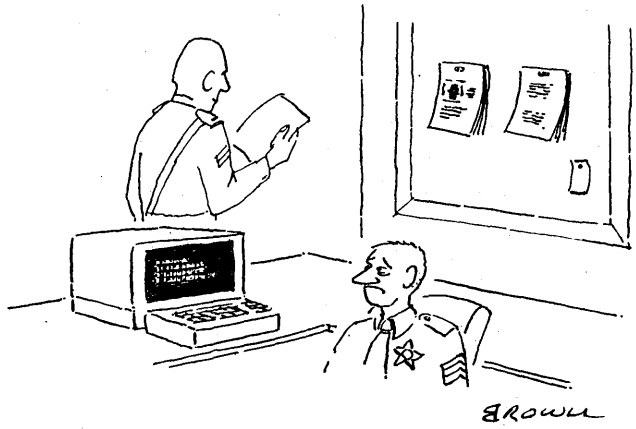
Let's Hear it for FORTRAN Too!

I read with considerable interest Mr. Daniel McCracken's article entitled "Let's Hear it For COBOL!" in the May issue of DATAMATION (p. 240). Although I personally do not use the COBOL language, I support Mr. McCracken's position on the modification of the language to ease the production of correct and comprehensible programs. Since most of his suggestions deal with the general concept of a structured format, they could and should be extended to other programming languages. In particular, they should be considered for FORTRAN.

The main problem with FORTRAN with respect to program structure is the limited logical IF statement. Since only one expression is permitted to be associated with an IF statement, program flow must usually be diverted around code

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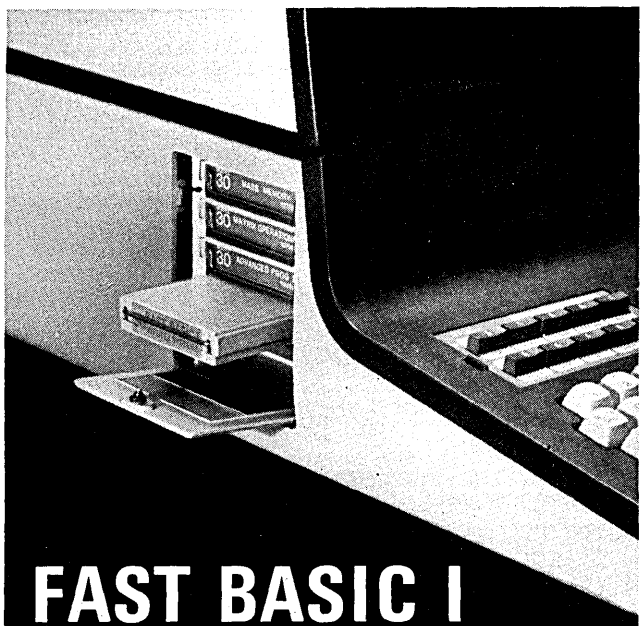
that follows when the condition is false. This diversion is accomplished by means of the infamous GO TO statement. For example

```
   IF(I.EQ.J) GO TO 10
   u=V+W
   X=Y+Z
   GO TO 20
10 A=B+C
   D=E+F
20 CONTINUE
```

Anyone who has used FORTRAN knows that it is virtually impossible to write a program that does not become littered with GO TO statements. The value of the GO TO has been debated without conclusion; however, I have yet to hear anyone contend that it adds comprehensibility to programs. Consequently, an alternative should be available to those who would rather avoid the GO TO statement.



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As indicated by Mr. McCracken, the most widely suggested means for improving program structure is to limit statements to three types: sequence, selection, and iteration. With respect to FORTRAN, the selection category appears to be the weakest and most likely area for improvement. In particular, the logical IF statement could be expanded to include an ELSE option with some form of statement blocking.

It seems curious that the logical IF statement has never been allowed to join one of the most powerful FORTRAN statements, namely the DO statement. The DO-loop is well known to FORTRAN programmers as a means of iterative control over a group of executable statements. However, in this capacity the DO also provides the blocking needed for program structuring. If the iterative indexing control is dropped from the DO statement, it still would denote a block of code by virtue of the line number. Thus, with an ELSE operator, the original example could become

```
   IF(I.EQ.J) DO 10
        A=B+C
10      D=E+F
   ELSE: DO 20
        u=V+W
20      X=Y+Z
   CONTINUE
```

The rules for the shortened DO-loops, including nesting, would be the same as the iterative version. The ELSE statement would also have its own syntax rules to avoid ambiguity.

The addition of a shortened DO statement and an ELSE statement would not entirely eliminate the need for the GO TO. The READ statement has an implied GO TO for end of file, and the computed GO TO statement is the FORTRAN version of the CASE statement. The arithmetic IF statement could be avoided if desired. A DO . . . WHILE statement would be handy, but I suppose that would be asking too much.

Perhaps enough people will desire changes to be made in languages like COBOL and FORTRAN to influence those that decide what features are incorporated into the languages. Maybe by the release of FORTAN X there will be features similar to those suggested here.

—Dennis M. Merrill

A programmer/analyst in Computer Sciences Corp.'s Systems Division, Mr. Merrill is involved in contract work for the Pentagon's Command and Control Technical Center.

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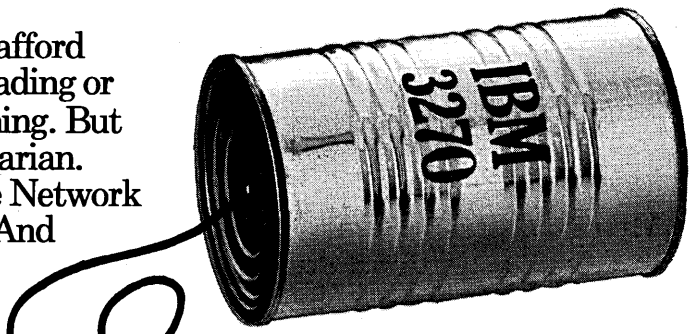

It's called PRONTO (Programmable Network Telecommunications Operating System). And it will help you make more efficient use of your network of terminals. It can help you off-load your IBM. And it will provide you with local processing capabilities.

It works like this. Your mainframe thinks PRONTO is a cluster of 3270's. Your terminals think PRONTO is your mainframe. And PRONTO allows you the flexibility of using TSO, IMS, CICS or any other communications package from a single undedicated terminal.

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If you'd like to learn to communicate better, just call one of our worldwide offices, or write Varian Data Machines, 2722 Michelson Dr., P.O. Box C-19504, Irvine, Ca. 92713, (714) 833-2400. In Europe, contact Varian Associates, Ltd., Molesey Road, Walton-on-Thames, Surrey, England, Telephone 28971. Our free brochure will show you why more and more companies are finding out that a Varian computer system with PRONTO makes good business sense.

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