

THE PUBLIC INTERFACE

Also: data base management, networks, INFO 74



Series 9000

Our Feature Attraction.

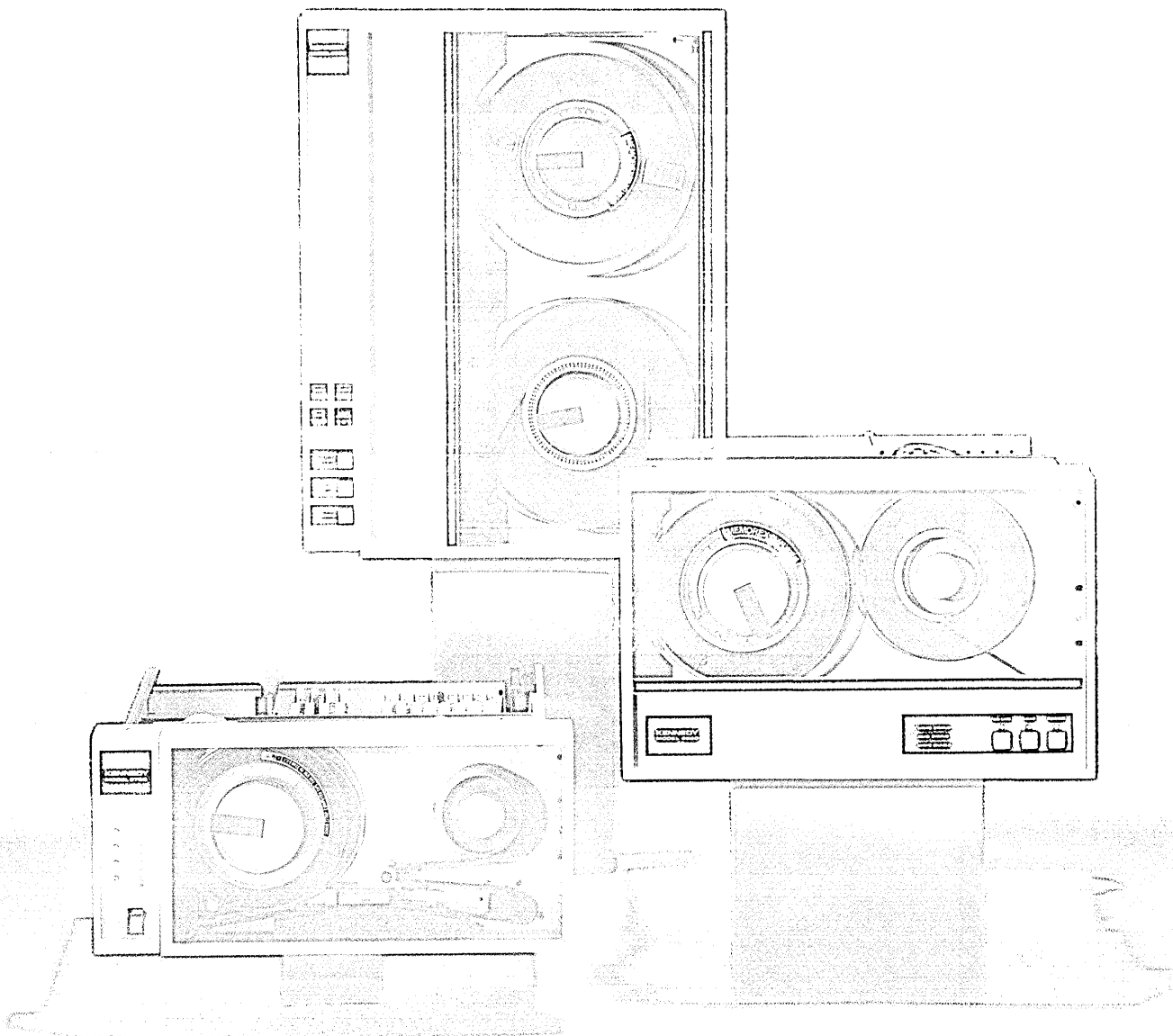
Features aren't something you tack on an instrument in order to make an ad — they're built in over a long period of time and because of a lot of experience. Kennedy OEM Series 9000 transports are like that. We were the first manufacturer to recognize the need for dual-density operation, so we offer both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

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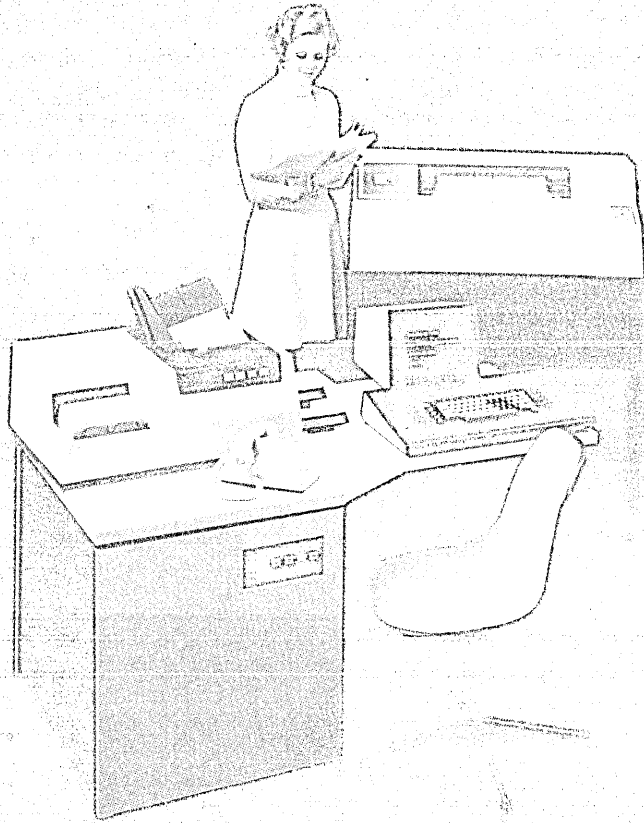
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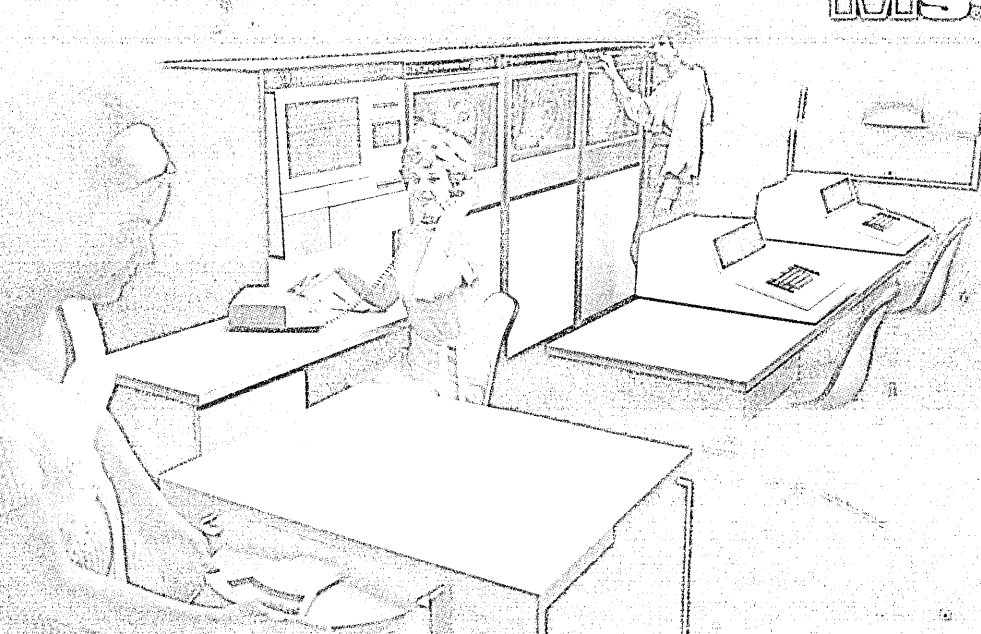
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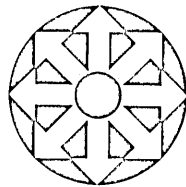
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AUGUST, 1974
volume 20 number 8
This issue 123,957 copies

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The Certificate in Data Processing is not so bad that it should be discarded, but too weak to stand alone.

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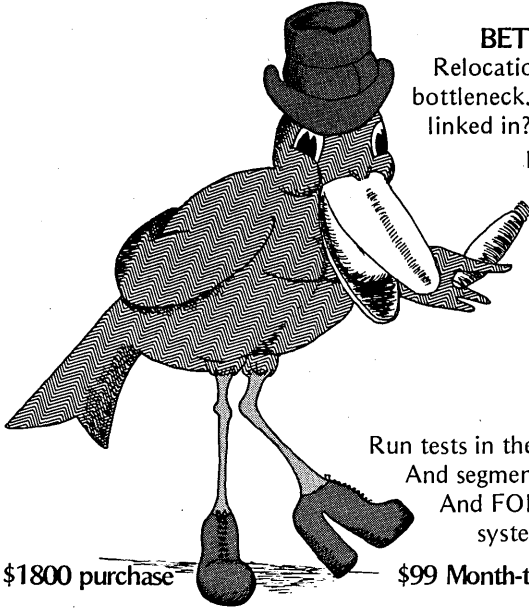
about the cover

This issue explores the ever-increasing interaction between the public and the computer.

As our cover suggests, sometimes the contact can become complicated, even baffling.

The parallax view is by photographer Andy Cominos.

The Ol' Crow Sez Increase Your DOS Thruput



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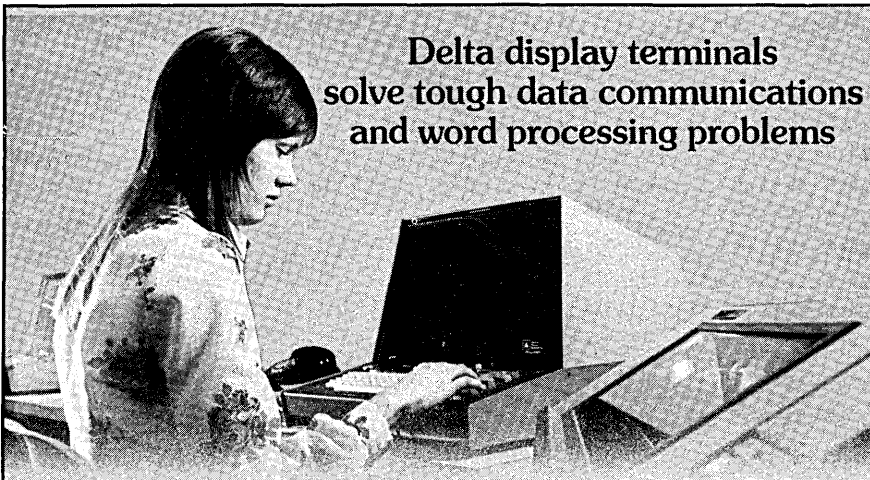
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EDITORIAL OFFICES

Headquarters: 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Phone (213) 559-5111. **Eastern:** 35 Mason St., Greenwich, CT 06830, (203) 661-5400. **Lakeside Office Park,** 599 North Avenue, Wakefield, Mass. 01880, (617) 246-2121, 9805 Singleton Dr., Bethesda, MD 20034, (301) 530-7271. **Southwestern:** 2711 Cedar Springs, Dallas, TX 75201, (214) 744-0161. **Western:** 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **Foreign:** 65, Hill Road, Chelmsford, Essex, England, 64/90 Blues Point Rd., McMahon's Point, NSW 2060, Australia.

GRAPHIC DESIGN & PRODUCTION

Art & Production Director	Cleve Marie Boutell
Advertising Production Manager	Marilee Pitman
Production Assistant	Alberta R. Martin
CIRCULATION	
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Circulation Director	Suzanne A. Ryan
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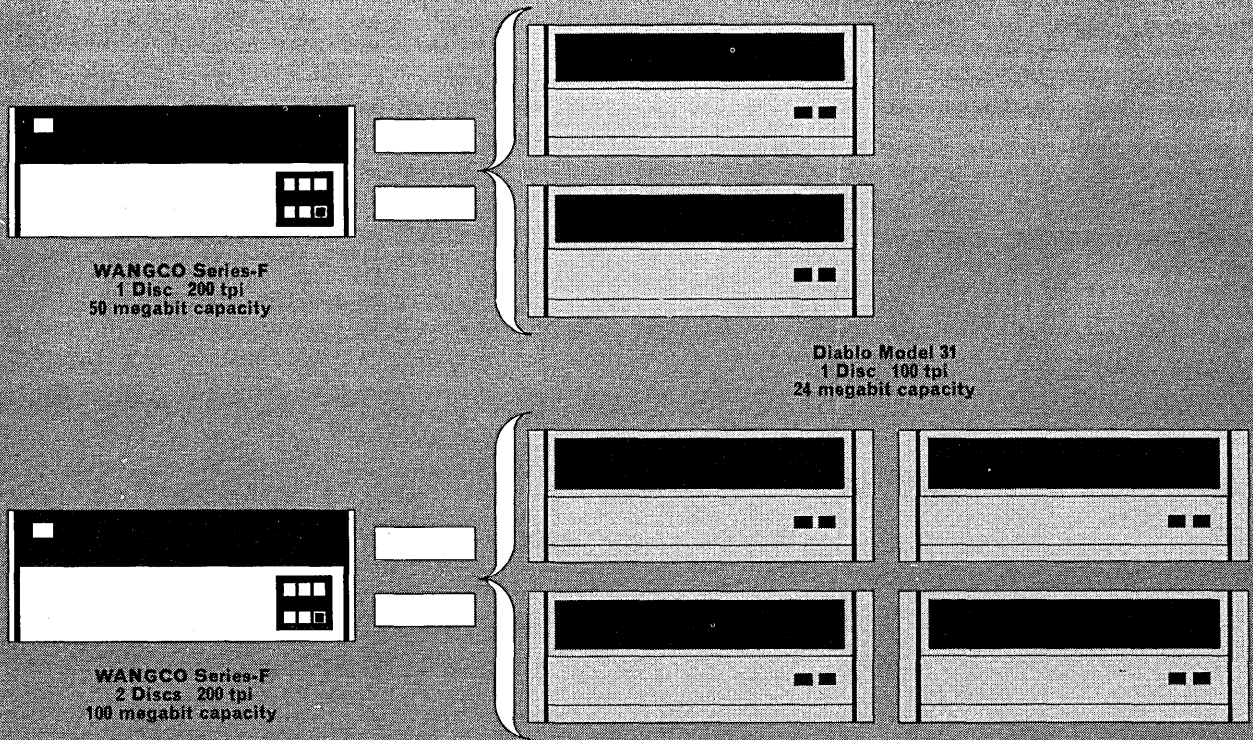
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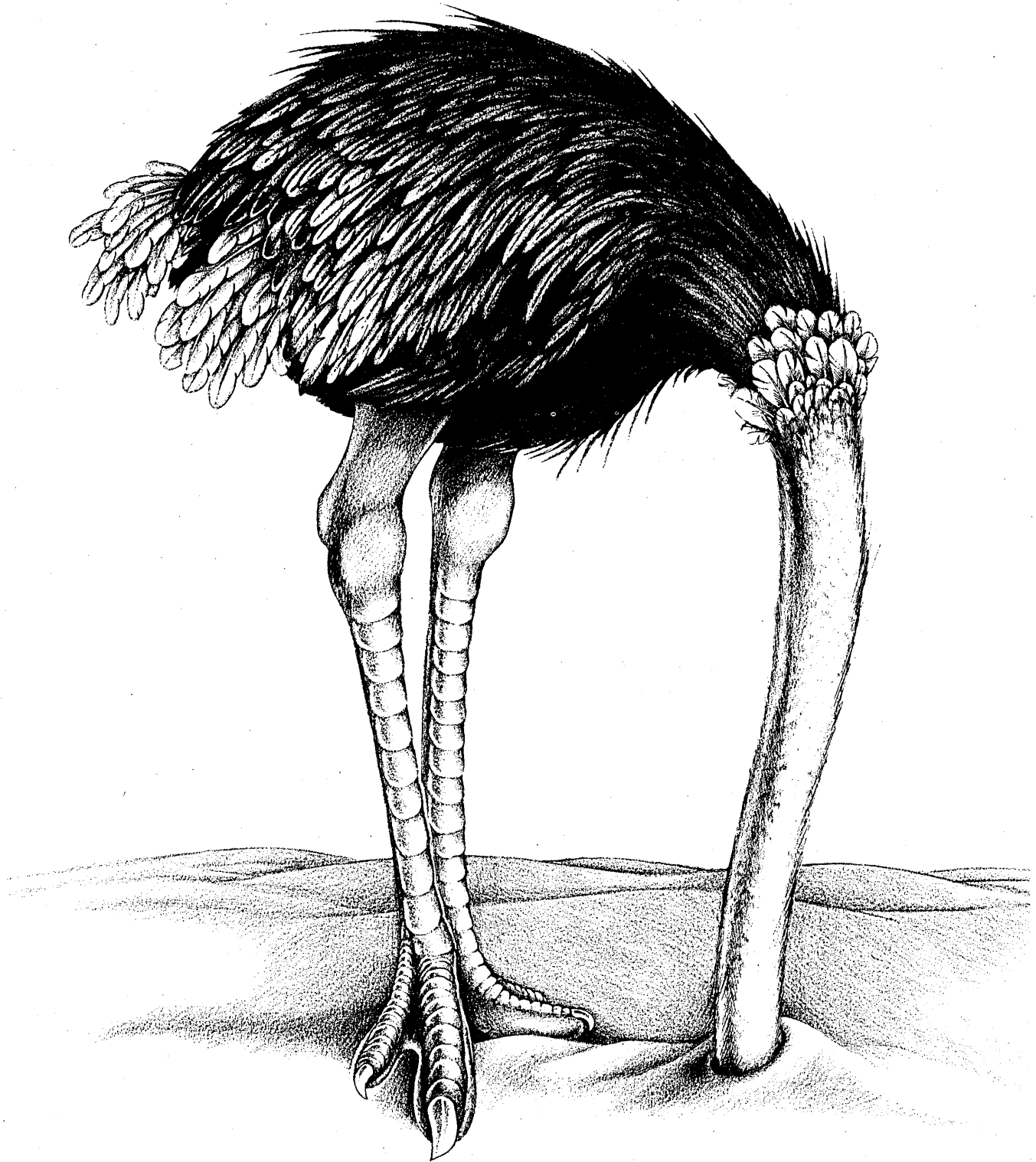
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calendar

SEPTEMBER

INFO '74, Sept. 8-12, New York. The emphasis here will be on use, rather than the technological aspects, of information systems. Twelve "mini" conferences within the general program will assist specialized audiences; among these will be special sessions for edp managers and technologists and courses for management execs who want an understanding of the fundamentals of information systems. Case studies, lectures, workshops, seminars, and roundtables will be among the formats used. Exhibits will feature demonstrations of equipment, supplies, and services. The emphasis here, as throughout the conference will be on creating and adapting new applications for information systems. Fees range from \$35-100 for AMA members and \$45-120 for non-members, depending on the number of days attended. Contact: Vern Lautner, AMA, 135 W. 50th St., New York, N.Y. 10020.

COMPCON '74, Sept. 10-12, Washington, D.C. The program for this conference focuses on the applications and design of microcomputers and minicomputers. Topics include: embedded micros, virtual machines, and minis in communications, business, manufacturing, health care, and POS. The day before the conference there will be a tutorial covering a mix of hardware, software, and applications designed to appeal to those needing a comprehensive understanding of the major elements of minicomputers. Fee: \$60, members; \$75, others; \$60 for the tutorial. Contact: Harry Hayman, IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901.

WESCON '74, Sept. 10-13, Los Angeles. The 1974 Western Electronic Show and Convention will feature over 500 exhibit booths. A professional program will consist of 28 half-day sessions including some on microprocessors, charge coupled devices, data transmission, and computer security. The \$5 admission fee covers the exhibits and the professional program for all four days. Contact: Don Larson, WESCON, 3600 Wilshire Blvd., Los Angeles, Ca. 90010.

OCTOBER

SEMICON/East '74, Oct. 1-3, New York. This tradeshow, sponsored by the Semiconductor Equipment & Materials Institute, will have 250 exhibits of the latest semiconductor production equipment and related materials. There will be a technical program with daily sessions centering on photo imaging, automated manufacturing, and new technologies and process control. Fee: \$3 at door. Contact: Richard Banks, Golden Gate Enterprises, Inc., Marina Playa Office Park, 1333 Lawrence Expressway, Santa Clara, Ca. 95051.

37th Annual Meeting of ASIS, Oct. 13-17, Atlanta. This year's conference will explore in depth the concept and services of "Information Utilities," emphasizing the development and use of on-demand information services. There will be sessions covering information services to the professions and to the public (news and entertainment media, educational materials, home and community info, environmental quality info, and employment and job matching). Another session will be devoted to issues concerning the

developers and regulators of information utilities. The final session will evaluate their importance and effect from a long-range viewpoint, and concentrate on questions such as national and international planning and R & D activities. An exhibit with 65 participants is planned in conjunction with the conference. Fees are \$50 members, \$65 non-members (discount if you register early). Contact: Robert McAfee, Jr., ASIS, 1155 16th St., NW, #210, Washington D.C. 20036.

Joint National Meeting of ORSA and TIMS, Oct. 16-18, San Juan, Puerto Rico. The program for this meeting between the Operations Research Society of America and The Institute of Management Science will feature sessions on urban, environmental, and energy problems. A full complement of methodology and applications sessions is also scheduled. Topics include stochastic modeling, game theory, decision analysis, forecasting models, portfolio analysis and management applications. Fee: \$35 for members; \$45 for non-members. Contact: Mr. Rafael Fernandez, P.O. Box 2342, Mayaguez, Puerto Rico 00708.

Annual Conference of American Records Management Association, Oct. 20-23, Seattle. The theme for this conference will be "Records Management—Today & Tomorrow." Following the keynote address, the conference will break off into general seminars, tutorial sessions, panel discussions, mini-tours, users' forums, industry forums, all-conference sessions and special topics sessions. Registration has been divided into two tracks so attendees can attend the sessions gauged for the right skill level. An exhibit area has been planned, as well. The fee is \$110 for members; \$135 for non-members. Contact: ARMA, P.O. Box 281, Bradford, R.I. 02808.

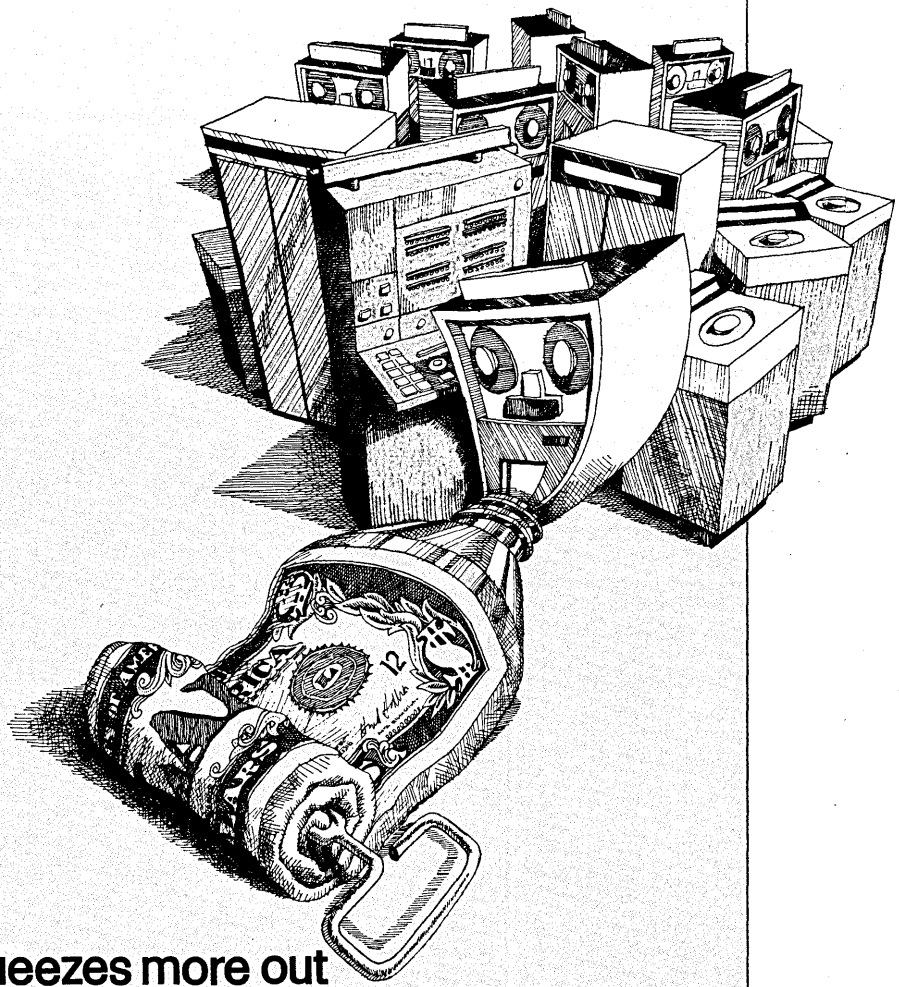
International Symposium on Information Theory, Oct. 27-31, Notre Dame, Ind. The areas to be covered in this conference include: coding theory, computational complexity, detection and estimation, pattern recognition, stochastic processes, and Shannon theory. Fee: \$65. Contact: Professor James L. Massey, Dept. of Electrical Engineering, Univ. of Notre Dame, Notre Dame, In. 46556.

16th Annual Retail Electronic Data Processing Conference, Oct. 27-31, Quebec. This year's conference will feature 75 sessions covering such areas as: point-of-sale, minicomputers for retail, and standards. In addition, there will be 18 workshops, each sponsored by a different manufacturer. The fee is \$140 for members, and \$200 for non-members. Contact: Irving S. Solomon, Information Systems Divisions, NRMA, 100 West 31 Street, New York, N.Y. 10001.

NOVEMBER

Second Annual Systems Engineering Conference, Nov. 6-8, Minneapolis. The theme of this conference is "Merging Manufacturing and Information Systems." There will be eight sessions in each of four areas: mini-computer systems, computer-aided systems studies, integrated systems for materials management, and management systems. Roundtable discussions are planned as well. Fee: \$95, members of American Institute of Industrial Engineers; \$120, others. Contact: Barbara Miller, Conference Dept., AIIE, 25 Technology Park, Atlanta, Ga. 30071.

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



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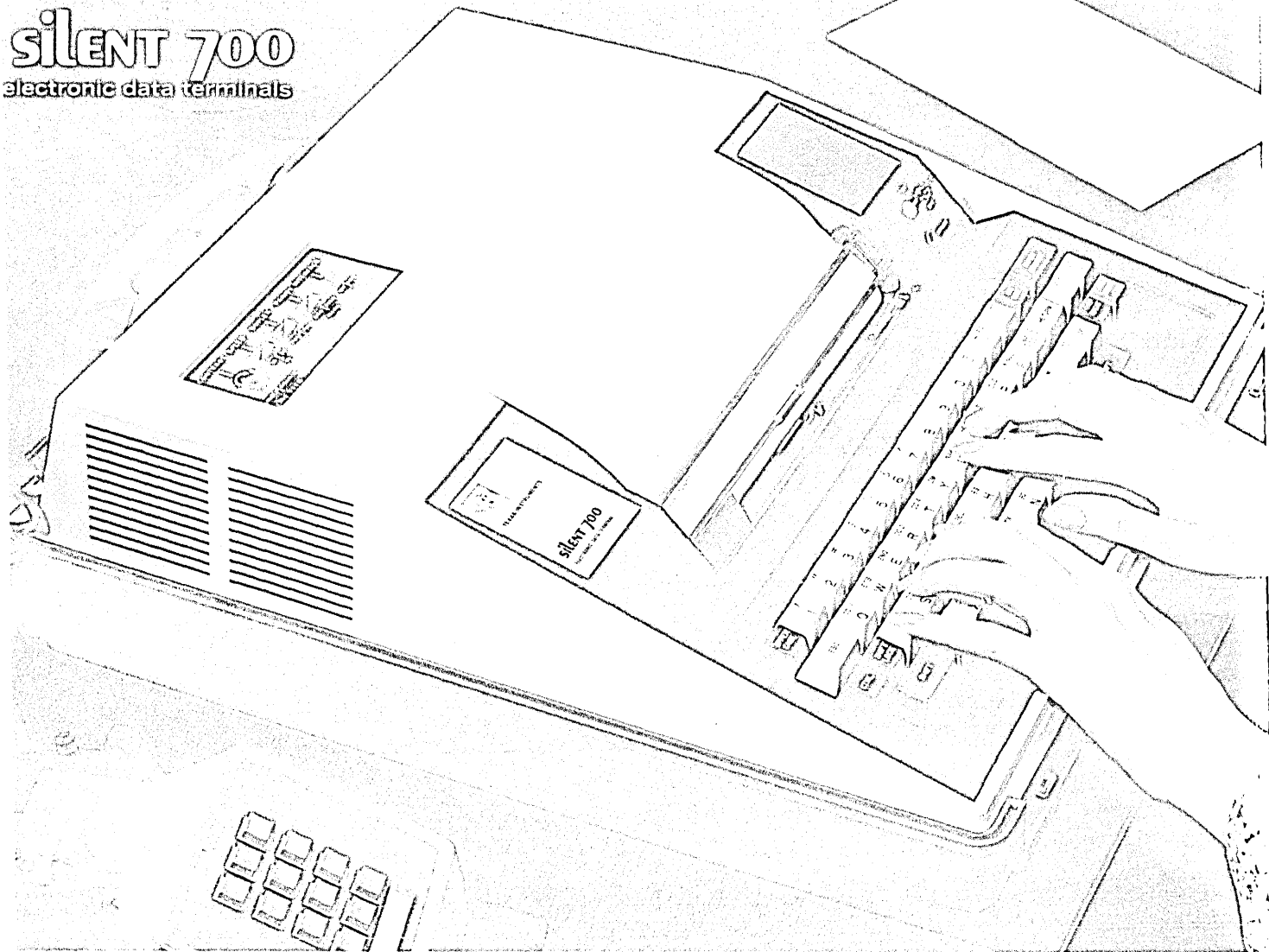
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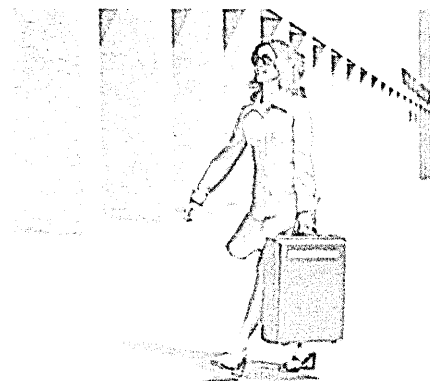


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TEXAS INSTRUMENTS
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people

MAN OF THE YEAR

His first job offer in his last year in college in 1951 was from an insurance company where he was offered two-thirds of the going salary. The college interviewer found him to be "the best candidate he had seen" and offered him \$75-80 a week. The personnel interviewer, observing he was blind, offered \$42 a week with the lame explanation to the 21-year-old Phi Beta Kappa Dartmouth physics senior that "you ain't got enough math."

Last June, twenty-three years later, friends recalled that experience of Edward L. Glaser as the 43-year-old



EDWARD L. GLASER "You ain't got enough math"

computer scientist in a Minneapolis ceremony received the 1974 Computer Sciences Man-of-the-Year award from the Data Processing Management Association.

During those years he has distinguished himself as a computer designer with IBM, Electrodata and Burroughs and as an educator with UCLA, MIT and Case Western Reserve University in Cleveland where he holds multiple titles as the university's computer czar.

His accomplishments are vast. He was on the design teams that pushed computer technology at IBM and brought forth that company's models 650 and 701 machines. He holds a dozen patents, many for the development of the Burroughs B5000. He has

taught system design at UCLA and electrical engineering at MIT.

Sightless since the age of eight, Glaser dislikes interviewers who make it an issue. He prefers to joke about it. As do his associates who note that he's been on both the giving and receiving end of a number of pranks relating to it. He's been known to come late for a meeting where the group holds its breath in silence while someone informs him, "everybody's left." At Electrodata in Pasadena, Glaser once tricked an associate, recently arrived from the east coast with the reputation as a gourmet, to bite into a hot pepper at a Mexican restaurant. To even things up, the associate completely rearranged the furniture in Glaser's office while his blind associate was away on a trip. Glaser, after calmly recovering his bearings, told the associate he liked the furniture the new way.

Glaser's office, like anyone else's, is cluttered with paper, "but it's all in braille," says an associate, noting that he also has an elaborate tape recording system. "All our proposals to him are on audio tape which he takes home to evaluate." He'll return and offer the opinion of his seeing-eye dog, Kaz, a fiercely watchful companion who recently smashed through Glaser's motel room door to quiet the pounding of an inebriated guest who had the wrong room. "If a proposal stinks, Ted

doesn't tell us it stinks," said an associate." He tells us Kaz told him so. He communicates bad news by telling us the way Kaz thinks."

"I tell my students I'm not much of a lecturer. It's that my dog is a good ventriloquist," says Glaser who has spent a lot of effort putting people at ease. "Some people get hung up when you walk in with a 100-pound German shepherd.

His interests in computer sciences are virtually unlimited but among his priorities is the use of computer technology to make instruction less labor intensive. He also considers the problems of computer privacy and recalls that 10 years ago, his offer to address a group on privacy and security was turned down on the grounds the subject was "too esoteric and an impediment to progress." "We're a crisis oriented nation," Glaser observes. "We don't address problems until we have a catastrophe."

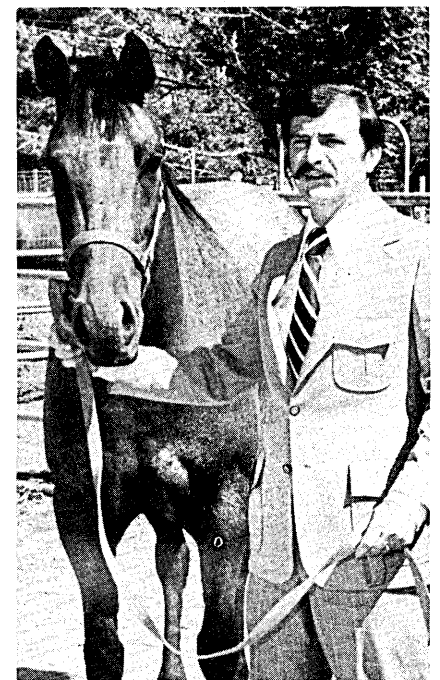
Glaser has loved music since childhood and is an accomplished pianist. As a youngster in the 40's, he frequented all the Chicago jazz joints and became a close friend of the jazz greats who played Chicago. Looking back on his career as a computer scientist—the accomplishments and the disappointments—Glaser said recently, "If I ever get tired of it all, I can always go out and open a piano bar."

"THE DESERT IS LIKE THE OCEAN"

Like many another Phoenician in the computer business, Don Oglesby got to Phoenix courtesy of General Electric Co. which transferred him to Arizona's capital in 1964 from Johnson City, N.Y.

And also like many of his counterparts, Don now heads up his own company. It's Three Phoenix Co., formed last summer with all hardware formerly produced by now-defunct Wabash Computer Co. as its base. Oglesby had been a vice president of Wabash. Three Phoenix' big product is its TCT 300 tape transport using the 3M ¼ in. cassette cartridge. Oglesby sees the 3M cartridge as vying with the floppy disc for position as THE low cost storage medium of the future. Three Phoenix also produces and markets Wabash's disc pack test equipment and head-per-track rotating memories.

Three Phoenix isn't Oglesby's first entrepreneurial venture. He left GE in 1965 to become the third employee of Omnitec Corp. where he was the prime mover behind the Omnitec acoustic



DON OGLESBY A transplanted New Englander—his ship is a horse

people

coupler, still on the market. Omnitech was acquired by Nytronics in 1967. Oglesby enjoys recalling a market research study commissioned by Omnitech at that time which indicated the market for acoustic couplers *might* reach 1,000 units through 1975!

He left Omnitech shortly after its acquisition. "It wasn't the same. The challenge was gone." So he formed Data Computing, Inc. which developed a card reader and printer which subsequently was acquired by Tally Corp. and today is Tally's only product.

Data Computing had to sell out in late 1970, says Oglesby, because its underwriter went bankrupt. Among the companies considering acquiring it was Wabash which acquired Oglesby instead.

A transplanted New Englander, Oglesby today is a dedicated Phoenician. He was born and raised in Cranston, R. I. "My summers were spent always on the water." He doesn't find Phoenix a drastic change. "The desert is like the ocean. The hills are like islands. Being on a horse or being on a boat, the feeling's the same."

Oglesby's an engineering graduate of Michigan State University. While in high school in Cranston, he didn't know whether or not he wanted to go to college. He accepted a football scholarship to Tilton, a New Hampshire prep school, and, when he finished there, entered the Navy in the submarine service where he became an electronics technician. "I chose the longest school." While in the Navy, in the best tradition of sea-faring men, he got married. He married a WAVE who also was an electronics technician.

"When we got out of the Navy," he said, "we both wanted to go to college."

We picked Michigan State because it had barracks housing we could afford."

Oglesby went directly from college to GE. He can't remember exactly why. "I guess they had a good recruiter on campus." He still has warm feelings toward his first employer and considers GE a "well run company. The only reason they went out of the computer business is because they really didn't want to be in it in the first place."

His new company, now 20 people strong with some manufacturing done on a sub-contract basis in Mexico, got its name kind of by accident. Oglesby wanted to call it The Phoenix Co. but couldn't get this name registered because it was too general. He'd had a lot of things printed up and it simplified changing to just add an r and an extra e to The. And he came up with a reason. The Three stands for, in reverse order, he explains, "our products, our company, and you, our most favored customer."

"IF THE CAPACITY IS THERE"

The digital data communications links being opened by such companies as MCI, Datran, and Southern Pacific Communications stand a good chance of making it, says Pete Bolles. With more than 25 years of electronics systems experience behind him, Bolles says, "It's just about like anything else that's come about in the computer business. If the capacity is there, it's going to be used. It always has happened."

Since last April, E.E. "Pete" Bolles has been president of Vadac Corp., the Mountain View, Calif., manufacturer of low- and medium-speed modems. It's a market the company may be dominating, having installed close to 70,000 in the 4½ years of its existence.

And Bolles has been around long enough to remember a remark by Howard Aiken. Talking about an early relay computer, Aiken said five such machines could perform all the computing in the world. But that capacity, too, was soon found to be lacking. Similar statements have been attributed to a number of early industry spokesmen. Bolles, referring to the chain of events since those adolescent years and including the slowly growing digital data transmission companies now in their pre-pubescent stages, says, "they foster their own need, really."

Their growth, he continues, can't help but contribute to the growth of Vadac's business. "If you get the high-capacity digital data links on a point-to-point basis, that will foster a greater need for modems for the dispersal of that data." Modems in all speed ranges, he thinks, will be in greater demand, but he looks for most of that business to accrue to manufacturers of the medium- and low-speed models. Bolles looks hopefully, too, at burgeoning installations of POS and credit verification terminals, seeing in this a demand for low-cost terminals and low-speed modems.

Bolles built his first digital computer at the Univ. of California at Berkeley in the 1948-49 period at the time Harry Huskey was doing the same at UCLA. He then went to Hughes Aircraft when that company was designing both military and commercial digital computers, the latter never reaching the marketplace. But they did develop the first airborne computer, the Digitac, for navigational purposes, a processor that got its first flight in 1950.

In '54 a couple of people named Si Ramo and Dean

Woolridge left Hughes to start Ramo-Woolridge, and Bolles joined them that same year.

"At Ramo-Woolridge, we pioneered the whole industrial, closed-loop, process control field," says Pete Bolles. A soft-spoken, unassuming man, Bolles is not much for the use of superlatives. He downplays the many firsts he has been involved with. But he speaks with obvious pride, again soft-pedalled, of the work at RW in applying computers to the control of continuous process flows.



E. E. "PETE" BOLLES A greater need for modems

Back in 1955 the company and the Air Force began a strange project. Bolles was part of a team that consisted of about a dozen people each from RW and the Air Force. "When we first got the briefing on it," he recalls, "I thought they were out of their minds." What the people from the Air Force wanted was a structure about 120 feet tall that would fly unattended halfway around the world. It was, of course, the start of the nation's ICBM program.

Bolles, who holds a BSEE from the Univ. of Washington and an MSEE from Berkeley, stayed on at RW. He was in the Computer Systems Div. that was joined with a part of Martin-Marietta to form Bunker-Ramo. There he served for five years as vp, managing the \$30 million/year Electronic Systems Div. in Los Angeles. □



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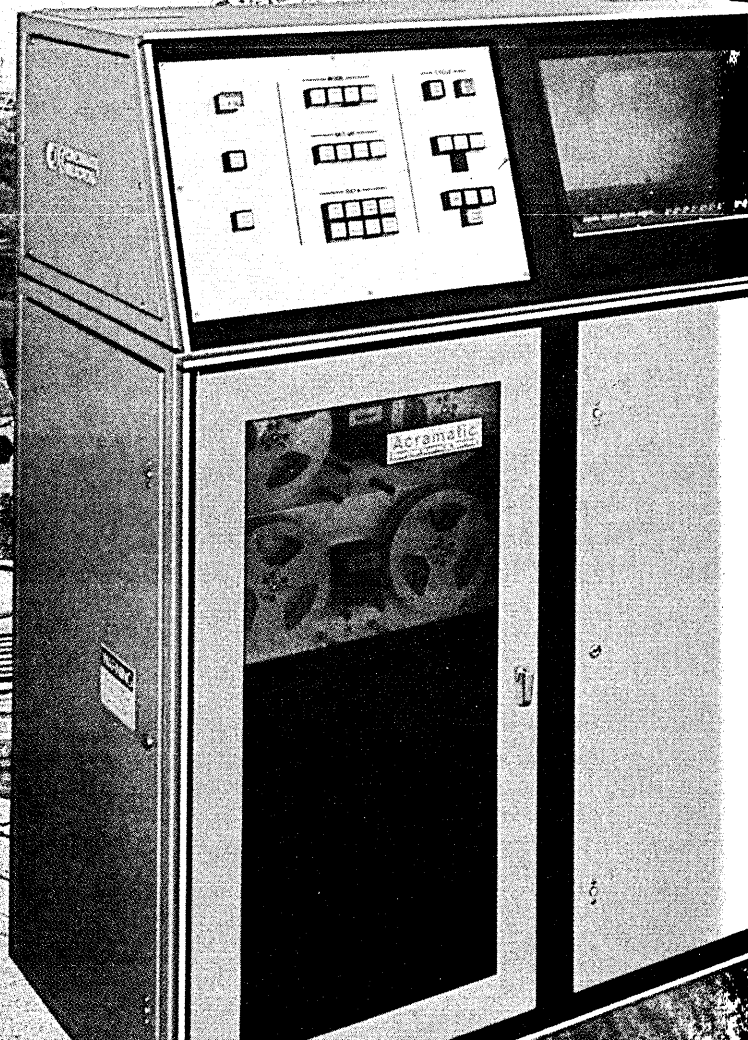
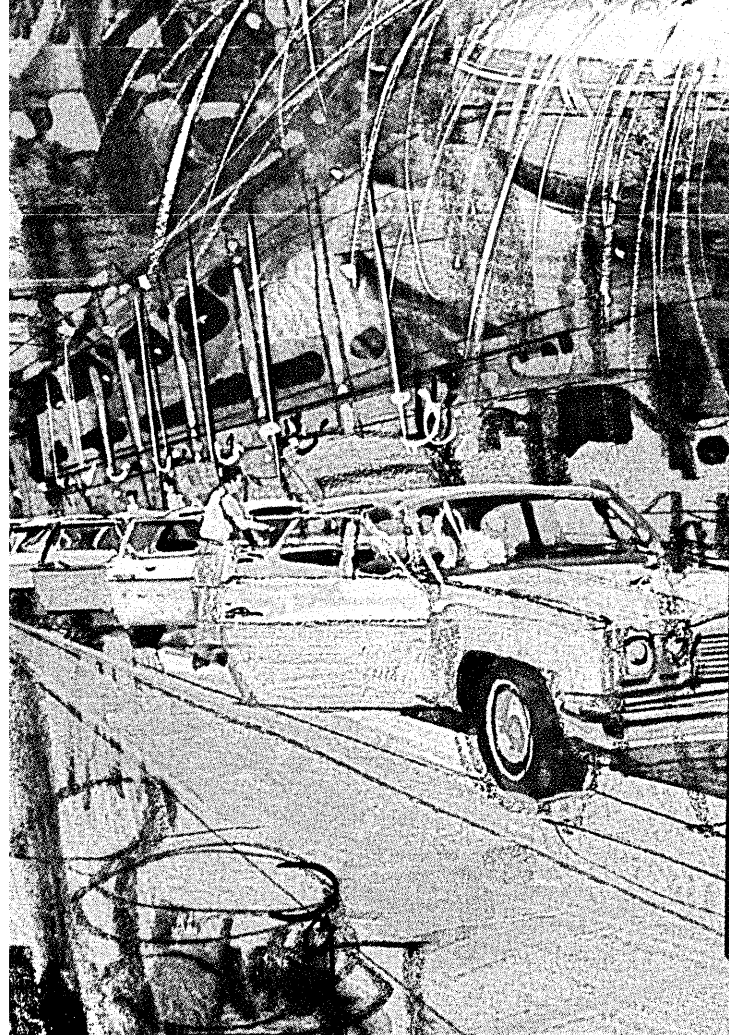
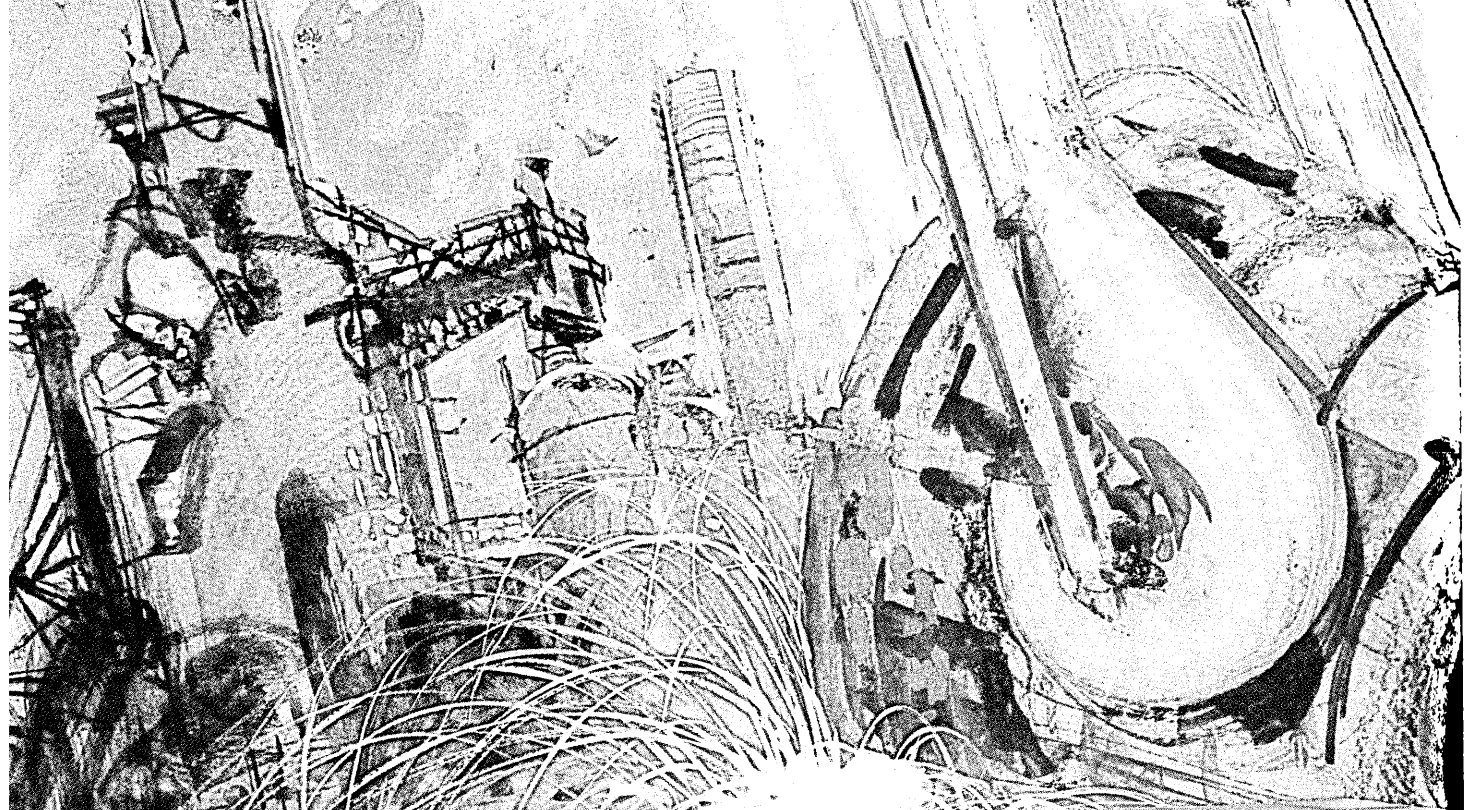
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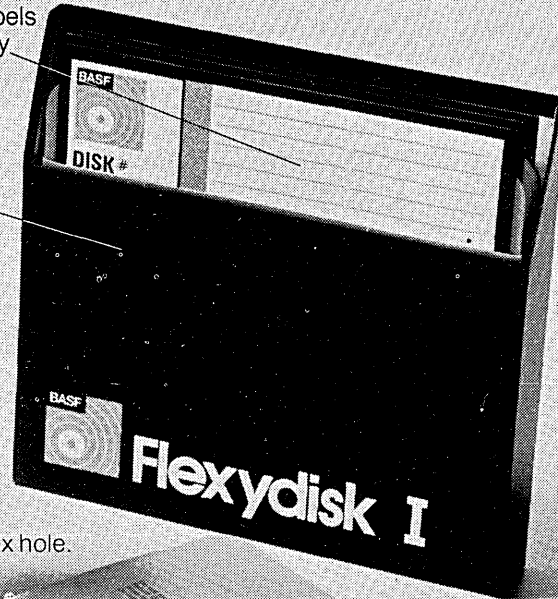
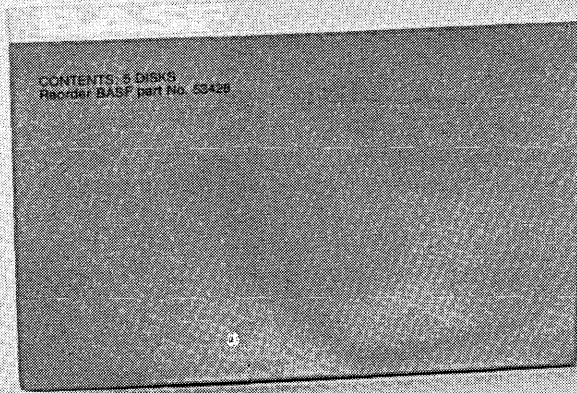
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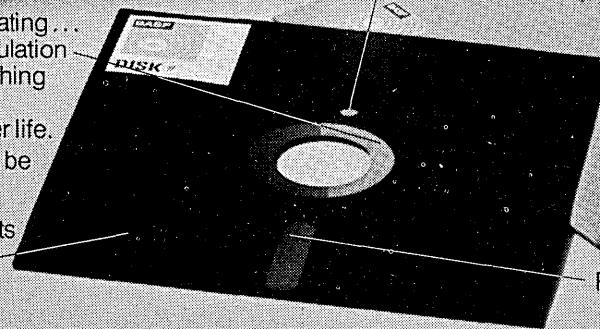
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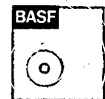
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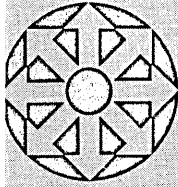
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LOOK AHEAD

PRIVACY: DO THEY KNOW WHAT THEY'RE DOING?

"If you have any major programming systems on the drawing boards, you'd better take a look--soon--on how this act is going to affect them," counseled Palo Alto attorney William A. Fenwick at a privacy seminar sponsored by Wema, a trade association. Fenwick, of the law firm of Davis, Stafford, Kellman & Fenwick, explained that the Goldwater-Koch omnibus bill, HR 14163, "The Right to Privacy Act," applies to personal identification in both computerized and non-computerized files both in government and private industry, even down to the level of files commonly used in the daily workings of business. "You've got to think of all the places in your organization where you have any information on John Jones," not only the accounts receivable file. Indexing the information, said another speaker, almost certainly would require the generation of a universal identification number--and that's something specifically prohibited in all pending privacy bills.

Admitting that no cost or feasibility studies were made, Goldwater told the seminar his bill--or one similar to it--will definitely come out of Congress this session. "There's tremendous pressure in Congress to pass something," says Dr. Willis Ware of Rand Corp., another seminar participant.

Fenwick said, "Two things scare me about this bill. First, it's the kind of legislation that is passed one minute before Congress adjourns and, second, when I talk to Congressional aides involved with drafting of the legislation and point out its implications, they freely admit they know they don't know what they're doing."

ICL'S SMALL COMPUTER: TIP OF THE ICEBERG?

"Who's replacing IBM gear with what" is one of the interesting games in industry reporting. In Europe in the last two months, we hear, IBM has been worried enough about the small business computer entry from the U.K.'s ICL computer company to hold "anti-2903 seminars" for its salesmen. ICL has booked 550 orders for the 2903 since the introduction in spring of '73. A telling statistic comes from ICL-France, which claims 20 of 80-plus orders are replacements for System/3 and 360/20 machines.

ICL has test installations in the U.S. and its New York office accepts invitations for demonstrations, but it hasn't yet committed to an active marketing effort in the U.S. for the 2903. We hear the machine can build to a 36-bit microprogramming engine in various increments. This makes possible all kinds of emulation--including nine-bit machines that might come up from the likes of IBM. ICL has been tapping only the standalone small users market so far, but its system obviously has many possibilities in satellite processing applications.

HONEYWELL READIES TRANSACTION SYSTEM IN U.S.

Honeywell is about to offer TDS, an on-line system that handles up to 20 financial transactions per second. Developed by Honeywell Bull in France, it's understood to be offered free to European users, but users in the U.S. must pay \$2,000/month and Honeywell-U.S. isn't aggressively promoting TDS. Instead, we're told, domestic customers are being offered TPS, an older, much slower, and less efficient system. For example, TPS is said to require a minimum 30K core allocation, versus 2K for TDS.

LOOK AHEAD

A Honeywell spokesman, asked about all this, said TDS is available in Europe and the U.S. for the same price--\$1,000/month. He said it's currently being final-tested in the U.S. and will be generally released "within a few weeks." He also said that TDS and TPS require about the same amount of main processor memory. TDS is a smaller program, but it needs a core-resident data management system that brings the total memory requirement up to 20-30K.

WWDMS: CRITICISMS ONLY PARTLY TRUE

"WWDMS doesn't work," says a government insider, referring to the data management system Honeywell is developing for the Defense Dept.'s World-Wide Military Command and Control System (Wimmix). He says the third version of WWDMS recently was rejected by the Joint Technical Support Agency (JTSA), the Wimmix project manager, after an attempt to run it uncovered 167 bugs. Honeywell, Phoenix, now is trying to fix the trouble, but our source says the company probably will have to start all over again--for the fourth time.

A major difficulty, he adds, is that the latest version of WWDMS cannot do multilevel hierarchical searches and retrievals of IDS-type files, although, ironically, the first version could.

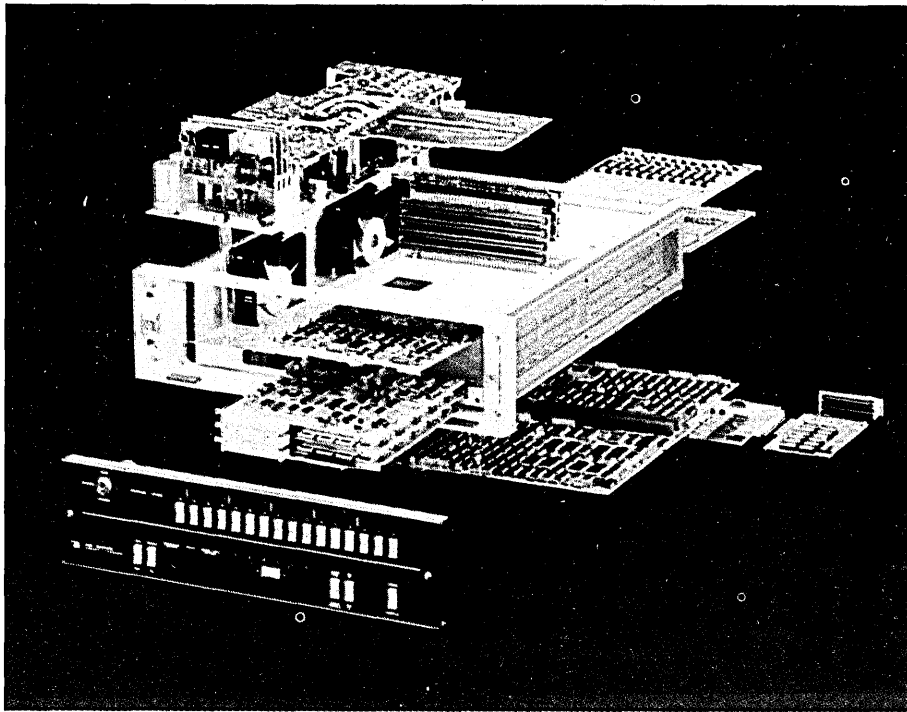
A JTSA spokesman says these criticisms are only partly true. "There were some bugs in Version 3 but they weren't serious enough to require a redesign of the whole system. Honeywell now is making the repairs and we expect them to be finished by the end of this month (July)." The spokesman added that Version 3's inability to do multilevel hierarchical searches was one of the initial shortcomings, but Honeywell has now corrected it. Besides IDS, Version 3 now can search ISP and sequential files on a multilevel, hierarchical basis, the spokesman said.

STRANGE SUPPORT IN IBM CASE

In their pre-trial depositions, the other mainframers shy from advocating a breakup of IBM--they're understandably frightened over what three or four IBM's might do to them in the marketplace. It's also becoming evident that IBM probably will pick up support in the government antitrust case from two dwarfs that have died since the government instituted the case nearly five years ago. (Due for trial Oct. 7, Justice has asked for a postponement to Dec. 2.)

At his recent deposition, RCA's president Anthony Conrad went to great lengths to explain that the "uniquely entrenched competition" that was a factor in RCA's bailing out of the computer business wasn't just IBM, as had been widely assumed at the time of the RCA debacle. That "uniquely entrenched competition," Conrad explained, was IBM and Honeywell, Sperry Rand, Burroughs, and NCR. (He didn't mention CDC.) Another eyebrow raiser was Conrad's contention that more than a year after RCA quit the computer business, the firm's top management felt it could have been "successful" in computers by the late 1970s. In view of the approach of the late 1970s and RCA's difficulties with some of its other units, it is evident that the company may have acted prematurely in getting out of the business.

As for the other computer disaster--General Electric--the chief of that defunct operation is now in the IBM fold, so to speak. Hilliard W. Paige, who headed GE's computer operation when it was preparing a frontal assault on IBM in the late '60s, is president and chief executive of CML Satellite Corp., the Comsat joint venture in which IBM seeks to acquire a 55% interest. (Continued on page 120)



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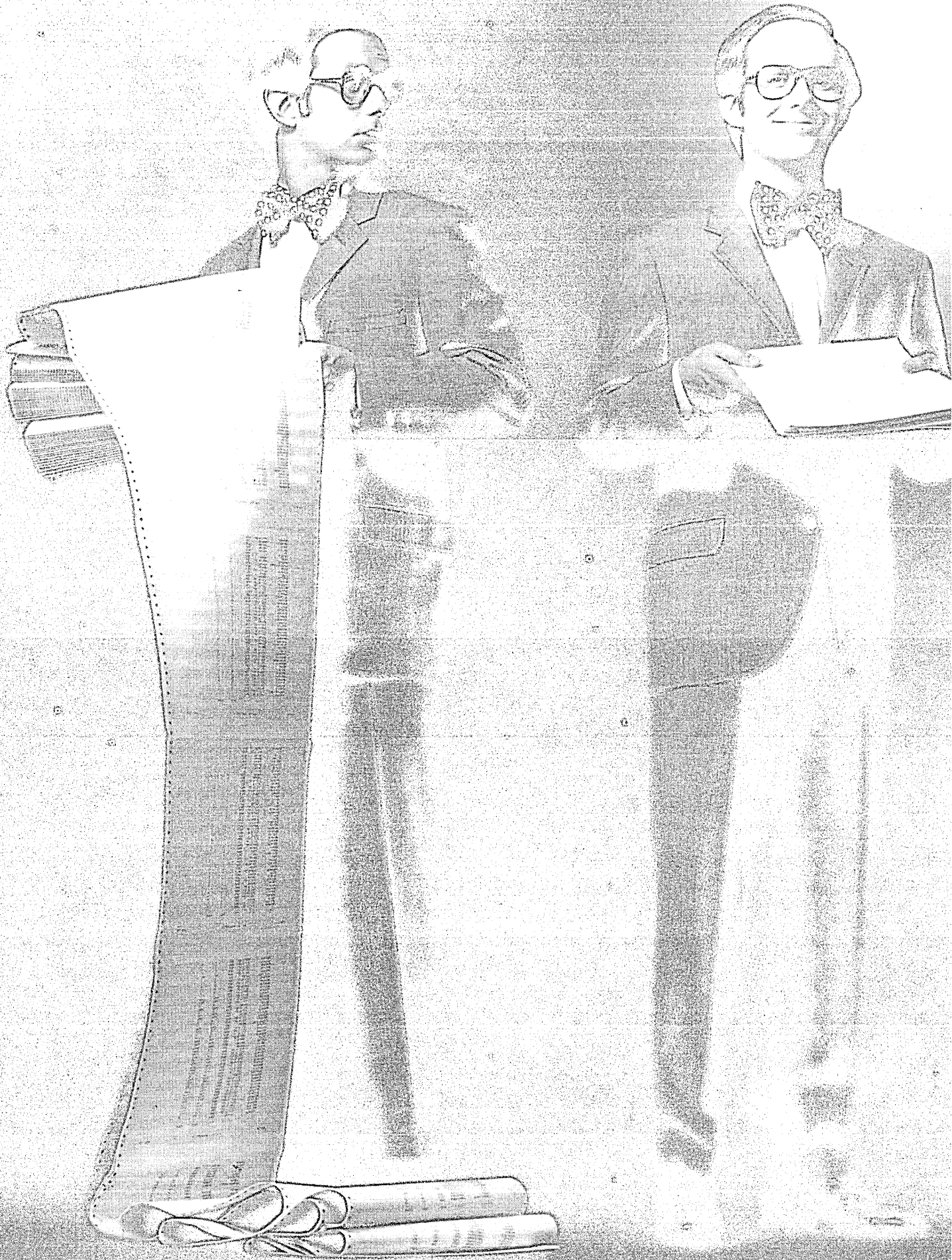
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CIRCLE 61 ON READER CARD



letters

Solving social problems

My afternoon was considerably brightened by reading Dr. Hoos' DATAMATION article, "Can Systems Analysis Solve Social Problems?" (June, p. 82).

My only comment: magnificent!

Not only is it well-written . . . it is all so damn, distressingly true.

As one of my fellows asked during the days I was trying to make electronic systems work right, "Why is it we can hire five arm-wavers for every performer we can find?"

The supply of trustworthy talent is slim indeed in these fields. Frequently they are not the ones with the loudest mouths.

An excellent job, and an important contribution to the world's small supply of common sense.

JACKSON W. GRANHOLM
Thousand Oaks, California

Unless the good doctor has a better alternative, the scientific method which is the "hammer" of systems analysis, is better than no "hammer" at all. One of the primary reasons for using the scientific method is to counteract some of the personal biases, prejudices, and superstitions built into "horse sense."

To her charge that RFP's elicit many poor responses, that is a fact of life in any field. People don't know how to read, don't know how to write, or don't know how to make a buck because they are using a shot in the dark with the resources they have. But then, that is why responses to RFP's are evaluated.

To the charge that in spite of automation, clerical costs have increased, that is true, but so has clerical work. And, clerical work has increased exponentially while costs have increased only linearly. What is the alternative—125,000,000 clerks (and phone operators) with green eyeshades? I don't believe we could afford them.

To the charge that transportation experts are more at home in century 21, I can only say "congratulations." They are, if so, at least thinking of alternatives to letting matters proceed as they have been. If we ignore today's trends for 40 years, tomorrow will be paved from town house to megalopolis. People get away from it all because they're sick of it all. Sylvan areas provide relief. Communications technology used to avoid urban crowds and rush would reduce sylvan slum-ups. With fewer crowds perhaps we could

give the onus and the control of ecological responsibility back to the people.

To the charge that there is nothing but "bad systems engineering"—any young science (including social science) makes many mistakes. So, unless Dr. Hoos has a viable alternative we will continue using scientific methodology to examine, analyze, and attempt to find reasons for existing phenomena, even in social science, like "real" scientists should.

But perhaps I am missing Dr. Hoos' point. If she's saying that social problems are hallowed ground and that science and system trespass only at their peril, I'm not impressed. In the past, that same taboo gave us the Dark Ages.

DENNIS CINTRON, MBA
*Systems Consultant
King George, Virginia*

The author replies: Social problems, far from being hallowed, are the happy hunting grounds for a myriad of solution-peddlers who delude themselves and the public into believing that there are techniques that can save us. Does Mr. Cintron seriously think that "communications technology" will reduce "system slum-ups," or in any way contribute to fewer crowds or to his idyllic but fuzzy notions of "control of ecological responsibility" by "the people?" Editor's note: By "slum-up" Mr. Cintron means slum formation.

I found Dr. Hoos' article interesting but puzzling. The title is a question, the answer to which is apparently "no." If so, I have a question to ask of the author. First, let me summarize what I think the article said:

1. Many attempts to date to apply the systems approach (systems analysis) to social problems have not been successful.
2. It may be that the systems approach is not applicable to social problems.
3. Therefore, engineers, scientists and other advocates of the systems approach should stop trying to apply it to social problems.

To me, the systems approach is characterized by an attempt to solve problems of any kind by rational means. Therefore, it seems to me Dr. Hoos is saying "social problems cannot be solved by rational means." If the above is valid, I have the following question to ask of Dr. Hoos: "by what means should we attempt to solve social problems?"

P. KNOKE
Melbourne Beach, Florida

The author replies: By all means.

Our Father's "rule"

In Chet Cohen's account of our conversion to the metric system with all deliberate speed, "The French Fad" (June, p. 77), he did not mention the

opposition to the metric system based on religious faith. There is a mythology dating from mid-19th century which claims that the width of a casing stone of the Great Pyramid of Egypt is the "cubit," the Divine standard of linear measurement. Anglo-Saxon units were derived from this.

An international Institute for Preserving and Protecting Weights and Measures was organized in Boston in 1879 to work for the revision of measuring units to conform to sacred Pyramid standards and to combat the "atheistic metrical system" of France.

One verse of a song which represents the Institute's point of view goes as follows:

Then down with every "metric" scheme

Taught by the foreign school,
We'll worship still our Father's God!
And keep our Father's "rule"!

A perfect inch, a perfect pint,
The Anglo's honest pound
Shall hold their place upon the earth,

Till time's last trump shall sound!

For those who want more there is an interesting chapter on The Great Pyramid in "Fads and Fallacies of Science" by Martin Gardner, the *Scientific American* columnist.

ALLAN KAHN
*School of Science
San Jose State University
San Jose, California*

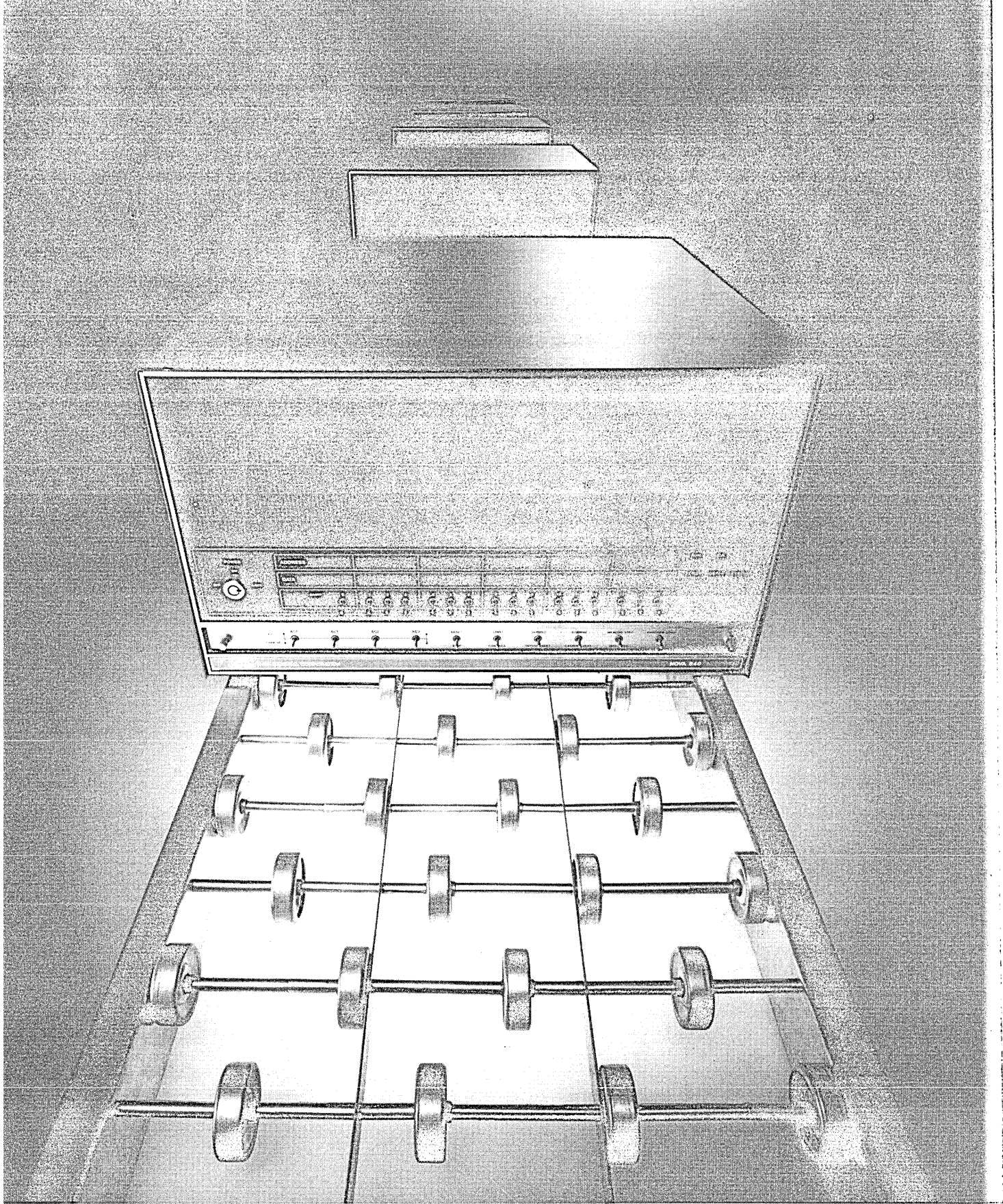
Objective hiring

In their article "A Structured Approach to Hiring" (May, p. 57), Swanson and Devore have flippantly shuffled, categorized, and sifted honest-to-goodness, red-blooded programmers with less concern than statements in a nested "DO" loop. It appears evident that the latest rage of structured programming has overstepped its bounds of usefulness.

Asking the interviewing candidate if the recording of the session would be bothersome can only be considered a hollow gesture at best. The candidate is obviously interested in leaving a favorable impression—one that will result in an offer extended for him to consider. It will be the rare applicant who will be sufficiently candid and confident to question the mannerlessness present in the recording practice.

And the questions to "relax the candidate" are just dripping with humanity and warmth! "What was your grade pt.?" "What degrees do you hold?" I find very little correlation between questions that can be readily answered and questions that truly attempt to put the candidate at ease.

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CIRCLE 13 ON READER CARD

letters

successful interviewer is his ability to rapidly transform the crisp and limiting question/answer setting into one where there is a meaningful exchange of information between prospective employer and employee. The successful interviewer would be placed in an extremely difficult position when situated in the environment of structured hiring, that is, with two additional interviewers and an ever-moving tape

recorder.

The authors may find that, as their methods for interviewing and hiring are made known through the computing community, a distaste for same will be made evident by the increasing absence of top quality candidates. People don't like to be treated as computers—even computer people.

DAVID M. ALMOS
Industrial Products Div.
Hughes Aircraft Co.
Oceanside, California

The authors reply . . . The overriding objective of an interview process is to

determine the best-qualified individual for a position. Our structured approach to hiring is an attempt to meet that objective. Further, it is designed to avoid the traditional "good old boy" approach to hiring, which tends to discriminate against women and minority candidates.

In regard to Mr. Almos' specific objections:

1. We are also concerned with the implications of recording interviews. However, a recording may ultimately work to a candidate's benefit by providing an accurate account of an interview for review of disputed and forgotten information.

2. I suspect the manner of the interviewer(s) "truly" puts a candidate at ease rather than the nature of the questions.

3. Two interviewers (there were only two) arriving at independent judgments will serve to enhance a capable candidate's chances of being fairly and objectively judged.

4. Judging applicants according to objective criteria should increase the number of top-quality candidates with top-quality jobs. Only the sycophants, the con artists, and the "good old boys" need be concerned about being considered on an objective basis.

I'm sure our approach to hiring is not the last word on the subject. What is important is that a rigorous process, equitably administered, be used in hiring.

Women slighted

In your article about S/3 installations ("Studies in Small-Scale Computing," June, p. 42), I was appalled to read that the Keene Corporation "had to look for a woman to run . . . the S/3 when it comes in . . . [and] simply because she's a woman, she commands a lower salary for that position than a man does."

Since the article also mentioned that Keene supplies gratings for missile sites, I presume they have already heard from the Federal Contract Compliance Officer about their violation of the equal employment opportunity laws.

As one who has spent much time and energy trying to achieve equal pay for equal work, I find it really shocking that a national magazine like DATAMATION could devote space to such a blatant violation without so much as raising an editorial eyebrow.

PATRICIA P. NELSON
Information Processing
General Electric Company
Syracuse, New York

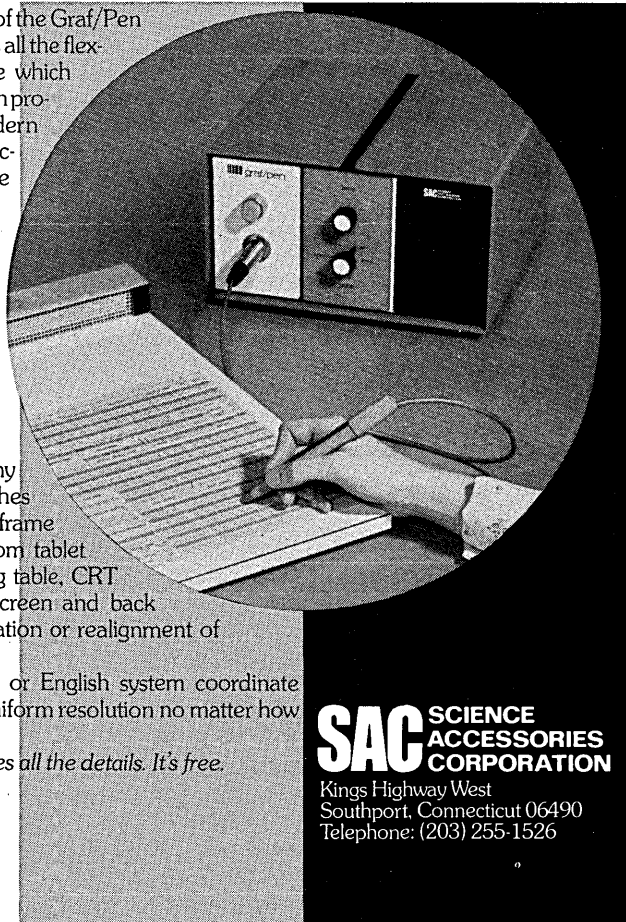
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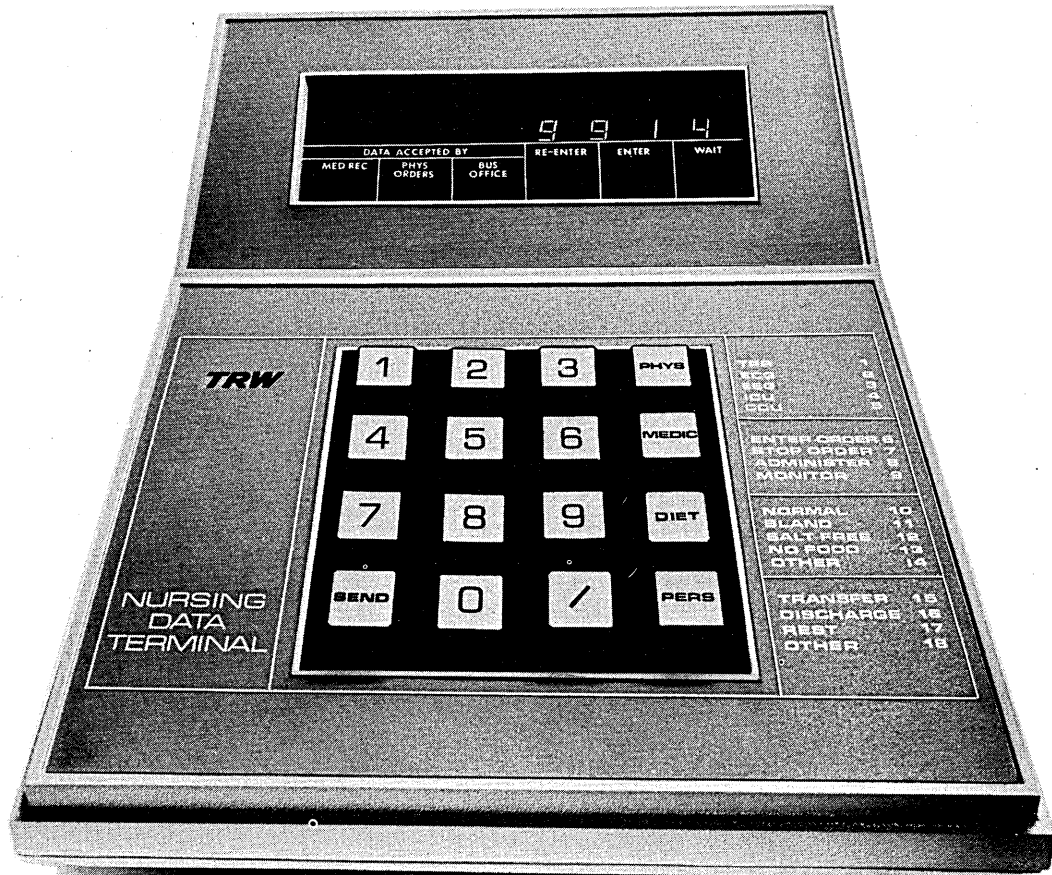


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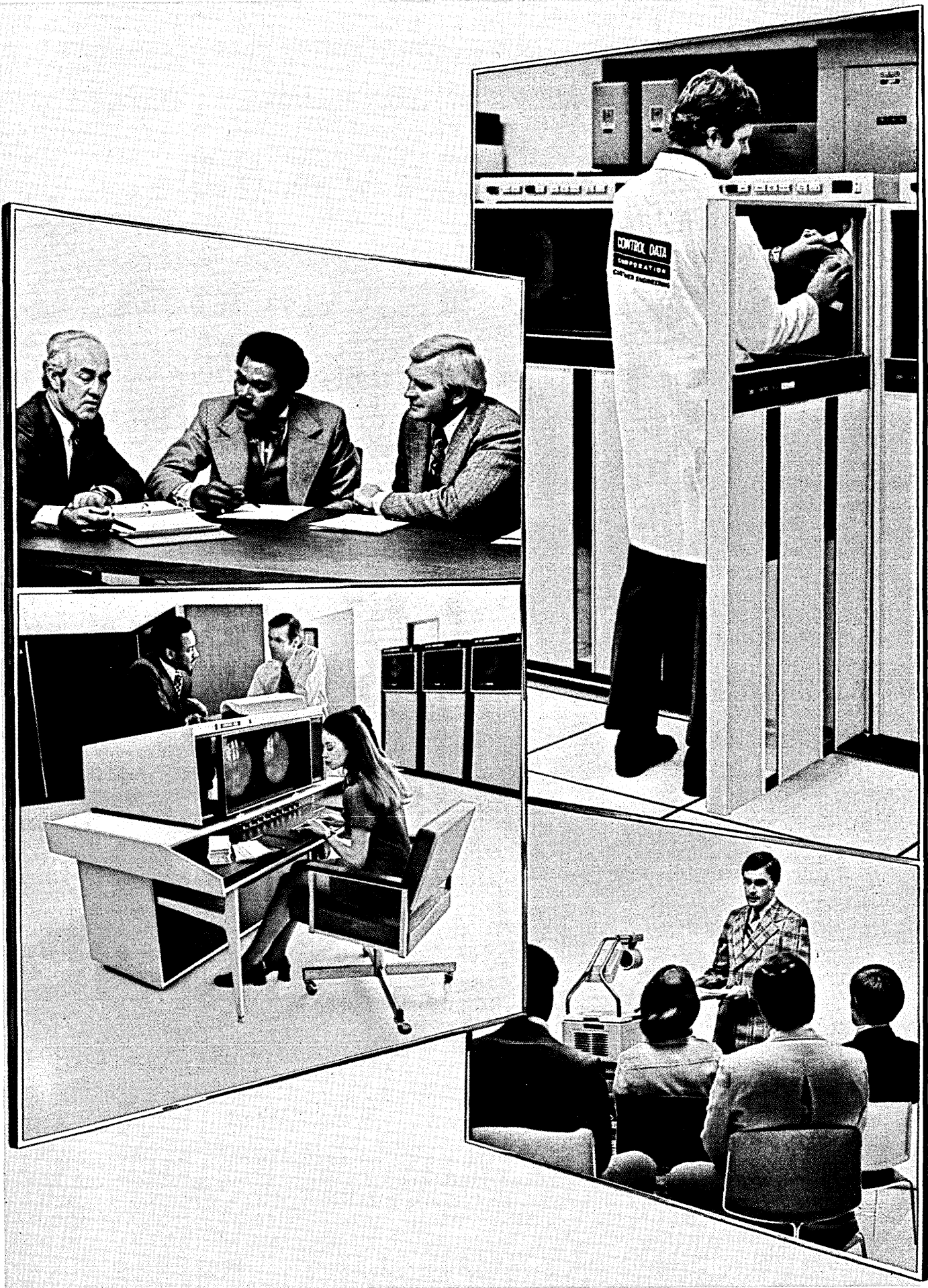
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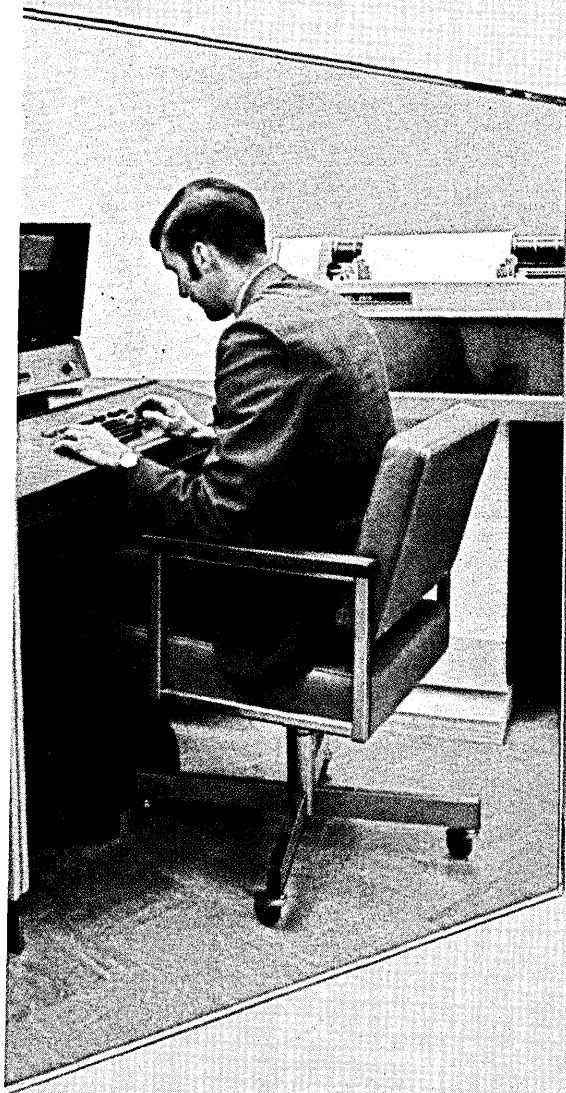
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Systematic Programming: An Introduction
by Niklaus Wirth
Prentice-Hall, Inc., Englewood Cliffs, N.J., 1973
169 pp. \$11.50

Reliable EDP Applications Design
by Tom Gilb
Lund, Sweden: Studentlitteratur, 1973
200 pp. \$8.00

Book reviewing for an author is usually a soothing pastime—a chance to play God with someone else's work and escape the press of daily affairs. This time, however, it didn't work. Reading these two excellent books only deepened my sense of despair and powerlessness in the face of the growing split of the computing business into two warring camps.

Not that either of these books is battling the other—quite the contrary. The problem is that even the best of our authors now seem drawn, however unwillingly or unwittingly, into the two culture split. How shall we characterize it? Computer science vs. data processing? Theory vs. practice? Ivory tower vs. salt mine? Let me try to explain what seems to be happening to us all, in spite of some very good intentions.

Niklaus Wirth is a professor at the Technical Univ. of Zurich; Tom Gilb is an independent consultant working out of Norway. Though both are internationally known, there are probably few computing people who know both. Their worlds do not have a large intersection. If you knew the two of them only through these books, your stereotype of the two computing cultures would be reinforced. Wirth's book is scholarly, disciplined, and theoretical; Gilb's, anecdotal, richly varied, and full of facts and figures. But your impressions of the two authors would be wrong: Wirth and Gilb are very much more alike than their books would indicate—more perhaps than they would like to admit. What has happened to them, I believe, is that

they have allowed their work to be shaped by the imagined shape of their audience, in which they see the split rendering the two computing cultures.

As it happens, Wirth is among the most practical-minded professors of computing I know. He never speaks—at all! He has built real programs, and continues to do so out of a deep belief that an important segment of our knowledge comes from direct experience. Tom Gilb, on the other hand, is among the most theory-minded consultants I know. He has extracted broad regularities from the gnarled field of edp applications, and continues to do so out of a deep belief that good theory is the most practical thing we have.

In a sense, Wirth's book is far less disciplined than Gilb's, for he frequently lets slip an altogether practical warning on the dangers of excessive "tuning" of a program to a particular machine, or the problems we always seem to have with uninitialized variables. To some computer science professors—the ones who wanted to be mathematicians but never quite made it—such glimpses into the real world of computing will be inexcusable. To them, difficulty in moving a program from one machine to another, or in getting it to run in the first place, is merely evidence of the student's inferior intellect.

Gilb, on the other hand, generally does a niftier job of concealing his theoretical tendencies. Such leanings would be taken as subversive by those of his readers whose claim to fame as "systems programmers" is their absolute mastery of every bit-tweaking device on one machine or operating system. On the surface, except for a final section flirting with 'Datametrics,' his book is a dense collection of down-to-earth advice and imaginative practical ideas on how to design reliable data processing systems.

An example may illustrate the contrast. In discussing files—and this in itself is a rather subversive thing for a computer science professor to do—Wirth gives a sample program for "eliminating of redundant blanks." Reading this program, I noticed that it does undefined things if the file happens to terminate with one or more blanks. Such a flaw seemed entirely out of character with the precision that Wirth customarily shows in his programs, and which he strongly advo-

cates and demonstrates in his book. I was astonished that such a common problem would have escaped his notice. Could I have been mistaken? Eventually, I found the key—a sentence inserted in the problem definition that stated:

"The last character of the input file is not a blank." The insertion of that sentence makes the program right, in the computer science sense. I don't believe for a minute that Wirth believes it.

As Gilb says, "no reliability defense system (should) be protected by a *single* layer of protection at *any* point." It is unrealistic to depend on the last character in that file being a non-blank even if, as Gilb makes so dramatically clear, it was an output file from another program. As a matter of fact, the most likely place for redundant blanks to creep into a file—man or machine-prepared—would be precisely at the end, where they would be least visible.

Wirth knows that the assumption is unrealistic, but that it makes for a crisp program to please the computer science professors, who, after all, decide which textbooks to use. Gilb, on the other hand, would demolish that example, lest his clients demolish him for oversimplification. Each author is right, each has important things to say to the serious practitioner or student, but each should be bridging the gap, not widening it.

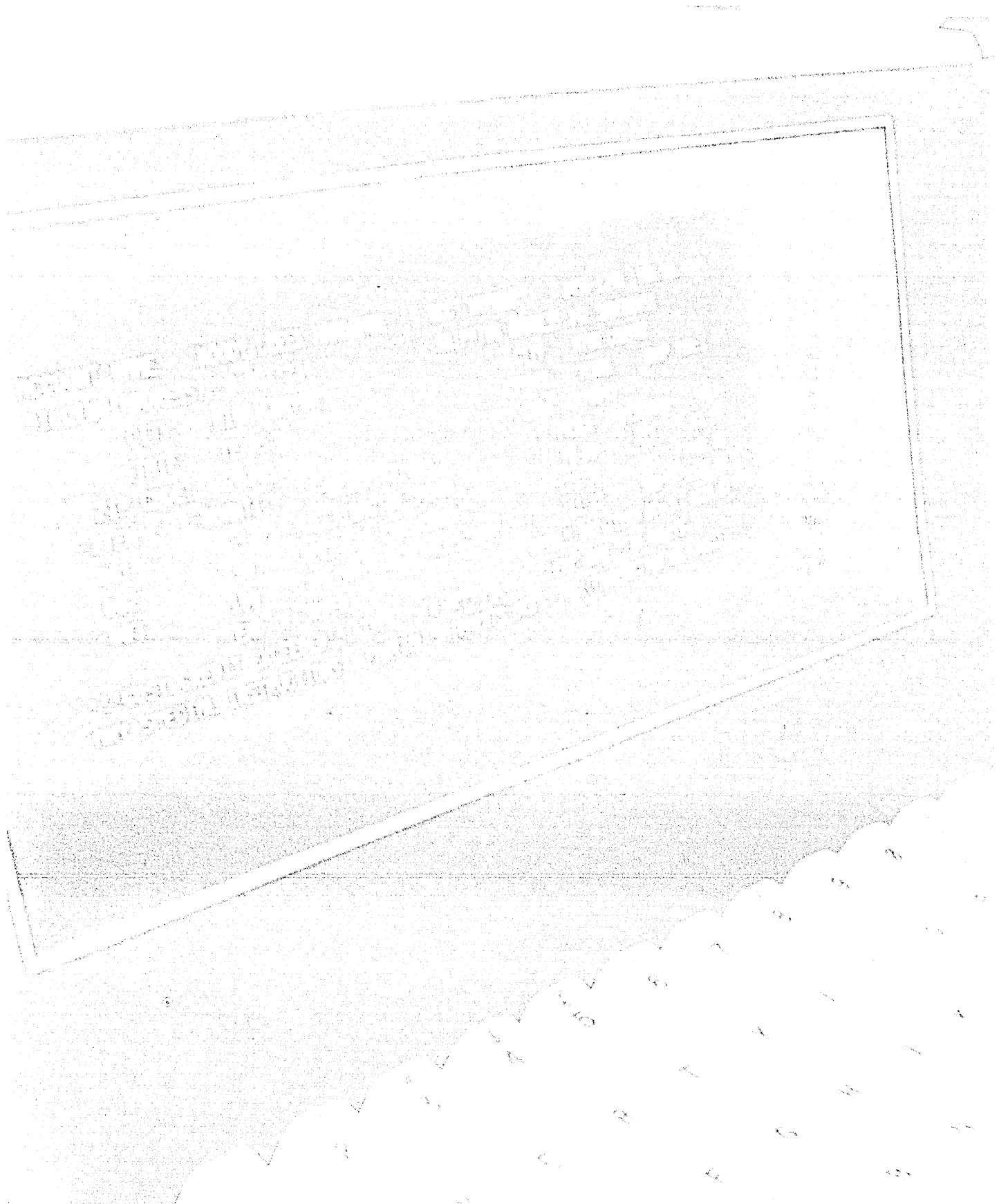
Wirth, of course, is absolutely right to simplify examples for students. Nobody seriously believes it is important to teach how to write a multiplication loop or number conversion for its own sake. His example of eliminating redundant blanks from a file is thus fine pedagogy. But it gives a misleading impression of potential elegance in programming. If I read Gilb correctly, over 80 percent of real application design is defending the system from dirty realities. We cannot afford to turn out computer programmers who think that *saying* there is a non-blank, or should have been, will terminate their responsibilities.

What Wirth should have done, in my opinion, was to add at least a problem stating:

What will happen to program 10.20 if there *is* a blank at the end of the file? How could the program be written to protect against this situation? What are the chances of a blank appearing, even though we have been assured that there shouldn't be one? What could we do *outside* the program to prevent trouble?

This is the kind of tough problem that Gilb tackles head-on, even though it has no neat, mathematical solution. If Wirth had done this, though, he

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source data

would have sullied his book and lost some of the "computer science market." Gilb, on the other hand, protects his market by the opposite tactic; reading his book, we might get the impression that the only way to get clean edp systems is with a shovel.

This destructive syndrome must be stopped if books are to make a contribution to computing. Computer scientists are creeping towards ever more "mathematical" writing. This wouldn't be so bad if they were all as good at it as Wirth, but has generally proved only a smoke screen for inexperience. Practitioners are put off by these notational games and throw out the baby of good theory with the dirty bath water of pseudo-mathematics.

An axiom of publishing theory says that if you try to get the union of two audiences, you get their intersection. If the significant material packed into Gilb's and Wirth's small books were to be packaged into a larger volume, it probably wouldn't sell 100 copies, while each by itself will sell thousands.

Then what can we do? As a start, I would suggest a simple rule that each of us—educators and practitioners—can start following right away: if you read computing literature at all, read it in a balanced diet of one kilogram of theory to one thousand grams of practice. An excellent first meal would be a combination salad of Wirth and Gilb.

—G. M. Weinberg

Mr. Weinberg is president of Ethnotech Co. and has been a professor of human science and technology.



AFIPS Brochure

The American Federation of Information Processing Societies, Inc. (AFIPS) has a brochure entitled *All You Ever Wanted to Know About AFIPS Constituent Societies . . . But Could Never Find in One Place*. AFIPS is a federation of 13 nonprofit professional societies engaged in information processing. The brochure lists the goals and purposes of each society, membership requirements, activities, publications, etc. Among the societies are The American Society for Information Science (ASIS), American Statistical Association (ASA), Association for Computing Machinery (ACM), IEEE Com-

puter Society, Society for Computer Simulation (SCS), and the Society for Industrial and Applied Mathematics (SIAM). AFIPS Headquarters, Montvale, N.J.

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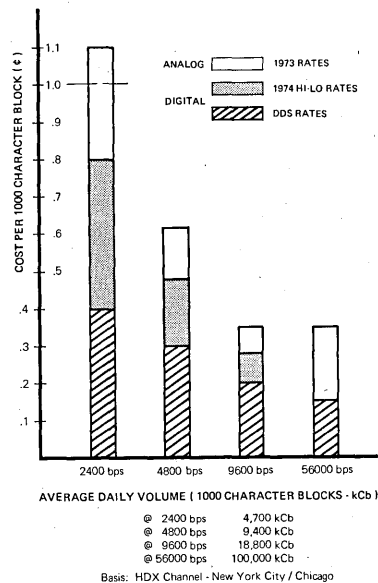
Information Management

A report aimed primarily at the dp service manager as an aid in assessing interactive information systems available as packages and services, many tailored to the "non-programmer," has been issued by the National Bureau of Standards. *A Technical Index of Interactive Systems* describes 46 of these systems in terms of a list of over 50 technical features, including operational and background information. Examples of the systems described are IMS/360, GIM, MARK IV, QUERY UPDATE, and SYSTEM 2000. This 73-page report (SD Cat. No. C13.46:819) is available for \$1.20 from the Superintendent of Documents, U.S. GOVERNMENT PRINTING OFFICE, Washington, D.C. 20234.

Common Carriers

Some of the specialized common carriers have been closely studied by this communications research firm to produce *Planning Guide: Dedicated Digital Networks*, a 200-plus page hardbound report. AT&T's Dataphone Digital Service and Datran are carefully contrasted; Western Union's Multipoint Data Service, the Dataroute trans-Canada network, and some European digital nets are also covered. The book

FIGURE 2 — TYPICAL PRIVATE LINE TRANSMISSION COST PER 1000 CHARACTER BLOCK



is liberally illustrated with tables and figures, such as above, and 117 of its pages are appendixes of items like tariff excerpts. The report is priced at \$85

including postage and handling. The vendor also offers companion tariff reporting services, and has scheduled a second volume, *Planning Guide: Switched Digital Services*, for the end of this year. CENTER FOR COMMUNICATIONS MANAGEMENT, INC., Ramsey, N.J.

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\$7 Billion in Memories

According to this study of the *Computer Peripheral Memory Industry*, the \$4 billion done in 1973 in worldwide sales of main memory, tape, and rotating memory will expand to \$7.1 billion in 1978. How these dollar figures break down is included in the contents of this 47-page report as well as the numbers of units to be shipped, the pertinent technologies, and the vendors involved. Projections of the estimated market segments, and such diverse things as projected cost per bit and the market impact of the growth of minicomputers are also covered. The study is priced at \$450; descriptive materials are available free. CREATIVE STRATEGIES INC., Palo Alto, Calif.

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Design and Measurement

Reports number 17 and 18 in the Infotech State of the Art series are on *Computer Design* and *Computer Systems Measurement*. Both volumes are about 700 pages, and follow the now standard formula for Infotech: an introduction, a couple of hundred pages of analysis of the subject, then invited papers and speech text, ending with annotated bibliographies and indexes.

The volume on design includes presentations by authors from the major computer manufacturers, including CDC, IBM, Univac, and Digital Equipment, plus papers from other designers and users, including one by D. B. G. Edwards on the Manchester Univ. MU5.

The tome on performance measurement includes pieces by R. W. Hamming, Ken Kolence, and Dudley Warner, among others. Volumes in the series are available separately for \$125, or on a subscription basis (eight for \$700). Descriptive literature is available. INFOTECH INFORMATION LTD., Berkshire, England.

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Security Bibliography

July saw the first issue of *Computer Security, Auditing and Control*, a semiannual review of articles, books, and bibliographies on topics related to computer security. Approximately 80 periodicals will be regularly reviewed

(Continued on page 47)

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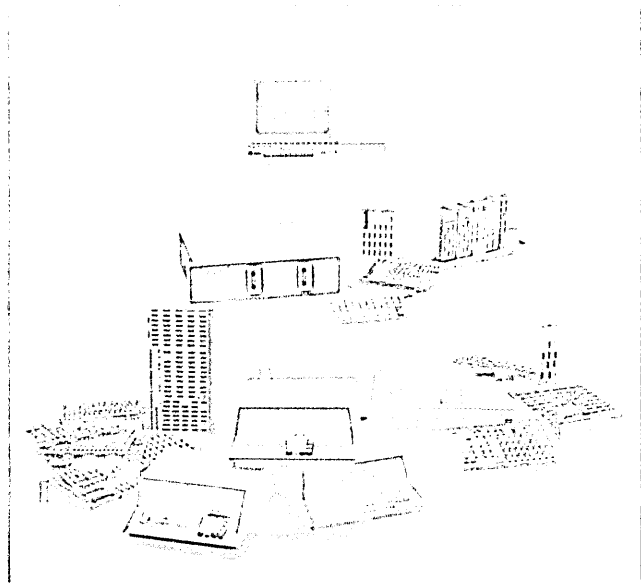
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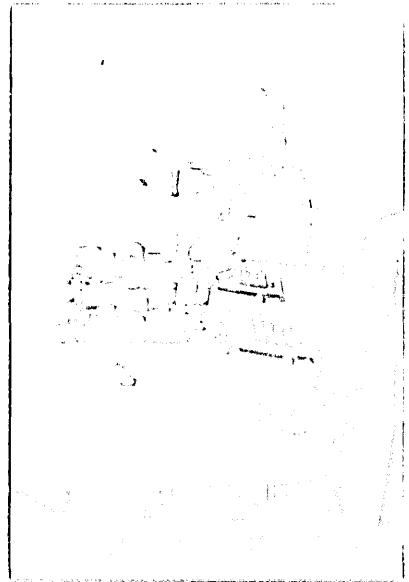
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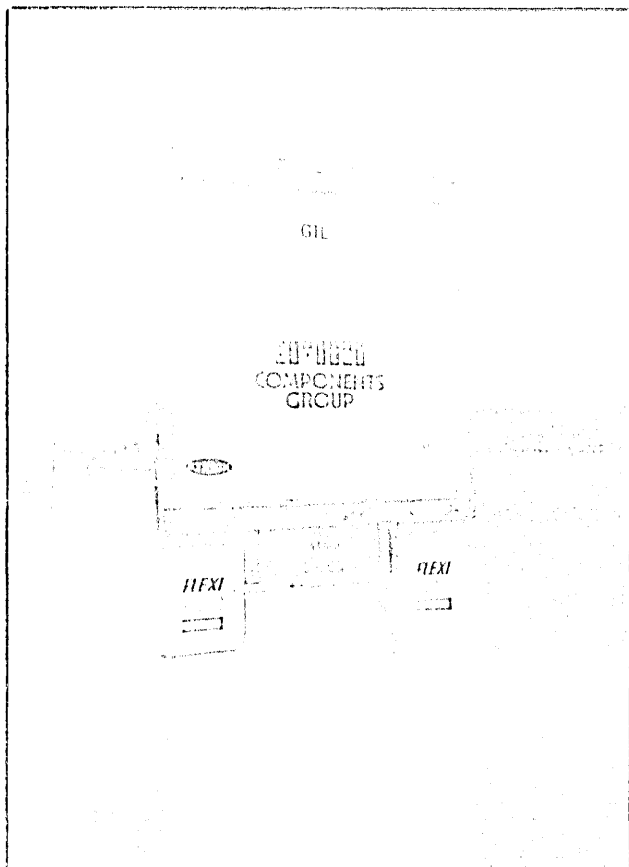
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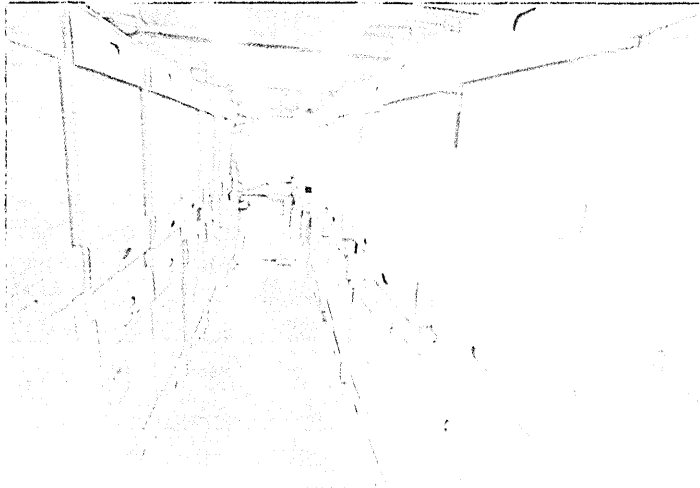
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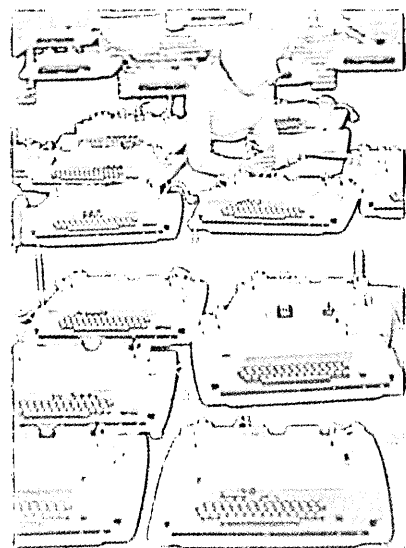
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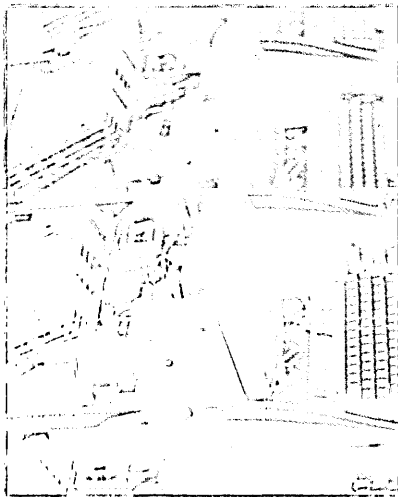
easy to interface to any other commonly used minicomputer. (If you wish, we'll even design and manufacture your interface in volume.)

Some Components Group products, like our cassette system, remote terminals, and logic modules, are products that we have been manufacturing for a number of years, in quantities to support only our own systems.

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and a minimum of sensitive or moving parts. Maintenance, when necessary, is accomplished by plug-in replacement of modular subsystems.

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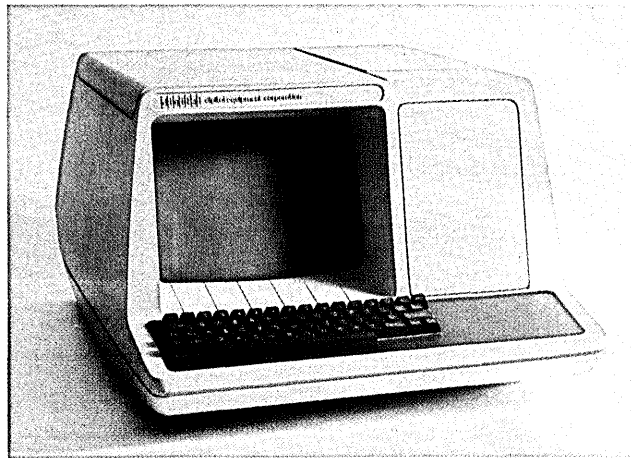
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Interfacing is with a standard 20mA current loop, or with an inexpensive EIA option for access to the computer over standard



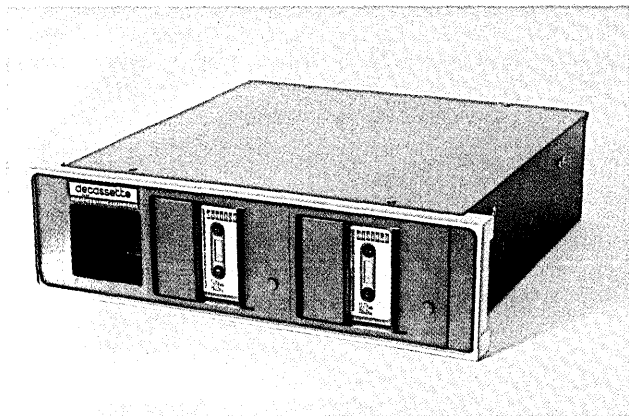
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Under \$1600 in quantities of 100.

The TU60 cassette mag tape system was designed for accuracy and reliability. It reads even very low data levels, yet rides right over any noise between the data blocks.

Compared to paper tape, the TU60 is easier to handle, less messy, and a lot more versatile. (Ever try to erase a hole?)

And the TU60 is tough. Its extra-heavy 1 mil tape resists stretching and edge wear, and is spec'd for a minimum of 1000 passes. Reel-to-

reel drive and servo-controlled motors give smooth, easy starts and stops, with no capstans, pulleys or pinch rollers that could damage tape.

With an error rate ten times better than most other cassette systems, the TU60 is a machine you can count on. The read electronics adapt to the tape speed, so power variation or mechanical difficulty won't cause mistakes on the tape.

Other error reducing features include automatic leader detection, single-track low-density recording, and 16-bit cyclic redundancy checking.

Maintenance is rarely necessary. When it is, it's no problem. The top flips open, everything is accessible, and the two main modules can be replaced in minutes.

And look at the price.

So how come you're still using paper tape?

A low-cost, easy-to-use microprocessor that you can have right now.

Our MPS microprocessor series of modules: the least expensive microprocessor on the market.

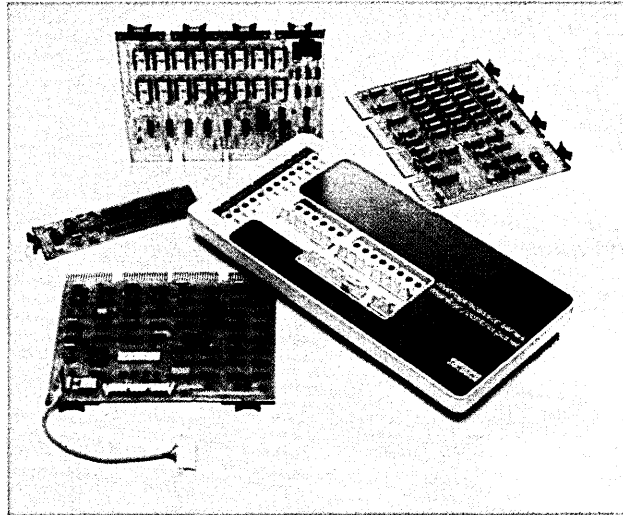
We designed the MPS using only standardly-available components with a proven track record. The CPU employs reliable P-channel MOS/LSI silicon-gate technology. We can get it to you now, and we can get it to you without the quirks and bugs that plague a too-new technology.

You can get it on-line fast, too: the MPS interfaces easily. Since its external circuitry is TTL-compatible, you can use it with Digital's broad line of logic modules.

Software development is easier. Control programs are prepared on a small, low-cost PDP-8 minicomputer, using the MPS software-development kit of six basic programs.

Physically, the MPS is a series of four building-block modules and an optional control panel. A basic, fully-operational processor can be assembled from as few as two modules: the CPU and a memory module.

The 8-bit parallel processor can directly address up to 16K words of memory; cycle time is $12.5\mu\text{sec}$. Reprogrammable memory (PROM)



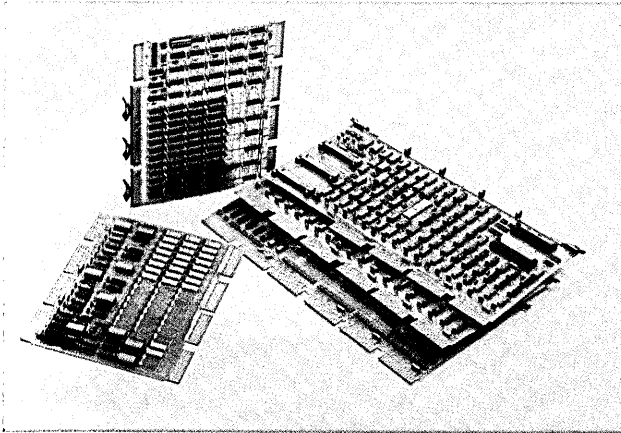
**\$476 in quantities of 100.
(CPU & 1K RAM.)**

is available in 256-word increments. Read-write memory (RAM) is available in 1K-word increments. An external-event-detection module implements nine levels of priority-arbitration. These include application-defined six-level priority interrupt schemes, AC and DC power-failure detection capability, and the processor-controlled functions of Halt and Restart.

The MPS gives you the convenience of building-block modularity and a design development package that allows you to customize to your application. It's an intelligent solution to low-end processing and control problems.

The PDP-8/A component computer.

A no-nonsense, no-compromise computer-on-a-board.



**\$572 in quantities of 100.
(CPU & 1K RAM.)**

To give you speed and performance at an extremely low price, we've put the world's most experienced mini-computer, the PDP-8, on a single board.

And we've done it using only proven, readily-available, multi-source, MSI semiconductor technology.

The 12-bit PDP-8/A has a cycle time of $1.5\mu\text{sec}$, a huge, healthy software library, and the same powerful instruction set as the PDP-8/E. It's fully compatible with most PDP-8 family hardware, operating systems, and high-level

programming languages like BASIC, FORTRAN IV, and FOCAL.

The Omnibus™ backplane makes it easy to interface the PDP-8/A directly to more than 60 PDP-8 options and peripherals. To make your life even easier, we've made the seven most-requested options available on two option boards: serial-line interface, 12-bit parallel I/O, front-panel control, and real-time clock on one board; power-fail/auto-restart, memory extension, and bootstrap loader on the other.

We've employed expandable semiconductor memory to enable you to tailor your memory capacity to your needs, from 1K to 32K words. Choose ROM, RAM, PROM, or ROM/RAM combinations — mix and match to suit your application.

The PDP-8/A will give you minicomputer power at micro-processor prices. We start delivering in quantity in late 1974. We're accepting volume orders now; talk to us.

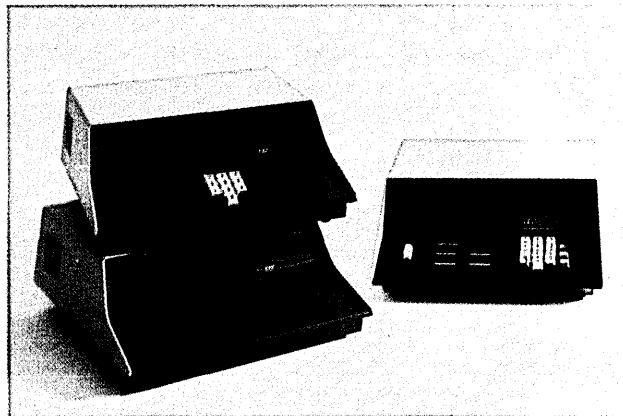
Remote terminals for people who think they can't afford remote terminals.

The RT01 and RT02 interactive terminals get around. To the warehouse, the textile mill, the stockroom, the factory floor, and a lot of other places where you might not expect to find the long arm of the EDP department.

Even non-computer people can use them to enter all kinds of data — crane positions, vat levels, logged time, part numbers, whatever — into a remote computer. There's no need for confusing, numerically-coded instructions. RT02 models will prompt the inexperienced operator, spelling out on the display what information is needed next.

The RT01 displays up to 12 digits of data in a numeric Nixie™ display. For non-numeric response, it has programmable status indicators. The 16-key pad will output 30 ASCII characters.

The RT02 costs more and gives you more. A 64-character gas-discharge alphanumeric readout that



Starting at less than \$600.

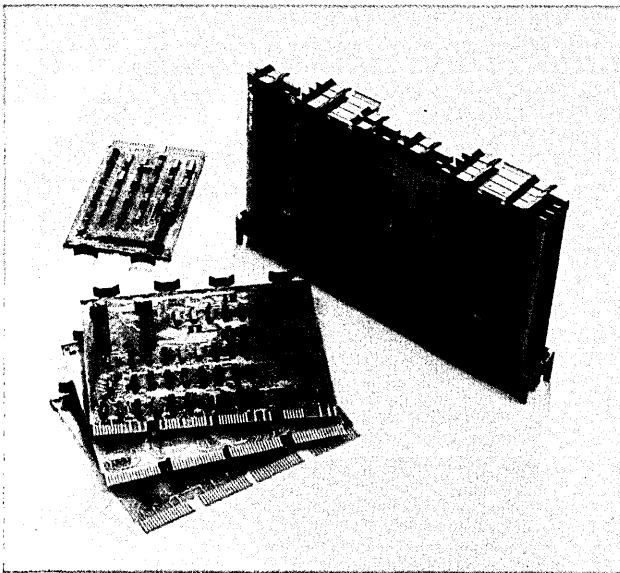
displays up to 32 characters at once. 16-key or 58-key input. Interactive display prompting.

Both terminals are ASCII-compatible, so you can interface them to any computer with a Teletype™ port. EIA modem interface is also standard.

Both have simple displays and few moving parts for built-in reliability and ease of maintenance.

And look at their down-to-earth prices. These are remote terminals that you can get close to.

Logic modules and custom interfacing to get it all together.



Digital, the world's largest seller of solid-state modules, gives you the widest choice on the market: over 400 pre-tested modules.

M Series modules. These high-speed logic modules give you high fanout, large capacitive drive capability and excellent noise margins. In frequencies up to 6MHz.

K Series modules. These noise-resistant modules are designed for easy system check-out in industrial control situations where noise-resistance is more important than speed. Though frequencies from DC to 100KHz are typical, we can give you frequencies as low as 5 KHz.

A Series modules. For communication between your computer and the outside world, our analog modules give you 10-bit and 12-bit performance in a family of mutually compatible functions — multiplexers, operational amplifiers, sample-and-hold circuits, A/D and D/A converters, reference voltage sources, and multiplying A/D converters.

DECKit interfaces. Our DECKits offer you pre-tested, fully-documented interfaces for a number of common interfacing situations. Basically just a few modules and a prewired systems unit, they eliminate design time, breadboarding, and wirewrapping.

And more. The Components Group will also supply you, in volume, with custom interfaces, custom modules, and custom variations of our standard terminals. Our Logic Products Handbook and Logic Systems Design Handbook can provide general support and solutions to specific standard problems. We also carry a full line of compatible hardware, power supplies, plug-in-boards, cabinets, racks and related equipment.

digital
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Unbundling the world's
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— we've got a lot to talk about. Call us direct at

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Prices quoted are in US dollars and will vary outside
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source data

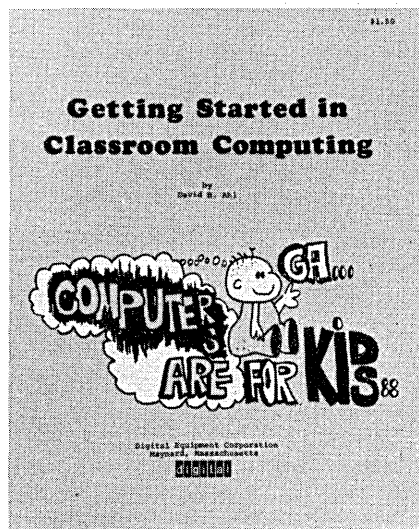
by the publication, including the *IBM Systems Journal*, *Harvard Business Review*, *Journal of Accountancy*, *The Wall Street Journal*, and something called DATAMATION. Abstracts are included for articles on the subject of auditing, fraud control, physical security, management control of dp, and privacy. The first copy ran 30 pages and included approximately 100 annotated article references. The subscription rate is \$22 prepaid, or otherwise \$30. A bibliography covering these subjects over the past ten years is also available, and is priced at only \$7.50 when ordered at the same time. MANAGEMENT ADVISORY PUBLICATIONS, Box 151, Wellesley, Mass. 02181.

Data Entry Newsletter

The publisher claims that *Data Entry Awareness Report* is the only monthly newsletter devoted to data entry systems and applications. A four-page report, each issue contains a detailed description of a new data entry product, plus industry news, and short descriptions of other new products and applications. Priced at \$30, the report is also available as a bonus with subscriptions to other publications, including the 300-page *Data Entry Today* (\$85 including two updates each year) and *Optical Readers Today* (200 pages and also \$85 per year with updates). MANAGEMENT INFORMATION CORP., Cherry Hill, N.J.

Computers are for Kids

A 29-page booklet, *Getting Started in Classroom Computing*, by David H.



Ahl, is designed to interest the grade-school student in computers and how to use them. Six games in an engaging

August, 1974

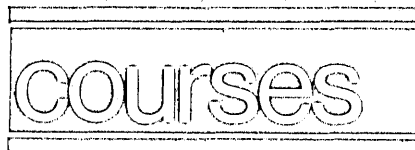
format are presented with the purpose of motivating the student to further inquiry into computing. BASIC source statements for one of the more complex games are included, and binary numbers are introduced. Price: \$1.50, plus 50¢ postage. DIGITAL EQUIPMENT CORP., Maynard, Mass. 01754.

Attitudes Toward EDP

A high level of concern among corporate executives with the productivity and justification of their information systems and EDP operations, is documented in *Management Attitudes Toward Information Systems and EDP Function*, a report prepared by Soltis Assoc., Management Consultants. Continually rising EDP costs, shaky confidence and credibility in EDP efficiency and productivity, and insulation of EDP activities from some management scrutiny, are touched upon in the managerial attitudes surveyed in a questionnaire sent to 600 corporations, of which 152 responded. This report is available for \$3.50. SOLTIS ASSOCIATES, 2120 Oliver Bldg., Pittsburgh, Penn. 15222.

Computer Graphics

Cost-Benefit Analysis of Computer Graphics Systems, authored by Ira W. Cotton, is a report published by the National Bureau of Standards which assesses the state-of-the-art in cost-benefit analysis, as opposed to the analysis of system performance, of computer graphics systems. A combination cost-effectiveness and benefit analysis is discussed, and an experimental methodology is suggested for improving such analysis of computer graphics systems, although no attempt is made in the report to actually perform such an analysis. The 47-page report (SD Cat. No.: C13.46:826) can be obtained for 90¢ from the Superintendent of Documents, U.S. GOVERNMENT PRINTING OFFICE, Washington, D.C. 20402.



Communications

The Bell System has been offering a continuing series of free seminars in communications since 1963, and has reportedly attracted some 30,000 executives during this period. The seminars are held in New York City.

Three basic courses are offered. The first is a one-day program for top-level

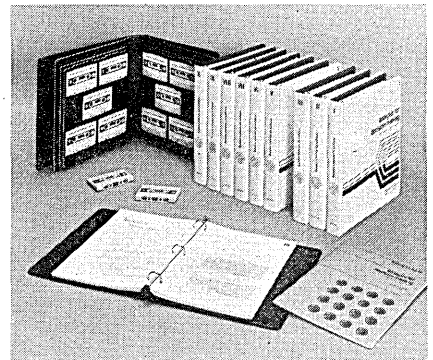
executives that covers the philosophy behind communications planning. The second is for operating managers, including systems analysts and department managers; it devotes more time to specific systems capabilities. The third is a group of one-day courses covering specific industries, including data processing, retailing, banking, health care, and even the press.

Demonstrations of voice, data, and video equipment are given at all sessions. Case histories are used, and ample time is given for discussion, Bell claims. Continental breakfasts and lunches are also thrown in free. For schedules contact the Communications Consultant of your local Bell Telephone Co.

Management Self-taught

Harvard Business School developed this self-instructional course on "Analysis for Decision Making," in the form of 10 3-ring binders and 20 coordinated audio cassettes. The course is based on the author's (Howard Raiffa) theory of decision analysis, and includes segments on decision trees, utility theory, information value, and probability assessment, among other topics.

The course is billed as the first attempt to teach decision analysis out-



side the university environment. It requires about 65 hours, and is said to be the equivalent of one semester. Abbreviated "tracks" through the materials alternately give the student 35 hours (the equivalent of an intensive one-week seminar), or 12 hours (the equivalent of a two-day seminar or "executive overview"—for managers who already know how to make decisions?) The package price is \$750. ENCYCLOPAEDIA BRITANNICA EDUCATIONAL CORP., Chicago, Ill.

FOR DATA CIRCLE 260 ON READER CARD

Minis and Micros

Technical managers, systems designers, and engineers are supposed to come away from this 4½-day course with the ability to evaluate, price, and de-

Oh, sure, our GTE IS/1500 key-to-disc systems are competitive in price. But we feature some other things that put us way above most other systems:

A brilliant 12" screen (not the usual 9").

Card reader and high-speed printer capability (which most competitors don't offer).

Up to 32 terminals per system (twice what you'll get with most others).

And, if operator comfort means more data on the disc, we think nothing touches our stations. From the wrap-around modesty panel to doubly-backed-up

error alert, everything's designed to keep things moving fast and accurately.

But the biggest extra you get from us is our software package. It's a whole bundle of add-ons at no added price...

Reformatting capability (with one competitor, it costs \$50 a month; another doesn't offer it at all).

Plus tape-in capability. Batch balancing (including data validation). Operator statistics. Multiple format levels (up to 8 levels with intermediate level tab stops).

Our key-to-disc system has a lot



All this would cost you hundreds of dollars a month from someone else. From us, it's part of the deal.

And here's something nobody else can offer you at any price: the unmatched GTE service organization, with more than 700 people at key locations around the country.

When you want an updated data-entry system, look at more than just price.

Now, more than ever, GTE Information Systems belongs between you and your computer.



GTE Information Systems: One Stamford Forum, Stamford, Conn. 06904. **Atlanta**, 404-688-1670; **Boston**, 617-237-5222; **Chicago**, 312-332-7800; **Cleveland**, 216-771-8455; **Dallas**, 214-741-4361; **Detroit**, 313-353-5494; **Hartford**, 203-563-3767; **Houston**, 713-626-1713; **Los Angeles**, 213-380-2309; **Minneapolis**, 612-854-2898; **New York**, 212-486-3290; **Philadelphia**, 215-649-7410; **Pittsburgh**, 412-391-4170; **St. Louis**, 314-863-0330; **San Francisco**, 415-349-2600; **Seattle**, 206-283-3103; **Washington**, 202-293-2800; **Montreal**, 514-866-9324; **Toronto**, 416-362-1541; **GTE/IS Europe S.A.**, 412 Ave. de Tervuren, 1150 Brussels, Belgium. CIRCLE 73 ON READER CARD

more to offer than just price.



source data

velop minicomputer systems for their own applications. The mainframes, peripherals, and software are covered, and the vendor claims that extensive prior knowledge of the computer field is not required. Sessions will be held in Montreal (Aug. 12-16), Houston (Aug. 26-30), and Washington, D.C. (Sept. 9-13). Course materials include two volumes of pre-printed notes, a text, and bound volumes of reprints and manufacturers' literature.

The course is priced at \$425, with discounts for groups of five or more. For information write TECHNOLOGY SERVICE CORP., 225 Santa Monica Blvd., Santa Monica, Calif. 90401.

Small Business Computers

This firm estimates that 14,000 organizations will acquire a small business computer in 1974, and has set up its three-day seminars to instruct in understanding, evaluating, comparing, and implementing small business machines. The first day's sessions cover technology, feasibility studies, vendor selection, etc. Day two is spent on reviewing systems from major manufacturers (including the IBM S/3, Burroughs B700, and Singer System 10) and reviewing some specialized offerings (like Qantel's and Four Phase's). Day three covers applications, management, and alternatives (including service bureaus).

The individual registration fee is \$425, but this falls to \$370 each for groups of three or more. Seminars will be held in Washington, D.C. (Aug. 26-28) and San Francisco (Sept. 4-6). For information contact AMR INTERNATIONAL, INC., 1370 Avenue of the Americas, New York, N.Y. 10019.

CORRECTION

In our June issue, we announced a new masters of information sciences program at Harvard Univ., and gave the impression that only field work is necessary. Two years of coursework at Harvard will also be required.



Software Reports

Two updated independent reports on Informatics Mark IV Systems, currently in use at more than 700 computer installations in the U.S. and 37 other

countries, are available free of charge. Datapro and Auerbach compiled these studies of the in-depth technical and operational aspects of these systems, including user reactions. The Datapro report on the Mark IV File Management System, which processes information by manipulating data files, includes detailed operational characteristics and a management summary. INFORMATICS MARK IV SYSTEMS CO., Canoga Park, Calif.

FOR COPY CIRCLE 265 ON READER CARD

Graphics Display System

A brochure describes the PDS-1G minicomputer-based interactive graphics display system which provides both on-line and standalone capability at prices starting under \$10,000. The IMLAC PDS 1G is a fully programmable, interactive graphics system which operates with all host computers that support remote terminal operation. IMLAC CORP., Newton, Mass.

FOR COPY CIRCLE 266 ON READER CARD

Valu-Lib System

The Valu-Lib Tape Library Control System, summarized in a 28-page brochure, is designed to manage and control a data center tape library, helping to minimize operator set-up time and prevent operator mistakes. The brochure reviews the features and benefits of the system, and provides an extensive systems overview with sample reports and subsystem flowcharts. VALUE COMPUTING INC., Cherry Hill, N.J.

FOR COPY CIRCLE 267 ON READER CARD

Time-sharing Systems

Evaluating a stock's performance in seconds, forecasting financial conditions, file handling and data retrieval, are the functions of several time-sharing software systems created by First Data Corp. FASTOCK, a computerized stock market data base, contains current and historical trading information on more than 14,000 stocks, bonds, mutual funds and government issues. BBL (Basic Business Language) can produce management reports, financial modeling and risk analysis. DMARS, a sequential search system, handles data files, and SYSTEM 1022 involves generation, storage, maintenance or retrieval of information for medium to large data bases. All these systems run on the DECsystem-10, and brochures are available. FIRST DATA CORP., Waltham, Mass.

FOR COPY CIRCLE 268 ON READER CARD

Formatter Booklet

A 40-page application booklet provides

a complete description including interface requirements for formatters used with all tape drives manufactured by Pertec. Both PE and NRZI formatters enable the generation and reading of ANSI and IBM compatible magnetic tapes and provide data encoding, decoding, deskewing, error corrections and tape motion control. PERTEC CORP., Chatsworth, Calif.

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Systems Analysis

"Systems" are defined rather broadly by this firm to mean "operating routines management uses," and only parts of their offerings are specifically related to dp. The target audience is management, systems analysts, and even trainees. Products or services include: consulting; five-day workshops (systems analysis, management, and project management); on-the-job extension courses (systems, systems for programmers, forms design, forms control, records and records management, and others); and various publications. A catalog of the offerings is available. SYSTEMATION, INC., Colorado Springs, Colo.

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Display Terminal

Complete product specifications are included in the data sheet describing the Infoton VISTAR/XL Microprogrammable Display Terminal. The VISTAR/XL features a built-in microprocessor and read-only memory. INFOTON, INC., Burlington, Mass.

FOR COPY CIRCLE 271 ON READER CARD

Multiprogramming Survey

According to a survey by Value Computing Inc., users of its Computer Scheduling and Control System are running an average of 2.78 jobs concurrently. For OS, the average is lower at 2.34 jobs running at one time, and for DOS, the number is 1.8; however, cutting batch production to less than 70 percent of the workload raises the average to 3.9 jobs. The company claims that users of its system get more than 30% more multiprogramming concurrency than non-users. The survey results are printed in the company's newsletter which is free on request. VALUE COMPUTING INC., Cherry Hill, N.J. □

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birth defects
are forever
unless
you help

March
of
Dimes

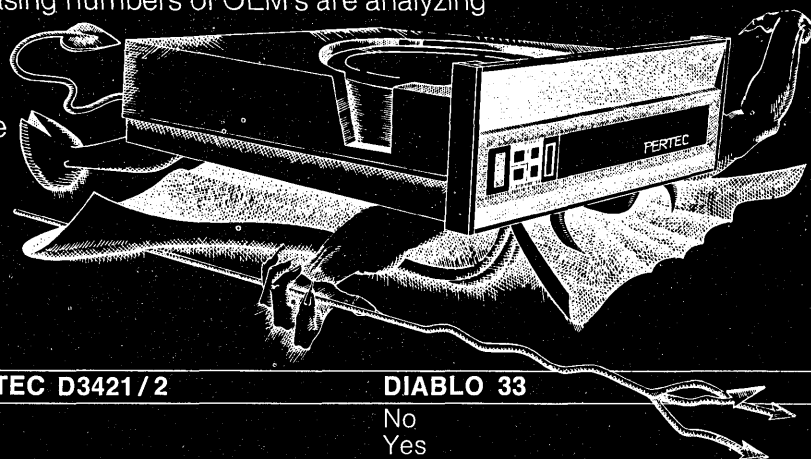
THIS SPACE CONTRIBUTED AS A PUBLIC SERVICE BY THE PUBLISHER

The Smashing Comparison

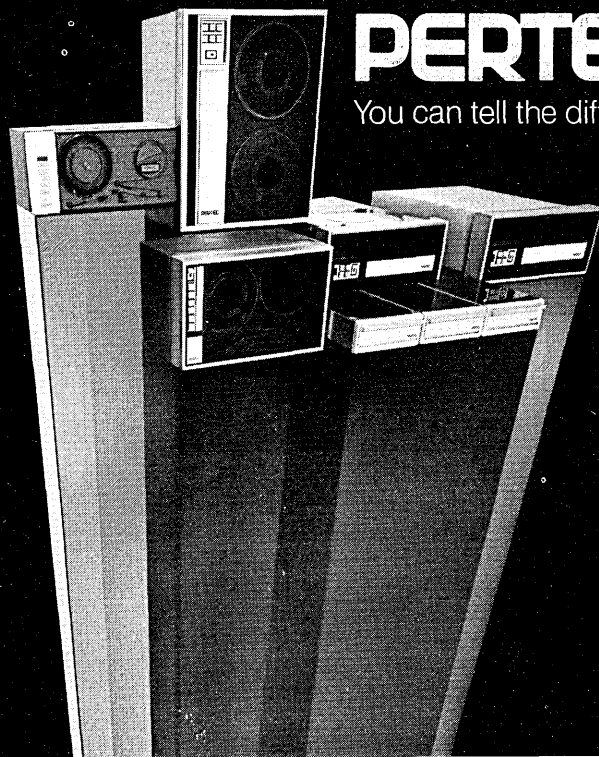
Since we began comparing the Pertec D3000 with the Diablo 33, sales of Pertec drives have more than doubled. Increasing numbers of OEM's are analyzing the differences, and buying Pertec.

Now with 200 TPI, you can double your capacity. We also provide a simple compatible interface, worldwide service and more.

Make your own comparison using the simple chart below. And for more information, call us collect at (213) 882-0030 or write us at 9600 Irondale Avenue, Chatsworth, California 91311.



FEATURE	PERTEC D3421/2	DIABLO 33
200 TPI	Yes	No
100 TPI	Yes	Yes
2200 BPI	Yes	Option
Removable and Fixed Disks	Yes	Yes
Disk Rotation	1500 or 2400 RPM	1500 RPM only
Transfer Rate	1562 or 2500 KHz	781 or 1562 KHz
Access Time (msec)		
Track-to-Track	9	15
Average	35	70
Maximum	60	135
Track-Offset	Yes	No
Mechanical Sectoring	Yes	Yes
Electronic Sectoring	Yes	No
Daisy Chain Capability	Yes	Option
Unit Select Switch	Yes	No
Write Protect	Yes	Option
Individual Switch & Indicator for Each Platter	Yes	No
Air Filtration	0.3 Micron Front Intake	"Absolute" Type
Internal Power Supply	Yes	No
Dimensions	19" x 8 ³ / ₄ " x 26" (rack mount)	17 ¹ / ₂ " x 13" x 22 ⁷ / ₈ "
Slide Mounts	Provided with unit	Option



PERTEC

You can tell the difference just by looking.

Announcing the first civil engineering computer that can help you build anything. Including your reputation.

Digital's PDP-11 civil engineering computer system.

The first system designed to handle all your civil engineering requirements and then some.

A system so dramatically different, it's got to be way ahead of whatever you're using now.

And you can have it for a purchase price of as low as \$100,000.

It includes all the applications software a civil engineer could

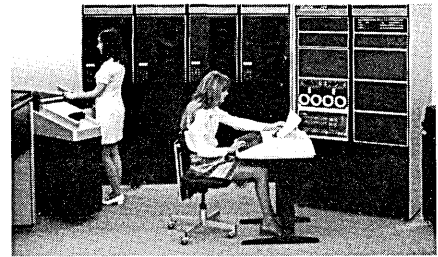
need, including COGO, STRESS, and PLOT. Plus the mass of software that comes with any PDP-11.

And we designed it so you can mix the processing load to help your engineers build while you run our applications software to help build the rest of the company's business.

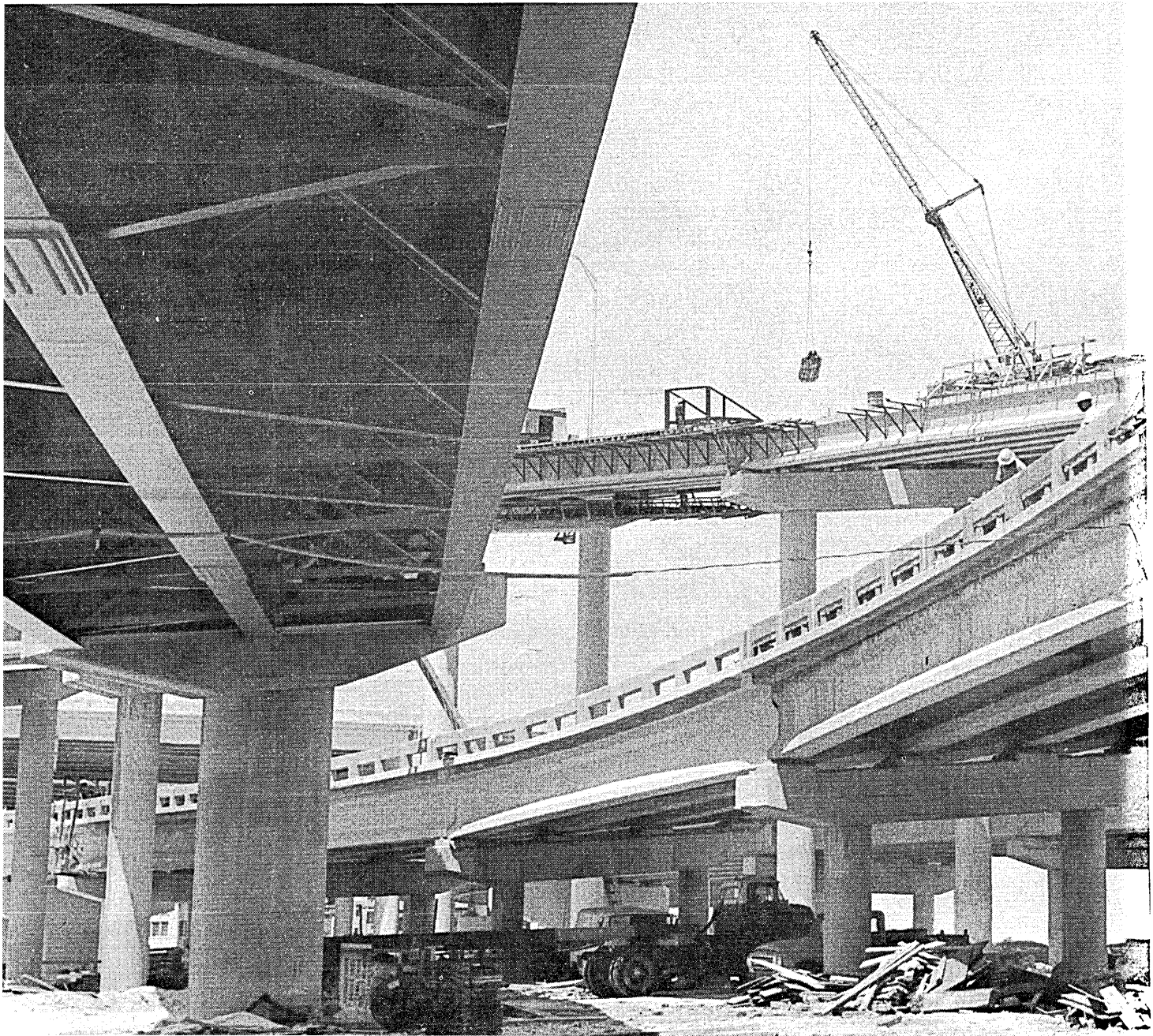
Our operating systems offer remote batch processing simultaneous with multiprogramming and batch processing or time-

sharing. So your system will reach out to the problem solvers.

You also get PDP-11 high-



speed performance with 48K of memory expandable to 128K.



Over 60 peripherals to choose from. Storage capacity to let you keep all your important operating data on line.

Up to 32 hardcopy and/or video terminals located wherever you want them.

Graphics if you need it.

And if your present system is more of a problem than a solution, try our conversion aids between 1130 FORTRAN and PDP-11 FORTRAN IV. They make

switching over a breeze.

But most important, a typical system gives you six to ten times the performance of competing systems. For a very atypical price.

Digital's PDP-11 civil engineering computer system. It'll help you build anything. Including your reputation.

Write for your free CE Computer Planner's Kit: Digital Equipment Corporation, Maynard, Mass. 01754. Or call

(617) 897-5111, Ext. 2358.

European headquarters: 81, route de l'Aire, 1211 Geneva 26. Tel: 42 79 50. Digital Equipment of Canada Ltd., P.O. Box 11500, Ottawa, Ontario K2H 8K8. (613) 592-5111.

digital

CIRCLE 50 ON READER CARD



Small-scale versions of 1984's two-way tv are alive, if not well, today. Transfusions of capital may be part of the cure.

THE OUTLOOK FOR INTERAC

Talking back to your television set—not to complain about the programs, but to conduct business conferences, to shop, to confer with a doctor, to vote—is a possibility which is technologically feasible today, here and now. Interactive television has already been in operation in a number of experiments conducted in several parts of the country. Social, economic and political implications of importance are yet to be considered. Along with the further speed and ease with which daily life can be conducted with the help of electronic media, looms the possibility of monitoring the user, with its concomitant danger to privacy. In the distance, the nightmare possibility of a 1984 type “Big Brother” who would take despotic advantage of this technology, brings fear to many. But for good or bad, the technology of the interactive television is available today, and *will* be used.

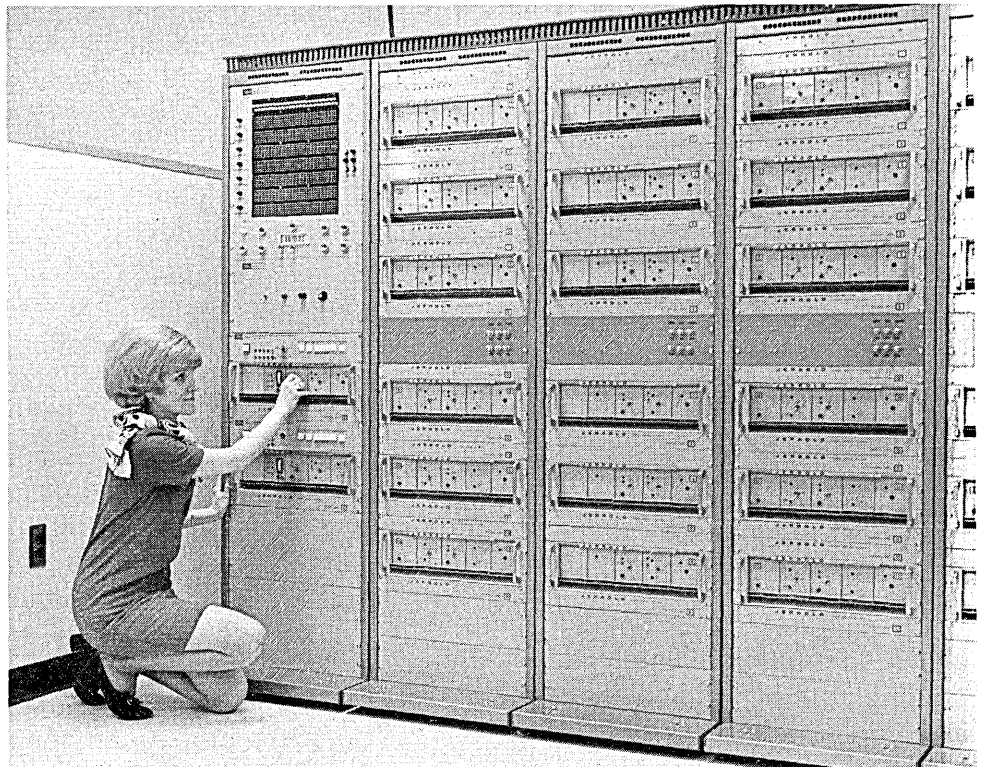
Conventional television is a broadcast medium using the airways within a comparatively narrow bandwidth (approximately six megahertz per channel). The “over-the-air” broadcast nature of this system limits the numbers of usable channels, and therefore, also the options available for new applications of the medium. Broadband communication networks (commonly referred to as cable television) can provide a much wider spectrum (about 300 megahertz), and thus can allow both for more channels and for a type of two-way communication with the potential to change our participation in television from passive to active. Current technology allows for 20 or more television channels to be cabled to each

subscriber. Some of these channels can be reserved for return communication providing the subscriber with a means for response.

It should *not* be inferred that cable television will evolve to provide a fully selective system. It is economically unfeasible to duplicate, on a wideband basis, what is provided in narrowband channels by the switched telephone network. However, because the new

broadband network involves cable connections rather than airwaves from the headend (beginning of the cable system) to the home, it does provide additional flexibility.

A simple configuration for such a system can be described in the following way: Assume that your television set is connected to a simple inexpensive terminal device such as a pushbutton telephone. With this terminal you can



The CATV “broadcast” station, or headend, requires a good deal of hardware. Shown is part of a 35-channel set-up with facilities for scrambling the signal (scrambling can be a marketing tool or a kind of aid to privacy).

ACTIVE TELEVISION

request specific programs. Once you have keyed in the desired program you can continue to use the terminal to interact with that program as in the case of a televised learning program. You might also talk over the receiver when a voice response is indicated by the content of your program. Included in the network is a computer that not only handles program switching chores, but can also be used by the

customer for various tasks.

The hardware could also include a storage device so that images appearing on the screen could be saved—this is called frame grabbing—and printed out by a facsimile device. Such a system is similar to one tried in Reston, Virginia¹.*

This configuration may sound more like a telephone system than a broadcast system, which contributes to the



In-home hardware can range from a simple keyboard terminal to more sophisticated unscramblers and even facsimile recorders.

by Donald P. Buckelew
and W. David Penniman

difficulties to be encountered in controlling this new communication system. From the strictly technical standpoint, however, the problems yet to be faced are surmountable². To conclude, however, that a new, complex communications system will develop in this elaborate pattern because it is technically feasible, is to ignore practical economics. For example, the last time the FCC officially tallied the physical plant value of the existing telephone network (December 1970), the value was about \$70 billion. The obvious move would be to take fuller advantage of existing equipment before expending funds on new apparatus.

Much simpler cable systems are developing, however, that involve only modest return signaling capability to provide subscriber feedback. The simplest methods might be used to switch through homes in an area to determine which sets are on and what channel is being watched.

It is not surprising that many communications scientists are talking in terms of "information utilities" and "wired cities"^{3,4}. But, as in so many cases, the limitations are not in technology.

The costs

Two-way capability, now a requirement of new cable systems** as stipu-

*Please refer to list of references on page 58.

**It should be emphasized that the FCC has stipulated that the systems shall be capable of two-way service. It does not require that such service be put in operation. The FCC Third Report and Order says that all new systems going into operation after March 31, 1972, will have this capability. Existing systems have until March 1977 to comply.

Interactive TV

lated by the FCC⁵, adds from 15 to 30 percent to the capital cost of a cable system². The operator must double or triple his monthly income in order to support this capability, and this means he must offer a selection of highly desirable services of wide interest to a major segment of the public he serves. While the initial cost of system installation must be paid by private industry, the government has funded several experiments in system application³. The major funding, however, must come from subscribers.

Each user would require a television set with associated special equipment. He would have to pay for the equipment and for the services. The equipment costs could be of the following order of magnitude:

Simple response terminal:	\$200
Television set: current market price	
Storage unit:	\$200—\$400
Facsimile unit:	\$200—\$400

Mass distribution and utilization of new technologies might bring the total cost estimates down to a more optimistic \$400 to \$500 (according to the Cable Television Information Center CTIC)⁶. In any case, such a system would represent a major reallocation of disposable income for a family. In addition to the equipment cost, each household would probably pay a subscription fee for the cable service (similar to the minimum rate telephone bill) of about \$10 per month³. Additional charges would be levied by the commercial enterprises offering specialized services. If the basic service were charged by the hour, estimates are that it would cost about 25 cents/hour by 1975⁷.

It can be seen that such a service would be readily available only to the relatively affluent. The alternative is subsidy by government agencies which would probably hinder development of services and *could certainly provide a significant opportunity for invasion of privacy*.

An alternative financial approach is being explored in Irving, Texas, where a conventional CATV system is being provided to all subscribers free of charge in a pilot study. The only income accruing to the cable company will be from pay tv and two-way services⁶. This approach at least provides basic service to all citizens, but must obtain revenues averaging \$8 or \$9 per subscriber per month to break even. A wide range of two-way services are required to produce such revenue.

The current trend, however, is toward private funding for experiments to discover marketable services. Unfortunately, most experimentation has been highly restricted, and broad-scale

market studies have not been conducted to date.

Current experiments

A brief summary of current field studies of two-way systems is presented here to indicate the financing/product/market strategies currently existing⁶:

1. El Segundo, California Theta Cable Company

This is a follow-on of the Los Gatos, California, experiment conducted by TelePrompTer. Funding is from TelePrompTer and Hughes Aircraft. There were 20-25 terminals in the field by July, 1973, and 1000 were expected by the end of 1973. This goal has not been reached.

Initially the customers are not being charged for the terminals. Services offered include:

- premium TV (pay cable)
- merchandising
- ad testing
- audience surveys and polls
- security systems
- credit card verification

The results of this test will be used to determine the product mix for commercial consumption.

2. Orlando, Florida Orange Cablevision, Inc.

This is a two-phase study with the first phase completed. Phase one consisted of 27 terminals in the field to test fire, burglar, and emergency alarms, meter reading, pay cable TV, merchandising, polling and credit card verification. The second phase was originally to involve about 500 terminals for pay cable TV, special educational programs on a fee basis, merchandising and testing, security systems, and data transmission for business. Orange Cablevision intended to acquire the programming directly and not use any middlemen for program marketing. Presently, however, phase two is back on the drawing boards.

This company is also building two-way systems in Jackson, Mississippi, Bartlesville, Oklahoma, Stillwater, Oklahoma, and Appleton, Wisconsin.

The firm is also cooperating with a local medical group in a telemedicine experiment and has set up workshops for training people in the use of the public access channel.

3. Overland Park, Kansas Telecable Corporation

This experiment involved two children who were restricted to home and has now been terminated. The system is still in search of useful and financially feasible applications for its two-way capability. The operator was turned

down for federal funds and has not filed public service applications due to subsidy requirements. Local city officials seem to have little interest.

The company has installed a new system in Spartanburg, South Carolina, and hopes for better luck there.

4. Carpentersville, Crystal Lake, Illinois LVO Cable, Inc.

This pilot project involved six terminals used for fire, burglary, and panic-button alarm service, in a subdivision close to LVO. The system provided smoke and fire detectors, window tapes, etc., in addition to the regular



One of the home "terminals" presently used is this one from Theta-Com, the hardware supplier for the Theta-Cable El Segundo experiment.

cable service. The system is similar to one installed in Monroe, Georgia.

5. Akron, Ohio Akron Cablevision

This company is currently retrofitting its system for two-way operation but has no plans for placing terminals. They are merely obtaining the capability in compliance with federal standards.

6. Irving, Texas Total Communications, Inc.

This is one of the most interesting experiments in two-way television because it is placed in a town where there is no market for conventional cable television. Sets can now receive seven stations by using rabbit ear antennas. The firm intends to conduct a pilot study with 1500 subscribers who will receive the basic cable service free. They will provide pay cable tv and two-way services (merchandising, meter reading, opinion polling, etc.) to recover operating costs. These estimates indicate that \$8-\$9 will be required per month per subscriber from a base of 5000 subscribers.

There will be 26 channels, 10 of which will have restricted access. Some services will be paid for by the merchandisers (market studies, opinion polls, etc.) and others by the subscribers (security services). Rates have not yet been calculated. As indicated by CTC: "If the pilot project proves that a cable system in a well-served broadcast area can make it on pay cable tv and new services, it could have a powerful impact on the shape of cable systems in large cities."

While these experiments are testing the markets for a few potential applications, there are a wide range of services that have yet to be tested in the marketplace. Many services could be of primary use to government agencies. The "wired city" concept involving municipal administration, education, health, pollution, and transportation will undoubtedly be funded through tax dollars⁴. Government agencies would utilize the two-way cable systems in the same manner that they currently use the telephone system. Government, in fact, could become one of the primary users of broadband communication^{4,8}.

Most important is the fact that the economic viability of these services is largely untested. Yet to be determined is the right combination of services that is worth the risk to the cable operator. To date, few CATV operators have

many sociologists blame upon the one-way dialogue of our current mass media⁷. There is little doubt that this capability has the power to change our educational, health care, transportation, political, and employment activities as well as our recreation. Our cities may be viewed in the future as huge information processing systems where the aim will be to improve the city's capacity to move information rather than people or materials⁴. A city, in this sense, becomes a federation of neighborhoods sharing facilities and services.

The question arises: Who will control the use and applications of cable? The current arbiter of the television networks, the FCC, will retain some control. Beyond setting guidelines for the retransmission of broadcast tv signals and for technical system operation, the FCC has allowed the states to exercise local control of CATV systems. The evolving pattern of regulation, then, appears to be state control, similar in a number of respects to the type of controls now put on narrow-band services.

One of the greatest social concerns is with possible invasion of privacy. The view of the FCC currently is relatively simplistic. Concerning two-way interaction the FCC states that: "When offered, activation of the return service

problems fall into three areas in such an application:

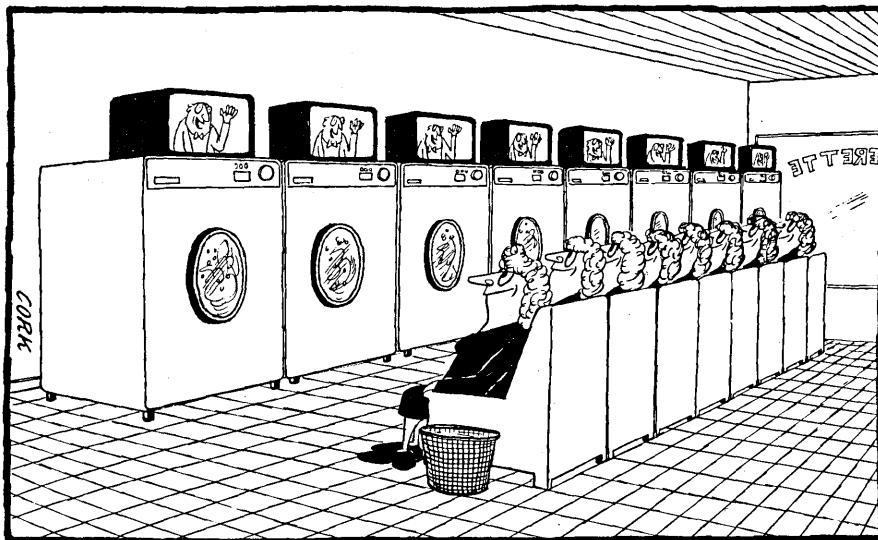
- legitimacy of source of information
- accuracy of information
- authority to extract information.

In one possible system, the user could access a police "wanted" file and a stolen car file. These files are currently available only to police networks. Some proponents of two-way cable would also include such files in the public access domain⁷. However, the experience of the New York State Identification and Intelligence System with access by a private organization is a prime example of system misuse⁹. This case involved access to state government files by the New York Stock Exchange to collect information on potential employees of the exchange.

Specific to the user of two-way cable systems are two general issues of privacy². First, messages meant for a specific terminal could be monitored by others. Such eavesdropping should be controlled in the same manner as wiretapping is currently controlled. Present laws should be extended to include potential cable applications. Second, it is necessary to face the issue of collection and correlation by the cable operator of data on individual viewing habits. Should the cable operator be allowed to collect viewing information and data on buying habits? Should he be allowed to correlate this data with other available data? Should he be allowed to sell such data to others or show it to government officials? If so, should the viewer/user of the system be given an opportunity to correct his file the same way he is allowed to correct current credit files? The issue is, at the least, much more complex than merely providing an "on/off" switch complying with FCC requirements.

With the ability to program and broadcast from the home end of the system,¹⁰ new forms of slander and libel become possible. With public access channels the opportunity already exists. This would be magnified with complete remote programming capability.

Another problem is that the potential for copyright violations would increase. Wide access to a new medium for transmission and recording by methods of document facsimile could affect more than just the newspaper industry. Each subscriber could become a source and an outlet for printed information of many types. Now that basic cable tv regulations have been established and in effect for over two years (since March 31, 1972), the most important legislation affecting CATV is the pending revision



had the financial resources to experiment. In view of the current economic slump in the cable industry, it will probably be a few more years before they have the necessary resources. Funds are needed for experimentation to identify the "next" services (after pay-cable) which will provide the necessary financial return to the operator.

Some social implications

The two-way capability of this new medium is seen as having great potential for reducing the alienation that

must always be at the subscriber's option⁵. This agency is obviously concerned with unwanted monitoring of the individual's viewing habits. The viewer should, at least, be provided with an on/off switch to control such monitoring. He should not be prevented from watching a particular program for fear that someone will know about his selection.

The privacy issue has appeared in the past in connection with the use of large computerized files for credit verification and other purposes⁹. Legal

Interactive TV

to the Copyright Act of 1909. Rewriting of the Act will affect the cable operator by requiring him to pay specific royalties for material carried on the cable system. While recent Supreme Court rulings (CBS vs. Tele-PromPTer, and National Cable TV Association vs. U. S.) have held that cable tv systems are exempt from copyright fee under the Copyright Act of 1909 and that cable systems are exempt from FCC-imposed subscriber-based fees, it is expected that a revised act will include some provision for the payment of fees on programs imported from outside the cable system's local area. Although no definitive fee structure has been established, it is certain that cable operators will have to pay something. The effect will be an increase in operating expenses which will place the operator in great economic stress. Consideration must be given to the economic viability of the cable industry if it is to continue to grow in the U. S.

The highly beneficial prospect of the use of two-way systems to provide health care delivery will, however, necessitate a revision of many government and private medical payment programs where personal attention is a necessary stipulation. Remote diagnosis and prescriptions may be technically possible, but insurance agencies must acknowledge the legitimacy of such treatment, and the medical profession will, of course, have to establish guidelines for such treatment.

If the new two-way cable systems are to become a true utility, the FCC would be faced with an even larger task than it already faces. There are many who question the Commission's ability, with one hundred professionals in the Common Carrier Bureau, to regulate the existing industry which has close to one million employees and over \$20 billion in gross revenues¹¹. How will this agency regulate the expanded facility envisioned as resulting from two-way cable technology? Yet, if the cable industry is not regulated, how will the public have a voice in the proper operation of the services? In addition, once the cable is linked to the computer, will computer manufacturers come under the control of the FCC as well? The problems are significant and are receiving the continuing attention of the FCC^{5,12}.

Another aspect of the cable regulation problem would involve the linking of various computer and information banks for use by several companies. If such systems are used to segment markets for these companies, then this could represent an antitrust violation, although such misuse would hardly be the fault of the system⁹.

Where do we go from here?

A number of problems that affect the public interest must be faced. The potential for applications of two-way cable is limited only by the imagination. As pointed out by Parker and Dunn³, there is a need for research in the entire field of sociological impact, including a study of the extent to which controls are necessary. Research regarding controls is not likely to be funded except by the government sector. The National Science Foundation grants for research in communication policy are examples of the kind of research that is needed.

Research must be conducted to explore the types of democratic interaction that would be made possible by a two-way system available to all citizens. With such a system, electronic referenda might become practical, and our forms of local, state and federal government would be directly affected. This would mean a significant change in our representational form of government. But are we ready for this development?

As indicated in the listing of existing pilot studies, there are several public sector services that have yet to be tested. The Federal government has an opportunity to play a major role in the development, as well as in the control, of the interactive cable television medium. There seems to be little doubt that some potential applications can be self-supporting.

While it is never too early to show concern for the possible social impact that interactive television will have on the public, too firm rules at the outset may have a stunting effect. By the same token, rigid technical standards for two-way cable would also be premature. Experiments with many new and different concepts for interactive television are yet to be tried. The ability to develop such concepts freely in the marketplace and have them prove their economic feasibility without excessive government restrictions would seem to be the preferable mode of operation for the moment.

There seems to be little doubt of the technical potential of cable communications to enhance our way of life. The full range of its impact, however, must be explored, in order that the public interest be served. This will require the combined efforts of social scientists (including communication researchers), economists, and technical persons.

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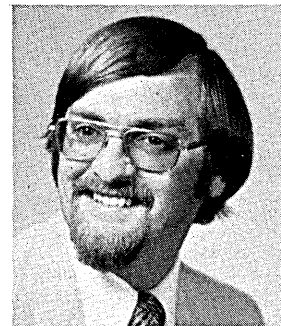
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Mr. Buckelew is director of the Municipal Assistance and Policy Development Div., New York State Commission on Cable Television. Previously he conducted research in technical, economic, and policy aspects of telecommunications systems while at Battelle's Columbus Laboratories.



Mr. Penniman is an associate manager of the Information Systems Section at Battelle's Columbus Laboratories, where he conducts research on interactive information systems. He has also conducted studies in mass communication techniques and human/machine interaction.

An employee's attitude about his job does change when he must begin interacting with a terminal. Generally the change is a good one.

TERMINALS AND THEIR IMPACT ON EMPLOYEE MOTIVATION

by John W. Lawrie, John M. Ryan, and Alastair Carlyle

Recently a large Midwestern bank faced a difficult question: Would the installation of terminals have a positive or negative effect on the motivation and morale of its tellers?

The bank prides itself on the quality and dedication of its teller group as its "first line of public relations." Thus it was natural that, along with cost-benefit analyses to evaluate the probable economic impact of the terminal, the psychological consequences of this fundamental change in the teller's job should be forecast. We felt that the ideal outcome would show both economic and motivational benefits that would outweigh the costs of the project. We also felt that even if the economic forecasts looked good, the project would have to be reevaluated if the probable impact on morale would be bad.

Accordingly, the focus of the research was summarized in the following questions:

Potential "benefits"

Would the tellers:

- see the terminal as a valuable tool?
- learn a new system faster?
- increase their scope of operations?
- feel "enriched?"

Potential "costs"

Would they:

- feel "lost" and afraid of "automation?"
- feel their status was minimized?
- feel threatened?
- quit, or be absent more?

In most cases managers are willing to let the "people impact" question be "answered" by opinion and speculation. In some instances the impact of automation on the people involved

doesn't even come up. In this organization, however, the commitment was to assess the problem operating from actual data.

The study

Here is how the study was run. Seven branches had already installed the terminals on a pilot basis to test the hardware. Seven branches without terminals were statistically tested against these to determine whether they were the same on some key operational and personnel variables (including the branch manager's management style, the branch's "service" mix—the proportion of installment loans vs. commercial loans, for instance—and the tellers' ages, lengths of service, sexes, and salaries). We were able to determine that these two samples of branches were not significantly different from each other in any of these personnel or operational variables and

furthermore, that they were like the rest of the branches in the total branch network. Thus we had a *terminal sample* and a *non-terminal sample* that were matched to each other and, by chance, concurrently representative of all other branches in the bank. This is the kind of situation which is usually only possible to set up in a lab; it was ideal for testing the effect of the terminal and then extrapolating our results to the rest of the bank.

Motivation and morale—what are they?

The next step was to measure morale and motivation in the terminal and non-terminal samples. But what is "morale?"

"Morale" is like a lot of concepts. It is an umbrella term that covers many attitudes and reflects itself in many behaviors. Therefore, we decided to measure both attitudes and behaviors.

	1	2	3	4	5
	Not at all descriptive of my work			Highly descriptive of my work	
1. I look forward to going to work because I enjoy the work itself.	1	2	3	4	5
5. I enjoy my co-workers.	1	2	3	4	5
9. I am excited by my work.	1	2	3	4	5
11. I feel isolated from the people I work with.	1	2	3	4	5
15. My work gives me a sense of achievement.	1	2	3	4	5
19. The work I do is important and valuable to my organization.	1	2	3	4	5
22. I feel my work allows me to do something worthwhile.	1	2	3	4	5
25. I feel like I am just "putting in my time" on my job.	1	2	3	4	5
26. I feel my work group gets along well.	1	2	3	4	5
28. I feel proud when I tell someone about the work I do.	1	2	3	4	5
34. I get more satisfaction from the people I work with than I do from the actual work itself.	1	2	3	4	5

The questionnaires used in the study were confidential; only the employee knew which one was his. In addition to questions like the samples shown here, the employee was asked to fill in his age, time with the company, time spent on the terminal, etc. Caveat: the authors warn that even these illustrative questions were designed and pretested for use at this particular organization, and that using any questions from published questionnaires without in-house validation can lead to spurious data.

Motivation

The behavioral indicators of teller morale were identified as Absenteeism, Tardiness, and Turnover (how many people quit).

On the "feelings" side we decided to measure teller attitudes toward a number of dimensions of the job we called "intrinsic," and their feelings about one "extrinsic" variable, their attitude toward "co-workers."

Having defined what we meant by "morale," we were ready to make our measurements. Since these samples were matched on other personnel and operational variables, any difference in morale could be attributed to the presence or absence of the terminal.

The factors we measured were as follows:

Attitudes about these job aspects

- the value of the work itself
- the sense of accomplishment
- the sense of responsibility for quality
- the chance for personal development
- the feedback on performance

Attitudes about the job setting

- feelings about co-workers

Behaviors

- absenteeism
- tardiness
- turnover (quitting) rate

Attitudes were measured with a double pre-tested questionnaire that was based on interviews with managers and tellers, and behaviors were measured through centralized personnel records. The measurements and testing were carried out over a two-week period. Approximately 70 people were included in each of the groups.

When we compared the terminal and the non-terminal samples on their attitudes toward the job, an interesting pattern was uncovered.

First: The terminal did not significantly elevate morale *nor* did it depress tellers' feelings about their job. Overall there was no difference between the terminal group and the non-terminal group in their attitudes toward the job.

But: As we looked at individual clusters of feelings, the terminal group showed some more positive attitudes than the non-terminal group. They felt more positive about their *co-workers* and about their sense of *personal responsibility for quality*.

This data is shown in Table 1.

Changes over time

We were intrigued by these results and therefore decided to look at the change in these attitudes *over time*. Luckily, our terminal sample contained tellers who had been working with the terminal for varying lengths

of time, between one and six months, and so we could assess these attitudes as a function of experience with the terminal. These comparisons are shown in Table 2.

Apparently as the teller has more experience with the terminal there are some interesting changes in attitude toward the job. With terminal experience there is no significant change in the teller's attitude toward the "work itself" or his sense of personal "development" or his responsibility for "quality;" his feelings of "accomplishment" show a slight depression while his feel-

ings about "co-workers" become more positive and he feels better about the amount of "feedback" he gets on his own job performance (his degree of accuracy is more immediately known to him).

We next looked at the behavioral indicators of morale. We wanted to know whether the terminal was associated with any differences in tardiness, absenteeism, or turnover. These were all thought of as varying degrees of "withdrawal" from the job, and, if present in the terminal group, as representing a clear-cut cost of the projected

FEELINGS ABOUT ...

The work itself	X X X X X O O O O O	(terminal) (non-terminal)	X X X X X O O O O O
Sense of accomplishment	X X X X X O O O O O	X X X X X O O O O O	X X X X X O O O O O
Personal development	X X X X X O O O O O	X X X O O O	
Feedback on personal performance	X X X X X O O O O O	X X X X X O O O O O	
Co-workers	X X X X X O O O O O	X X X X X O O	
Responsibility for quality	X X X X X O O O O O	X X X X X O O O O O	X X
		10	20
			30
			40

Table 1.

ATTITUDE CLUSTER	CHANGE OVER TIME
The work itself	no change
Sense of accomplishment	slight decrease
Personal development	no change
Feedback on personal performance	increased
Feelings toward co-workers	increased
Responsibility for quality	no change

Table 2.

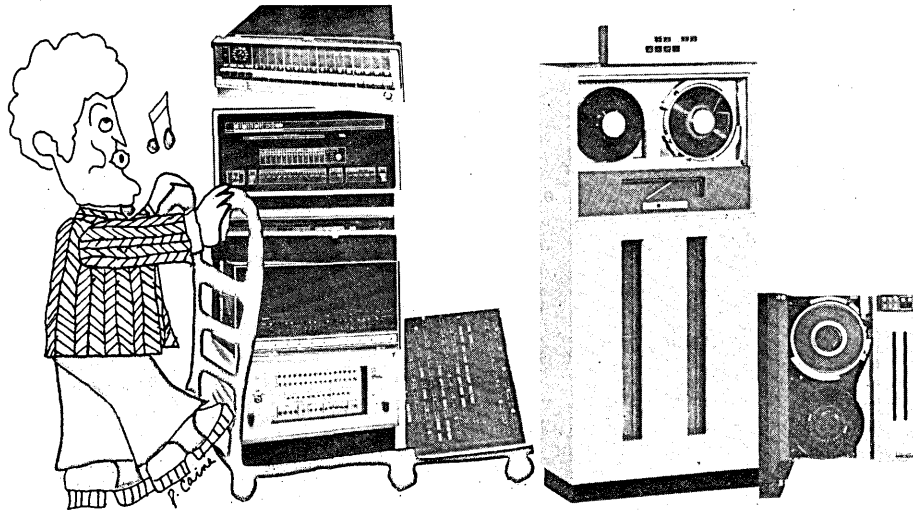


"Oh ... come in, Boswell. We were just talking about you."

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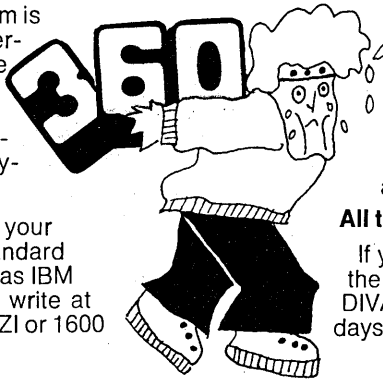
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The drives rewind tape at 500 ips around air-bearing turn points through photo-electrically monitored vacuum columns. Tape can automatically be loaded in a few seconds under the gentle and positive action of a single capstan (non-pinch) drive.

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SPECIFICATIONS

	DMT-1000	DMT-1001
Tape drive	Single capstan	Single capstan
Tape speed	200 ips	125 ips
Recording density	800 bpi NRZI or 1600 bpi phase encoded	800 bpi NRZI or 1600 bpi phase encoded
Recording format	9 track — 0.6" nom IRG	9 track — 0.6" nom IRG
Tape loading	Fully automatic: 7 secs approx	Fully automatic: 7 secs approx.
Rewind		
Speed	500 ips	500 ips
Time	45-70 secs	45-70 secs
Start/stop time	IBM compatible (2 msec nom)	IBM compatible (2 msec nom)
Speed variation	±3%	±2%
Transfer rate	320KB max	200KB max
Tape characteristics		
Type	1/2 inch	1/2 inch
Reel	Std reels of 10.5", 8.5" or minireel; or IBM cartridge	Std reels of 10.5", 8.5" or minireel; or IBM cartridge
Environment		
Temperature	50° to 110°F (op)/ -30°F to 150°F (non-op)	50° to 110°F (op) -30° + 150°F (non-op)
Relative humidity	20% to 80% (op)/5% to 80% (non-op)	20% to 80% (op)/5% to 95% (non-op)
Power	208/230 VAC, 3 phase, 60 Hz	115/208/230 VAC, single phase, 50/60 Hz
Dimensions	67"H x 30"W x 29.5"D (stand alone drive)	24 1/2"H x 19"W x 19"D (rack mtd drive)
Weight	900 lbs approx	230 lbs approx
Controls	Load/rewind ■ Rewind/unload ■ Start ■ Reset ■ Power on/off	Load/rewind ■ Rewind/unload ■ Start ■ Reset ■ Power on/off
Indicators	Select ■ Ready ■ Load Check ■ File Protect ■ BOT ■ EOT	Select ■ Ready ■ Load Check ■ File Protect ■ BOT ■ EOT



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Motivation

conversion.

No significant differences were found. Evidently the terminal did not cause the tellers to withdraw from their job; neither did it "enrich" the job such that withdrawal was reduced.

Findings

We were ready to evaluate the results of the total study and report to management. Would it be "go" or "no-go?" We summarized our results as follows:

1. There is no evidence that the terminal significantly changes absenteeism or turn-over . . . it neither helps nor hurts.
2. Over-all the terminal neither helps nor hurts teller's feelings about the job . . .
3. But the terminal is associated with more positive feelings about "co-workers" and the teller's feelings about being "responsible for quality work."
4. Furthermore, as tellers have longer experience with the terminal, their feelings about "co-workers" and their "knowledge of their own performance" become more positive . . . There is no change in their feelings about the "work itself," "chances for development" or "quality responsibility" . . . and . . .
5. Their feelings about gaining a "sense of accomplishment" from their work show a moderate (though not significant) decrease.

Obviously, our results were not all positive nor were they all negative; there were "pros" and "cons". Therefore, bank management followed our recommendation to give a "tentative green light" to the project with the provision that at each step of the conversion continued measures of motivational impact should be made.

The transition

Armed with this data the organization was able to plan the transition from a personnel point of view far more rationally than if we could only speculate about the impact of the terminal.

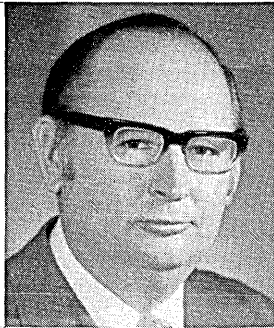
Training programs could be constructed for tellers that emphasized "hands on" experience and provided a realistic representation of what they could expect when their branch was converted to the terminal rather than being "sold" on the approach. Management seminars for branch officers could be conducted detailing the results of our study and thereby equipping managers with what to anticipate in teller reaction.

Perhaps the most far-reaching result of our work, however, was to demon-

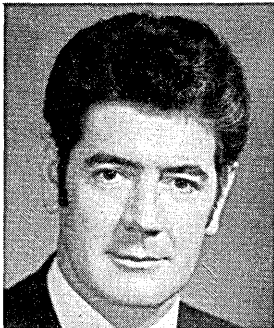
strate to managers and staff alike top management's conviction that no technological change can move forward without motivated personnel and that personnel impact should be measured prior to a final decision. □



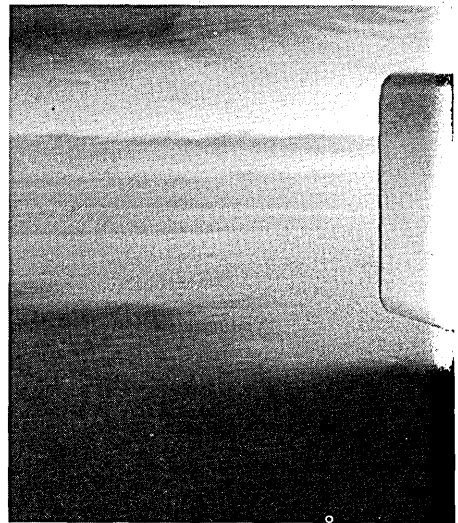
Dr. Lawrie is president of Applied Psychology, Inc., a consulting firm specializing in personnel research and management development. He holds a PhD in Organizational Psychology from Wayne State Univ. Past chairman for the Board of Examiners in Psychology for the State of Indiana, Dr. Lawrie is presently a member of the American Psychological Association and associate professor of psychology at Wabash College.



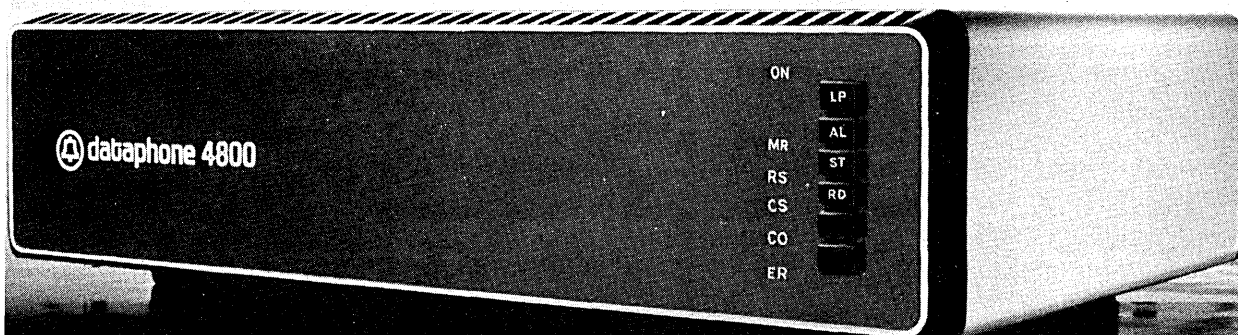
Mr. Ryan is vice president, administration and also personnel director at Manufacturers National Bank of Detroit. He has 14 years experience in personnel administration with Manufacturers.



Mr. Carlyle is a senior vice president of Manufacturers National Bank of Detroit, where he is responsible for the systems, data processing, and check processing departments. He belongs to the DPMA and SMIS.



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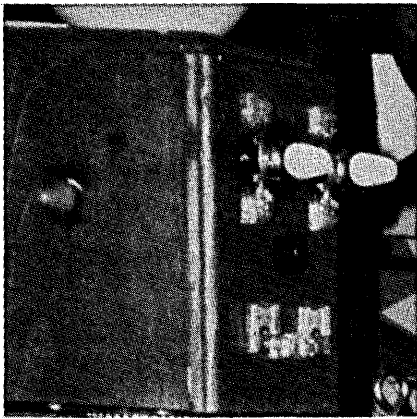
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Students interact with a teaching robot, which, in spite of its comic appearance, is a serious tool for individualized instruction.

LEACHIM THE TEACHING ROBOT

by Marvin Grosswirth



See the teacher.
See how tall and straight he sits.
See how patient he is.
See how slowly and benignly he turns his head
from side to side.
See how his expression never changes.
See the blue light bulbs in his ears.



THE PARKCHESTER SECTION of The Bronx, one of New York City's five boroughs, is a quiet, middle class neighborhood where, to the everlasting gratitude of the people who live there, very few exciting events occur. It is probably the last place one would expect to find an automaton teaching fourth grade, but it is in fact precisely the place to look for such a mechanical mentor. In P. S. 106, on St. Raymond Ave., in Room 317, Mrs. Gail Freeman does all the things a fourth grade teacher is supposed to do, while off in a quiet corner of the room, anywhere from one to five of her pupils may be

plugged in to Leachim, the teaching robot.

Firmly ensconced on a table near the wardrobe, the 5-foot-5-inch, 200-pound Leachim unfailingly and unflinchingly performs his tutorial duties. He has a body of oak, limbs of PVC plastic piping, the heart of an analog computer, and the mind of your typical Miss Higgenbottom. (No one ever refers to Leachim as "it;" the robot is "he" to his creator, his caretaker, and his charges.)

As a teacher, Leachim has several unique characteristics: he does not belong to a union, so there is no danger of his ever going on strike. He is impervious to inclement weather, transit breakdowns, assistant principals, and other natural disasters. On the other hand, he never attends PTA meetings, nor does he grade papers, help with boots and parkas in the winter, or escort a child in distress to the bathroom. What he does is teach. He teaches, moreover, by talking directly, personally and intimately with each of the children in Mrs. Freeman's class.

Leachim is the creation of Mrs. Freeman's husband, Michael, a 26-year-old assistant professor of management and behavioral science at the Baruch College of the City Univ. of New York (CUNY) where he is also a doctoral candidate. ("Leachim" is approximately "Michael" spelled backwards. Exactly "Michael" spelled backwards would be "Leahcim," which is at best unpronounceable and at worst probably something unspeakable in Welsh.)

According to Prof. Freeman, Leachim was created to solve a relatively new but rapidly growing problem in public education, particularly in urban settings. The problem arises from the dual factors of bussing at the public school level and open enrollment at the college level. Where classes used to be relatively homogeneous, they are now heterogeneous. While the resulting ethnic, cultural, and economic mix may be socially beneficial, it may make the teacher's task more difficult, because it virtually eliminates the "common-denominator" factor in the once-typical classroom structure. With so many different types of students in a single classroom, the need for individual instruction becomes ever greater. But at the same time, it becomes increasingly more difficult.

"My motivation for a machine like Leachim," Prof. Freeman says, "was to individualize classroom instruction geared toward the ability level of the student. I wanted to build a machine that has things like memory and that is capable of giving individualized instruction while the teacher does other

things.”

Leachim was installed in Room 317 in October, 1973 and since then he has been running smoothly and efficiently, apparently living up to his creator's aspirations.

When a pupil has completed his general class work, he will ask—or Mrs. Freeman will suggest—that he work with Leachim. The child is given a key with which he turns Leachim on. He then dons a headset and begins taking instruction from the robot. What differentiates Leachim from other teaching machines is that it—er, *he*—talks. And not just in generalities, either. Leachim knows the pupil's name, his family background, his hobbies, interests, and hangups. Perhaps more important, he also knows the student's I.Q., reading ability, learning level, and problem areas. He relates to the children and, without being overbearing or petulant, he can chastise them for being inattentive. He can—and does—compliment and encourage

print analyzer for personalizing Leachim's response still further. Federal government agencies are presently working on voice print analyzers that will be able to determine, in addition to the speaker's identity, his mental stability and his emotional state. When perfected, such a device could be an invaluable aid in responding to bomb threats, weeding out potential skyjackers, and in general dealing with talkative antisocial types. With minor adaptations, a similar system could be installed in future Leachims, enabling them to determine whether a student is unhappy, angry, nervous, cheerful, apprehensive, or high, and the robots would respond accordingly.

His master's voice

In the meantime, Leachim does the best he can with the facilities at hand. He “discusses” sports, sings the Star Spangled Banner, and even makes little jokes, as was overheard (through another headset) during his question-

now.” Clifford punches button C. Leachim exults. “Correct. Correct. You-are-correct.” Then, as though to be certain that Clifford did not merely make a lucky guess, Leachim adds: “Whenever-you-find-a-new-word-you-should-look-it-up-in-the-dictionary.” During the course of Leachim and Clifford's “conversation,” the machine will employ maps, diagrams, and spacial problems by flashing them on a screen, called a tableau, situated nearby. At the end of the session, Leachim gives Cliff his score, and a little compliment for doing so well.

Michael Freeman is an alumnus of P. S. 106, so it is no surprise that Leachim has a Bronx accent, despite his creator's efforts to de-humanize the voice, for it is Prof. Freeman's voice that Leachim uses. The voice has been electronically modified and while it is capable of producing high, medium and low tones—whatever is appropriate to the particular response required—it is deliberately metallic and mechanical sounding. Nevertheless, the unmistakable inflections of a New York childhood are clearly discernible. This is probably as it should be; after all, communication is the name of the game and Leachim is talking to Bronx kids. His grammar and syntax are, of course, impeccable.

Leachim is not the first robot created by Prof Freeman. In the eighth grade, Michael won first prize at a New York City science fair for building a robot. Leachim, he admits, is considerably more complicated. Prof. Freeman worked some forty hours a week for a year and a half to bring Leachim into functioning existence.

Inside Leachim

Leachim is basically an analog computer, “but he searches through memory on a digital basis to come up with the counterparts to his verbal responses,” explained Prof. Freeman. The machine's innards consist of “ninety percent regular computer parts,” including some that were salvaged from an RCA (you remember RCA, don't you?) Spectra 370. “These digital computer parts were combined with analog components that I developed especially for Leachim,” he says. This electronic organ-transplant was performed at a cost of about a thousand dollars of out-of-pocket expenses, but there were generous contributions of components and free computer time. Leachim's inventor estimates that it would cost about seven thousand dollars to construct the robot commercially. That is only for the hardware; the software costs would vary, of course, with the input. “It should be possible,” he postulates, “to mass-pro-



The teaching assistant in this fourth-grade class in P.S. 106 looks like a toy, but performs as a mixture of the teacher, Mrs. Gail Freeman, and her inventor/professor husband. Here he gives personalized instruction to one student while the rest of the class continues undisturbed.

them when they do well.

Although each child has his own personal user code, Leachim can usually identify the pupil who is plugging in by means of a voice print analyzer. He then addresses the child by name and may make a comment or ask a question of a personal nature, much in the manner of an acquaintance or a classmate. Prof. Freeman believes that there is enormous potential in the voice

ing of ten-year-old Clifford Schuman:

“When-reading-a-story,” intones Leachim, “if-you-find-a-new-word-that-you-do-not-know,-what-should-you-do?” (Leachim talks exactly as one would expect a robot to, with some quaint variations; more about that shortly.) “A.-Guess-at-its-meaning? B.-Pretend-you-did-not-see-the-word?” Pause. “Ha. Ha. Ha. C.-Look-it-up-in-the-dictionary?—Choose-your-answer-

Leachim

duce Leachims for about three thousand dollars each."

Because there are a number of patents still pending, Prof. Freeman is reluctant to discuss in detail how his robot works. In principle, Leachim performs like any other computer. He uses a binary search system to locate, within his disc pack memory, whatever it is he is supposed to be "saying" at any given moment, whether it is a question, an answer, a personal observation, or one of his little jokes or songs. The major difference, as far as Prof. Freeman is concerned, is that instead of selecting characters for printing out or for display on a crt, Leachim selects sentences, phrases, words, and phonemes (i.e., sound units) to produce an audio response to the pupil. There are, according to him, two independent programs inside Leachim which he refers to as the "binary program" and the "verbal program." While the "binary program" determines by code the specific information Leachim will give forth, the "verbal program" carries the actual response and therefore determines to a great extent the specifics of the "binary program." The time required by Leachim to speak a particular word or phrase is a major design parameter of the "binary program." When making changes in Leachim's programming, "if the same time-frame is used for a particular new response as was used for the one it is replacing," Prof. Freeman explains, "then there is no need to change the binary program. But if the revision is a major one that requires a change in the time needed for the response, then a change in the binary program is also necessary." If that is not entirely intelligible, it will doubtless become clearer once the sought-after patents are obtained.

While Prof. Freeman can tell Leachim how to say things, he relies on the expertise of his wife, Gail, to decide what to say. "My wife tells me what the robot should do that's relevant to the fourth grade class she teaches. I follow her instructions. She knows when the robot should get angry, when he should review more . . . what a good teacher's all about." Thus, on Mrs. Freeman's advice, the robot is equipped with fourth-grade level material gleaned from a dictionary, a thesaurus, a science text, a reading series, and an encyclopedia . . . plus, of course, the biographical data on each pupil. This not only enables Leachim to pose the right questions and offer answers; it also permits him to work more closely with the sometimes astounded child. "Did-you-find-the-answer-on-page 53?" Leachim will ask. The dumbfounded kid can only nod in in-

credulous and somewhat worshipful assent.

Because of his size, Leachim has a somewhat limited memory. "I have to program him every six months," says Prof. Freeman, "to prevent redundancy and to make sure that he's relatively up-to-date on material."

Most of Leachim's programming is done through the facilities of CUNY's IBM 370/145, located at the university's graduate center on West 42nd Street in Manhattan, a somewhat seamy district not normally noted for its educational or technological atmosphere.

Although Leachim is now in the fourth grade, Prof. Freeman has high hopes for his prodigy's educational future. "One of the advantages of a machine like Leachim," he points out, "is that he can go over the same material for hours at a time without losing patience with a slow student. The infinite patience factor can't be programmed

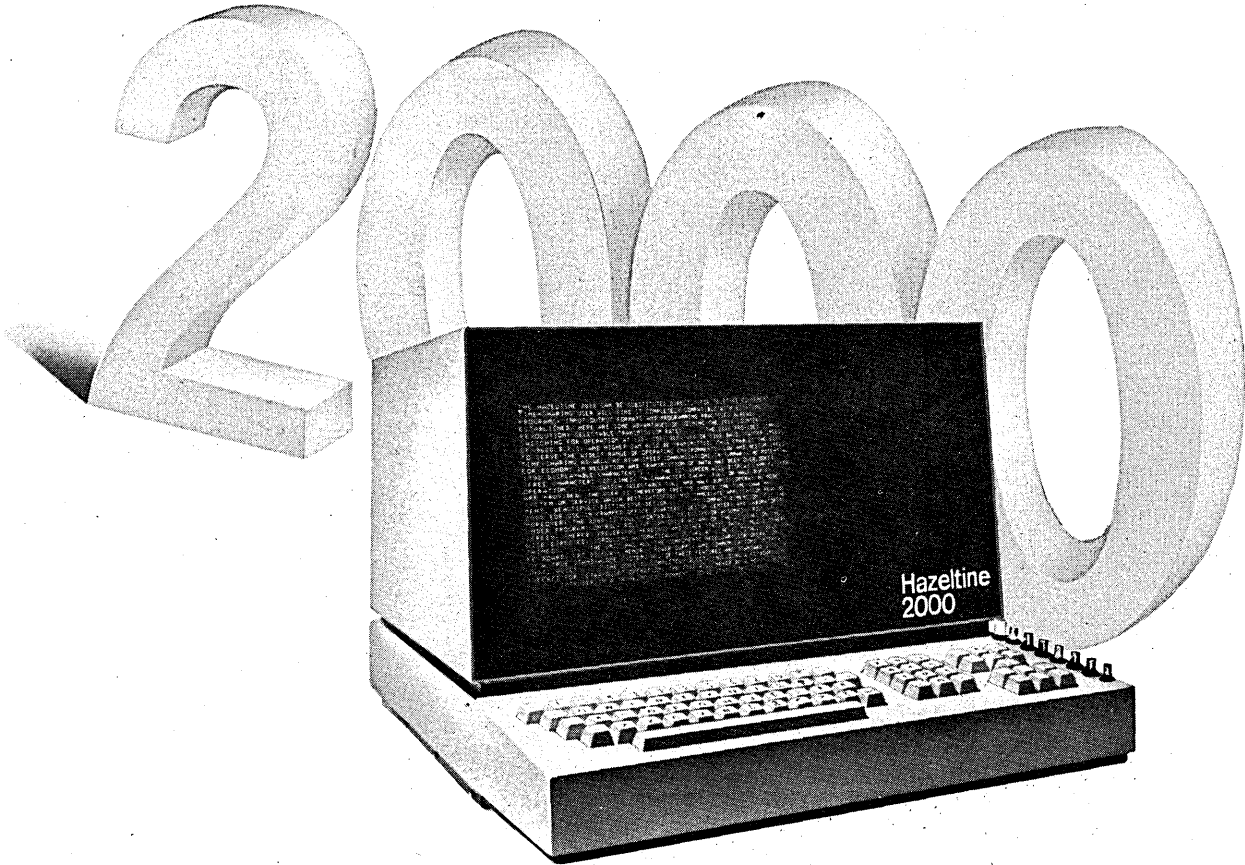
into a person but it can be programmed into a machine." Thus, Leachim can keep pace with the learning ability of the pupil, regardless of how fast or slow that ability may be. A slow student need not suffer the frustrations inherent in not being able to keep up with the rest of the class; a bright student need not endure the boredom of lessons that are beneath his level. Problem children, such as the mentally retarded or physically handicapped, are, in Prof. Freeman's view, especially good candidates for being taught by Leachim.

There is also the possibility that Leachim may go to college. "CUNY is contemplating giving me a fairly large grant to develop two of these machines for college, particularly for the open enrollment students," Prof. Freeman confides. It is clear that his dedication is to the concept, rather than the corpus, of Leachim. "He happens to be



From one to five students can hook into Leachim and each be given personalized attention. The robot interacts through audio input and output, push buttons, and a screen. Its voice, which has purposely been made to sound metallic, has a trace of a Bronx accent.

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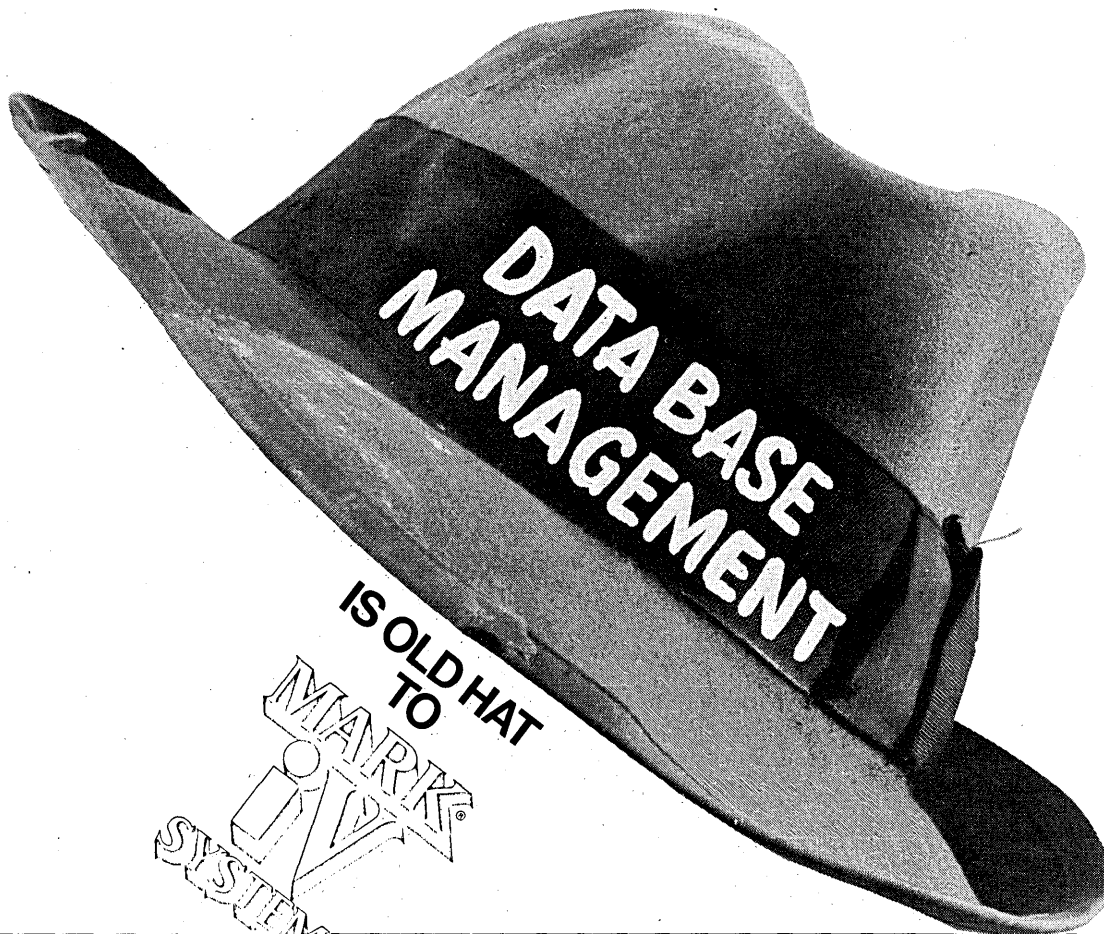
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The evolution of data base management systems includes milestones of single-thread processing, first hardware and then software front-ends, task monitoring, paging, and hardware buffering. The next stage should be to unload the burden all this placed on the applications programmer.

A BRIEF HISTORY OF DATA BASE MANAGEMENT

by Robert L. Flynn

With the growth and acceptance of data base management systems (DBMS), the computer industry has at long last given itself "information system" potential. Information differs from data in that information "participates" in the corporation—answers questions, solves problems. In other words, the computer user may now stop dealing with "data." DBMS is that tool which enables us to build a framework of data which, when properly related, can generate information.

In all our business, information has a value. In fact, information is the single most important asset of any organization, for without that information, business cannot exist, function or reach profitability.

True information has an interesting characteristic. The value of information (a real measurable commodity) decreases across time. It loses "currency." The longer it takes data processing to get a piece of information to the person who requires it, the less value it is to the organization. Since the function of dp is to turn data into information, it also has the responsibility of disseminating that information on time, which means before its absence will begin to hurt the orderly progress of the company.

This is where data communications comes in. It is via our on-line data base systems that we can execute that dissemination of information when it has its peak value. We can achieve maximum profitability for our organizations when we can answer questions, solve problems, and provide information on an immediate basis.

Data management, or preferably data base management, enables us to generate information by creating a framework of data within which we can turn data into information. Our on-

line data base system allows us to bring that information system into the mainstream of our business reducing cycle time for its dissemination, making full use of its value and reducing costs.

Today's dp manager is faced with users crying for information, and he has "information system potential" within his grasp. Unfortunately, however, he is wary. On-line processing has been expensive for the most part, long in lead times and failure-prone. If one were to define the characteristics of an on-line implementation, they might read as follows:

On-line systems are traditionally installed late.

It appears we are never able to gauge the number and types of resources that are going to be necessary to bring an on-line system in on time. Nor do we seem able to measure the functional dependencies that exist between processing steps.

Significantly over budget.

If a system is brought in late, it is probably over budget. It is brought even more significantly over budget when we somehow wind up with a larger hardware configuration than we had originally specified for the system, and sold to management and users. So we run into needs for more extensive core, larger cpu, more channels, more file space for support. Apparently we are unable to define on-line hardware requirements, at analysis time.

Below performance expectations.

Embarrassingly, even though installed late and on larger hardware, the system is probably performing at well below our original response criteria: five-second response instead of two, ten-second response instead of five.

Low cpu utilization.

Then, in a belated attempt to define the problem, we monitor the hardware and find that although it is performing poorly on that larger cpu, the system is rarely using more than 5, 10, or 15 percent of its capacity.

Difficult to expand.

Problems experienced in the implementation of the first major application discourage users and are so complex in their maintenance that we tend to stay with the first application brought on-line, usually data entry or inquiry-only.

Conversion becomes a way of life.

And now, not only because we are committed to processing on-line information systems, but also in an attempt to chase down and achieve our original performance goal, we are forced to implement the new technological tools presented to us every day. Almost invariably we discover that in order to take advantage of a minor increase in performance due to a change in technology, we have to go back and change everything that we've done up to that time. The industry has seen conversion after conversion as we changed cpu's, terminals, storage devices, operating systems, modes of transmission, and other elements of the mix.

Major sectors of personnel resources become devoted to maintenance and conversion functions.

Most technological levels are reached through progression or evolution, and as in most evolutions, many separate limbs or branches may be taken in reaching the current level. The same is true of the systems technology for teleprocessing task monitoring. Perhaps the ability of the data processing manager to make valid decisions

Data Base Management

concerning choice of teleprocessing modes, of which there are many, lies in his understanding how we have arrived at the current technological levels.

At least in the old days, most of us started with on-line systems in what is called single-thread mode. It called for one transaction to be completely processed before we could go on to the next transaction. Take as an example for a single-thread system an actual system running on an IBM 360/30 servicing IBM 2260 terminals. It is an order-entry/inventory control application of fairly moderate size.

The system is polling the terminal environment, looking for valid ready messages. It gets a ready message, brings the message in, and does some initial editing against that message, because the system is anticipating unfiltered input and would like to shield the applications program from as much poor data as it possibly can. The system then selects an application program from the multitude of applications and transaction types that can occur in this system. The system gives that application program control, allows it to access the data base, reads a couple of master files, updates a couple of master files, logs the transaction to enable us to recover and audit the system, formats an answer, and actually transmits that answer back to the originating terminal. A measurement of the overall timings break down as follows. Total message read time, including the polling of the 2260, runs about 0.5 second. Total computation time, even on a Model 30, ran about 0.3 second. Total data and program I/O time of the various forms that were required, ran about 1.2 seconds. Total message write time, including the logging and response to the terminal operator, cost about one second in time. We are talking about a system with a minimum response time of three seconds, one dealing with a fairly standard commercial transaction.

Perhaps a more important way of looking at on-line systems is in terms of their capacities. What kind of throughput can we expect? If we assume that there are eight 2260s, each one of those terminal operators inputting a message perhaps every 30 seconds, in a random environment, we find that with three-second response we are using the partition approximately eight times three or 24 out of every 30 seconds. That gives us 80% utilization of the on-line partition. The system meets current needs. What happens to the system if we add three more terminals, each one inputting a message approximately every 30 seconds? We now have 11 terminals; and we find that we want to use that system 33 out of every

30 seconds. What we want is 110% utilization of the on-line partition!

What does occur is a degradation in the system response time. And the degradation isn't necessarily in proportion to the increase in message rate, because queuing theory says that once you have exceeded the limitation of any one of the factors in your environment, each of the activities which becomes queued must incur the wait time of the activity that proceeded it in the queue. System degradation can be nearly exponential.

The situation is similar to that of a four-lane highway being serviced by a one-lane bridge. The one-lane bridge represents our single-thread mode. It is perfectly able to handle light and moderate traffic on the highways. But what happens in heavy traffic? When we add those new terminals or the new applications, or are experiencing any peak or increases in our message rate, that bridge becomes a bottleneck. It is not a solution to raise the speed limit on that bridge, no matter how high it might be raised. The actual amount of time spent on the bridge is minimal. Most of the time is spent engaged in other activities. Yet, this is the most commonly sought solution. We raise the speed limit by progressing to a large cpu while retaining the single-thread mode.

The valid solution, the one that we were looking for in data processing, is that of a multi-lane bridge. We wanted to get more than one thing going on in the system, some form of concurrency or overlap. We sought solutions. We looked at the situation, put our hardware monitor on the system, and discovered that we were using that cpu only 0.3 second out of every three seconds for a transaction, or only 10% of the time. If we could stagger the processing requirements of messages, process messages asynchronous of one another, there is plenty of room for a lot more lanes to the bridge on the Model 30.

On examination, every individual message has two distinct components: the message-handling requirements and the message-processing requirements. Breaking those two requirements apart, functioning asynchronously of one another, would provide the equivalent of a two-lane bridge. Data processing did just that.

The early implementations of this approach were in the form of front-end computers. We set up a separate piece of hardware, usually a small cpu, and made it the message-handler. Its function was to handle all aspects of a message as it related to the teleprocessing network. It would transmit messages across some hardware boundary

to a message-processor partition or region in our mainframe as fast as the processor could handle the messages. Some that were a little more sophisticated did some initial editing and queuing of messages. They were good equivalents of a two-lane bridge.

The early front-end computers were usually a little expensive, however, also difficult to program and somewhat unreliable. More importantly, we still weren't making tremendously effective use of the system cpu. What was needed was a method of getting both of those processes, the message-handling process and the message-processor considerations, back into the cpu.

We went to what is called the early QTAM (Queued Telecommunications Access Method) or TCAM (Telecommunications Access Method) approach; the separation of message-handler and message-processor, now not in separate pieces of hardware, but in different partitions or regions within that cpu. The message-handler performed the very same functions as a front-end computer (all aspects of the message as it related to the teleprocessing network), passing those messages not across a hardware boundary but across what is really a software boundary to the message-processor partition. With software alone we achieved the equivalent of a two-lane bridge within the cpu.

As systems grew and the two-lane bridge became insufficient, we analyzed again. Examining the situation, we found that message-processing requirements overall were still minimal users of the cpu. Our bottleneck was at the processing step; and tremendous potential for overlap and concurrency lay untapped in the I/O and wait time processes of a transaction. The source of additional lanes to the "bridge" lay within the generation of multiple message-processors serviced by a single message-handler. The evolution then was to the *true* QTAM or TCAM approach: one message-handler supplying messages across multiple partitions/regions to multiple message-processor functions.

This approach brought users to a major branch in the tree of teleprocessing software, with very specific results. We had most definitely improved the system capacity, but had uncovered new limitations.

The first limitation was the number of partitions. In a DOS system, at least until recently, the good equivalent of a three-lane bridge meant a dedicated system which was unable to process batch-oriented production. Dedication imposes a limitation on the throughput that we could reasonably expect from any system. It is a limitation which has

nothing at all to do with the physical capabilities of the hardware allocated. Under os or vs, the limitation isn't quite so severe; but it is still a set logical limitation on the potential throughput of the system.

The second problem was the requirement for duplication of application code. If the message-processor partitions or regions were to be efficient, they would have to be capable of handling any of the transaction types that might occur in the system. A message-processor that can handle any one of the transaction types that could occur in the system is going to contain the code to support that transaction type. We started to build words where we were constantly duplicating the application code in each one of the partitions generating the required concurrency to yield desired throughput. This was not the most effective use we could make of the core space that we had available to us. One measure of the throughput we can expect from a system is the number of tasks that can be executing in core at any one moment in time. To limit the kinds it can handle is to limit the number it can handle.

The third problem, the one that caused an extremely rapid demise of the QTAM approach to on-line processing, was the fact that our data base had to be shared by multiple and asynchronously processing partitions/regions. We could not protect against concurrent update to the data base when common application code kept accessing the common data base, very often accessing common records within that data base. It was an impossibility. This problem tended to keep users in the data entry or inquiry-only environments, never able to implement applications which were updating files or requiring structural maintenance against the data base.

The last problem was that of checkpointing such a system. If one of the regions went down while the others continued processing and we went on doing structural maintenance against the data base, what was the status of the system? How could anyone communicate that situation to the other partitions and where, at what point, was the status of the data base good? These kinds of problems kept us in inquiry mode. Our only means of recovery was to restore the data base and reprocess all transactions.

CICS for task monitoring

What had happened was very simple. As systems evolved we had developed very sophisticated operating systems and application goals. The responsibility of the operating system is to maintain all hardware resources and

to allow controlled access to those resources by major tasks in the system, which can be viewed as partitions or regions. On the other side, we had developed some very sophisticated application code; and the responsibility of the application code is, and always will be, to manipulate data, to generate information, to answer questions, to solve problems. But we had introduced a new factor of concern. We were attempting to get as many tasks processing in this system concurrently, all dealing with one common set of application code, all of which were processing against a common set of files or a common data base. We were attempting to build a multitasking environment and had no system task management at that level. We had no centralized control over the problems of concurrent update, resource use, and inter-task communication. We sought additional task management.

Because our operating systems view a task as being either a partition or a region, it was obvious that those partition and region boundaries would have to be broken down. The approach was to break down those boundaries, bring the allocated core together, and make that on-line job look to the operating system like one task: the on-line partition. We built in another level of control that we call a "partition supervisor," or task monitor, and allowed it to be the centralized control over the multitasking world.

It was and still is a valid approach to the problem. The early implementations of this, or what we might call the early CICS approach took this form. (CICS, IBM's Customer Inventory Control System, is the prototype for the vast majority of teleprocessing/task monitoring systems that exist today.) Within one partition, we had that section we called the "partition supervisor" or "task monitor." Above that, we had space where we could dynamically load blocks of application code and dynamically allocate space for blocks of data.

What resulted was an on-line multitasking world within a single partition or region: the Task Monitor approach. As it solves past problems, however, the achievement of any level in an evolution inevitably breeds new problems. The task monitor approach was no different. When we broke down those partition boundaries, the problem we created was that it was no longer feasible to have more than one copy of an individual program processing in the system at one time. Since we were now processing within a single partition/region, the problems of link-edit, identification, and the control of multiple copies of a common program

arose. We didn't want to throw the "vanilla transactions" or each individual transaction type back into a single-thread mode for that transaction type; so we had to have some way of coping with the problem. We went to our application programmers and asked them logically to remove the data associated with an individual task or with an individual message from the actual physical code. And we made provision to dynamically allocate space in another section of the partition. That solution enabled a system to maintain multiple messages of a common type concurrently in core.

Another factor was involved. A tremendous amount of overlap had been achieved in a QTAM environment during the I/O and WAIT time requirements of messages. What was really needed was to have more than one task or transaction passing or threading through the same piece of application code at pretty much the same time—at least with as much concurrency as System 360/370 would allow. Several considerations were involved. One was that the code never changes. If one transaction, preceding another through a block of logic, physically changes that code, the logical integrity of the code is compromised for the second transaction, this necessitates "refreshing" the module. What was required was semi, quasi, or fully reentrant code. The programmer, however, was faced with a new problem. All the high level languages which had been developed to make his function more efficient, to simplify his role, generated non-reentrant code. Faced with the barrier of severe restrictions inherent in the chosen high level language, compounded by the inefficiency of code generated by the compilers, the programmer turned to assembler language for his on-line applications.

This introduced more complexity. It added more lead time to the writing of even simple application programs. We were willing to live with that complexity. And we did gain those benefits.

The CICS approach brought systems to a major level in the evolution of teleprocessing. As occurred at each level, this approach introduced or left unsolved some basic problems. Four of them are worth discussing at some length.

Task on conversational context

As we attempted to build on-line "information systems," it was found that rarely, if ever, was our transaction inputted so as to accomplish every activity desired. We were actually feeding in data, getting information back, making decisions, feeding in additional data, getting information back, making decisions, etc. We were in a conversation

Data Base Management

with that system just as two humans might be conversing, with all the appropriate give and take that goes on in any conversation. The effectiveness of an on-line information system depends on how well conversational mode can be maintained. To process in conversational mode, transaction context must be maintained.

Program loading overhead

The second problem was that of severe program-loading overhead. The user never seemed to have enough core space available to get the entire application library into core. We had to find a way to share the core space. This meant that when an individual transaction completed, if no other transaction was currently using that load module, the area occupied by the code would be released to enable any differing transaction type to load its required code. In active environments, systems find themselves devoting great portions of time to the program-loading function. Such a severe existing or potential bottleneck to the throughput of the system was rather frustrating in the light of the tremendous time and expense put into making the code both re-entrant and reusable.

Non-effective use of core space

Third, although in a mode of loading and reloading of the application code, most of that effort was being wasted, since the bulk of code is, for the most part, unused. The 80/20 rule that is often applied to data (20% of the data is accessed 80% of the time; data once accessed tends to be reaccessed) applies even more to application code. Application code can be expected to fall into a 90/10 rule. Ten percent of the code is accessed 90% of the time. Yet 100% of the time, 100% of the code in an application is loaded and occupies core space. Since a measurement of throughput in any multitasking environment is the number of tasks that may be executing in core at any one moment (e.g., if 10% of the code is used, only 10% of the potential throughput is being realized), that became an important consideration.

Partition fragmentation

The fourth problem was that of partition fragmentation. As the system kept shuffling application modules of different sizes in and out of core, and as that code was dynamically allocating, freeing up and reallocating space for uneven blocks of data, a condition defined as fragmentation would occur. The partition would begin to break down (fragment) into small noneffective/unusable pieces of core. It was unusable because program load modules require contiguous core space for execution. As more and more core fragments become unusable, rapid or

steady degradation in system performance occurs and will continue to occur until one of two actions take place. One, performance degrades until the user becomes ineffective and we decide to stop processing, flush the system, and then resume processing. Two, "fragmentation lockup" occurs. Two or more tasks become resident in core, each task waiting for the other to free enough core space so that the other can load the code or data necessary for its completion. The system comes to a grinding halt, must be brought down and flushed, and a decision must be made as to whether or not the files have been compromised and require recovery. Not until then can processing be reinitiated.

Paging

All of the above problems had to be solved by the user, and were solved in the following fashion:

The solution to the problems of fragmentation was sought in programming standards. Obviously, if all programs were of a common or standard size, then the problem of fragmentation, at least for the code, could be resolved. Recommendations for this standard abound, usually in the 2K, 4K, 6K, 8K size range. The impact on the programmer is immediate. Given a new project the programmer sits down and writes a 4400 byte program. He then spends the next two and one-half weeks optimizing that code down to meet the 4K standard. Extensive lead time and complexity being added to what might have been a simple application. The system is brought up on Monday morning and the programmer discovers the 50 bytes of exception which had been left out. He is then back to another week of reoptimization of the code. Complexity and lead time again.

When applications are well beyond the standard range, 12K, 30K or larger, an additional process is added. The 12K program is broken into three 4K modules and a mechanism for transfer of control from module to module is added; or the program builds a three 4K module overlay structure. More complexity, more lead time. One month later a user inputs a minor request for change requiring 150 bytes of exception coding. The 150 bytes logically belong in the first 4K module and the programmer is back to the restructuring of the source program. An expensive price to pay in complexity and lead time, but necessary in order to control fragmentation.

This emergence of the paging concept was applicable to the solution of the "unused program code" problem.

Most major applications are larger

than 2, 4, 6, or 8K of code. Most applications are, therefore, multiple page applications. We apply this to the 90/10 rule. If when executing an application, only those modules pages actually being used are brought into core on a demand basis, the vast bulk of the code (the exception coding) will remain in the library and will not be occupying valuable core space. The concept of "demand paging" then emerged to secure maximum throughput out of a given amount of core.

With demand paging, the choice of page size became critical. The mainline of processing (that 10% of the code) is not localized within the code, it is spread throughout. This often results in demand paging environments falling short of their potential. If a transaction in the simple process of using the mainline of code must find sections of that mainline in many different pages, all of those pages must be loaded for execution.

A valid solution would be to make the page size small enough to allow mainline processing to filter out of the overall code. However, since studies show that the "optimum" page size runs between 64 bytes of code (the chosen page size for system 370 buffer cache memory) and 512 bytes of code (as implemented under the Cincom Systems Envion/1 software paged memory), the small page size solution to the demand paging problem is far too complex for the applications programmer to implement. The alternative is to have the programmer analyze and reanalyze the code, during developing stages and while in production, in an attempt to identify and structure the code isolating the mainline in as few pages as possible.

The second problem was that of constant program loading overhead. Within the technologies of the 360/85, the model 195, and the bulk of the true System 370 line, the announced performance speeds of the systems are often five times greater (faster) than the actual main memory speed (a general rule of thumb for system speed since instructions are never actually executed in core, but in registers and must be transferred there). This is an inconsistency that is by no means fraudulent. It revolves about a fine piece of technology whose origins reside in the many studies of application code that have been executed in an attempt to understand and make the demand paging concept work.

The concept involved is called a "buffer store" or "buffer cache" (as seen on true System 370 hardware).

When the Model 195 proceeds to execute an instruction, that instruction (in fact the 64-byte page within which

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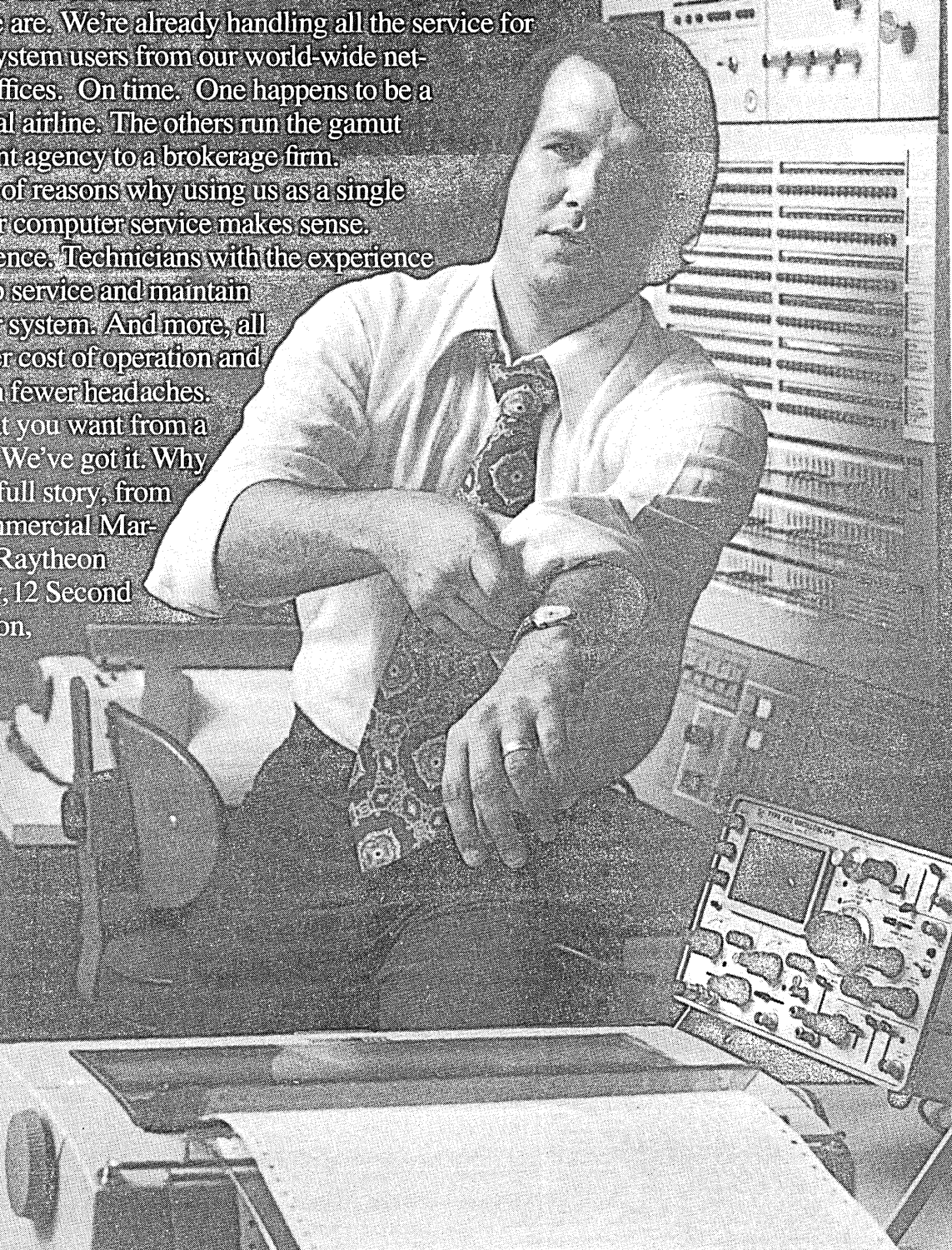
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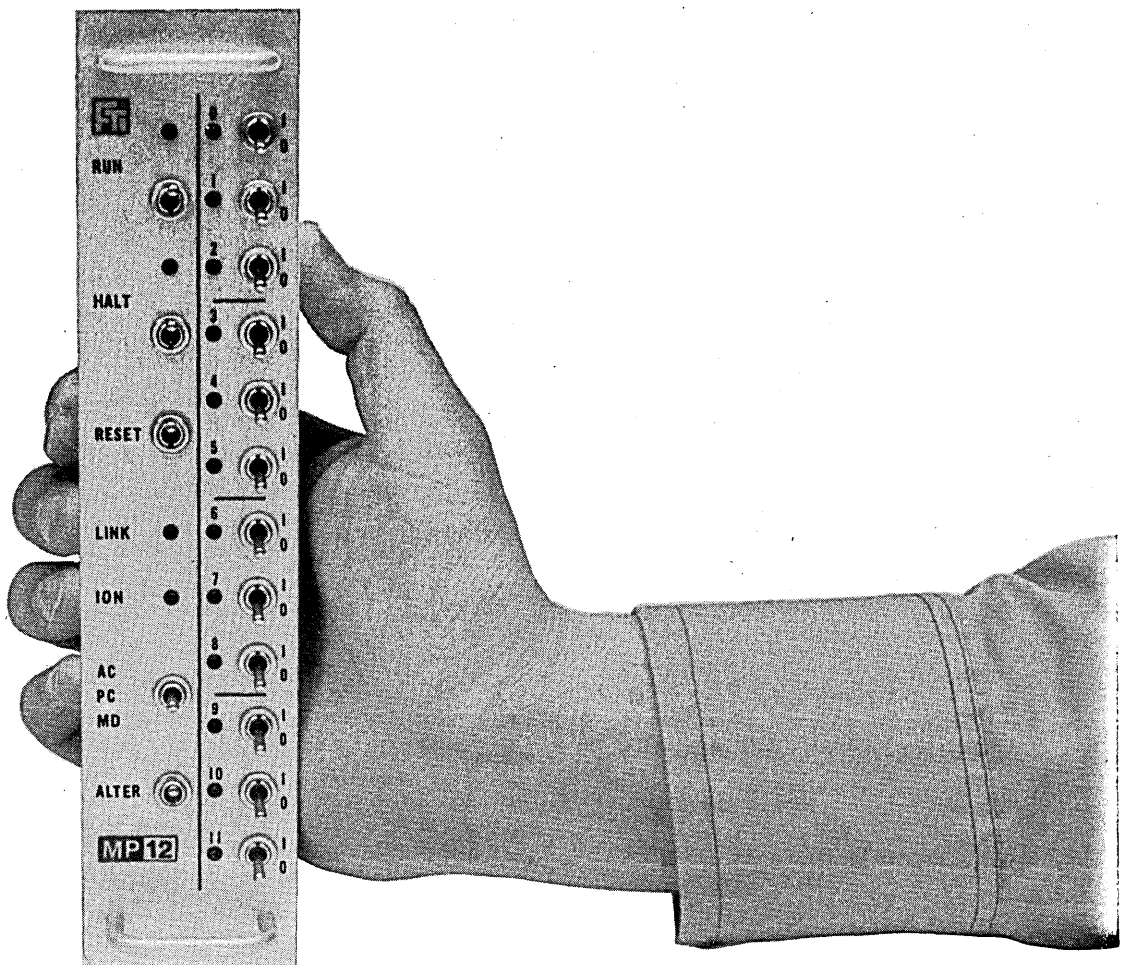
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CIRCLE 35 ON READER CARD

Data Base Management

the instruction resides) is loaded across a hardware boundary into a 64-byte slot within a small piece of associated monolithic memory, whose speed may be many times that of main storage. The code is then executed within this high-speed buffer store. Should execution then go beyond or branch out of that 64 bytes of code, the new 64-byte page is loaded into the next available slot in the buffer store. When the available space in buffer store has been exhausted, should an instruction then branch or proceed to code which is not already within the buffer store, a page must be overlaid. (Reentrant code or some kinds of unchanged data may be reused directly with no repetitive load.) The choice of page to overlay is made via a "longest disuse algorithm" (also called the "buffer store algorithm"). That page is overlaid which, because of its use factor, stands the greatest statistical chance of *not* being part of the mainline (meaning it's probably exception code).

The buffer store process is a very simple one. The use of a small page size enables the mainline to be efficiently filtered out of all the code. The use of a longest disuse algorithm in conjunction with reentrant code and reusable data forces the residency of that mainline within an extremely limited amount of high speed core. Those factors combined eliminate the constant page loading. Our solution then is to implement a true buffer store, using hardware or software, and create such a relationship between paged code on direct access devices (very slow storage) and the main storage partition/region (high speed storage). An approach mildly successful under the IBM Virtual Hardware and (we at Cincom think) extremely successful under the Environ/1 Virtual Software system.

Tracking transactions

The first problem was that of maintaining transaction context. On-line transactions, just like conversations, must be kept in context. We must identify the unique conversations, identify our position in those conversations, and be able to recover our positions in our unique conversations. Analogous to the system situation is the view of oneself as the system. The person's task, just as it is the system's task, is to carry on a conversation with persons at the end of perhaps 30 telephone lines. Only, there are certain restrictions just as the system has restrictions. The major restriction is that we can only receive ten words or one sentence at a time and can only respond with ten words or one sentence at a time before we must go to the next conversation. Given normal memory we don't do too

badly as we go from the first conversation to the second or the second to the third. But, as we go from the 11th conversation to the 12th, and the 20th to the 21st, the first conversation starts to fade from memory. Then going from the 29th conversation to the 30th conversation, and then faced with going from the 30th conversation back to the first conversation and resuming it in line, the chances of remembering that person's telephone number, much less his name, the subject of the conversation, or the current position in that conversation, are extremely remote. In fact, it is impossible. But we could have resumed that conversation if we had a secretary sitting next to us. And as we engaged in each conversation, he would take down some basic totals, tallies, status, and communication data pertinent to that conversation, perhaps the telephone number, the person's name, the subject of the conversation, and maybe the last sentence in the conversation. You could then, as you went from the 30th conversation back to the first, by reviewing those notes, pretty well have resumed that conversation, in line without any break at all. In fact, if during the midst of all of the conversations, someone with a completely new memory took over the telephones, that person, by reviewing those notes about each of those conversations, could also have resumed all of those conversations in line without interruption. That basic information which is pertinent to the identification of each unique conversation in the system, to its maintenance, and to the recoverability and reinitiation of each conversation in the system is defined as "transaction context."

The solution was back in the application programmer's hands. His job was to fully recognize all tasks that might participate in conversational activities, insure that current positions in the conversation are maintained, recognize the possible impact of external routines or processes which might participate in the conversation, and should the system incur any problems, insure the resumption, in-line, of any of the individual conversations. That's all! Maintain the conversations' context.

Awaiting the next chapter

At the start of this discussion I mentioned that the data processing manager could best cope with the implementation of on-line systems if he understood the process and evolution by which the technological levels of today were achieved. If he understands fully the problems still left unsolved, then he can best cope with those problems and, of course, perpetuate the evolutionary process.

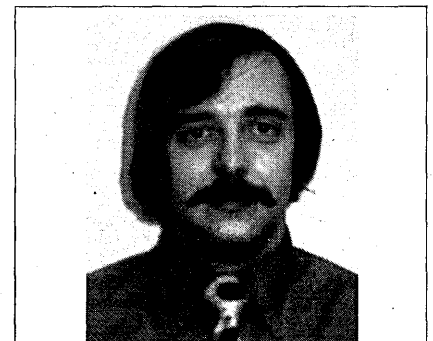
If we choose to define basic criteria necessary in a teleprocessing system to insure success, the list would be similar to this:

- ease of implementation and use
- hardware/software flexibility and independence
- broad performance range
- high system availability
- ability to identify future requirements and the effect of change
- optimum performance and efficiency
- information system support
- open ended

If we summarize the single major problem left unsolved at our current technological level, it would be the tremendous burden of complexity placed upon the applications programmer requiring him to:

- logically disassociate data pertinent to a task from the code
- recognize the physical terminal network
- code in low level languages
- code reentrant programs
- optimize and restructure code for efficiency
- code in fixed module size or in fixed overlay structure
- maintain all transaction context

The major problem left unsolved then is that of "ease of implementation and use." If the premise (and the promise) of evolution is to solve yesterday's problems, and to grasp and use to the fullest the coming technological advances, then tomorrow's teleprocessing systems are going to achieve two fundamental goals: One, to insure that all criteria defined above are met by all new systems technology. Two, to implement the technological advances necessary to sweep away the complexities of the application programmers world and to make on-line systems truly "easy to implement and use," thereby releasing the full potential for successful on-line information systems.



Mr. Flynn is a marketing representative for Cincom Systems, Inc. He has been involved in developing, installing, and marketing teleprocessing systems for the past seven years.

Info '74 offers a timely program on today's information systems. There is a lot for everybody. But will they come?

YOU AND YOUR INFORMATION SYSTEM

by Tom McCusker,
Senior Associate Editor

Info '74, the first large-scale conference and exposition of its kind, faces formidable obstacles when it opens Sept. 9 for a four-day run in New York. Aimed at the busy corporate executive, it takes place between the Labor Day weekend and the Jewish holidays. Aimed also at the technical man, it runs up against two other technical conferences—the IEEE's Compcon '74, Sept. 10-12 in Washington, and WESCON '74, Sept. 10-13 in Los Angeles. Heavily systems oriented, it smacks head-on with the annual conference of the Society for Management Information Systems, Sept. 11-12 in San Francisco.

"If it were being held later—say in November—I'd be disappointed if we had less than 5,000-6,000 registration," says I. E. Block, of Auerbach Publishers, Inc., who has helped to organize the conference program for the sponsoring American Management Associations. "But in September," he adds, "It's anybody's guess." A spokesman for Clapp & Poliak, Inc., which is producing the exposition of some 160 exhibitors, says his organization isn't officially forecasting attendance. He adds, "Some of us think we'd be proud with a total turnout of 15,000 for the exposition and conference, but nobody's saying it couldn't exceed 30,000."

Two things point to a success. The turnout of 160 exhibitors, which the sponsors think might reach 170, is unusually high for a first-ever exposition. And the conference program leaves little missing from the interests of the audience to which it is targeted—the managers who organize the information needs of their companies, the executives who use the information and the edp managers who mechanize the systems for meeting these needs. The 61 sessions with about 230 speakers range in content from "the simple to the esoteric, from the general to the specific," says Block, "addressing all aspects of the information system in an organization and the technology to mechanize it."

Vern Lautner, the Info '74 program director, says "We felt the need for a conference where the corporate manager type would be more at home in

sessions that weren't heavily technically oriented. Only recently has he become involved in the design and building of information systems. But at the same time, we felt we couldn't lose sight of the data processing manager. The more we looked at information systems, the more we found all of it related to the computer."

Lautner is manager of the management systems and sciences division of the American Management Associations, a 50,000-member organization with 12 special interest groups," all of them represented in the selection of the program for Info '74." The organiza-

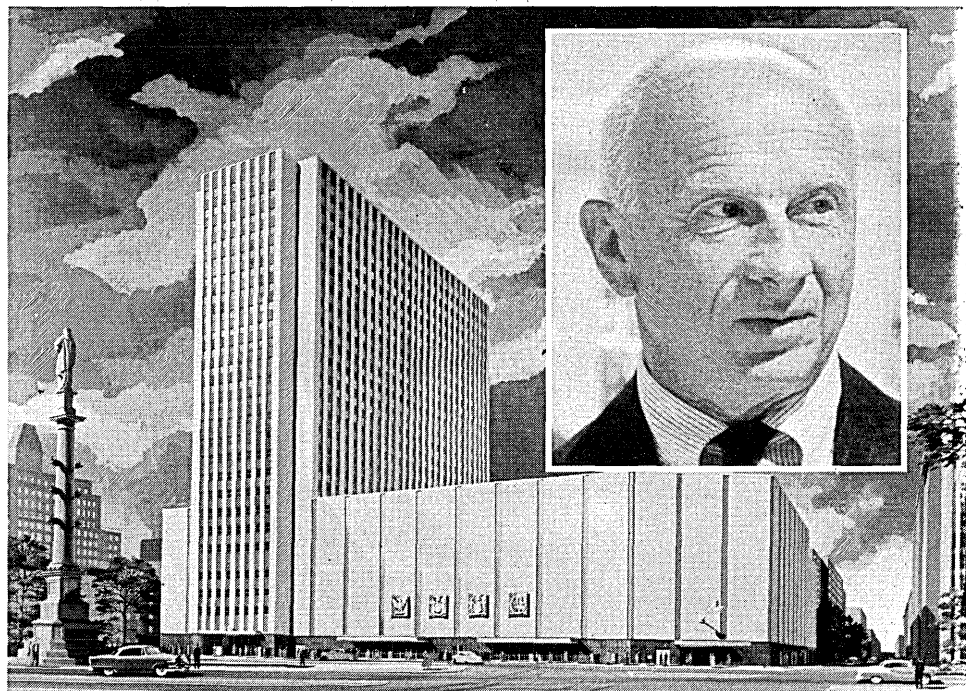
tion began planning the conference a year ago by selecting subjects it felt covered everything that had to be known about the delivery of information systems. "We didn't have the luxury of sitting back and reviewing papers," says Block. "We decided where the problems were, then we went out to look for speakers who could address them. All the papers are invitational."

The product is an interesting and innovative three-part program: one part consists of executive sessions for the non-computer person, a second is for people involved in organizing information systems, and a third is for

INFO-'74 PARTICULARS

- Dates:** Sept. 9-12
Place: New York Coliseum, Americana Hotel, Lincoln Center
Times: Conference, 9 a.m.-5 p.m. (opens Monday at 9:30 a.m.)
Exposition, 11 a.m.-5 p.m. (closes Thursday at 4 p.m.)
Fees: Conference, \$120 for four days, \$70 for two days, \$45, one day. (For AMA members fees are \$100, \$60 and \$35).
Exposition, \$5 unless registered for conference, \$1 with exhibitor passes.

Information: Write Info '74, The American Management Associations, 135 West 50th Street, New York, NY 10020. Tel: 212-586-8100



Clapp & Poliak's Saul Poliak hopes to fill Coliseum and nearby meeting rooms during Info '74 Sept. 9-12.

the management and technology needs of the data processing manager. The topics range widely (see accompanying summary of the program) from papers on virtual memory and networks to the use of computers in collective bargaining and in measuring profitability of insurance companies.

The insurance session is the idea of Harry F. Downing, general manager of Nationwide Insurance Companies, Columbus, Ohio, who is chairman of the session. Titled "Measuring the Profitability of Insurance Company Operations," it will have three speakers: Robert N. Powell, a vp of Nationwide, "Generally Accepted Accounting Principles in Life Insurance Companies: A Prerequisite to Automated P&L Reporting;" Theodore J. Turner, Nationwide's coordinator of information systems, "Product Cost Accounting in Insurance Operations: A First Step in Mechanizing Profitability Reporting;" and Ralph Verni, director of investment research with Equitable Life Assurance Society, "Using the Computer to Support the Investment Function in an Insurance Company."

There are sessions discussing methods as well as those addressing implications of mechanized information systems. One of these is the widely-discussed use of computers in the transfer of funds in banking and thrift organizations. Dr. William Ford, of the American Bankers Assn. will discuss the economic impact of Electronic Funds Transfer Systems. In theory, EFTS—the transfer of funds from a customer's account to the merchant's—implies the end of the traditional eight-to-ten-day float. What is the implication in the economics of retailing? Also, what does the advent of EFTS do to the way credit is advanced? This is an issue to be addressed by Peter Livingston, a Madison, Wisc. Credit Union executive.

Collective bargaining

There is a session Sept. 11 on the use of computers in collective bargaining, chaired by Monroe Morris, director of manpower, planning, research and analysis with Pan American World Airways. His paper asks, "Computer-Assisted Collective Bargaining—Reality or Dream?" And another speaker, William E. Berry, of Information Science, Inc., New York, discusses the use of automation in the search and analysis of labor union contracts. On Tuesday, in a session on the use of data communications resources, a labor union dp specialists discusses another tactic—the use by the International Brotherhood of Teamsters of data communications to set up a nationwide network of computer terminals to keep track of

dues paying by members. The paper, by William H. Allen, the Teamsters' manager of dp, is entitled, "Planning a National Data Communications Network—a Case Study."

The conference also treats the question of Management Information Systems (MIS), once dreamed of as a way in which a company could have instant access to comprehensive reports on all of a firm's activity. Today, it's a more modest concept: the MIS's are more specialized, department by department, rather than company-wide. And there are sessions covering all of these specialties: Information Systems for Manufacturing Management (Session 17); for Merchandising Management (session 21); for Financial Management (Session 44); For Banking (Session 50) and for Marketing (Session 34).

There are presentations for edp people involved in government. One of these, session 61, "Information Systems for Emergency Services of Local Government," features a paper by Capt. John M. Walters, director of public safety for Jacksonville, Fla. The city's emergency system, using telemetry, has transformed aid for the injured from "a system in which people were

taken from an accident to the morgue, to one where they now are taken from the accident to the hospital, thanks to techniques for assisting paramedics."

And there's the provocative session on PSRO's—the newest of the funny acronyms permeating this business, "Professional Service Review Organizations." These are the organization set up to audit the know-how of doctors. It's part of a session on information systems for hospitals. Speakers will address the impact of the audit system on teaching hospitals and the use of computer technology in making the reviews and coping with the implications.

Technology forecast

For the technology people, there is a paper by Dr. Gene Amdahl on "Fourth Generation" computers. The paper by Amdahl, an architect of IBM's ubiquitous 360 computer line, will present a forecast of the systems "of the next ten years and their impact on the user." Software specialists, Martin Goetz ("Advanced Techniques for Developing and Maintaining Business Data Processing Applications") and Larry A. Welke ("Software Products: An Emerging Industry Offering Cost-

CONFERENCE AT A GLANCE

	SESSION NUMBER	AM	DAY	PM
Corporate Management				
Coping With the Information Function: Some Answers to Three Major Problems Perplexing Top Management.	E 1		Mon.*	
Information Management for the State and Municipal Government Executive.	E 12		Thur.	
Information Management for the Insurance Executive.	E 13		Thur.	
Administrative Services				
Automated Word Processing 1: Low Cost Ways of Putting Words on Paper.	2		Mon.	
Micrographic Systems: New Methods for Storing and Retrieving Records.	3		Mon.	
Some Expected Developments in Telecommunications and Their Impact on Business.	4		Mon.	
Implementing a Word Processing System.	9			Mon.
Micrographic Systems in Records Management II.	10			Mon.
Automated Office Systems: Stepping Stones to the Paperless Office.	11			Mon.
EDP Management & Technology				
Management and the EDP Manager.	5		Mon.	
Evaluation and Planning for Improved Configuration Performance.	6		Mon.	
Acquiring a Data Base Management System.	7		Mon.	
Advanced Computer Techniques for Developing and Maintaining Business Data Processing Applications.	8		Mon.	
Managing the EDP Professional—Guidelines for EDP Managers.	12			Mon.
Future Considerations for Configuration Planning.	13			Mon.
Virtual Storage for the User.	14			Mon.
Advances in Data Communications.	15			Mon.
The Management of Computer Programming Projects.	22		Tues.	
Data Base Management: Concepts, Benefits, Costs, Methodology.	23		Tues.	
The Effective Corporate Use of Current Data Communications Resources.	32B			Tues.
Managing the Security of Data Processing.	39	Wed.		
Computer Networks and Distributed Processing.	40	Wed.		
Software Products: An Emerging Industry Offering				
Cost-Saving Opportunities for EDP Managers.	41	Wed.		
New Information Sources for Business Decisions—Data Base Services	41A	Wed.		
Increasing the Productivity of the Programming Staff.	48			Wed.
Computer Program Verification and Reliability.	49			Wed.

(Continued on page 83)



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CONFERENCE AT A GLANCE

	SESSION NUMBER	DAY	
		AM	PM
Manufacturing			
What Small Manufacturers Are Doing to Computerize Their Accounting.	16	Tues.	
Information Systems for Manufacturing Management.	17	Tues.	
The Management of Information in Process Manufacturing.	18	Tues.	
Information Systems in Distribution and Shipping.	19	Tues.	
Managing Production on a Small Computer.	24		Tues.
Using the Computer to Cut Manufacturing Costs.	25		Tues.
New Hardware and Software for Manufacturing Applications.	26		Tues.
Information Systems for Industrial Automation.	27		Tues.
Retailing			
What Small Retailers Are Doing to Computerize Their Accounting.	20	Tues.	
Information Systems in Merchandising Management I.	21	Tues.	
New Horizons for Information Systems in Merchandising Management II.	28		Tues.
Source Marking: The Needs, Progress and the Problems.	29		Tues.
New Computer Hardware for Retail Applications.	30		Tues.
The Effective Corporate Use of Current Data Communications Resources.	30A		Tues.
Point-of-Sale Systems:			
The Issues, Cost Justification and Long Range Effects.	33	Wed.	
Marketing and Sales			
How Sales Managers are Using Computers.	31		Tues.
Using the Computer in Market Research.	32		Tues.
The Effective Corporate Use of Current Data Communications Resources.	32A		Tues.
Marketing Information Systems in the Manufacturing Organization.	34	Wed.	
New Information Sources for Business Decisions—Data Base Services.	34A	Wed.	
Personnel Administration			
Computer Assisted Compliance—Information Systems for Federal Programs.	35	Wed.	
How Personnel Managers are Using the Computer.	42		Wed.
Using the Computer in Collective Bargaining.	43		Wed.
Banking			
Electronic Funds Transfer. I—A Practical Goal?	36	Wed.	
New Information Sources for Business Decisions—Data Base Services.	36A	Wed.	
Electronic Funds Transfer. II—A Practical Goal?	44A		Wed.
Integrated Information Systems for Bank Operation.	50	Thur.	
Automated Planning for Bank Management.	51	Thur.	
How Small Banks Can Use Computers.	56		Thur.
Insurance			
Automated Claims Systems in Group Health Insurance.	37	Wed.	
Measuring the Profitability of Insurance Company Operations.	38	Wed.	
Computer-Aided Selling of Insurance.	46		Wed.
Automated Claims Systems in Casualty Insurance.	48		Wed.
Financial Management			
A Financial Information System for a Diversified Business.	44		Wed.
Service Organizations			
What Small Service Organizations are Doing to Computerize Their Accounting.	45		Wed.
Hospitals			
Information Processing in the Hospital I.	52	Thur.	
Automated Planning in Hospital Administration:			
Requirements, Forecasting, Personnel Scheduling, Facilities Allocation, Rate Analysis.	53	Thur.	
Information Processing in the Hospital II.	57		Thur.
PSRO's (Professional Service Organization):			
Supporting Information Systems and Organizational Concepts.	58		Thur.
Public Administration			
Information Systems in State and Municipal Governments I:			
What the Jurisdictions Are Doing.	54	Thur.	
Information Processing for Law Enforcement.	55	Thur.	
Information Systems in State and Municipal Governments II:			
Planning and Scheduling.	59		Thur.
Information Systems for Health and Welfare Administration.	60		Thur.
Information Systems for Emergency Services of Local Governments.	61		Thur.

*This session will continue on Tuesday, Wednesday and Thursday mornings. Special sessions relating to most of the above topics will be held for corporate executives in manufacturing, retailing, marketing, finance, banking, transportation and personnel. These are in addition to those noted above.

Saving Opportunities for EDP Managers") will participate as chairman of two sessions. Throughout the four-day conference, Herbert Z. Halbrecht will head a session on "Coping With the Information Function: Some Answers to Three Major Problems Perplexing Top Management." Halbrecht, the head of Halbrecht Associates, New York, has collected nine experts to explore the issue. It relates somewhat to the theme of the conference: "Who's on Top—You or Your Information System?"

The opening session is on Monday at 9:30 a.m. at Lincoln Center's Avery Fisher Hall (capacity 2,000), located next to the Coliseum where the exposition and some sessions will be held. It will be a bus or cab ride of ten minutes to the other conference site, the Americana hotel where most of the conference sessions will take place. (A program detailing all locations is available from the AMA—see Info '74 particulars accompanying this story).

Info '74 is a first—the idea, initially of Clapp & Poliak, a producer of trade shows which began promoting this affair shortly before the American Federation of Information Processing Societies decided that shows were dying. AFIPS decided to hold a show once a year, instead of the semi-annual Joint Computer Conferences in the Spring and Fall. "We thought a lot about this declining interest before committing ourselves to the Clapp & Poliak venture," says AMA's Lautner. "We were aware of how the joints' attendance had dwindled and how the Data Processing Management Assn. (DPMA) shows had dwindled. We thought it was time for another type of conference."

A spokesman for AFIPS does not consider Info '74 serious competition to the annual National Computer Conference (NCC). "They aren't holding it where the NCC will hold its next event. We are 73% sold out in exhibit space. Maybe if we didn't exist, they'd grow—so would the Computer Caravan—but there's no serious competition."

Still, Info '74 is a first—and its first opening, to continue to attract exhibitors, must be a winner. The sponsors so far have mailed 850,000 pieces of literature to prospective attendees. This includes some 300,000 programs and 250,000 exposition tickets to the exhibitors permitting visitors to save \$4 on the \$5 entrance fee. They are running advertisements in the New York Times and Wall Street Journal and in a dozen special interest trade publications.

It leads Auerbach's Mr. Block to say, "there'll be an Info '80. And an Info '75, 76, 77, 78 and 79 before that." □

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Beside the CRT, the keystation features a keyboard housed in a convenient desk-sized console. The 1900 allows the use of 1 to 32 keystations at the same time by individual operators without interrupting normal keystroke cadence. Concurrently, key information can be accumulated on intermediate disc storage and selectively output to computer compatible magnetic tape.

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Redundancy in hardware and lines is still a key to network reliability. Choosing where to be redundant can be the key to controlling costs.

NETWORK RELIABILITY

by Howard Frank and Lynn Hopewell

A major development in the computer field in the 1970's is the movement from off-line to on-line systems. It is expected that 70% of all data processing installations will be connected to terminals by communication facilities by 1980.¹ This integration of computing and communications is what is here broadly referred to by the term "computer network."

Even medium size computer networks involve investment and operating costs in the millions of dollars. Thus, considerable effort is usually expended in selecting appropriate architectural strategies for implementing such systems. The criteria of response time and capacity are most commonly used in evaluating each strategy, and methodologies for conducting analyses using these criteria are well documented in the technical literature.

Another criterion—network reliability—is rarely treated explicitly and quantitatively. Yet network reliability often becomes the most important criterion governing network architecture—especially as networks grow in size and extensiveness. This occurs for two reasons. First, for many types of networks, due to simple conservatism in the design process, a network configuration is implemented which performs well in terms of response time and capacity. What then happens is that the system is considered successful. Users come to depend on it, and, after the warm afterglow of a successful new tool has worn off, become increasingly intolerant when it is not available. The first pressure the system operators feel from their customers often causes hasty attempts to improve reliability — usually with expensive redundancy.

The second reason reliability becomes an important criterion is that for some networks reliability becomes the driving design criterion. That is, if a network is designed using only re-

sponse time and throughput as criteria, network cost will increase when the design is adjusted to provide a high level of reliability. The costs and architectural consequences are such that in order to meet the reliability criterion, sufficient capacity must be provided so that response time and throughput requirements are, in a sense, obtained free.

One reason that the reliability criterion is not as well treated as others is that the computational techniques required to analyze some situations are complex. Additionally, the techniques can only feasibly be carried out on a computer. Only in the last few years have research and development in this area provided usable results.

This article will attempt to show that networks can and should be designed with consideration of "network" reliability as opposed to "element" or "component" reliability. Specific case examples from client studies at Network Analysis Corp. will be used for illustration.

Measures of reliability

Network reliability analysis is concerned with the dependence of the reliability of the network as a whole on the reliability of its nodes (terminals and computers) and communication links. Element reliability is easily defined in terms of the probability that the element (a communications link, or a specific piece of equipment) is operating satisfactorily. (Deciding when an element is *not* operating satisfactorily is a separate problem. The throughput on a transmission link is a function of the error rate occurring on the link. At some point decreased throughput on the link will begin to adversely affect the whole network. This point is a function of the network and of user criteria. Here we assume the user has taken this into account in his statement of the probability that the link performs "satisfactorily.") The definition of network reliability is not as clear and simple as that for element reliability.

Consider the following measures:

1. *The expected fraction of terminals or nodes that can communicate with each other.*

This measure of reliability is of interest to a message-switched network or to other types of networks in which the ability to send data from any point in the network to any other point is important.

2. *The expected fraction of terminals that can communicate with a central site.*

This measure applies to systems oriented to centralized data bases.

3. *The probability that all terminals in a single physical location will not be able to communicate with a central site.*

This measure is also of interest to those users operating a centralized data base system. It is not too burdensome if a single terminal in a multi-terminal office fails. However, the inability of an entire office to communicate might have serious consequences.

Many other measures are used.

These include the number of elements which must be removed to disconnect the network or to degrade the expected throughput of the network, given element failures. More general criteria arise when different node pairs are weighted by their importance. For example, communication between ILLIAC IV and certain other nodes will be of high priority in the ARPANET.²

There are many possible definitions, and the choice of criteria is highly dependent on the function of the network and the value judgments of the user. Here are a few examples of how network reliability has been evaluated.

A financial organization

This client maintained an on-line centralized data base with data entered and edited at over 500 terminals in 100 locations across the U.S. Terminals in an office were on individual loops be-

¹Frost & Sullivan, Inc., "The Data Communications, Modems, Multiplexors, and Processors Markets," Dec. 1972.

²Kershenbaum, A., and R. Van Slyke, "Recursive Analysis of Network Reliability," *Networks*, vol. 3, no. 1, 1973.

Network Reliability

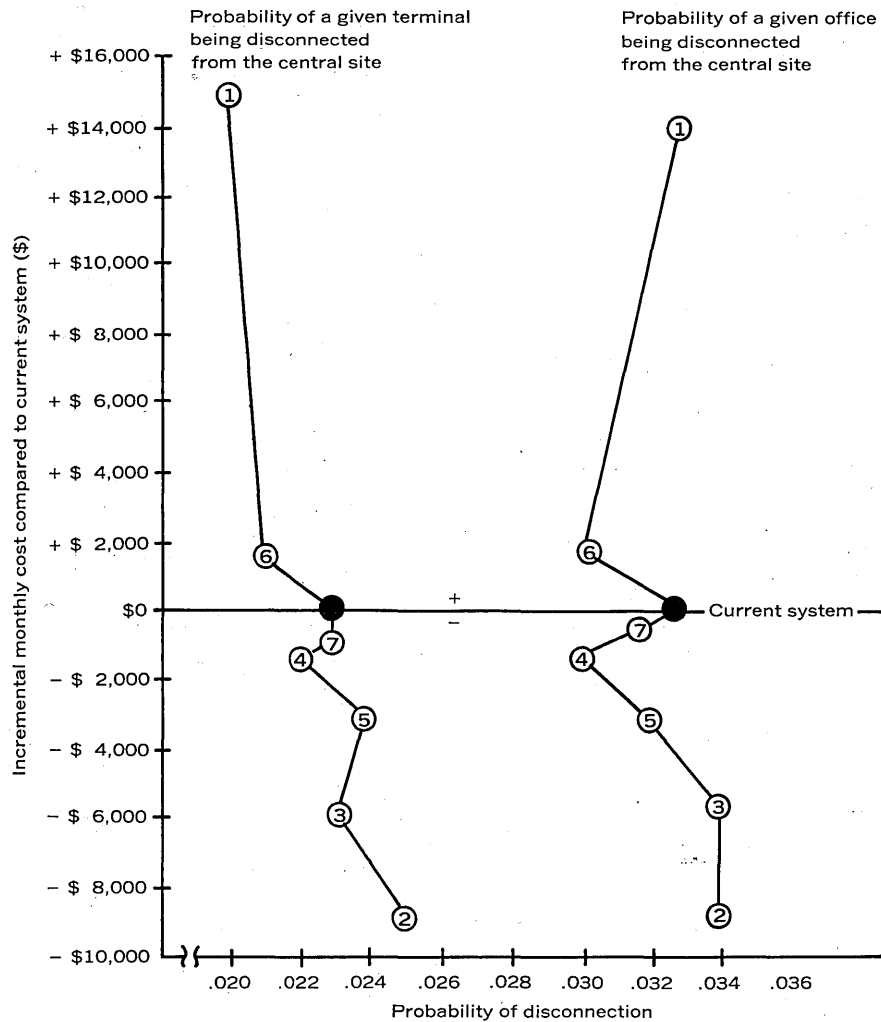


Fig. 1. For one 500-terminal network, seven strategies for insuring reliability were studied: (1) multiple communications links, (2) modem sharing, (3) multiple modem sharing, (4) dial-up backup lines with modem sharing, (5) partial dial-up backup with modem sharing, (6) dial-up backup with multiple shared modems, and (7) partial dial-up backup with multiple shared modems. One strategy provided lower cost and better reliability.

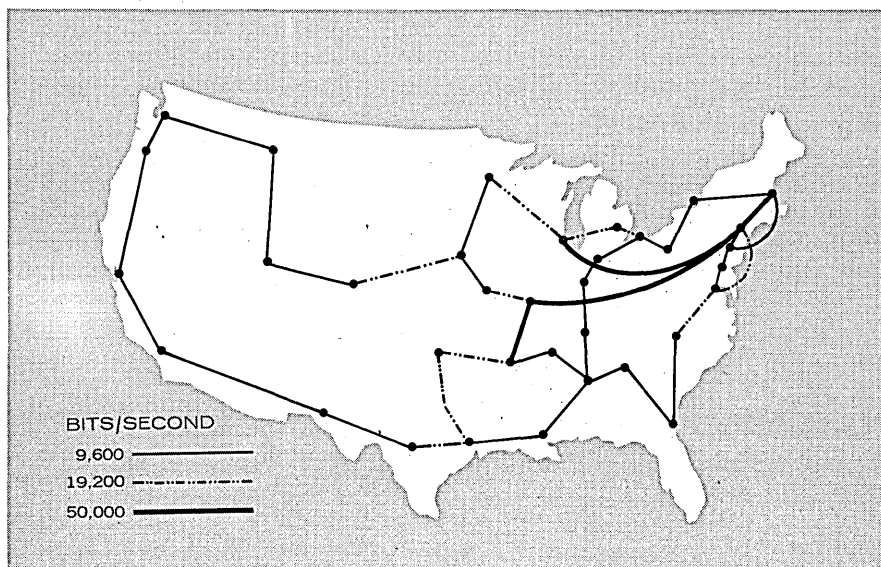


Fig. 2. The original Federal Reserve System network, before reliability analysis. The network is used in clearing checks between banks.

cause the user "felt" that local loop failures would predominate. As part of a study to choose a strategy for expanding the network to accommodate several times as much traffic and many more terminals, an analysis of alternative reliability strategies was performed.

In this case, the client was interested in two measures: (a) the probability that a terminal could not communicate with the central site, and (b) the probability that an entire office (all terminals at one location) could not communicate with the central site. The following design strategies were examined. (The numbers refer to the points on the graphs in Fig. 1.)

1. Diverse routing

One way of increasing reliability, especially criterion (b), is to ensure that each branch office has terminals on at least two different long line paths to the central site. Thus, if one long line fails, at least some of the terminals in an office will still be able to communicate. Since each terminal is still on only one long line path, criterion (a) is unchanged. Providing more than two independent long line paths is not cost effective, since with two paths, the joint probability of both paths failing is already extremely low.

2. Modem sharing

Modem sharing units (MSUs) allow the user to place a number of terminals on a single modem and local loop, thereby saving the extra modem and drop charges.

3. Split modem sharing

To protect against the possibility of an entire office being unable to communicate with the cpu when its sole MSU fails, the network can be reconfigured with at least two MSUs in each office with terminals divided between them. The probability of an office not being able to communicate is lowered, but the probability of a single terminal being able to communicate remains the same.

4. Dial-up backup with modem sharing

It is possible to backup the local loops and long lines by placing port sharing units (PSUs) and additional data sets at the cpu. A PSU is a device which allows several (usually up to six) lines to share the same cpu port. Thus, the leased lines and the dial-up backup lines can share the same port.

Without modem sharing, any consideration of dial-up backup is prohibitively expensive because one telephone must be provided for

each terminal, plus an associated modem and telephone at the central site, plus additional PSUs. With modem sharing, dial-up backup becomes far more attractive. We now need only provide one telephone for each MSU, an associated telephone and modem at the central site, plus one PSU for each port.

5. *Partial dial-up with modem sharing*
This strategy provides enough dial-up backup for only a portion of the terminals in an office.
6. *Dial-up with split modem sharing*
An even lower cost alternative.
7. *Partial dial-up with split modem sharing*
The lowest cost split modem sharing strategy.

Fig. 1 summarizes the results of the above analysis, showing the trade-off between cost and reliability of each of the proposed alternate network configurations discussed. It is common to find that increased reliability can be achieved with increased cost, and the decision usually revolves around just how much additional reliability is worth. However, notice that in this case, the client was able to have his cake and eat it too! Strategy (4) allowed him to lower costs and also increase reliability.

The Federal Reserve System

In a study of the feasibility of distributed networks for use in the Federal Reserve check clearing process, networks (see Figs. 2 and 3) were designed to specific response time, throughput, and minimum reliability requirements. The study of the resulting system provides a dramatic example of the worth of examining criteria in a parametric fashion, in this case reliability as a function of cost. By making low cost topological modifications to the basic network designs, it was possible to reduce the time any two banks could not communicate by a factor of 200 to 1 (see Fig. 4) for only a 2% increase in the cost per transaction. (At a 1.5% outage rate, any two banks might not have been able to communicate with each other for as many as 10.5 hours each year. Another design, which increased transaction costs by 2%, cut the 10.5 hours to only three minutes per year.)

The Arpanet

The ARPANET is a resource sharing network, (sponsored by the Department of Defense's Advanced Research Projects Agency), of over 40 computers interconnected by a distributed packet-switched communications system. Distributed networks like ARPANET are capable of adapting to network failures by rerouting flows

around their failed parts. Many designers have believed that if there were at least two totally independent routes between all pairs of points, high network reliability would be maintained. Fig. 5 shows the results of one aspect of a major study of distributed network reliability. It shows clearly that for large networks, three-way connectivity (i.e., at least three totally independent routes between all pairs of points) is required for reliability.

A second technique studied for the improvement of reliability in the present ARPANET consists of the installation of low cost, high throughput bypass switches at the nodes. In the event of a message switch failure, the bypass switch installed in the local telephone company office routes flow directly from one high speed line at the message switch onto another at the same node. Thus, the path between the neighboring switches is preserved. Fig.

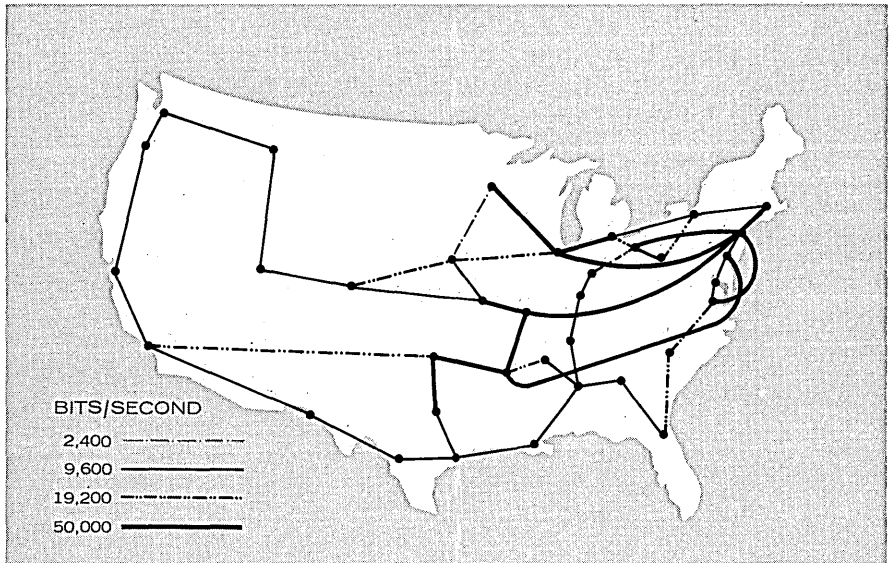


Fig. 3. Low cost changes to the Federal Reserve System network resulted in a 200 to 1 reduction in the time communications between any two banks would be cut off.

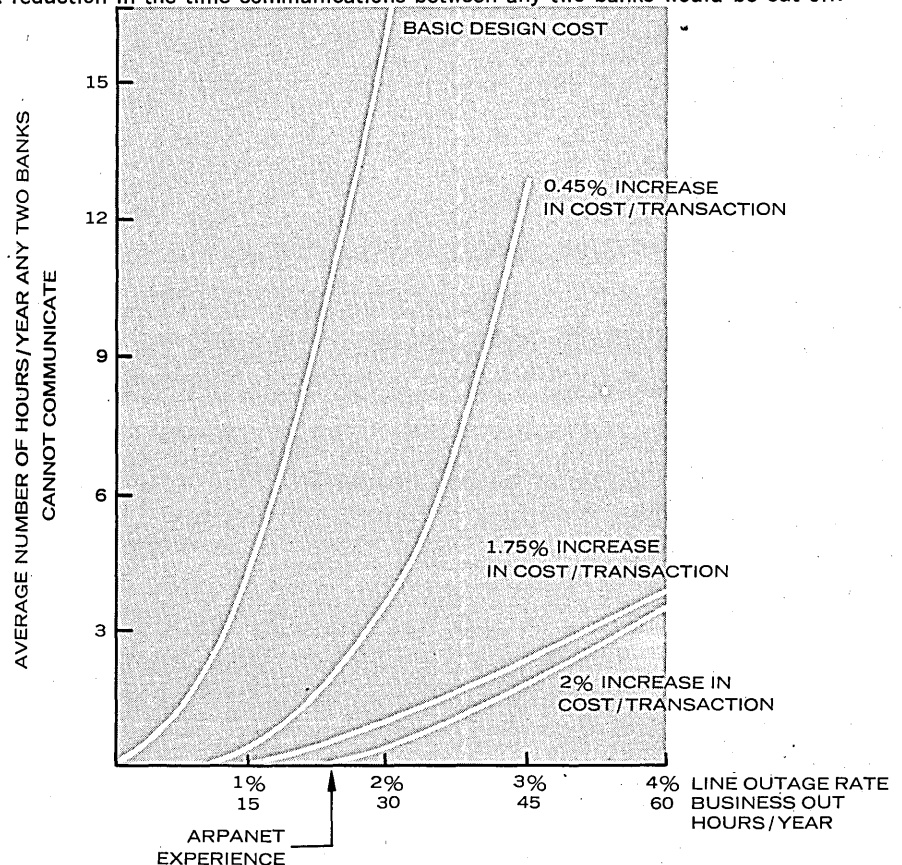


Fig. 4. The 200 to 1 reduction in disrupted communications for the Federal Reserve System was achieved at an incremental cost of 2%.

Network Reliability

6 gives an example of the value of these techniques for reliability improvement.

Fig. 7 shows the importance of reliability analysis to guide investment decisions. It is clear that in this particular packet-switched network (an early version of the ARPANET), improving link reliability is of limited value in improving total network reliability. Investment should be directed towards improved node reliability.

Federal Aviation Administration

Three alternative designs were studied for the modernization of a major FAA data communications network: Design I involved mixed lines without concentrators; Design II called for voice-grade lines only; and Design III involved mixed lines with concentrators. All designs were to meet the same response time and throughput criteria. Design III turned out to be the preferred strategy on the basis of reliabil-

ity.

In this case, the useful reliability criterion was the expected fraction of terminal pairs not communicating as a function of average link downtime. This is shown as the curve marked "concentrator" in Fig. 8. Several strategies were examined for improving the reliability of this type of network, including: (1) adding equipment to assure that there is always a path from any concentrator to its associated switch, and (2) adding even more equipment, including multiplexors, to make the concentrator facility nearly perfectly reliable.

There is no way to make a path from a concentrator to its switch completely reliable. However, there are several ways to achieve nearly perfect reliability (to make the path's failure rate negligible when compared to the failure rate of other elements). To achieve such reliability one can either: (1) have an additional leased line from the concentrator to the switch so that there are two diverse paths between them; or (2) have dial-up equipment at concentrator and switch sites so that if the regular path is broken, the path between the concentrator and the switch can be reestablished by dialing through the switched network.

The second method is less convenient, since human intervention may be necessary, and there will be momentary delays during the switch-over. However, since there will be a reduced cost, a cost-performance trade-off is possible.

To make the concentrator almost completely reliable, one can either: (1) place a redundant concentrator at each concentrator site so that if the primary concentrator fails, its load can be assumed by the backup concentrator; or (2) place a multiplexor at each concentrator site and a demultiplexor at any two concentrator (or switch) sites—the two facilities chosen will thus provide routine service to their areas and a backup service to each other.

If a concentrator fails, all low-speed lines can be multiplexed over the dial-up backup line to one of the two demultiplexors located at the backup facility. The same improvement in reliability can be obtained by using dial-up lines instead of leased lines as backup, and by using redundant concentrators instead of multiplexor backup. The extra cost of one method over the other is the price paid for operational ease.

The other curves in Fig. 8 show the improvement in the reliability of the concentrator approach by these techniques. A decision maker now has the necessary benefit-cost information to

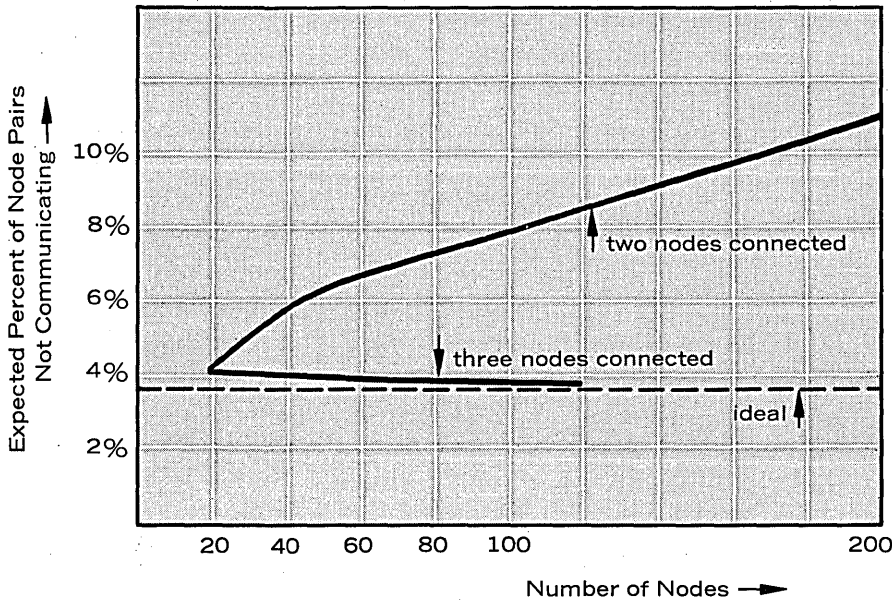


Fig. 5. For large networks, like the ARPANET, high reliability requires having at least three routes between any two points.

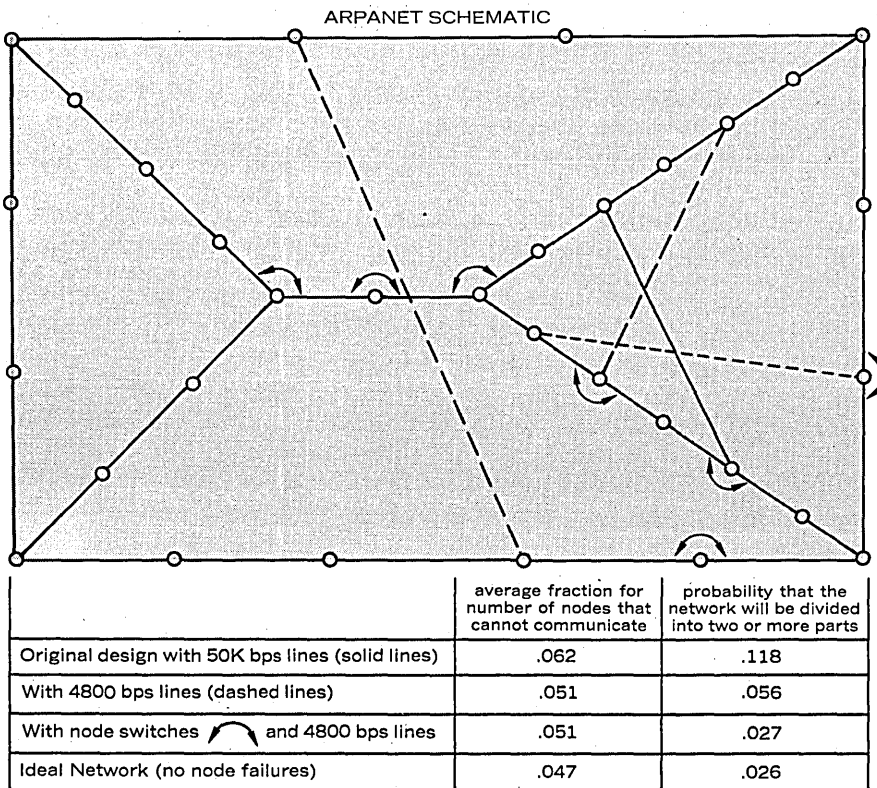


Fig. 6. The probability that the ARPANET would ever experience enough failures to split it into two non-communicating parts was reduced dramatically through the addition of node switches and backup communications links.

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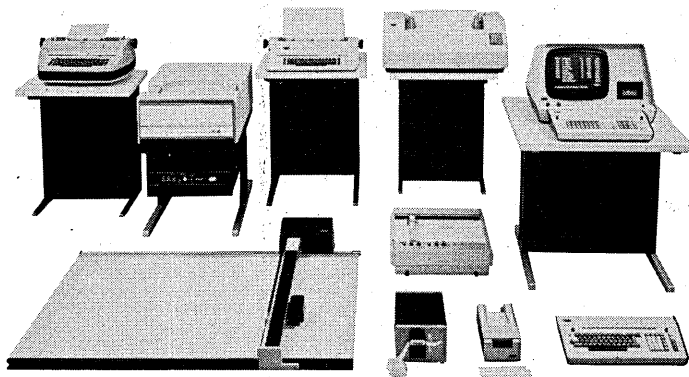
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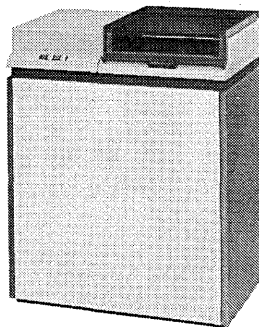
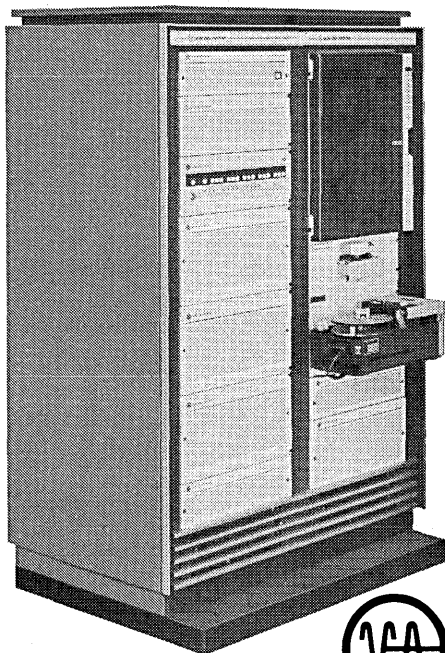
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Network Reliability

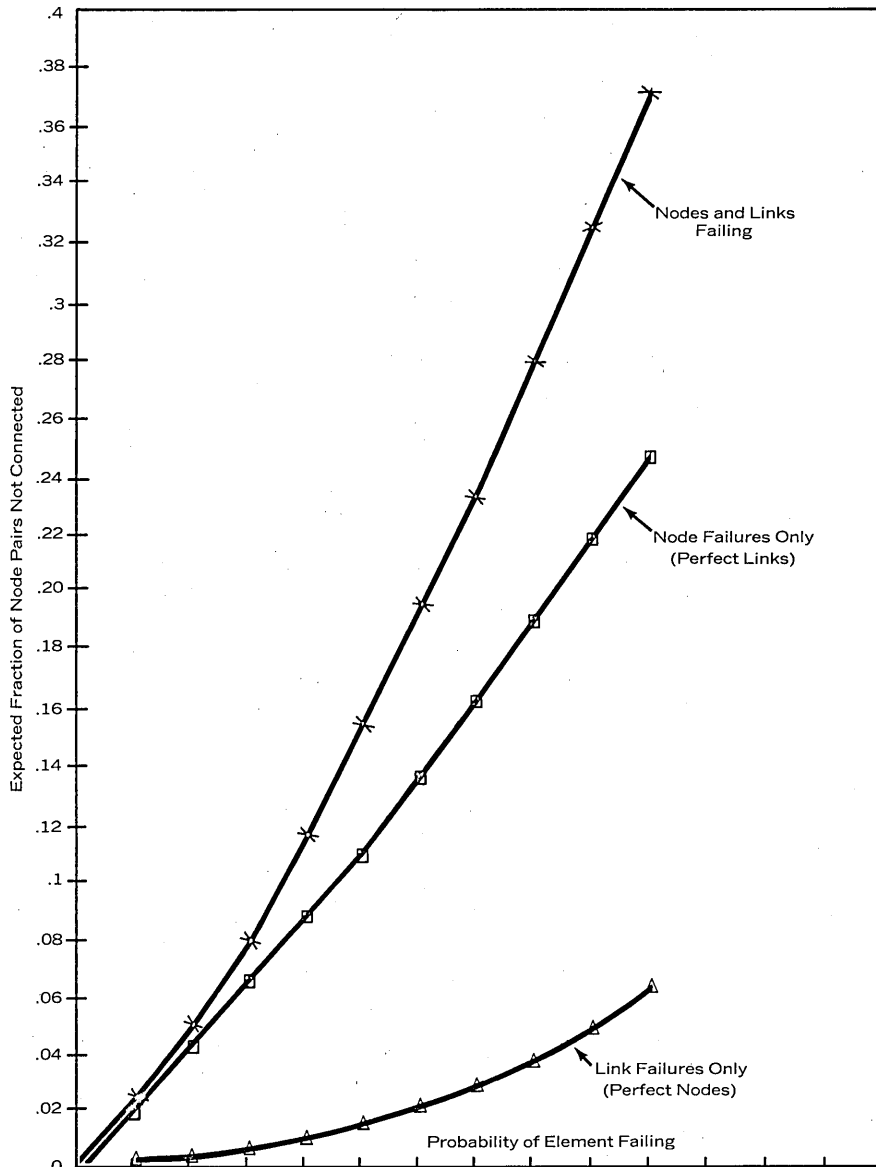


Fig. 7. When the affects of node failures and link failures were studied separately for the ARPANET, it became clear that additional investment should be aimed at improving the reliability of the nodes.

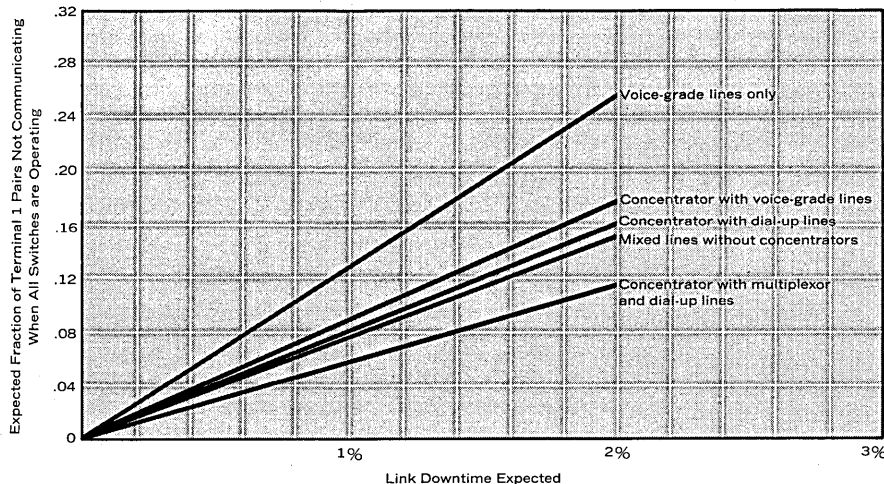
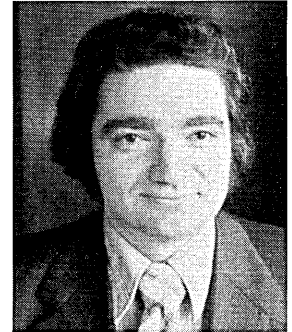


Fig. 8. Networks designed around throughput or response time criteria may differ markedly in terms of reliability. The decision maker must know what the differences are in benefits, as well as in costs.

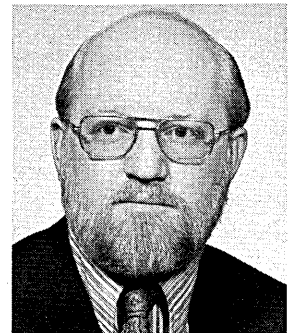
make a choice between alternative reliability approaches.

Summary

Reliability is always an important design criterion for computer networks; and, as these networks become larger, this criterion can dominate design considerations in some types of networks. The proper analysis of reliability alternatives is necessary to ensure a wise choice of network design strategy. Modern computational techniques now make these analyses feasible. □



Among many other distinctions, Dr. Frank's credentials include being president of Network Analysis Corp., author of over 70 technical papers (including one which was named best paper of 1969 in the "IEEE Transactions on Communications Technology"), and co-author of the book "Communication, Transmission and Transportation Networks" (which received Honorable Mention for the 1972 Lancaster Prize). He has been an assoc. prof. of electrical engineering and computer sciences at the Univ. of Calif., Berkeley, and served as a full-time consultant in charge of network analysis in the Office of Emergency Preparedness of the Executive Office of the President in 1968.



Mr. Hopewell specializes in planning computer communications networks as vice president of Network Analysis Corp. Previously he was the director of data communications systems engineering for Telcom, Inc.

The authors wish to acknowledge the contributions of A. Kershenbaum and W. Chou, who performed many of the calculations leading to the results given in this article.

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How big is big? Common Market commissioners are looking into IBM's dominance of the European computer industry. Does the company violate Article 86 of the Treaty of Rome, forbidding the abuse of a dominant position by a firm? page 94 . . .

Meet Univac's John C. Butler—the man who meshed RCA's business with Univac's, page 96. He's now running Univac's acquisition-minded operation in Europe . . .

IBM quietly entered the satellite communications business early in July. Now it seeks an OK from the Federal Communications Commission, and there are mixed feelings over whether it will be given the commission's blessing, page 99 . . .

Not everyone likes the way CSC and Orange County arranged a facilities management contract a year ago, page 101. Computer expert Norman Ream thinks of going to court over the agreement . . .

The U.S. Senate may pass a bill updating the copyright laws this month, page 104. If it does—and the House later concurs—it would be one of very few changes ever made to the law, dating back to 1909 . . .

California's Teale Center controversy over a big contract to IBM still is stormy, page 105 . . .

How are OCR users faring with this kind of data entry? On page 105, users and vendors attending a users' meeting discuss their experiences.

International

Common Market May Step Up Probe of IBM's Dominance

Violation of EEC Rule Could Lead to Suits, Fines

"L'Affaire IBM" is what they call the case in the halls and offices of "Le Berlaymont," the European Economic Community's modern glass-sided headquarters in Brussels. What might best be described as an informal investigation of IBM was instituted quietly last November by the EEC's Directorate-General of Competition.

Now it is picking up momentum and, although there had been no official announcement of the inquiry at this writing in mid-July, the investigation is entering a stage in which it undoubtedly will become more active, if not public.

"We are just starting phase two of the investigation," said EEC Commissioner Albert Borschette in an interview. "We are only interested in the behavior of IBM in Europe. We are looking to see if there has been an abuse of a dominant position."

As an EEC commissioner, Borschette is a member of the governing body of the EEC. The Luxembourger, who is in charge of antitrust policies in the EEC, is known as a staunch consumer advocate.

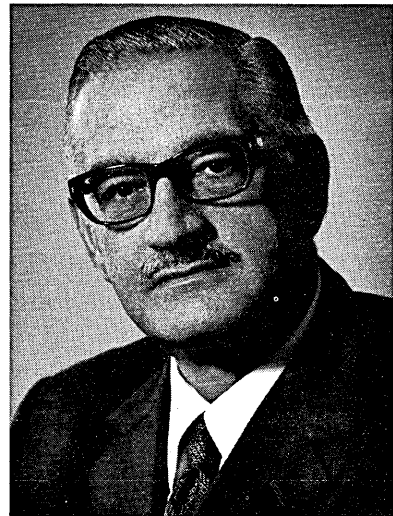
What was phase one of the inquiry? Borschette would say only that some of his staff went to the U.S. to look into the case. It has been learned, however, that the Inspection staff of the Competition Directorate-General has had numerous contacts with the U.S. Justice Dept. which is in the midst of a U.S. antitrust case against IBM. Others who are said to have been visited by the European inspection team included the Computer Industry Association, computer peripheral firms including Telex and Memorex, and at least two mainframe companies. The inquiry team also has had access to the flood of IBM documents that became publicly available in the IBM-Telex antitrust case.

A priority

Borschette said that an investigation of oil companies was the chief item before the Directorate at the present time, but concerning the IBM case he said: "It is

in the first line of priorities." Pressed further, he said that of some 50 to 70 matters being investigated by the Directorate-General, the IBM case certainly ranks in the first 10.

The investigation, Borschette said, is based upon Article 86 of the Treaty of



ALBERT BORSCHETTE
The EEC's consumer advocate

Rome, the constitutional document that established the EEC. Article 86 forbids the abuse of a dominant position by a firm.

Borschette indicated that phase two of the IBM inquiry would consist of EEC inspectors fanning out through European countries and collecting information from IBM, its customers and its competitors. Borschette added that the EEC does have legal rights to look at IBM's books and if IBM declined to cooperate in the inquiry, the member countries of the EEC could require it to produce the documents.

In any case he expects IBM will cooperate. In the U.S. antitrust suits against IBM, the computer firm has buried its opponents in a cascade of documents, which have been difficult to handle. Borschette admits "very few" men are assigned to his case.

While Borschette is freer to talk about

the case, his chief competition administrator, Willy Schlieder, cannot discuss the case publicly, nor can members of Schlieder's staff.

Like Borschette, Schlieder has gained a reputation in Europe as an antitrust and consumer crusader. Schlieder, however, has discussed in speeches the antitrust issues at stake in Article 86 as it relates to dominant position. In a speech he gave two years ago, Schlieder said: "According to the Commission, enterprises are in a dominant position when their scope for independent behavior is such that they can make their decisions without paying any real attention to competitors, buyers or suppliers. The Commission has ruled that this may occur if either their share of the market or their market share coupled with their technical knowledge, raw materials and capital, enable them to determine prices or to control production or distribution in a substantial part of the market."

Although Schlieder indicated that interpretation dated back some eight years ago, the EEC is nevertheless a new enough entity for the EEC body of legal precedent to be meager. Indeed, many feel that with "L'Affaire IBM," the EEC is sailing into legal waters that were uncharted by legal precedent and that the IBM case itself eventually could become an important legal precedent for the EEC.

When it was suggested to Borschette in an interview that there might be charges made that the case could have political or anti-American overtones to

it, he said flatly: "The IBM case is not a political case; nor is it an anti-American case."

"Several complaints"

Borschette said the Directorate-General of Competition had received "several complaints" about IBM. He indicated they came from both manufacturers and users, but he declined to name names. European manufacturers have complained for years about IBM's business practices and Heinz Nixdorf, head of the German small computer firm, has been particularly vociferous in public in his urging that the "IBM monopoly" be eliminated.

Scores of parties have been interviewed concerning the EEC's inquiry into IBM—including IBM and some of its users and competitors. Indeed, IBM itself seemed to be pretty much in the dark about the EEC investigation and Borschette said that there had been no contact between IBM or his department at the top of both organizations. He said his inspectors will be contacting IBM as the case moves into phase two in which IBM European documents will be examined by the EEC.

Asked for comment on the investigation, an IBM spokesman said: "IBM is aware of the fact that the EEC Commission (the Competition Directorate) has initiated an informal investigation of the data processing industry in Europe. Since IBM is one of the leading companies in the industry, such an inquiry would obviously involve IBM."

The Stakes Are High, Proceedings Lengthy

Penalties that can be incurred if a firm is found guilty of violating the EEC's Article 86 concerning dominant position by a firm can be high.

The EEC can stipulate that the practices it deems abusive be stopped. And the firm can be fined up to 10 percent of its annual revenues for the previous year.

More important, perhaps, is the potential exposure from competing firms. After an EEC decision, they could sue for actual damages in national litigations.

The entire proceeding in "L'Affaire IBM" could be lengthy. First, the Directorate-General of Competition and its investigators must prove that IBM has a dominant position in the computer industry in Europe. Second, it then must prove that IBM has abused that dominant position.

EEC commissioner Albert Borschette says the "dossier" in the IBM case simply would be closed if either point could not be proven. He estimated that it would take at least two

years to determine whether IBM has been abusing a dominant position. Others in Brussels and other European capitals feel the case could drag on for years.

Once the Directorate-General of Competition reaches a decision that a firm has violated Article 86, it sends a "Lettre de Grief"—letter of complaint—to the violating firm. The accused firm then is given the opportunity to defend itself both orally and in writing. It is at this point, too, that interested third parties in the proceeding can be heard.

A draft decision then is written by the Directorate-General which must be approved by various units within the EEC and officials from the EEC member nations. Finally, the decision is published in the EEC's official gazette and the document becomes law. As a last resort, the accused firm can appeal the decision to the Court of Justice of the European Communities in Luxembourg, the Common Market's "supreme court." □

"IBM is confident that its business practices are in accordance with the rules of fair competition and with relevant provisions of the Treaty of Rome."

The EEC does not have consent decree legal machinery, but Borschette did not rule out the possibility that EEC and IBM could enter into "a gentlemen's agreement" anywhere along the line. He noted that firms are increasingly coming to his department to work out arrangements amicably over business practices frowned upon by the Competition unit. The result, of course, is that some lengthy legal proceedings are avoided.

The specific issues at stake in the EEC case were not spelled out by Borschette, but they are thought to parallel closely the issues being examined by the U.S. Justice Dept. in its case against IBM. Borschette said he has discussed the IBM case with Asst. Atty. Gen. Thomas E. Kauper, who heads the Justice Dept.'s antitrust division. In addition, there has been regular contact between representatives of each concerning the IBM case, and there has even been unconfirmed speculation in Europe that EEC staffers are helping the Justice Dept. prepare its case against IBM. Justice Dept. comment on the issue cannot be obtained because of an IBM-inspired gag order that muzzles both from discussing the case.

However, in a communication earlier this year to the U.S. Chamber of Commerce, Kauper said the Justice Dept. has been working to harmonize antitrust policies between the U.S. and other nations.

"Borschette's Raiders"

There could be another reason the Common Market is investigating IBM. As in the U.S., there is a growing concern over the power of multinational companies and bigness per se. The concern is not just aimed at big business, and many European countries with large Socialist concentrations in their governments are said to be unhappy, too, about the callousness multinational industries often possess. A reaction to this has been a growing consumer movement in Europe. Indeed, Borschette's staffers are sometimes referred to as "Borschette's Raiders"—an allusion to Ralph "Nader's Raiders."

Even IBM is sensitive to the new ground swell against bigness. In its most recent annual report, IBM's chairman Frank T. Cary said earlier this year:

"There are also, I think, some less obvious factors behind the legal actions against IBM. We have seen in recent years in our society an increasing distrust of large institutions, a feeling that 'bigness is badness' no matter how that bigness was achieved."

On another subject, Borschette said

news in perspective

"up to now" he sees "nothing against the rules" in the establishment of Unidata, the EEC-promoted combine of three European computer firms—Siemens of West Germany, CII of France and Philips of Holland. Indeed, Borschette, like many other Common Market leaders, looks to a concentration like Unidata as a solution to the "European computer problem." The problem is that the European computer industry is dominated by U.S. firms, particularly IBM.

While the efforts to merge the computer operations of Siemens, CII and Philips might look to some as an attempt to create a classical European cartel, the feeling in the EEC is that the combine could never become a monopoly. (The three firms combined possess less than six percent of the European computer market.) In addition, during the first years of the Common Market, much effort was expended in encouraging mergers in an effort to make European industry more competitive and in part the Unidata venture is an extension of that effort.

The Unidata operation, however, is already being used by IBM in its defense in the U.S. Justice Dept. case as evidence that foreign powers are ganging up on the firm and forming "cartels" to compete with IBM. The computer company has noted in pretrial proceedings that Unidata is committed to entering the U.S. market, too.

But a more pressing question regarding Unidata is whether it can fly? The feeling that seems to pervade the EEC—but with some notable exceptions—is that European computer technology has never been far behind American technology, and with massive governmental subsidies, the Europeans can create an effective combine that could become a factor in the worldwide computer market.

Few would question the contention that European technology has been sophisticated: Firms like Bull in France and ICL in England have long been worldwide computer technological leaders. But the idea of putting together an effective company that could capture a sizable piece of the worldwide computer market could be another matter entirely. Indeed, Bull probably would not have survived as an effective firm without merging with General Electric and later Honeywell, and ICL is a conglomeration of several firms and has required massive government grants to keep going.

Nevertheless, the move to push Unidata remains, and there has been some

progress in the past two years. First, the Europeans have finally relinquished the idea that there must be national computer companies and, as a result, are at least willing to attempt to work among themselves. Second, there is a growing feeling that any company that wishes to be strong must enter the U.S. market and perhaps with a U.S. partner.

The staunchest proponent of creating a European computer industry is EEC Commissioner Altiero Spinelli, who is in charge of industrial policy for the EEC. In spreading the gospel of a united European economic community, Spinelli looks upon the national member states as rivals to the EEC. The problem for Spinelli, however, is that although the EEC's power is growing, it still isn't strong enough to effectively support Unidata. The EEC business alone would be little more than a drop of business for Unidata, for instance, because the EEC isn't big enough to be a good customer.

Despite the massive financial transfusions into Unidata from European governments and the three participating companies, Unidata continues to bleed profusely. Many believe that Unidata will be unable to attain its goals unless it acquires a U.S. partner. Honeywell Bull, Univac, Control Data and Burroughs all stay in more or less constant touch with Unidata with the thought that some day—when the time is right—a deal can be made.

Honeywell Bull has the advantage of having large European R & D resources, as well as having forged an effective multinational firm with Europeans having a strong role in the firm. In addition, there is a big European financial equity in Honeywell Bull. Univac has a strong equipment advantage, because Siemens—by far the largest member of Unidata—has long been a supplier of RCA equipment and now that Univac has acquired the RCA base, the two have equipment compatibility. Both Control Data and Burroughs have the reverse advantage of being relatively weak in Europe—a situation the Europeans might find less odious than teaming up with a firm that is strong there.

Meanwhile, ICL and Heinz Nixdorf continue their mysterious *pas de deux*. The irrepressible Nixdorf is virtually camped out on ICL's doorstep. ICL uses Nixdorf Computer terminals and the two firms have had extensive cooperation on all levels; they nearly teamed up in Spain recently. Although the two firms' equipment is incompatible, the equipment would complement each other since Nixdorf makes low-end

equipment while ICL supplies the higher-end. Nixdorf has offered to market ICL's New Range—the British firm's new series.

ICL has delayed the introduction of its New Range and many look for the success or failure of the new line to provide the next big break in the European line-up of firms. Sooner or later, ICL can be expected to team up with another firm, and in addition to Nixdorf, has talked with Unidata and U.S. firms.

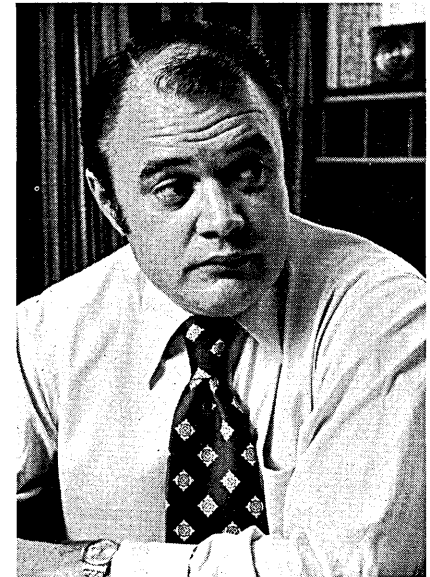
The wild card in the whole game, of course, is IBM and its various antitrust suits. It is possible that the firm's basic structure could be changed dramatically by the various U.S. antitrust suits. And now, with the new EEC antitrust investigation underway, it is possible that, if the U.S. actions do not change IBM, then the Common Market could change it in Europe.

—W. David Gardner

Companies

On the Prowl for Buys in Europe

After Univac's John C. Butler finished the challenging and exhausting job of meshing RCA's computer operation into Univac's, he was assigned to what some thought was a cushy reward—he was



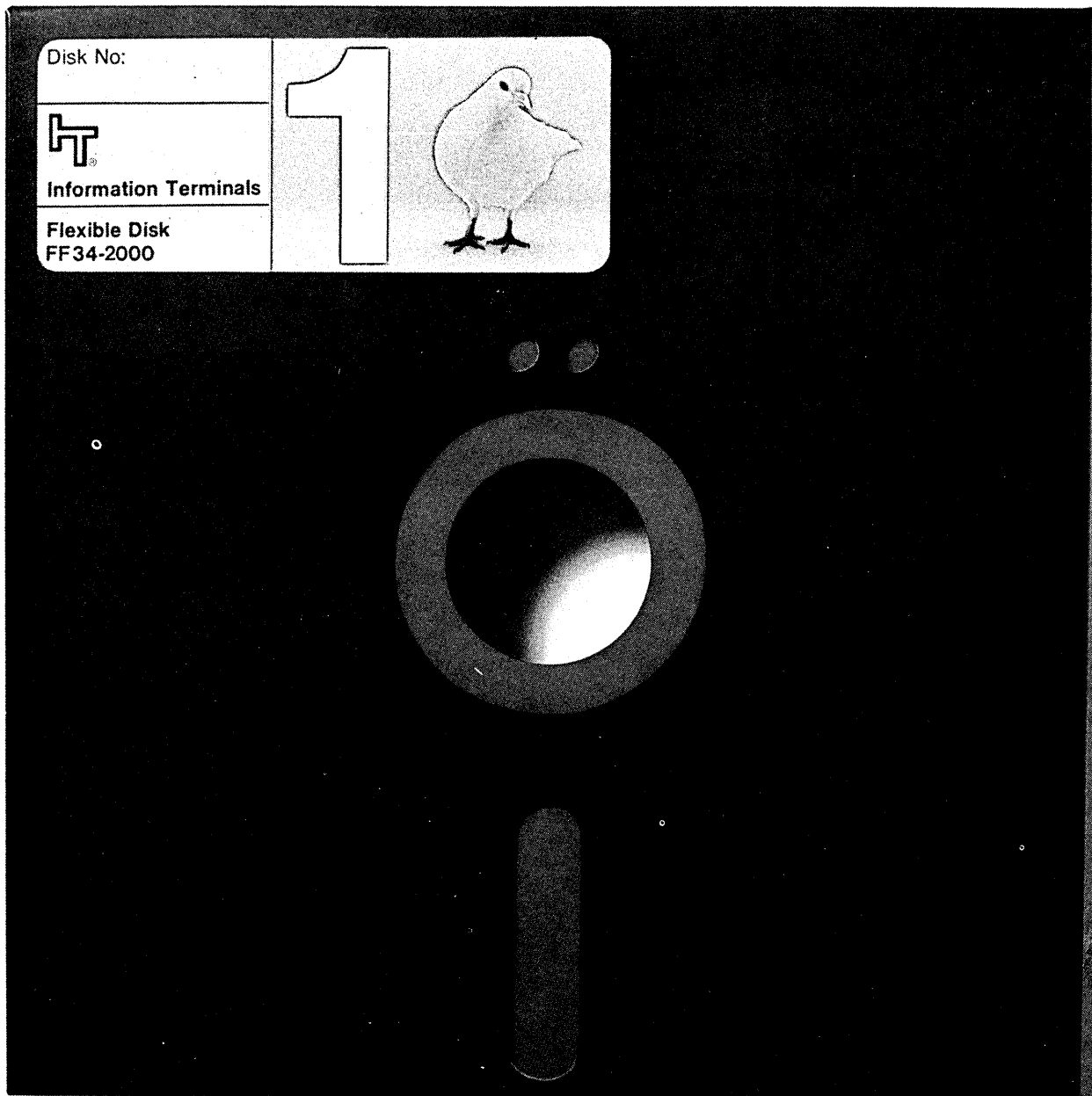
JOHN C. BUTLER
After RCA, some buys
in Europe?

sent to Europe. That was in April of last year and sparks have been flying in Univac's European operation ever since.

Butler, who is also a Univac vice president, started off as general manager of the Northern European Div., but in a few months that unit was meshed with the firm's Central European Div. Today Butler directs Univac operations in

(Continued on page 99)

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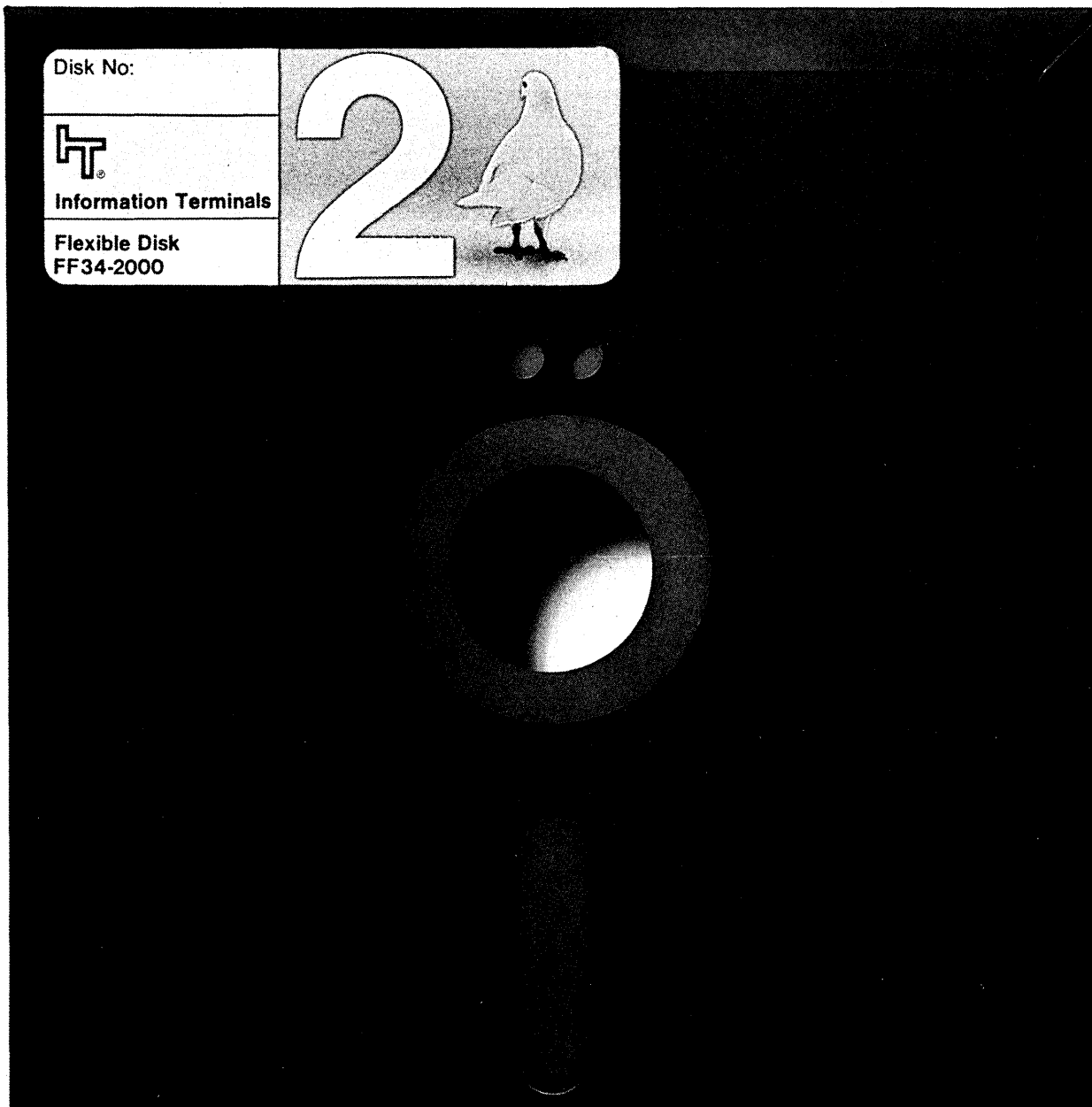
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Western Europe, Eastern Europe, the Middle East, and South Africa.

Not only does he have big plans for expanding the existing operations from within, but he is constantly on the prowl for acquisitions. "We make no bones about it," says Butler. "We think a European-American computer partnership would be a good thing." Butler says he spends a good deal of time talking about the subject with the Unidata companies—Germany's Siemens, France's CII, and Holland's Philips. Moreover, he has the same thought in mind when he talks with the United Kingdom's ICL.

The time probably isn't ready yet for any formal links between Univac and those four companies, but Butler wants to be there when the time is right. Actually, the time may be getting right for a deal in Sweden. Univac has been talking acquisition turkey with Saab Scania for months, according to Swedish sources who think Univac may acquire that firm by the end of the year.

And what about the other acquisition-minded man on the prowl in Europe, Heinz Nixdorf? Butler won't elaborate, but he indicates there won't be a deal with Nixdorf.

Sales Growth

Acquisitions aside, Univac has been on the move in Europe, with its installed base revenues growing at about 20% a year. Obviously the annual sales value increase of Univac equipment is even higher. Butler is also moving Univac into Eastern Europe. ("Just about everything in East Europe is net new. We started with virtually no operation there.") Univac has opened a new headquarters in Vienna, and Butler looks forward to the day when Univac will be opening offices in the Eastern European countries proper. Univac serves the Soviet Union directly from Butler's London base, and has nailed down a big reservations system contract there with Aeroflot, the Soviet Union's airline.

Although Butler hasn't yet made a company acquisition in Europe, in a sense there have been acquisitions of territories made. Not only is there the new territorial push in East Europe, but Turkey, as a new country served by Univac, has become a new market. "And Turkey is all net new, too," says Butler. "We've sold three 1106s there in the past six months." Butler is also understood to be eyeing the Iranian market. Univac's European operation has also been providing some valuable product development. Butler points to the division's German- and Swiss-developed production control package, called the Univac

Industrial Information System. Several hundred packages have been installed in Europe and Butler notes that the package is being modified for U.S. use.

Butler, 41, has been a young man in a hurry at Univac ever since he joined the firm as a sales rep in 1960, not long after he graduated from the Univ. of Pittsburgh. He was a member of the group within Univac that argued in favor of the firm acquiring the RCA base, and that group has become increasingly influential and aggressive in Univac.

—W.D.G.

Communications

IBM Too Big for a Satellite Venture?

Opinions differ on how IBM will fare before the Federal Communications Commission in its request to enter the communications satellite business.

On a Wednesday before the July 4 long weekend, the company quietly issued a joint press release announcing that it and Communications Satellite Corp. (Comsat) have offered to buy out the shares of MCI and Lockheed in CML Satellite Corp., which is developing a specialized domestic system.

MCI and Lockheed want to sell, but the FCC must give its blessing first. Objections are certain.

Jack Biddle, executive director of the Computer Industry Assn., complains that if the IBM-Comsat joint venture is approved, it will enable IBM to monopolize the telecommunications business "in the same way it has monopolized the computer business."

By offering a complete package of hardware and software, tied together with proprietary interfaces and bundled pricing arrangements, the computer giant will be able to deny independent firms a chance to compete, Biddle contends.

He predicted that the effects would be felt by specialized carriers, interconnect suppliers, data terminal manufacturers, and value-added carriers, but not by AT&T. Instead of competing with each other, Biddle contends, "AT&T and IBM will simply divide up the market."

Datran's view

That's not the opinion of a spokesman for Datran, the Wyly Corp.'s data transmission subsidiary which recently began transmitting data between points in Texas and plans a national network. The Datran spokesman, who asked not

to be identified, said he thinks IBM's entry into the satellite business will spur the development of new data communications technology, accelerate growth of the market, and benefit "all suppliers." Asked whether the IBM-Comsat venture posed a direct competitive threat to Datran, he said, "No, because they're going to provide specialized services—such as image processing, digital voice, and circuits accessible through antennas mounted on the customer's roof. There will continue to be a big need for the terrestrial private line services offered by Datran."

Both the Federal Communications Commission and the Office of Telecommunications Policy (OTP) have stated that any legitimate supplier of telecommunications services should be allowed to enter the market. So on that basis the prospects of IBM-Comsat winning government approval would seem to be good. But the regulators and policy makers also have said they oppose telecommunications monopolies, except for local exchange services. The head of the OTP, Clay T. Whitehead, appeared in July before Sen. Philip Hart's antitrust subcommittee to blast AT&T for using its "legal, political, and economic power to extend its monopoly by government fiat."

So, if CIA and like-minded critics can convince the regulators that IBM-Comsat is a nascent telecommunications monopoly, its chances of being certificated will be reduced.

One observer, inside the FCC, believes that the most important result of the new venture will be to exploit the rooftop antenna idea. His basic point is that this arrangement poses a threat to AT&T's local loop monopoly. He also suspects that AT&T may now ask the FCC for permission to market private line satellite services, although the commission already has told the phone company it could not offer such services for three years. The purpose was to give smaller firms the first bite at the apple. But now that IBM is in the orchard, this rationale may no longer be valid.

The wrong partners

Elsewhere within the FCC, there is the feeling the commission may regard IBM and Comsat as the wrong partners to provide a satellite common carrier service. "Considering the close and growing interdependence of computers and communications channels, this kind of partnership could be judged a type of vertical integration which the courts have held to be a violation of the antitrust laws," says one source. He adds, "Both Comsat and IBM derive vast revenues from other activities. The commission may decide that, as a result, the proposed partnership would discourage

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CML is a joint venture between Comsat, MCI, and Lockheed. Each partner has a one-third interest. If the proposed reorganization is implemented, IBM will have a 55% interest, Comsat 45%. MCI and Lockheed each would receive \$2.5 million for their shares (each invested \$750,000). Comsat would pay MCI \$900,000 and an equal amount to Lockheed, while IBM would pay each of these companies \$1.6 million.

If the venture is blessed by the FCC, the CML name will be replaced. An 11-member board—including six from IBM—will run the operation. IBM will form a subsidiary to oversee its interests and to establish a clear boundary between those company activities subject to, and those outside, FCC regulation.

In announcing the reorganization plan, IBM and Comsat said they intend to make a “substantial offering” of the new company’s shares to “either other investors or the public. The time of the offering will be determined by the success of the company in operating its first satellite, expected in the late 1970s.” IBM-Comsat also said they would “pro-

ceed promptly with a joint system study looking toward a system design and toward appropriate construction applications.”

—Phil Hirsch

Facilities Management

Orange County One Year Later

On Aug. 7, 1973, Orange County, Calif. entered into a facilities management (FM) contract with Computer Sciences Corp. It was a seven-year contract valued at \$26 million.

One year later there are those who are happy with the contract and at least one who isn't. Computer Sciences likes to point to the fact that the county's edp expenditures in 1973 (“before us”) were \$4.019 million. This year they will run \$3.913 million. Per capita cost (per county resident) was \$257 in 1973 and will be \$243 in 1974. Maxine Mannis of the county's administrative office notes that “things are going beautifully.

I only wish we'd done it sooner.”

Unhappy is Norman J. Ream, an Orange County resident and a computer industry veteran. Ream was a vocal opponent to the contract during a series of stormy hearings conducted by the county's Board of Supervisors prior to its signing. Now he's decided to take his case to the courts, both state and federal.

On May 25, in a lengthy letter to Calif. Atty. Gen. Evelle J. Younger, Ream asked the attorney general to conduct an investigation “to determine whether or not an agreement entered into, by, and between the Computer Sciences Corporation and the County of Orange, as of August 7, 1973, is a legal and binding contract and is in the public interest.” Copies of the letter went to William Keller, U.S. Atty. for the Central Div. of California; Elmer Staats, Comptroller General of the U.S.; and Cornelius Cooper, a regional administrator for the Law Enforcement Assistance Administration (LEAA).

By mid-July, only Staats had acknowledged Ream's letter; and Ream's attorney, Robert Michaels of Michaels, Ornstein, and Kontos, Century City, Calif., was preparing the papers necessary to bring the matter into federal and state courts. Ream said his suits would



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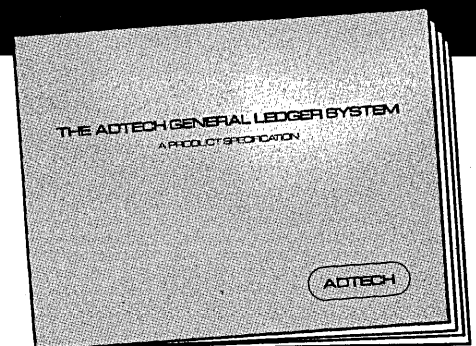
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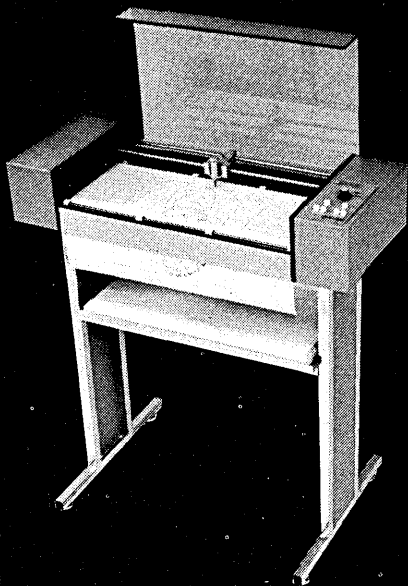
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name Orange County, Computer Sciences Corp., and Univac. When the contract was originally signed, it hadn't been decided whether Univac 1110s or IBM 370/155s would be used. The county data processing department had been using Univac Spectra 6s. csc's original proposal was for IBM equipment. It subsequently recommended 1110s.

No such trip?

Ream, in his letter to Younger, said, "I have personally learned that during the week of either Aug. 13, 1973 or Aug. 20, 1973, an unidentified official of the FMO (Computer Sciences Corp.) accompanied a member of the office of the vice president, Western Operations, of the Univac Div. of Sperry Rand Corp. to the Univac Div. offices in Blue Bell, Pa., apparently for discussion of the pending Orange County procurement." A csc spokesman said he knew of no such trip.

In a letter dated Aug. 22, 1973, to County Administrative Officer Robert Thomas, csc's Commercial Div. president, Erwin Allen, recommended selection of 1110s primarily on grounds it would save the county \$502,185.

Ream contends, among other things, that the Orange County/csc contract violates state and federal statutes concerning privacy, the state constitution, and rules and regulations concerning the expenditure of revenue-sharing funds. The csc spokesman said the contract has been carefully studied by its internal and external attorneys, the county attorney, and state attorneys, and all have found it to be legal.

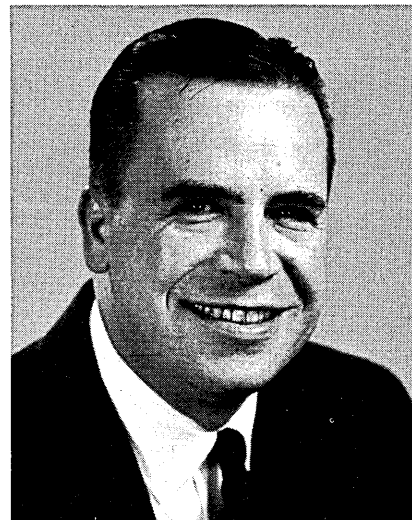
One point in the Ream letter—"that the county edp systems, which are under control of the FMO, are linked directly into the California Law Enforcement Telecommunication System (CLETS) and thus into the National Crime Information Center and all information in those systems can immediately be available to the FMO through interrogation"—is categorically denied by csc. "They (the county) have their own separate system for this in a closed-off room. They can access us but we can't access them," said a spokesman. In addition, he noted, the county has a committee of judges, administrators, and representatives of the sheriff's office, which regularly monitors the handling of justice information.

Ream expresses concern over "proper control of the election process as required under state and federal laws" since, under terms of the FM contract, county personnel are prohibited from operating the edp equipment used by

csc. The csc spokesman said all they do in elections is the computations done from summaries provided by each precinct.

Talking to prospects

csc, when it won the Orange County contract, saw it as the beginning of a long line of FM contracts with cities and counties. So far it is the first in a chain of two, although the company says it is talking to others. The second contract, with the city of Torrance, Calif., is for three years and \$1 million and is not a true FM contract. It provides for csc to manage conversion of existing data processing operations to a "distributed



NORMAN J. REAM
Questions concerning FM

processing" approach, using a Basic 4 system hooked into csc's Infonet network.

csc currently is talking FM to the city of Newark, N.J. That city's tax collector sought the opinion of Robert Citron, tax collector/treasurer of Orange County. Citron wrote that the difference in the service he was receiving from the FMO and what he had before was "the difference between the 20th century and the dark ages."

Computer Sciences officials say they have been assured by Evelle Younger's office that the investigation Ream asked for will not be conducted. Ream says he never really expected it would. What will happen in the courts remains to be seen. In the meantime, csc consoles itself by comparing the Orange County budget decrease in '74 to other California counties: San Diego, up from \$3.5 million to \$4 million; San Bernardino, up from \$2.4 million to \$2.7 million; San Francisco up from \$6.7 million to \$7.3 million

—Edith Myers

(Continued on page 104)

DATAMATION

The honeymoon is over.



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news in perspective

Legislation

Another Pass at Copyright Change

After gestating for the past 10 years, a new copyright bill seems to be making significant progress through the Congressional gristmill.

Last month, the Senate Judiciary Committee completed work on a proposed revision of the present legislation, enacted originally in 1909 and changed very little since then. There may be a good chance the bill will be passed by the Senate this month. The House then will have to consider it.

Title II of the Senate bill (S 1361) establishes a National Commission on New Technological Uses of Copyrighted Works. It would advise Congress what to do about protecting a copyright owner's interest when his work is used in a computerized system. The commission also would make recommendations concerning "the creation of new works by the application or intervention of automatic systems or machine reproduction."

The commission would have 13 members, representing copyright owners, the public, and the Library of Congress. The committee indicated that it wants some of the public members to be "creators and proprietors of commercial information and products."

S 1361 requires the commission to submit a preliminary report to Congress within one year of its first meeting, and a final report within three years of the legislation's effective date.

Another section says, in effect, that S 1361 does not alter whatever rights a copyright owner now has with respect to the use of his work in automatic systems. Essentially, this means that until the bill is enacted, the commission is established, and its recommendations are adopted, the courts will be arbiters of such applications.

Computer programs are not included in this provision. They are subject to the section of the new bill which relates to "original works of authorship fixed in any tangible medium of expression. . . ."

The bill gives the copyright owner of

such work the right to collect royalties for their reproduction subject to a number of limitations—for example, a library, under certain conditions, can reproduce a single copy without infringing the copyright. The Judiciary Committee report says that copyrights applied to computer programs extend only to the "expression adopted by the programmer," not to the actual "process or methods embodied in the program."

The Senate bill also would extend the time a copyright remains in effect. Under present law it's a maximum of 56 years. Under S 1361, a copyright would last the life of the author plus 50 years.

—P.H.

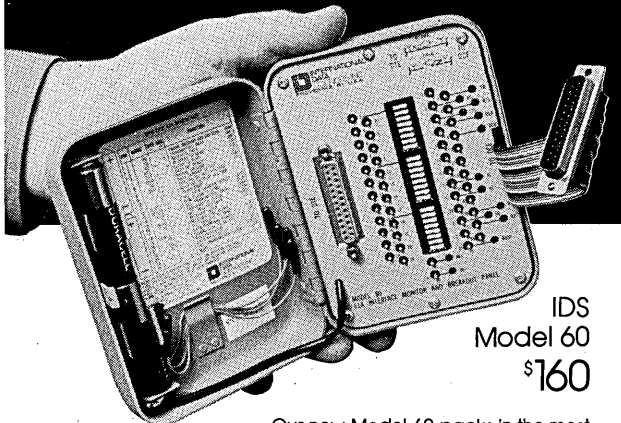
Government

Teale Storm Still Brewing

California's controversial Teale Data Center (see March, p. 122) is perking along with the second of its two 370/168s delivered last month.

But the controversy surrounding procurement of the center's equipment is perking right along, too. When the state Assembly reconvened this month, a series of new hearings was started by the

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CIRCLE 88 ON READER CARD

DATAMATION

Assembly Ways and Means Committee to look into the propriety of awarding contracts to: IBM for \$20,824,590; Data 100 for \$1,160,000; and Boeing Computer Services, \$237,000.

The state's latest Budget bill effectively voided the contracts with IBM and Data 100, although both have delivered the called-for equipment. The Boeing contract was left intact. The bill allows the procuring agency, the Dept. of Transportation, to renegotiate with IBM and Data 100, free from competitive bidding restrictions and those of the "two mainframers" rule. (An earlier Budget bill required consideration of at least two separate mainframers in any state procurement.)

Negotiations with Data 100 were taking place in mid-July and Ira Isbell, Teale Center director, said he didn't anticipate any problems there. The IBM situation will be trickier as damages are involved. A critical point in the IBM contract was a guaranteed conversion of the Dept. of Motor Vehicles (DMV) by July 1, a deadline the giant freely admitted it was unable to make. "There's all that extra rental to Univac (DMV has Spectra equipment), extra salaries, and all," said one state official. "Their (IBM's) liability could run all the way up to the full amount of the contract." The critical point to the state in the missed conver-

sion date is the fact it will not be able to proceed with a staggered renewal system for motor vehicle registration this year—"and how do you put a value on that," said the official.

The Budget bill "temporarily" withdrew DMV from the Teale center. Isbell feels it ultimately will be put back in,

but it will have to be legislated back in. Teale currently is serving 22 of the 34 state departments it originally was intended to serve. The Dept. of Water Resources was withdrawn prior to passage of the Budget bill. Other departments are receiving various degrees of service.

—E.M.

Data Entry

OCR Users Study Multi-Media Methods

Users of optical character recognition (OCR) systems whose objectives were to economize are reporting cost savings. Those who sought to handle an inordinate volume of data in a short period of time similarly cite success in their effort. But those who attended last month's meeting of the OCR Users Assn. in San Francisco made one thing clear. The savvy OCR user views this technique along a spectrum of data entry methods, relying not on one medium such as OCR but rather on a mixture to handle his data conversion job.

And the same is true with the OCR vendor. The conference's keynote speaker, Is Sheinberg, vp of Recognition Equipment Inc., was asked in an inter-

view later about the major changes in the last few years. "We all have a lot more humility than before," he responded. The problem behind the slow acceptance of OCR is not technology, he explained. "We all have concluded that OCR is no longer a product, nor even a business. We're all part of the input system." He added that hardware manufacturers must look at the entire data entry job and sell a 100% solution to the user's problem.

One of the users of REI's Input 80 system is the Bureau of Medical Assistance in the state of Michigan's Dept. of Social Services. Paul M. Allen, director of the Bureau, told how the multifont OCR

(Continued on page 109)

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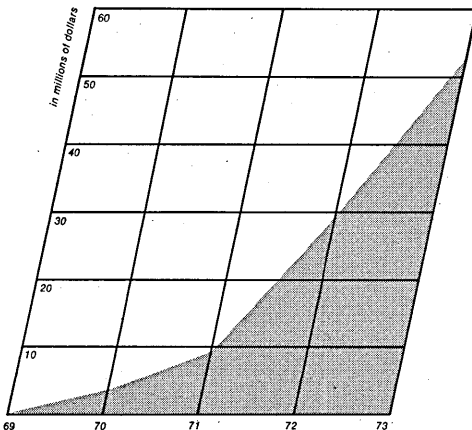
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D-8

news in perspective

system was being used to read Medicaid billing forms sent in by doctors and pharmacists, dentists and optometrists. Using the hardware's maximum multi-font reading capability, he said they can read just about any model typewriter or printer in use in the state. From the program's inception, the font reject rate has been less than 3%.

"As expected, the fonts we cannot read are odd ones, such as script and miniaturized fonts pharmacists use in labeling drug bottles," he explained. "Except for these isolated instances, major read problems have not been because of the font recognition difficulty, but rather because of mask tuning, blurred printing caused by defective ribbons, defective or dirty typewriter keys, or poor ink quality. When we started using the Input 80, our 'document accept' (read rate) hovered around 40%. At the present time it exceeds 80%."

Hefty savings

Allen said auditors have found the operational expenses—including the hardware, operators making corrections or keying in characters the system couldn't recognize, the programmer/analyst support, and the cost of OCR forms—came to \$57,000 a month. Figuring the current volume of 33,000 invoices a day and using key-to-tape/disc would cost about \$140,000 a month. "And we still have reserve capacity with the Input 80."

Key-to-tape and key-to-disc systems, as well as intelligent standalone terminals, continue to be a competitive threat to OCR, says A. Blair Jensen of Management Systems Corp., Salt Lake City. He adds that if a user had installed OCR when it seemed to be the only way to go, he might find that these newer input methods are now a better solution. Jensen, the president of the OCRUA, said the 200 attendees of the conference could be split into two camps: those with OCR who continue to be interested in it and in competitive data entry methods, and those who are not yet committed to the technology but are interested. A growing number is apparently in the latter category.

Jensen said the association's conference three years ago was heavy on tutorials, but this emphasis was cut back. Now the interest of members in the educational sessions has picked up again and will be given increased emphasis in the future.

The OCRUA, originally but no longer an organization of REI users, is open to all users and vendors. Formed by four REI users in the Chicago area back in

1968, it was incorporated as a nonprofit organization in '72 and is administered, for a fee, by the office staff at the Data Processing Management Assn., Park Ridge, Ill.

"Three times zero"

The world of OCR, as do so many others, faces a paper problem, according to REI's Sheinberg. First, there's the shortage that many people are experiencing, stemming from a lack of incentive for paper manufacturers to supply forms to manufacturers. But on top of that, there's the problem of "noise" that can come from lower grades of paper to be scanned, of defects being read as a comma or a period. If the pulp is bleached, explains Sheinberg, this can be avoided, but the bleach used is a petroleum derivative, and everyone knows about the petroleum shortage. But Sheinberg, not wishing to become an alarmist, says the standards people are the ones who are warning of a tripling in the noise factor within the next three years. He explains that because there's no noise being generated by today's OCR paper, he doesn't know how serious a three-time increase could be. "Three times zero is still zero," he says with a smile.

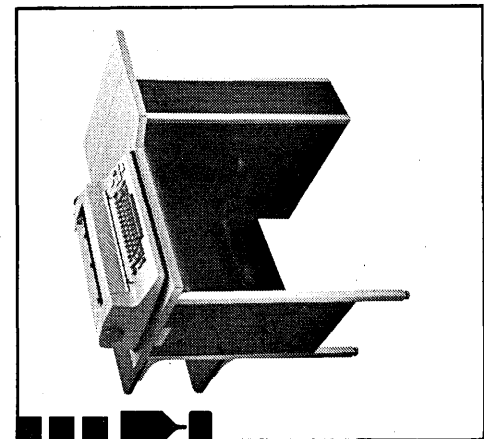
A potential problem of another sort was raised by Carl F. Rench of NCR. Rench said retailers have decided on the use of a special subset of the standard OCR-A font to be read by a wand. But grocers have picked the OCR-B font for human-readable data. And the makers of commodities being sold in both grocery and department stores do not wish to print both fonts on one product. "And they probably never will," he added. In a subsequent discussion, it was said that drug producers have settled on still a third font, which should compound the problem.

One industry that seems to have taken to OCR is graphic arts. Estimates of the number of systems installed for the typesetting application vary from 500 to 800, but Compuscan's Ron Vergoz says, "OCR is a totally accepted method (of data entry) in graphic arts." In fact, he adds, it's a preferred way. Greg Smith of ECRM in Cambridge, Mass., says newspapers are scanning copy for classified and display ads that are typed on a Selectric typewriter, as well as news stories prepared in-house and syndicated stories and wire service copy transmitted to the editorial office. Thus some newspapers are scanning 100% of news copy.

—Edward K. Yasaki
(Continued on page 111)

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news in perspective

Research

Going One Up On Voice Input

Terminal input—with an on-line human as the terminal—is being studied at the Stanford Research Institute, Menlo Park, Calif. The idea is to take an idea, a thought, a spoken word, and classify the brain wave pattern associated with that thought—and see if a computer can accurately interpret it.

SRI neurophysiologist Lawrence Pinneo has started with seven words: up, down, left, right, fast, slow, and stop. Attaching eight electrodes to a subject's head, much like it's done to get an electroencephalogram, he flashes the words on a screen and has the subject speak or think about the word. The brain wave signals received with each word from all eight electrodes attached to the scalp are averaged. After 10 repetitions of this, a "template" is formed for that individual.

Dr. Pinneo cites an average accuracy rate of about 60% for a spoken word, and some 30% on thought words. But he adds that on some words the accuracy goes up to 80, 90, and even 100%, and down to 30% on thought words. The way people think about and enunciate a word

Japanese Slash AI Project Funds

Japan's eight-year project to develop a so-called Pattern Information Processing System has become a victim of the nation's economic crunch. The government, which had estimated an expenditure of some \$127 million over the life of the project, has made a substantial reduction in the budget for this, its fourth year. Earlier, almost \$14.2 million was scheduled to be spent during this fiscal year, ending next March 31, but that has been cut drastically to some \$7.7 million (at the current rate of exchange), according to Dr. Hiroji Nishino, head of the Information Sciences Div. at the Electrotechnical Laboratory (ETL) in Tokyo.

This program, when first announced in mid-1971, stirred the artificial intelligence community in the U.S. In some circles it was feared the upstart Japanese were preparing to take the leading role in this technology. It was suggested that the announcement be used to extract a similar financial commitment from the American government. But the idea was shot down.

The Japanese project, which was inaugurated in July of 1971, seeks to de-

velop an information processing system that allows inputs to take the form of the human voice, three-dimensional objects, pictures, and handwritten characters. Along with research to make these things possible, funds are also being expended for the advancement of technologies in related materials and devices, such as a semiconductor laser, bubble domain and charge-coupled devices, and LSI circuitry. Completion of this R&D phase is scheduled during fiscal '76, ending in March of '77, and two more years are allowed for the prototype system that integrates all the subsystems. That would be the spring of 1979, in time to become the basis for what the Japanese see as the capabilities of a fourth generation computer system.

Under Dr. Nishino, the ETL is coordinating this effort, for it is an arm of the powerful Ministry of International Trade & Industry (MITI). Research is being conducted at ETL, as well as by a number of contractors, such as Hitachi, Fujitsu, Nippon Electric, and Toshiba. Thus those skills are being acquired by the major mainframe manufacturers, who can use all the technological upgrading they can get to compete both in domestic and international markets.

can vary each time, he explains. Plus there's the normal variability in an EEG on which the brain wave is imposed. "We're not sure that our classification technique is the best one. It works reasonably well," he says, "but there may be other pattern recognition techniques that would work better . . . We have actually reduced our error rate quite a bit. It was much worse than that."

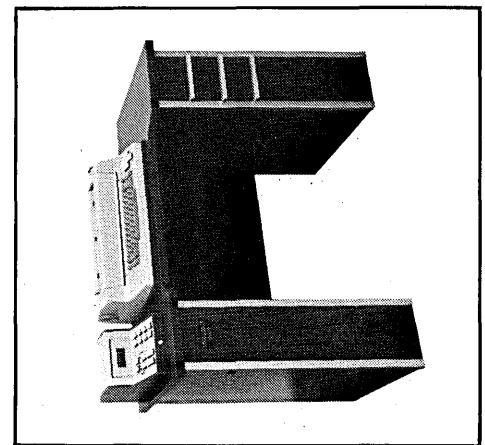
Although he is in his final year of a three-year, \$330K ARPA grant, with little likelihood that the Defense Dept.'s Advanced Research Projects Agency will renew, Dr. Pinneo would like to try to improve the signal from his subjects, investigate different electrode placements, see if fewer electrodes would work better with some people, and work with a computer that's faster than the DEC Link-8 he's currently using. Asked about the possibility of enlarging the vocabulary, he says one approach would be a fixed-vocabulary machine with, say, a thousand words. Another would be to find a universal language, perhaps a metalanguage. "There's a possibility of classifying on phonemes, using the English language," he adds. In that case, there would be a need for a vocabulary of only 46. Indeed, the initial phoneme experiment was begun last month.

—E.K.Y.

(Continued on page 113)

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news in perspective

Benchmarks

Rent and Buy: Outright purchases of computers have been contributing to amazing profit increases for IBM for more than a year, yet the company says its rental revenues also are soaring. IBM's second quarter profit of \$482.6 million was a spectacular 35% gain over the year before. Its gross revenues went up 28% in the second quarter to \$3.26 billion. This brought the computer company's first six months earnings up 31% to a record \$913.8 million on gross revenues of \$6.26 billion. The company attributed the increase to substantial increases in shipments of the 370 line and in outright purchases of the equipment. Its revenues from rentals and services also rose 10.2% in the first six months, although this figure is considerably below the 20% growth range the company has experienced in the past.

With the exception of Control Data Corp. (see below), other organizations that are in the computer business reported improved second quarter results. Burroughs income rose to \$33.9 million from \$26 million a year ago on second quarter revenues of \$379 million. NCR's cost cutting and stepped-up production of computers and terminals brought its second quarter earnings up 49% to \$19.9 million on revenues of \$477.3 million. Xerox profits rose 15% in the second quarter, although its computer operations continued below the break-even mark. Honeywell income inched up to \$21 million, compared with \$20 million a year ago.

Pressure on Profits: Unlike IBM, which has been experiencing a high volume of outright purchases, Control Data Corp. reports fewer outright buys by customers and an increase in leasing. This factor hacked away at the company's computer profits, which slid in the second quarter to \$3 million from \$5.2 million a year earlier, despite an increase in revenues. The firm's second quarter revenues rose to \$283.2 million from \$231.3 million a year ago. Contributing to the leasing trend, according to analysts, was the firm's announcement of the Cyber 170 line, which reduced outright sales of the Cyber 70 line. Rising costs have put pressure on computer profits, but the firm said this might be offset later in the year by recently announced price increases of 2-10%, which it made retroactive to last June 1. A Minneapolis investment research concern, Dain, Kalman & Quail, has revised CDC's computer earnings estimates

down to 60 cents a share from the \$1.25 it was forecasting earlier in the year.

Total revenues for the company, including the Commercial Credit operation, rose in the second quarter, but profits dropped 23%. That brought earnings for the first six months of the year down to \$26.7 million, compared with \$32.3 million a year before.

40% Ain't Bad: It's been 13 months since 10 people were indicted for the theft of drawings and specs for the 3330 and 3340 disc drives from the IBM plant in San Jose, Calif. At the time of the alleged rip-offs, the devices had yet to be announced, but were popularly referred to as the Merlin and Winchester files. Since that time, six of the defendants have been cleared for lack of evidence, leaving four to face trial in October.

At last count, three of the principals have filed false-arrest lawsuits against IBM, asking damages totaling more than \$175 million. One of them is still a defendant in the case. But the latest, asking some \$161 million, was filed by Phillip J. Kronzer (see June, p. 113).

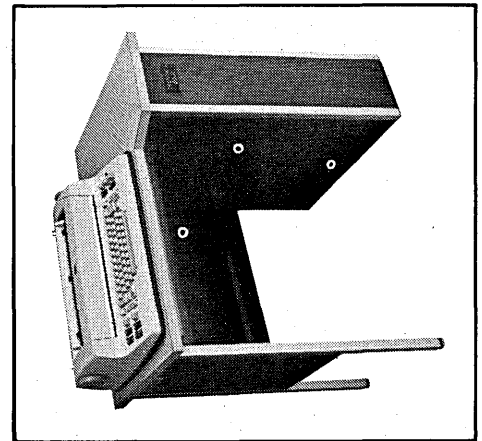
Vote for Entry: Only a formality remains before the Data Processing Management Assn. (DPMA) becomes a member of the American Federation of Information Processing Societies (AFIPS). DPMA's international board of directors early this summer approved a proposal to join the 13-society federation and take part with three other societies in staging the National Computer Conference and sharing in its revenues. DPMA said, however, that it will continue to hold its own annual conference, which it calls INFO/EXPO, the next to be held in Atlanta. AFIPS last May voted to accept DPMA into the federation and will take a second formal vote in November.

CIA Takes On Ma Bell: The Computer Industry Assn. (CIA), in testimony submitted to the Senate Antitrust & Monopoly Subcommittee, asked that AT&T be placed under the Public Utility Holding Company Act, which currently applies to gas and electric firms. The act would split AT&T into 24 local telephone operating companies; an interstate transmission (Long Lines) company; and one or more terminal equipment, switchgear, wire and cable, and supply companies. CIA also asked that the Federal Communications Commission be divided into two agencies, one to regu-

(Continued on page 116)

Direct replacements for IBM 2740/2741 terminals

- Enhanced performance at lower cost
- Rugged and reliable, with heavy duty I-O type Selectric
- Human-engineered for operator comfort and efficiency
- Fully plug-compatible with IBM
- Prompt delivery (30 days)
- Backed up by nationwide service
- Built-in dual switchable modems (optional)
- Optional copyholder, work area, utility shelves
- Acceptability proven by many major accounts
- Switch for operation either as 2740-Model 1 or 2741



SWITCH NOW!

Trendata Model 2000 Polling and Addressing Station replaces IBM 2740-Model 1 or 2741

Write or call for full information

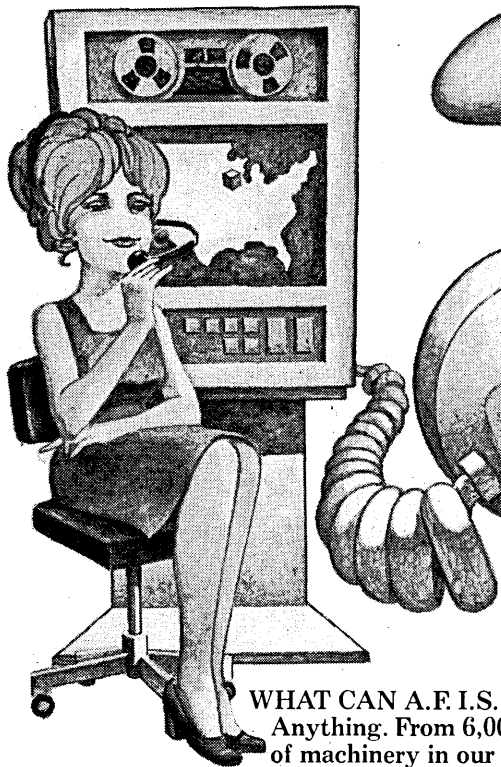
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You wish somebody had an electronic genius to tell you where your shipment is—while you're still on the phone? Somebody has. United.

IT'S CALLED A.F.I.S.
A.F.I.S. stands for Air Freight Information System.
It's the airline industry's most advanced
computerized control system. In a flash, it tells
you where your shipment is, how it is, who has it.

That operator you see is the A.F.I.S. agent. She
works with A.F.I.S. to give you all the
information on your shipment.



WHAT CAN A.F.I.S. FIND?
Anything. From 6,000 pounds
of machinery in our new
LD-11 container, to 100 pounds of
clams in the belly of a freighter.
If we have it, we know where it is.
And so do you.

**ALL IT TAKES IS
A PHONE CALL.**
Just phone your local
United Jet Freight office.
All you need is the airbill number.
Or we can locate your shipment
with your United account number. Or the shipper's
order number. Or just the shipper's name.

United Air Lines Jet Freight No. 1 in the U.S. sky

Why Remex is the bee's knees in digital cassette systems

- Get speed, reliability, to keep your system humming
- Low cost takes the sting out of upgrading your great punched tape system
- And what you miss without Remex is really a-pollen.

Remex offers you the world's most advanced, innovative digital cassette mechanism and systems including complete, compatible interface packages tailored to popular minicomputers.

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

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

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

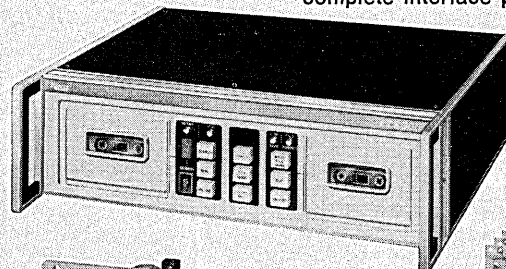
THE EXCLUSIVE REMEX Punched Tape Emulator that simply plugs into your punched tape system to increase its read/write speed up to four times, and its storage capacity up to 10 times. And you use both your existing hardware and software!

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

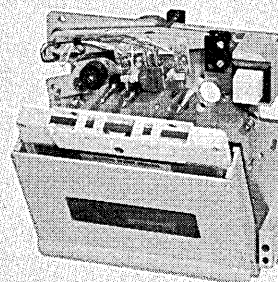
For full information on all or any part of the complete Remex line, write Remex, 1733 Alton St., Santa Ana, California 92705. (714) 557-6860. In Europe and the U.K., contact S.p.A., Microtecnica, Torino, Italy.



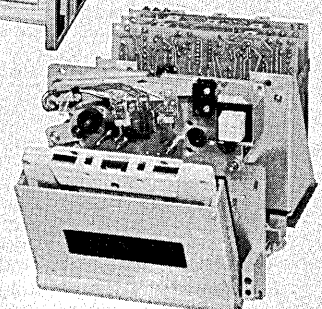
Digital cassette tape system with complete interface package.



Plug-compatible Punched Tape Emulator



Digital cassette tape drives



Digital cassette transports

We work with you!

REMEX



news in perspective

late broadcasting and the second to regulate telecommunications. "By using the holding company approach, AT&T has effectively placed the vertical relationship between the regulated operating companies and (its) unregulated supply company beyond the scope of the FCC's authority," the written testimony of CIA's executive director, A.G.W. (Jack) Biddle, said.

If Not the Whole Then a Part: Richard Ahern, president of Computer Shopping, Inc. (see July, p. 18) to date has not been successful in getting sufficient financing to build the computer-based in-home shopping system he's developed, so he's selling a part of the system. "It's the part that connects the living room to the warehouse," says Ahern, who has formed Applied Electronics to build the subsystems for materials handling applications. It's a paper tape controlled system which lights shelf ends in warehouses so that order pickers can pick quickly and with both hands. The system will be sold by SI Handling Co.

and North American Equipment Co. North American has named the unit EASE for Electronically Aided Selection of Equipment. Ahern hasn't given up on Computer Shopping. He hopes that EASE will ease his way up to that, financially anyway.

A Second First: Canada, which has the world's first commercial digital data network—Dataroute—may also bring you the world's first commercial packet-switched network. The operators of Dataroute, Trans Canada Telephone Systems, plans to establish a packet-switched network by mid-1976; and another concern, CNCP Telecommunications, is understood to be planning to announce a similar service before the end of this year. CNCP, amalgam of the Canadian National and Canadian Pacific railroads, operates Infodat, Canada's other digital network, which expects to be providing synchronous service coast-to-coast among 16 cities by the end of this year. It already offers asynchronous service up to 1200 baud. The first synchronous link, capable of

speeds up to 50 Kbps, goes into operation within another month or so between Montreal and Toronto and soon will be extended to Winnipeg. Although a CNCP spokesman declines to give any particulars about a packet-switched offering, it's learned that Telenet Communications, Inc., which is developing a packet-switched network in the U.S., has been retained as a CNCP consultant.

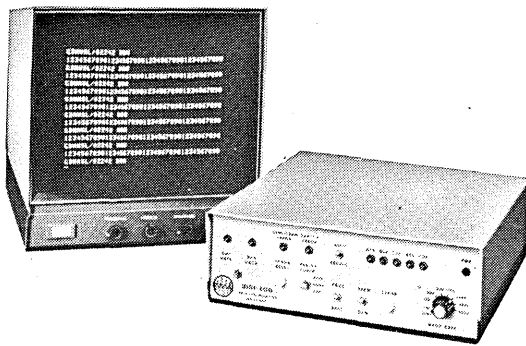
Nixdorf in Orange County: A small development unit of Nixdorf Computer, which has quietly been developing a low-end 370-like computer since late last year (see Feb., p. 133) in temporary quarters in Costa Mesa, Calif., is expanding into larger quarters in which it says it will begin manufacturing operations during the second quarter of 1975. The unit's computer is described as "what a 370/130 would be like if there were such a thing but with I/O exceeding that of the 158." Development director for the division of Nixdorf Computer AG, West German manufacturer of small business computer systems, is C. Allen Burns, architect of the Gemini and most recently with International Computer Controls, Inc., Santa Ana, Calif. manufacturer of block multiplexors.

Bell and Howell Gets COM Line: Bell and Howell Co. has purchased the computer output microfilm (COM) assets, including the existing customer base, lease portfolio, accounts receivable, patents, and manufacturing rights, of Pertec Corp. Pertec will continue manufacturing COM products for Bell and Howell at production levels anticipated to be equivalent to or better than those experienced in the past year. Pertec said it expects to realize a profit before tax on the transaction of approximately \$1,450,000.

New R&D Expense Rule Proposed: The Financial Accounting Standards Board is circulating for comment a proposed ruling which would require expensing all research and development costs as incurred, beginning Jan. 1, 1975. This would not affect IBM, Burroughs, NCR, and the major minicomputer manufacturers, which have always done this. For Control Data, Honeywell, and Sperry Rand, which defer a portion of their R&D expenses, the rule, if adopted, would mean they would have to write off, as a prior period adjustment, those R&D costs capitalized on their balance sheet. This would have to be done before Jan. 1, 1975 and would result in a reduction in retained earnings and, where possible, a restatement of prior years' earnings. □

THE TATTLETALE

RAPID FAULT ISOLATION AT MINIMUM COST

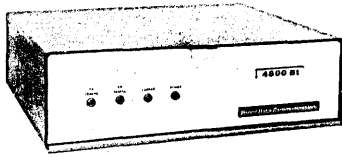


The Digi-Log Data Line Monitor minimizes the cost and time of fault isolation by rapidly locating and isolating communications systems problems • EBCDIC and ASCII switchable • Synchronous and asynchronous switchable • Displays control characters as well as data • Presents up to 1280 characters per screen • Speeds to 9600 bps switchable • Less than \$2000 in quantity . . . call us!

DATA LINE MONITOR

**DIGI-LOG
SYSTEMS, INC.**

BABYLON ROAD • HORSHAM, PENNA. 19044 • 215-672-0800

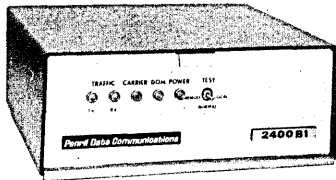


4800 bps

Penril's 4800B-1 offers outstanding performance over unconditioned lines with dial back-up—performance unaffected by changing line characteristics—single site equalization and special diagnostics.

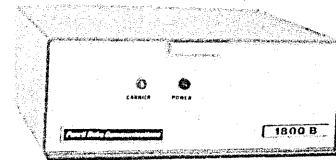
Penril Modems

Exceptional Performance to 4800 bps



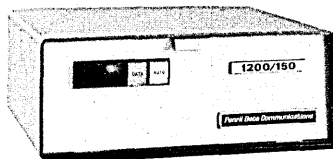
2400 bps

Six models available to meet your system requirements—offering: exceptional performance, special low-cost system diagnostics, low speed reverse sync/async channels, and compatibility with the Bell 201 B and C Data Sets.



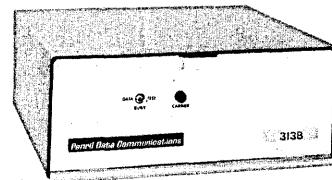
1800 bps

Penril's 1800B async modem is on-line compatible with the Bell 202 C and D Data Sets—dial operation to 1200 bps—synchronous model available operating at 150, 300, 600, 900, 1200, and 1800 bps over dial lines.



1200 bps

Two models operating half-duplex over dial lines or full-duplex with 5 bps or 150 bps reverse channels—feature automatic dial and answer capabilities—compatible with Bell 202C Data Set.



300 bps

Penril offers a complete line of 300 bps modems for operation in any system configuration—offering: auto-dial, auto-answer, special OEM Teletype model, and compatibility with Bell 100 Series Data Sets.

For complete product information write or call Penril Data Communications, Incorporated or your area representative.

Penril
corp.

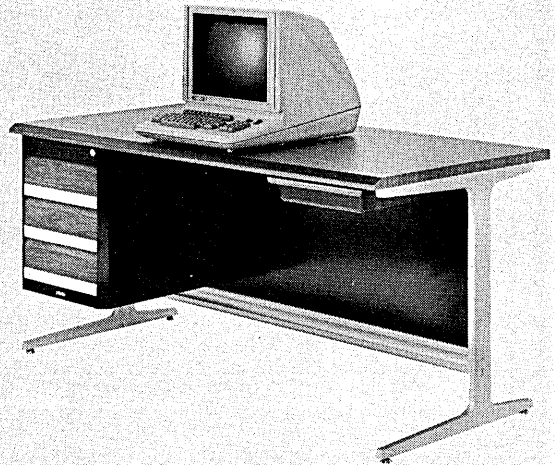
5520 RANDOLPH ROAD
ROCKVILLE, MARYLAND 20852
(301) 881-8151

Regional Offices: San Jose, California (408) 243-5761 • Northfield, Illinois (312) 441-6226 • Newton Centre, Massachusetts (617) 969-4075

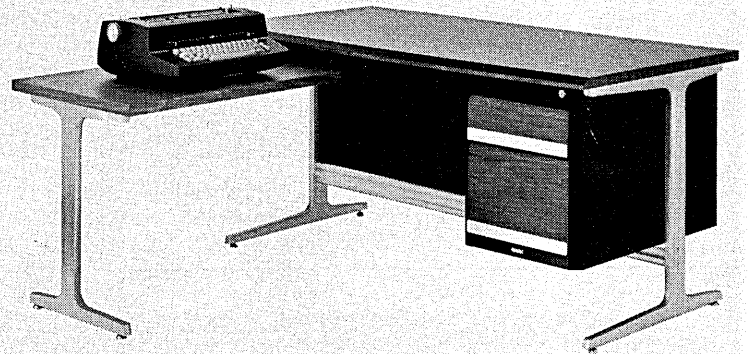
Representative Offices: Connecticut (203) 453-5424 • Colorado (303) 771-6200 • Georgia (404) 963-9855 • Kansas (913) 362-2366 • Michigan (313) 354-6421 • Missouri (314) 938-4992 • North Carolina (704) 527-2536 • New Jersey (201) 673-2500 • Ohio (216) 585-8421 • Pennsylvania (215) 265-3450 • Texas (713) 686-9627 • Washington (206) 763-2755 • Canada, Gandalf Data Communications, Ltd. (613) 825-4526 • Europe, Computer Instrumentation, Ltd., England TELEX 47326

Tab makes -

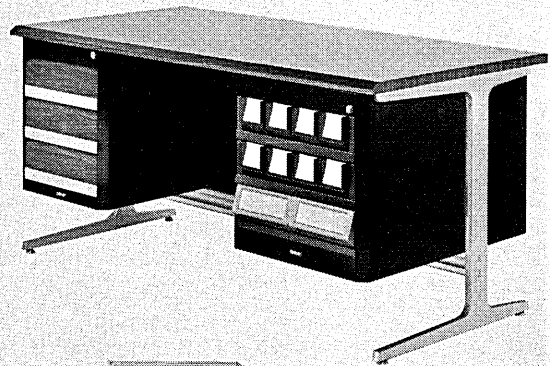
**one desk for
CRT displays,**



**one for
typewriters,**



**one for
programmers,**



**one for
microfilm readers,**



and one for just plain work.



This one.

The function of Tab Data Display Desks can be adapted to whatever work you need to get done. Component options let you make the desk a programmer's work station; another change makes it ideal as a CRT desk; still other pedestals and desk returns can transform it into a secretarial desk; or, used without components, the desk is an ideal conference or work table. You select from 2 and 3 drawer pedestals, 6 and 12 drawer card files, desk return, modesty panels, 27"

and 30" heights and 31 $\frac{1}{2}$ ", 45" and 62" lengths to create the exact desk you need to accommodate virtually any function. Tab display desks come in black and simulated walnut or contrasting shades of grey, with pedestals in any color you need to suit your office decor.

For complete information contact your local Tab representative, or write Tab Products Company, 2690 Hanover Street, Palo Alto, California 94304.

Tab Data Display Desk
"Make of it what you will"

TAB
PRODUCTS CO

CIRCLE 49 ON READER CARD

LOOK AHEAD

(Continued from page 18)

BUSINESS TELEPHONE GETS NEW OWNER

Those developers of the business telephone with the numeric display, touchtone pad, and built-in calculator, General Teletronics Inc., have sold out to Continental Telephone. Under the new owners, the third largest independent phone company in the U.S., GTI reportedly will remain in test with its so called Electronic Business Telephone for another year before appearing in the marketplace. That EBT (Jan., p. 18), with the dual-tone multi-frequency option can also go on-line, permitting a computer to access any or all memory positions and to display its output under program control. And in certain applications the computer could answer an inquiry with a phone number to call for exception processing. New president is Bob Beatie.

NCR'S POLICY ON FOREIGN ATTACHMENTS

NCR is the latest to issue a policy statement on foreign peripheral and memory attachments (July, p. 120). It "requires any foreign peripheral to meet interface specifications (and that) such peripherals must operate without affecting the mainframe diagnostic routines and software or requiring alteration of the cpu." It says, though, that on alterations, "the situation hasn't come up," and if a case should arise, the question of a policy change hasn't been decided. NCR doesn't assume responsibility for maintaining non-NCR gear and adds that its responsibility "for overall performance and reliability" is best met "when there is a single hardware supplier."

"ENGINE" WOULD RESTRUCTURE PROGRAMS

A Pasadena software house claims it will have before year-end a package that can be used to automatically restructure programs written before the popularity of structured programming packages. The result, says Caine, Farber & Gordon, would be programs that are easier to maintain and which might run even faster on their host computers. Their product, possibly to be called the "Structuring Engine," is written in PL/1 and converts existing Fortran and Cobol programs into supersets called S Fortran and S Cobol. Statements closely resemble traditional Fortran and Cobol, but algorithms in the "engine" alter the coding.

A translator also can be used to convert the intermediate stage coding back into standard Fortran and Cobol statements on IBM, CDC, Honeywell, and Univac machines if an installation doesn't want to establish an S Fortran or S Cobol standard.

RUMORS AND RAW RANDOM DATA

Control Data's STAR computer is undergoing final checkout in Minneapolis and within a week will be torn down and shipped to the Lawrence Livermore Laboratory. A second is to be shipped there before year-end, while a third will be installed in the Cybernet network in 1975...Honeywell is having considerable--and surprising--success with the ultra-secure Multics operating system, chiefly due to software improvements bringing Fortran up to the level of GCOS/6070 Fortran and beyond. Besides 3-5 systems within Honeywell, Multics has been installed or committed within Nippon Electric, Rome Air Development Center, USAF Data Services Center, and Ford...The Austrians, proud of their work with computer technology, also have a sense of humor, and both are on display at the new computer exhibit at the Technical Museum in Vienna, which contains the first transistorized computer made in Austria. Tongue-in-check, it was named after Project Whirlwind. The Austrians call their machine "Maileufferl"--breeze of May.

Plug this in to ordinary power and your computer might teach you an expensive lesson.

Power put out by utilities is fine for toasters, light bulbs and electric typewriters. But sometimes it's not right for computers. Slight over-and-under voltages or changes in AC frequency can throw a computer off-stride. Cause it to drop random bits of data. Wipe off some or all of its programmed memory. Or even produce physical damage. The results? Data delays, late deliveries, dissatisfied customers — the same problems a computer is supposed to solve.

These disruptions are more than a headache. They're extremely costly. In some cases, they can run well over \$100,000 in downtime and repair bills for a single year. And that figure doesn't include their overtime costs.

To achieve super-clean, no-break electricity, a computer

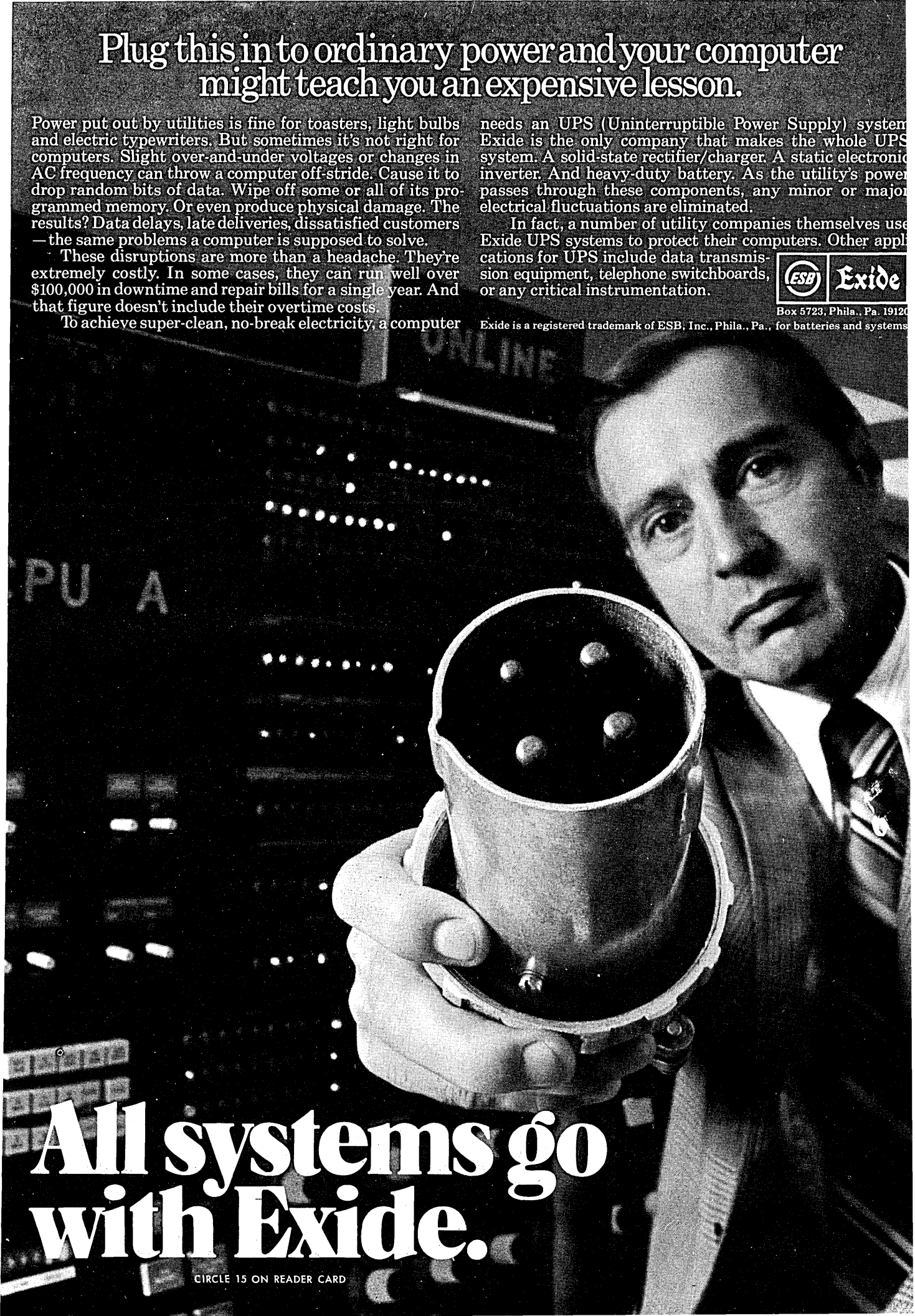
needs an UPS (Uninterruptible Power Supply) system. Exide is the only company that makes the whole UPS system. A solid-state rectifier/charger. A static electronic inverter. And heavy-duty battery. As the utility's power passes through these components, any minor or major electrical fluctuations are eliminated.

In fact, a number of utility companies themselves use Exide UPS systems to protect their computers. Other applications for UPS include data transmission equipment, telephone switchboards, or any critical instrumentation.



Box 5723, Phila., Pa. 19120

Exide is a registered trademark of ESB, Inc., Phila., Pa., for batteries and systems

A black and white photograph of a man in a suit and tie, looking intently at a large, cylindrical battery component he is holding in his hands. The background is a dimly lit control room with various panels, lights, and a sign that says 'CALINE'. The overall tone is serious and technical.

All systems go with Exide.

CIRCLE 15 ON READER CARD



In one coffee break CalComp's Automated Tape Library can find and load 40 reels.

This librarian doesn't run on coffee.

The only way it can load the wrong reel is if you tell it to.

Behind that innocent front it can store over 6,000 reels of 1/2" tape. It can find and mount any one of those reels in an average time of 15 seconds. And it can serve 32 separate tape drives.

The tapes are automatically selected, mounted and then dismounted and returned when the job is done. Human

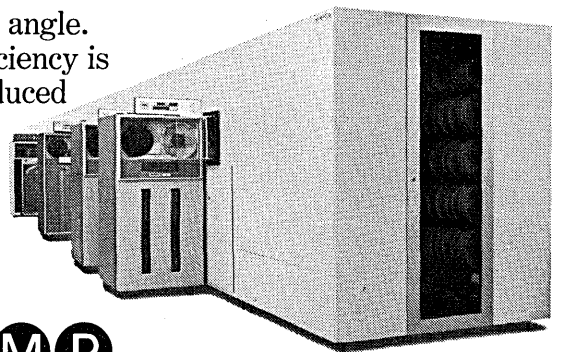
hands never touch a thing.

The wrong reel never comes through those entry ports. And physical damage or loss of a tape is a thing of the past.

You could justify purchasing The CalComp Automated Tape Library from any angle.

The increased efficiency is obvious. So are the reduced operating costs. But just think of your valuable tapes, safe at last, 24 hours a day.

You've got to see it to believe it. Call or write your local CalComp office, or contact California Computer Products, Inc., DM-M8-74, 2411 West La Palma Avenue, Anaheim, California 92801. (714) 821-2011.



CALCOMP

hardware

Off-line

Three IBMers have received a U.S. Patent for a novel solution to the problem of getting computers to perform several tasks simultaneously. The breakthrough is called the "data synchronizer"—better known as the data channel or just plain channel—and it's been a key component in most large-scale systems (IBM's and others) since the days of the IBM 709 in the late fifties. The seventeen year wait for recognition was due to several challenges to the original concept by other mainframers, and to the workings of the U.S. Patent Office. All three men, Carl L. Christiansen, George R. Monroe, and Lawrence E. Kanter still work at IBM's Poughkeepsie, N.Y. development laboratory.

Varian Data Machines seems to be holding some sort of summer "one-third off" sale. Crediting decreasing costs of MOS semiconductors and greater demand for large memories, prices on its 8K, 16-bit, 330 nsec memory chunks for the V-73 and V-74 minis have been marked down from \$6K to \$4K. Memory map, available for all V-70 series machines has been reduced from \$5K to \$3,500. Prices on large-scale disc units also came under the hatchet, with prices typically reduced between 26-33%. An example is the 14.5 megaword removable cartridge unit, complete with controller, reduced to \$16K from its "pre-sale" price of \$24K.

Bell Labs has turned a prototype bubble memory device over to its Western Electric subsidiary for potential manufacture and use in telephone switching circuits. Measuring only 3-3/4 x 1-3/4 x 13/16-inches, the bubble pack holds 460,544 bits of information, enough for 27 thousand telephone numbers. The memory has an average access time of 2.7 msec, a data rate of 700,000 bps, and a read error rate of less than one error in 630 billion read operations.

Hitachi, Ltd. has come up with a way to make magnetic heads for disc drives that contain both the conventional core and coil in ultra-miniscule form, making possible a substantial reduction in the size of file memories. Over 100 patents are pending on the heads by Hitachi, which claims they can be volume reproduced with uniform characteristics.

product spotlight



Expandable Small System
Univac upholds its reputation as a hot cpu constructor with the 90/30, latest but by no means last entry into its Series 90. With purchase prices ranging from \$143,760 to \$535K, Univac is not plugging a gap in the product line: it's filling a veritable canyon. The targets: everything IBM manufactures between the 360/20 and the 370/135, the System/3, the Burroughs B-1700 series, Honeywell's 58, and any other small system that falls in that price range.

The base 90/30 has 32K bytes of MOS memory, a 500 lpm printer, 500 cpm reader, two brand new ISS-designed disc drives providing 57 megabytes of storage through an integrated disc adaptor, and a crt for operator control. Options then abound for letting the user expand the memory up to 256K, adding up to two 833 KB/second selector channels for support of larger capacity disc and tape subsystems, and a multiplexor for handling a faster set of conventional peripherals.

The microprogrammed cpu is fast—a two-byte fetch with the 600 nsec semiconductor storage endows even the smallest 90/30 to run at 139,000 operations per second. Univac claims it is 2½ times faster than a System 3/15 and almost twice the speed of a 370/125. A field-expandable system that can range in performance from a System 3/10 to a 370/135 might just interest a flock of small IBM users, since they'd have to tear up their installation three times to accommodate such expansion using IBM equipment.

90/30 software, all slated to be available at first customer delivery in January, includes os/3, a new operating system, and COBOL, RPG-II, FORTRAN, SORT and an assembler. A data

management system, IMS/90, will provide capability for on-line interactive user file inquiries. The basic software is included in the contract price, with special application programs priced separately. These include PERT, a mini-APT, UNIS for manufacturing control, PROFITS for financial institutions, and NEWSCOMP for the printing trade.

os/3 supports spooling, automatic job initiation, roll-in/roll-out, dynamic memory management, remote job entry (probably from a yet-to-be-announced terminal) and communications. Up to seven jobs can be running at one time. os/3 is not compatible with the operating system on the larger 90/60; user upgrades will be through source language compatibility, an oft-stated but seldom achieved goal.

Key markets include the existing 9200/9300 base—emulation has been included to give Univac a good chance to cover its flank from an IBM attack on these aging systems. Simultaneously, Univac will take the offensive with emulation packages for the 1800-2000 360/20s that are run as computers and not just eam systems.

It remains to be seen whether the 90/30's cpu speed will impress a printer-bound System/3 customer. This will require real marketing expertise in a marketplace of small users with whom Univac has no great experience. Never having been in the accounting machine business a la NCR and Burroughs, and having left the tab world to IBM a long time ago, Univac is up against a learning curve. Direct replacement of the brand new 370/115 and 125 would appear unlikely. The real targets would appear to be the large System/3 10s, the 360/20s, and present Univac customers. UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 273 ON READER CARD

(Continued on page 127)

Congratulations: you didn't have a computer fire again last year.

You're one of the lucky ones.

Unfortunately too many companies last year did suffer major business interruptions due to fires in or near their computer rooms.

What's even more unfortunate is the fact that a lot of the damage, clean-up and downtime could have been avoided.

Days of Downtime vs. a Few Seconds of Halon

These companies could have been protected by a high speed Fenwal Halon Fire Suppression System.

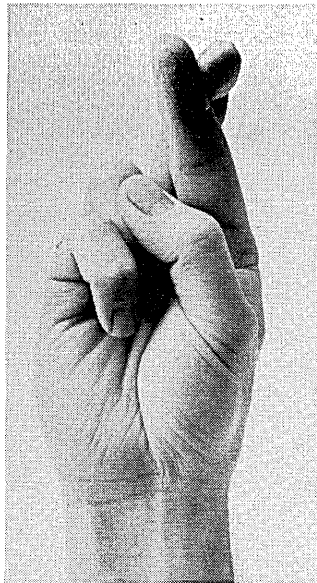
The system that snuffs out fires dry. Just seconds after they start.

And lets you get right back to work. No wet mess to clean up.

With some systems you've got to evacuate a room before the extinguishing agent can go to work.

But because Halon 1301 is harmless to people, it can start snuffing out the flames immediately. Which gives you the fastest jump on the fire.

With ordinary systems there's usually at least 48



hours of clean-up before your computer can go back on line.

With a Fenwal system there's virtually no clean-up, no shorted-out wires. No electrical shock hazards. No damage to tapes or records.

Fenwal's unique, modular system permits rapid agent discharge and easy extension of existing systems.

Why Push Your Luck?

The consequences of a computer fire are a lot more devastating than you might think. Despite all the precautions you take.

At Fenwal we've got documented proof that our Halon Fire Suppression Systems are *the* solution to the damage and downtime of computer room fires.

It's proof you can see for yourself. In a film called "The Fireaters".

We think it will convince you that you need more than luck to keep your computer in business.

To arrange a viewing, call us at (617) 881-2000. Or write to Fenwal Incorporated, Ashland, MA 01721. A Division of Walter Kidde & Co., Inc. Our local, service-oriented distributors



are listed in the yellow pages under "Fire Protection".

FENWAL

Nobody in the world has more experience in fire and explosion suppression systems.

FM Approved - UL Listed

Your First Mate

TECHTRAN offers the best MATE for your CRT or data terminal.

Our **BUFFERED CASSETTE RECORDERS** are:

FIRST IN INSTALLATIONS. Users are saving countless dollars in computer time and connect charges.

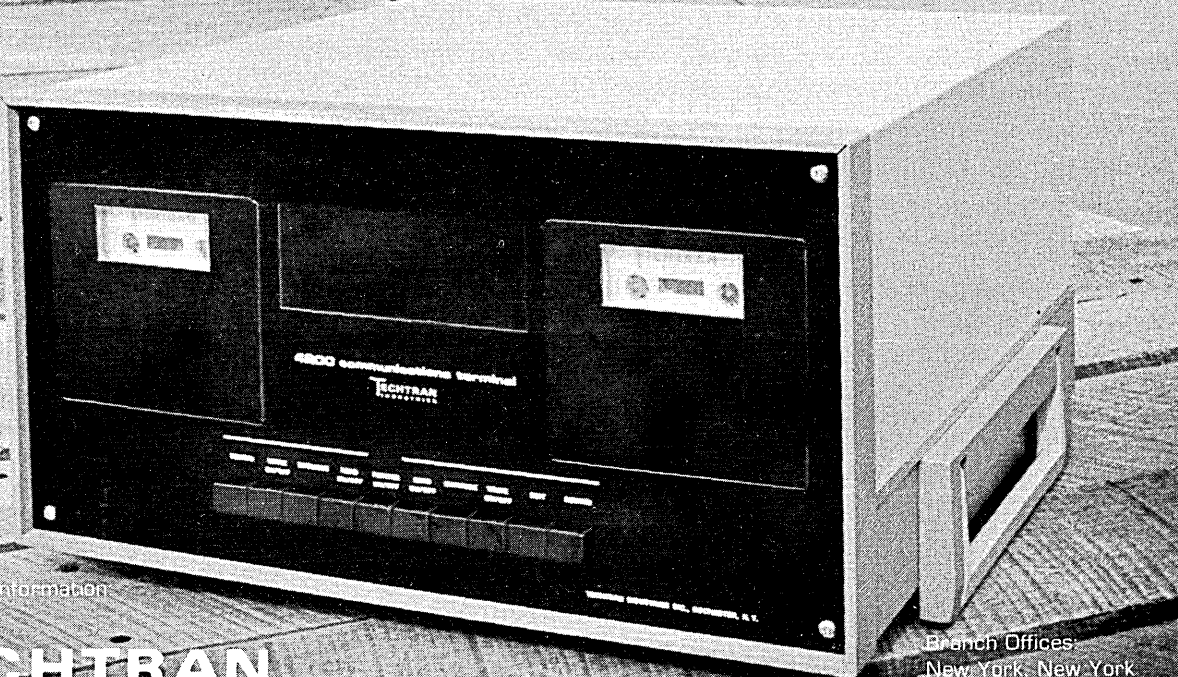
FIRST IN APPLICATIONS. You name the usage and our MATE will be there. Add-on cassette to Data Entry Terminals, Collection Systems and MTST applications.

FIRST IN FEATURES. Remote control, Bi-Directional Search, Data Edit, 110-2400 Speeds, Code Transparent (Binary) Mode, ASCII or Baudot Coding, Standard Interfaces.

FIRST IN COMPATABILITY. They're plug compatible add-on to virtually all data terminals.

FIRST IN COST SAVINGS. Our mates provide ease of operator entry and faster transmission speeds which provide cost savings in any system.

Only Techtran offers you **TOTAL PERFORMANCE** mates which are operationally and plug compatible to most data terminals and communication systems. Most users are applying our mates. Shouldn't you?



For Further Information

TECHTRAN

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hardware

Honeywell Front End

The Datametrics Communication Operation Program (DCOP) software residing in this product's Nova 1210 controller may be fully compatible with Honeywell's os/2000 operating system, but the product isn't compatible with Honeywell's marketing department, and the first installation of the communications front end will probably generate more business for lawyers. Potential users should sound out Honeywell on what will happen if the DCOP unit is attached.

Technically, the product looks interesting, relatively inexpensive, and reliable, if "no down time since December" in the first installation is any measure. Two models are offered: the D-COP I, capable of handling up to 16 asynchronous tty-compatible lines with single message queuing, and D-COP II, capable of handling a mix of both asynchronous tty-compatible lines and synchronous polled lines. Line speeds go up to 1200, with higher speeds offered as "projects." A minimum configuration consists of 4K of memory and supports a single line. It's priced at \$15K. An eight-line set-up runs \$22K. DATAMETRICS, INC., Boulder, Colo.

FOR DATA CIRCLE 275 ON READER CARD

Programmable Intelligent Calculator Terminal?

When equipped with bisynchronous communication interface, there do not seem to be many functions that the Hewlett-Packard large-scale calculator cannot perform. Two new BASIC statements contained in an optional ROM mean that in addition to the 9830's capacity for performing BASIC programmed calculator chores, anything it can't handle can be shipped over 110-9600 baud synchronous or



asynchronous lines to large-scale computers, with the output coming back to a cartridge disc unit the 9830 can be equipped with. Later, off-line, the information can be printed on the 9830's built-in printer. Final pricing for the

optional ROM interface hasn't been established, but will add approximately \$2-3K to the 9830's base price of \$5,975. Developments like this must make the minicomputer side of H-P wonder whose side the large-scale calculator group is on. HEWLETT-PACKARD, Loveland, Colo.

FOR DATA CIRCLE 276 ON READER CARD

Entrance Control

TWINGUARD is a closed-circuit tv camera system for use in controlling access to sensitive company areas such as computer installations. It consists of

one or more cameras mounted at entrance points that relay to a guard located at some distant control station a view of the person entering, and how he appears on his I.D. card. The guard then opens the area to the person by releasing an electric door lock supplied with the TWINGUARD system. The manufacturer is working on a nine-key arrangement that the person must enter to match a number encoded in the middle of the I.D. card—sort of a password arrangement.

Each stainless steel station monitor is priced at \$1100, with door lock, and console monitor bringing to approxi-



This is the electronic "key" that can be a photo ID badge. It can open a door...selectively, control your parking, automate your payroll, control off-hour elevators...and printout a record of who went where...and when.

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CIRCLE 94 ON READER CARD

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

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

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

Sound like a good deal? Well, it is. But what's even better is the system you'll be saving all that money on. In quality and performance it's the equal of anything on the market.

The Lockheed System III has an RPG II compiler in operation with over a year of proven reliability. And it's fully compatible with industry standard RPG II source level programs.

It has a keyboard/console, video display, line printer and disk memory storage. And it's easily

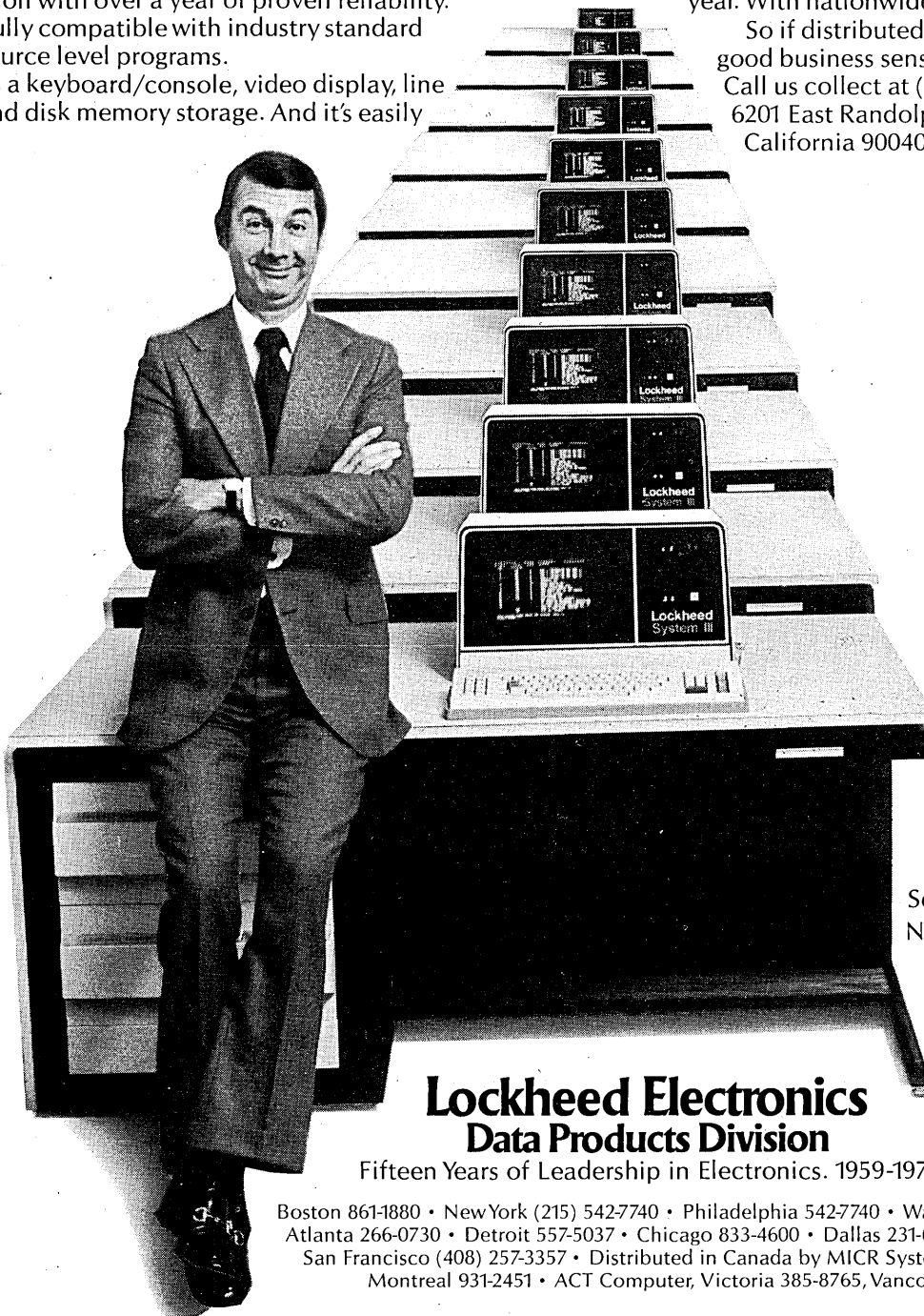
configured to your requirements, including 80 and 96 column cards, faster printers, plus expanded disk and core storage. You can have an auxiliary remote video terminal, too. So you get big-system performance at small-system cost.

With System III you also get supporting software systems to compile and run your RPG II programs. That includes a DOS, data and source edit and sort/merge, too. And all that's going to make your programming a lot easier.

And you're dealing with a company you can count on. We're the only minicomputer company that unconditionally warrants our software for a full year. With nationwide service, of course.

So if distributed computing makes good business sense to you, let's talk.

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hardware

mately \$2K the price of a single-entrance system. Numerous options can increase the price, such as outdoor hoods, heaters, fans, and a digital clock in the unit so that one can see what time a person entered the area, substituting for a time clock. VISUAL METHODS INC., Westwood, N.J.

FOR DATA CIRCLE 277 ON READER CARD

Minicomputer Storage

The series 2400 tape storage system offers minicomputer users an interesting alternative to more conventional on-line storage systems, such as discs and standard tape drives. If an installation wants to put a lot of data on-line and can stand some degradation in access times and transfer rates compared to an expensive disc unit, the 2400 seems a very good competitor to floppy disc subsystems. The 2400 uses the 3M sealed data cartridges, each with a storage capacity of 2.5 megabits. From one to eight of these can be driven by the controller, providing a total storage capacity upwards of 20 megabits. The average access time is 20 seconds to any piece of data, and

the transfer rate is 48 kilobits/second. The 2400 performs all standard half-inch tape drive commands, and is set up for eight-bit byte reading by the interface. The DEC PDP-11 is the first system that can take the 2400, with other mini interfaces in the works. A dual-drive configuration for the PDP is \$4,140; four drives for \$5,735. Delivery can be as long as 120 days ARO if you have special requirements. QANTEX, Plainview, N.Y.

FOR DATA CIRCLE 278 ON READER CARD

370/145s to Two Megabytes

Remember when "big" 360/65s could have as much as a megabyte of core on them? Now IBM has doubled the storage capacity on a system everyone considers a medium-scale system, the 370/145. Two additional memory chunks are offered to support the 145's hot cpu—and perhaps do a more efficient job of supporting virtual memory environments. The 1K bits-per-chip bipolar technology memory is compact enough to stick within the cpu, and both the 512K and 1 megabyte sizes can have an optional integrated storage control to provide direct attachment of 3330 and 3340 series disc subsystems. If your installation is up to the 1

megabyte limit on the 145, you'll have to shell out an additional \$5,420/month for 512K bytes, or \$10,380 for the full megabyte, plus \$350/month for the new power supply required. First customer shipments and field upgrades are due to commence before the end of September. IBM CORP., White Plains, N.Y.

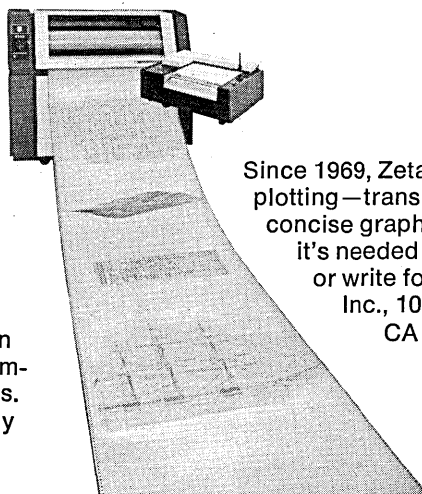
FOR DATA CIRCLE 279 ON READER CARD

Double-density 3330

It hasn't been that long since CalComp introduced a 3330 alternative, and now they've already solved the problem of how to attach an additional eight spindles to it (total of 16) with either single or dual-density storage capacities (100 megabytes per pack and 200 megabytes per pack, respectively). A 1035 so equipped now offers a maximum capacity of 3.2 billion bytes—16 bytes for everybody in the U.S. The transfer rate of 806 kilobytes per second remains unchanged.

A dual access capability allows two independent data paths from two controllers to a shared string of up to sixteen spindles; two-channel and four-channel switching is also possible. Additional features include format write release, which frees the controller during erase operations of format write

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Versatility — 12 and 36 inch models using standard 10, 14.8, 15 and 30 cps terminals.

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CIRCLE 99 ON READER CARD

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FIL is the fill-in-the-blanks language for field editing that's as easy to code as RPG. It

augments existing screen formats—including the ones generated by CICS and IMS.

As a result, you can perform operations like capacity control, range checking, check digit verification, cursor control, arithmetics and many more. Before the data is sent to the CPU.

FIL stands for more productive operators.

You don't need an interpreter to tell you the value of this new language. Catching errors instantaneously not only makes better use of operator time, but communications line time, too.

In fact, many companies find this increased line efficiency lets them install more terminals per line.

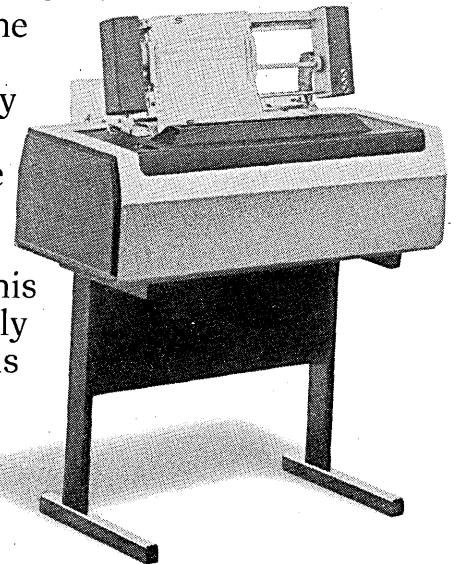
And, of course, you benefit by reducing CPU time wasted checking errors.

Our '3270' costs less. Not only is our Sycor 250 completely 3270 compatible, it costs less. And it's available with a wide range of peripherals—printers, a badge reader and light pen.

The Sycor 250 is part of a family of intelligent terminals that's made us the recognized leader in the industry.

To find out more about the Sycor 250 and FIL, contact your nearby Sycor representative.

When it comes to on-line display stations, he speaks your language.



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Announcing "take-along" computer power.



That's right, now you can have access to your central computer wherever you go. You can be on-line from the plant across the street or from a hotel room across the country. Weighing just 30 lbs., the portable NCR 260 KSR Thermal Printer Terminal is as easy to transport as your attache case.

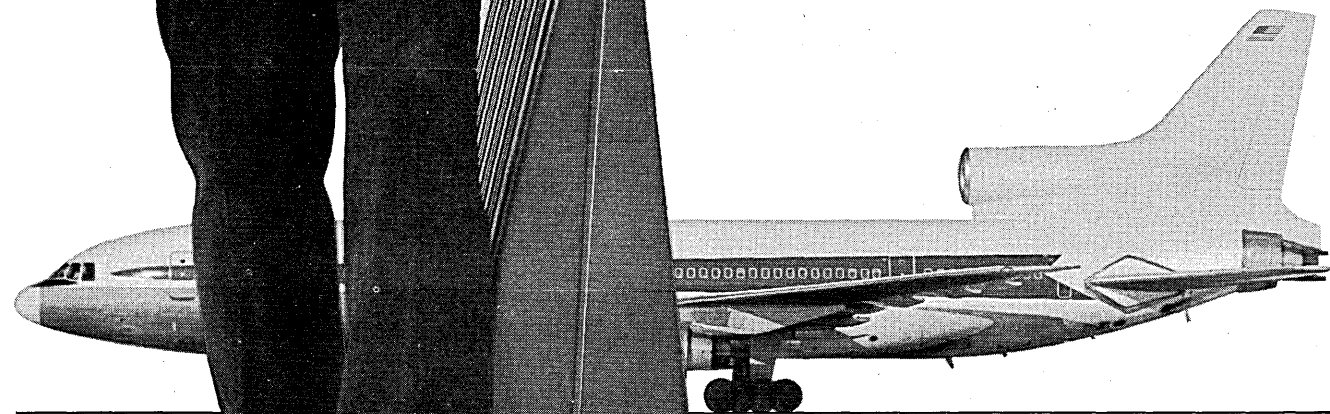
Besides portability, the NCR 260 KSR Thermal Printer provides all the functions required to send and receive numeric and alphanumeric data. Included is an integrated modem with an acoustic coupler, a thermal printer, and an alphanumeric keyboard with an imbedded numeric pad. And even the cabinet is functional. It opens and becomes a nesting place for the terminal.

Equipped with a 30-character per second printing rate and non-impact printing mechanism, the NCR 260 KSR is the quicker, quieter way to transmit and receive data.

Portability remains the key, though. This advantage provides you with much more efficient use of computer time. And increased efficiency adds up to a better return on your computer dollar.

As with all NCR products, the NCR 260 KSR thermal printer is backed by the entire network of NCR support systems. With more than 7000 field engineers in more than 480 field offices, you are assured of fast, complete service when needed.

The portable NCR 260 KSR is a terminal you'll want to know more about. To get additional information just contact your local NCR representative. Or write to NCR, Dayton, Ohio 45479.



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Complete Computer Systems

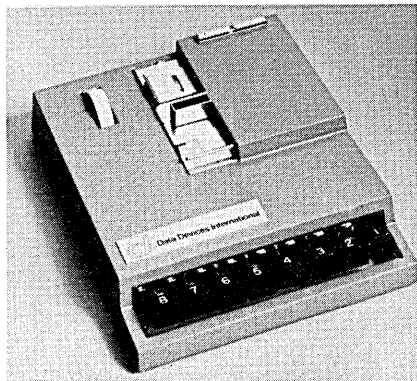
hardware

commands; rotational position sensing; multiple requesting; error checking and retry; and micro program load operations. The 1035 controller is priced at \$45, with each two spindle disc drive (400 megabytes) priced at \$45K. Rental, lease plans, and seven day maintenance contracts are also available. CALIFORNIA COMPUTER PRODUCTS, INC., Anaheim, Calif.

FOR DATA CIRCLE 280 ON READER CARD

Paper Tape Punch

The model 58 is to paper and mylar tape what the IBM 010 was to punched cards: an inexpensive way to make low volume generations or correct errors. The 58 has a keyboard-style punch mechanism said to eliminate incorrect



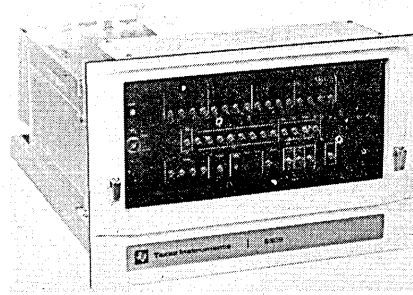
channel punching errors. The 58 even has something going for it the 010 didn't have—it's completely manual and doesn't require electricity. It's priced at \$249. DATA DEVICES INTERNATIONAL, INC., Woodland Hills, Calif.

FOR DATA CIRCLE 281 ON READER CARD

Minicomputer

TI's own 4K bit-per-chip MOS technology is the basis of a new minicomputer called the 980B intended for high performance, general-purpose applications. Up to 64K 16-bit words of 750 nsec memory can be ordered with the 980B, and all of it fits within the main chassis enclosure. Two interesting features on the new mini are built-in single-bit error correction and multi-bit error detection capabilities, along with fault isolation indicator lights for instant identification of memory components. These may be a first in the mini industry, and should certainly help sell the machine into high duty cycle applications.

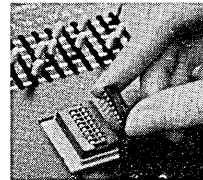
For \$4,975, a user gets a rack-mountable chassis; 8K words of memory; programmable memory protection and privileged instructions; hardware multiply and divide; double precision



instructions for load, store, add, and subtract; hardware memory address

biasing; ROM bootstrap loader; i/o bus with four ports (expandable to 13 ports in basic chassis and 256 overall; a DMA channel expandable to eight ports; and eight directly addressable hardware registers, plus a status register. Other standard features include 98 basic instructions (16, 32, or 48 bits), bit/word/byte-string data addressing, four hardware priority interrupt levels, and power fail/interrupt/auto restart. About the only thing missing from the line-up is decimal arithmetic which would better qualify the 980B for small

No GO-NO-GO IC checker is so low

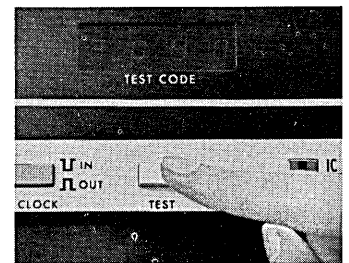


Searching through your circuitry for bad digital ICs is a waste of time and money. ESI's new Functional Tester quickly identifies bad ICs before they are wired in. It takes less time so it costs less dollars. (And the 1248 sells for under \$600!)

Fast and easy, any assembly worker can obtain a GO NO-GO analysis on 10 or more units per minute. Simply insert the IC—TTL, DTL,

CMOS—in the test socket, push the TEST button and check the digital readout for the proper test code. No comparison with a "good" IC is necessary and changeover from one device type to another takes less than a minute.

Send for our demonstration brochure on this unique IC Functional Tester, or call Stan Gressel at the factory.



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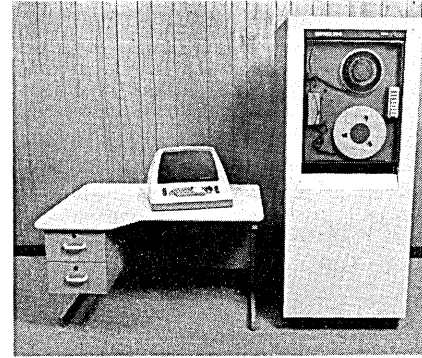
business applications. TEXAS INSTRUMENTS INC., Houston, Texas.
FOR DATA CIRCLE 282 ON READER CARD

Key-to-disc System

If this product were being introduced by a Detroit car manufacturer, it would be called a "mid-size" as it combines the large "engine" of the manu-

facturer's larger 480 system with the small-screen (360 character) DATA/SCOPE crt stations used on their small 280 system. The result is a low-cost way to offer a system for users who need from eight to 22 key stations, the system maximum.

The controller is expandable up to 48K bytes of core storage, and a number of supporting peripherals are available for it, including an additional 2.4 megabyte disc (to the standard one), 1600 bpi magnetic tape, a card reader,



on-line printer, and data communications features. The system is software compatible with the other two family members, and operates under the same control logic that has been in the field four years on the 480 system. Entrex has a good idea with its HELP! key which summons instant guidance on keying procedures for harried operators. Typical 15-station systems rent for under \$1,500/month on three-year leases. ENTREX, INC., Burlington, Mass.
FOR DATA CIRCLE 283 ON READER CARD

Engineers

PROCESS CONTROL OPPORTUNITIES

Energy conservation, resource management, pollution control and environmental protection are not just ecological buzz words. At Control Data's AUTOCON Industries Subsidiary. They are down-to-earth applications harnessing the speed and power of modern electronics technology to help solve these problems. Our continuing growth in the Electric Utility and Waste-Water Treatment Industries has created current openings and career opportunities for:

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Business oriented positions for senior technical personnel who have managed a hardware and software team in successfully completing a project in terms of quality timeliness and cost. Candidates would have degreed technical experience with 5-10 years experience in computerized Electric Utility Control systems, Waste-Water Treatment systems or related real-time process control applications.

SALES ENGINEERS

Markets include the Electric Utility Industry, Waste-Water Treatment Industry or Oil Pipeline Industry. Positions involve direct sales and application support for both computer and non-computer based process control systems and instrumentation. Technical skill and specific applications knowledge or sales experience required.

Control Data offers competitive salaries, comprehensive benefits and outstanding career opportunities. The Minneapolis area has excellent schools, many cultural opportunities, major league sports, easy access to year-round recreational areas and a "Quality of Life" truly appreciated by families and individuals familiar with this area.

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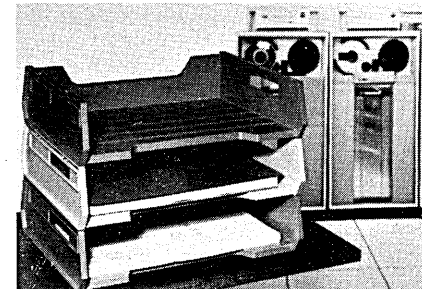
Tape Cartridges

3M has developed a self-threading tape cartridge compatible with 10½-inch tape reels of IBM 2420 and 3420 tape drives. The principal advantages of the model C-143 are its slim-line design, permitting tapes to be stored in a smaller area, and a small hook built into it making it possible to suspend the tapes on a rack for storage. For installations presently converting to self-threading cartridges, the C-143 is priced at \$3.50/each in lots of 20. The cartridge is also available with an assortment of tape grades included. 3M, St. Paul, Minn.

FOR DATA CIRCLE 284 ON READER CARD

Printout Trays

No more folding of thick printouts to get them to fit into hoppers designed for 8½ x 11 paper when you use the Jumbo Stak-ette tray. The trays are useable from both the front or back,



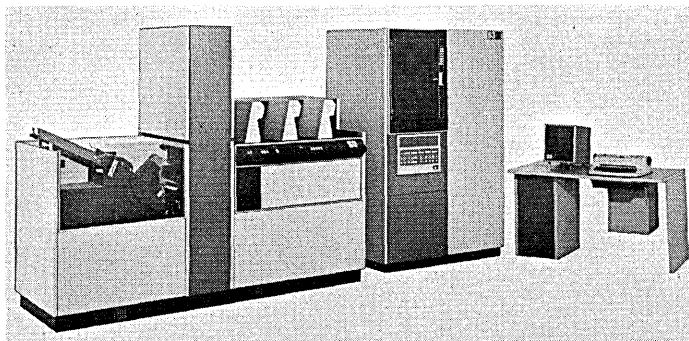
and can be snapped together for holding all your aborted runs. The high-grade polypropylene Stak-ettes are available in six colors and are priced at \$5 each. WALTER'S, Waseca, Minn.

FOR DATA CIRCLE 285 ON READER CARD

Is your mind on making turnaround billing more PROFITable?



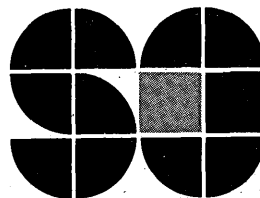
Meet the mind reader: SCAN-OPTICS SYSTEM 410!



Profitable turnaround billing operations are what the System 410 was designed to deliver.

Off-line operation puts it a whole generation ahead of competition in computer time scheduling and precious dollar savings. It also minimizes input errors, spots faulty documents in a flash (rescanning or rejecting as needed) and does it all at astonishingly low cost.

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hardware

Source Data Recording

What may initially appear to be another powerful pocket calculator is even better. It's a completely self-con-



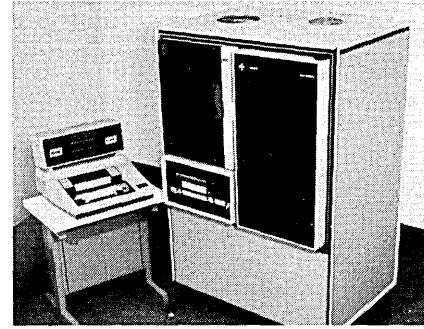
tained portable data recorder, including keyboard, display, memory, and battery pack, weighing in at three pounds. Two models are available. The Infopac I has a capacity of 4,000, with

unit records made up of eight characters, plus up to three digits of record identification. The Infopac II runs from 4,000 to 32,000 characters, and unit records are 32 characters in length plus record identification. The Infopac II features the ability to receive as well as send data, permitting it to be loaded with information transmitted from a remote computer. Individual records can be divided into fields to meet user application requirements. Depending on options, prices for the Infopac I start at approximately \$1,500, and Infopac II at about \$3K. AZUR DATA CORP., Richland, Wash.

FOR DATA CIRCLE 274 ON READER CARD

Scientific/Graphic COM

The 800L is a programmable, high-resolution COM system for converting computer-generated data to graphics and alphanumeric images on 35mm and 16mm roll film, with 105mm microfiche optionally available. No newcomer to the field, Gould has made improvements in the optics of the system, and equipped it with a 14-bit vector processor, a forms light source and forms alignment viewer, and a new input terminal. The vector generator has direct access to the 800L's mini-



computer memory, helping to attain an impressive rate of 12,000 vectors per minute with an addressability of 16K x 16K points. System resolution is 80-line pairs per millimeter over an entire 1.4 x 1.1-inch film format.

A dual-cassette input terminal has been added to the system to accept program patches and job set-up parameters. With the terminal's search capability, an operator can recall any job parameter set for input to the computer. The operator can also obtain hard copy printouts of frame, fiche, tape, and file counts, as well as systems conditions. Basic prices for the 800L start at \$130K, with initial deliveries slated for next month. GOULD INC., DATA SYSTEMS DIV., Newton, Mass.

FOR DATA CIRCLE 287 ON READER CARD

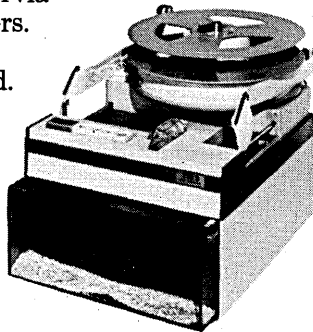
Versatile tape punch for OEM's

Designed for the OEM market, this low speed parallel input punch operates synchronously or asynchronously at up to 46 ch.p.s. Handles 5, 6, 7 and 8 level tapes and edge punched cards up to 7 1/2 inches wide. Tape transport is by sprocket wheel. Punch pins are motor driven via

solenoid operated interposers. Tape taut/tape out sensors and back space are standard.

Available as an OEM mechanism, or as a desk mounted or free standing unit with full tape handling as an optional feature.

For further information please contact the Marketing Director.



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CIRCLE 81 ON READER CARD

Save time...money...trouble...

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Model 33ASR (with tape perforator and reader) **\$55 per month.**

Model 33KSR (send/receive) **\$40 per month.**

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CIRCLE 92 ON READER CARD

"If your terminal malfunctioned, which support system would you want to fix it?"

Z. V. Zakarian, president



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Terminals our only business. Largest organization totally devoted to terminal support. Nationwide service locations.

Centralized service:

One toll-free call for service anywhere in the U.S.A.

Immediate response.

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Immediate assistance. Almost 30% of calls don't involve terminals. Many solved over the phone.

Preliminary diagnostics. Serviceman knows problem, brings what he needs.

Can monitor all terminals in a system.

Serviceman on-site supported by Termicare staff for terminal diagnostics and testing.

Follow-through: job stays open until finished. Status always available to you. Records stay on file.

Ordinary Terminal Maintenance

Terminals may compete with other products for service.

Decentralized service:

Must call area office, local office or franchised serviceman.

Could get answering service.

Major contact: one man in the field.

Usually no knowledge of your terminal history.

You have to wait until serviceman arrives.

Doesn't know what's wrong or needed until he gets there.

Knows what's happening at only one location.

Serviceman is usually on his own.

If you don't make follow-up calls, you could be forgotten.

Local Repair Services

If you're more than a one-location company, forget it.



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software & services

Updates

Will rising fuel costs and falling telecommunication rates make it possible for employees in some computer-oriented industries to work out of their homes—while at the same time providing a measure of relief to pollution and traffic congestion problems? According to a National Science Foundation study conducted at the Univ. of Southern California, the cross-over point where it becomes more economical to purchase a terminal and work out of the home rather than foot the costs of driving to work may already have been reached. As examples of telecommunications economy, the study pointed out that to send a million bits of information by telegram costs \$3,300, by airmail \$3.30, and by a leased 50 kilobit line, just 23¢.

Some facilities for generating structured COBOL programs have been added to the MetaCOBOL translator marketed by Applied Data Research. These include a module format that allows the programmer to identify and describe each module, define its data and working storage requirements in a concise and non-redundant form, and enter its procedures and conditional linkages. Four special macro statements with which structures and links between modules are created have also been added to the package.

Dataproducts Corp. is the latest firm to jump into the ribbon re-inking business, a market that has now attracted approximately 25 companies. Since Dataproducts refurbishes the ribbons on equipment used to manufacture new ribbons, it prefers to call the service "remanufactured" ribbons. One of the pioneers in the industry, Teda Corp., whose product was featured in May of last year (p. 191) has already placed more than 400 automatic re-inking units in the field. Paul Davis, one of Teda's founders before it was acquired by Burroughs, says the recent chemical plant explosion in Flixborough, England reduced the world's ribbon nylon capacity by one-seventh, and that European ribbon prices are skyrocketing. As a result, he claims companies are becoming increasingly interested in salvaging ribbons.

Cobol Pre-processing

The developers of the NSCOB COBOL language generator/pre-processor have used it to support their optical scanning service for some time, concluding that it has reduced coding efforts 60% on average, and sometimes as much as 90%. Three distinct facilities are provided by NSCOB: the ability to use abbreviations that allow the programmer to specify shortened coding of data names, editing pictures, literals, or full statements; a data division short-hand notation for rapid coding and uniform formatting; and a powerful macro language for generating COBOL source code from a macro call. Additional features of the macro language include conditional expansion based upon the occurrence of parameters or parameter

values coded in the macro call statement; positional and key-word parameters; local and global variables; and others.

For \$3,500, the user gets the complete package, including programmer and systems documentation, all programs necessary for maintaining the macro and abbreviation libraries, sample programs, and source decks and documentation for standard utility macros. Presently, NSCOB is set up for 360 and 370 systems running either OS or DOS and having 54K of available storage, but the firm is developing versions for other systems that should be available in the near future. NATIONAL SCANNING, INC., Columbus, Ohio
FOR DATA CIRCLE 251 ON READER CARD

software spotlight

Source Program Editing

The Sorcerer seems like a perfect name for this powerful source program librarian/editor package, as it contains some carefully honed features that set it apart from most similar packages introduced in the past. For reasons of security and efficiency, it makes more sense than ever before to store source libraries on-line rather than in card files—especially considering rapidly decreasing disc storage costs.

The Sorcerer provides users with powerful conventions for adding, deleting and replacement source statements in a choice of formats: separate free-format control statements followed by program cards, or more simply with numbers coded in the sequence field of the program cards themselves. No complicated or special JCL is necessary—or desired. From these basic functions the user can move statements from one place in the program to another, and perform copy and other forms of updating, all in a single pass.

Users facing conversions to a data base management system or new peripheral devices will appreciate The Sorcerer's ability to scan all or part of a program for particular data names,

keywords, or other character strings, and then, if desired, replace every occurrence with a different string. The replacement string may be of equal or unequal length; correct language format is preserved in either case. A nice feature of the package is that the designers have incorporated a limiter option to guard against the possibility of unforeseen "false matches" in string replacement operations. This way, a programmer who wanted to change a variable name from COUNT to CTR doesn't wind up modifying variables with COUNT imbedded in them (such as COUNTER to CTRER. The string replacement feature can be applied against selected portions of the entire program.

Sorcerer's output is not normally written back into the library, but rather onto a temporary file for a compiler. When another compilation is necessary the new changes are merged by the programmer with the old, and both new and old changes are applied by Sorcerer to the library version. Complete printout logs indicate all modifications made to the subject program.

Sorcerer runs in 14K under DOS, and less than 40K under OS/VS operating systems on IBM 360/370 computers. Including documentation and maintenance, the package can be purchased for \$4K, or rented for \$99/month. MARCUS POWELL ASSOCIATES, Pinole, Calif.

FOR DATA CIRCLE 250 ON READER CARD



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Project Control

The Singer System 10 market is getting large enough to attract some independent software house attention, as in the case of this project control system. PROCONS-1 is a project planning, management and control system developed for designers, planners, management, and supervisory personnel. It aids in exercising greater control over projects by accurately monitoring all functions, activities, resources, and costs. In effect, it allows its user to evaluate the "pros and cons" of a project before ever committing resources to its implementation.

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FOR DATA CIRCLE 252 ON READER CARD

Integrated Accounting

The key to this integrated accounting system is a nucleus called the Master Control System charged with maintaining a common data base for all the programs tied to it. These can include payroll, personnel, labor distribution, accounts payable and receivable, check reconciliation, basic general ledger, budgeting, cost allocation, and a fixed assets package. It's claimed that the independent packages work very well when sold separately, but when used with the MCS controller, efficient accounting processing really begins to happen on IBM systems (360/370) having at least 54K of storage, two tape drives, two disc drives, card reader, and printer. A report writer is available for producing reports which

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are not produced by the system, but are needed in the user's environment. It's claimed that all systems can be installed with a minimum of change to the user's existing input documents, and that needed changes, such as the addition or deletion of a department, are easily accomplished. MCS is priced at \$1K when used exclusively with the vendor's application programs, \$4K when used with a mixture of the vendor's and outside programs, and \$7,500 for use without the vendor's applications programs. The application programs are separately priced, ranging from \$1,250 for the special report writer, to \$12,500 for the accounts receivable module. INTERNATIONAL MANAGEMENT SYSTEMS CORP., Marina del Rey, Calif.

FOR DATA CIRCLE 253 ON READER CARD

VM/370 File Utility

The functional counterpart to IBM's DEBE file utility that operates under OS and DOS monitors is now available for operation under the Conversational Monitor System (CMS) of the VM/370 operating system. CMS DEBE provides the CMS user with the ability to manipulate files and obtain listings and/or hexadecimal dumps from tape, disc, and card source files. The program is invoked by typing DEBE while in the CMS command environment. DEBE then asks for the program identification and other appropriate information concerning the specified request. CMS DEBE is priced at \$1K. STANDARD DATA CORP., New York, N.Y.

FOR DATA CIRCLE 254 ON READER CARD

Real-time Monitor

DEC has come out with a scaled-down version of its RSX-11D real-time system for use on smaller PDP-11s (16K minimum). The new package, RSX-11M, is totally upward compatible with its predecessor, easing conversion considerations for users with applications in process control, data acquisition, communications, and computer/multi-terminal hookups.

Data communication subroutines permit both synchronous and asynchronous communication modes—the latter capable of full-duplex transmission. Data can be transmitted at line speed of 110 to 2,400 baud. A minimum configuration for RSX-11M consists of any PDP-11 processor, 16K of storage, real-time clock, 1.2 million-word DECpack disc system, automatic

bootstrap loader, another mass storage device (disc, cassette, or tape), and a hard copy I/O terminal such as a DECwriter or tty. The license price of RSX-11M is \$3K including user training, on-site installation, and field support. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 255 ON READER CARD

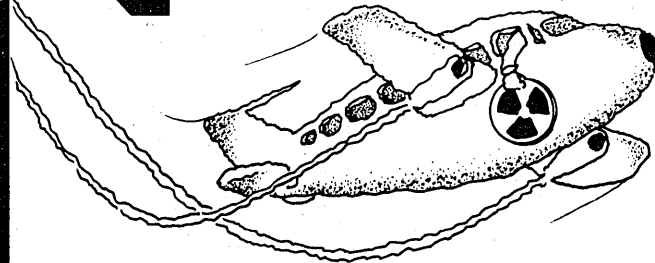
Performance Measurement

PROGLOOK consists of two programs, PROGTIME and PROGLOT, for accumulating statistics on user program performance and printing them in a form that can aid the programmer in optimizing the coding. Developed at

the Stanford Linear Accelerator Center, PROGLOOK is written in assembler and FORTRAN IV for use on IBM operating systems vs2 release 1.6 and both OS MVT and MFT. The software is designed to handle overlay structures and dynamic programming linkages, with the only constraint being that a task cannot attach more than 254 subtasks. The output is in the form of graphs showing where the program has spent its time (wait and run time, including the LOAD macro). The program number is COS-02251; the price, \$450; and the documentation, \$7. COSMIC, Athens, Ga.

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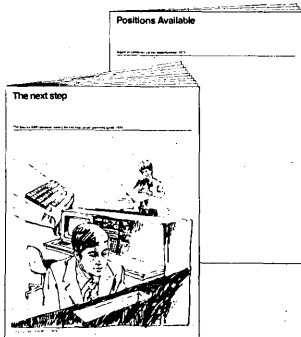
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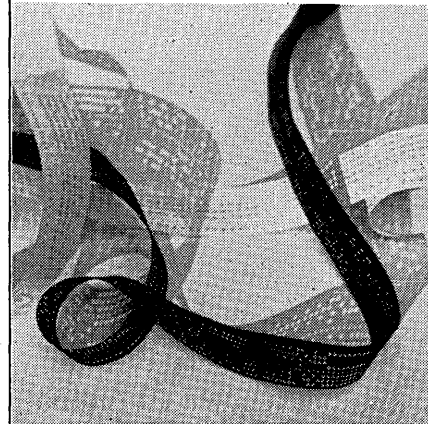
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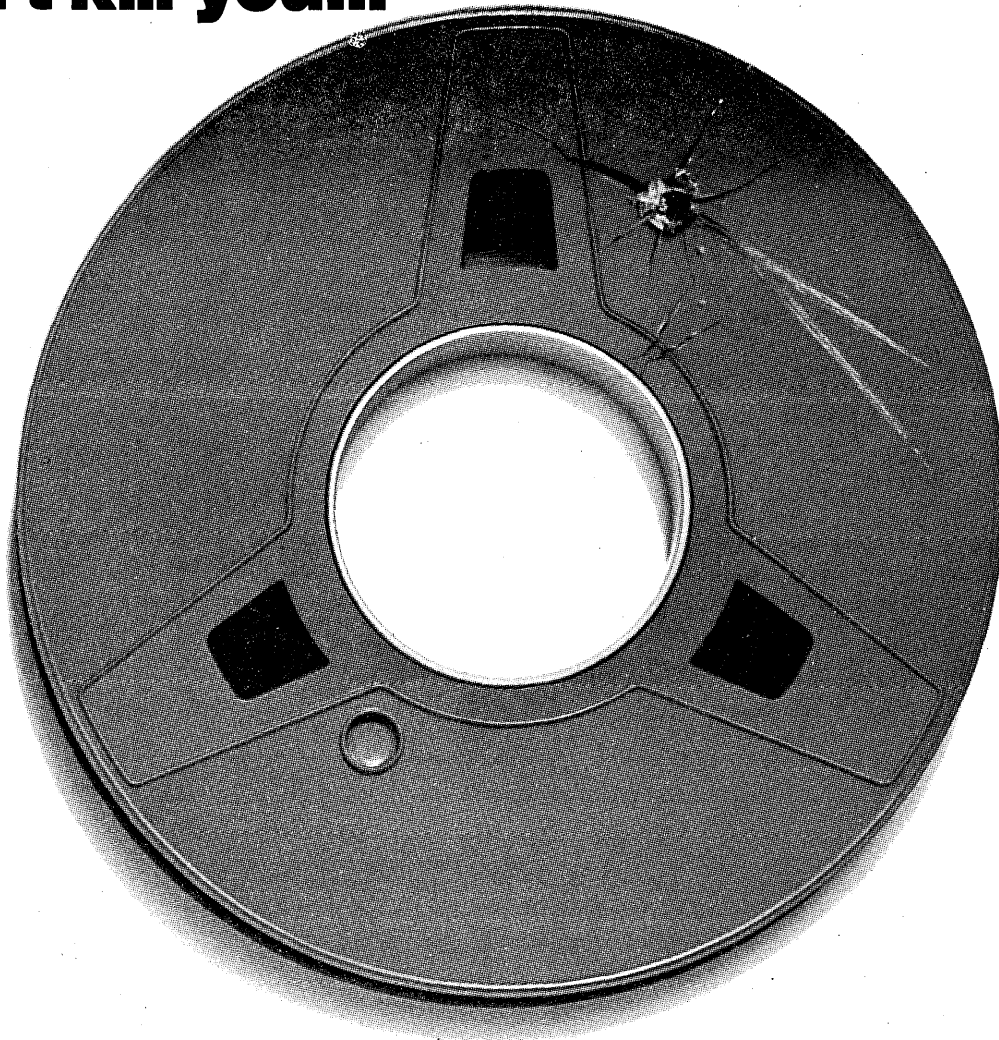


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the forum

CERTIFICATION OF PROFESSIONAL DATA PROCESSORS

To certify or not to certify . . . is that the question? I think not. As a rapidly developing industry of computer professionals, we may now reword this maxim into a question of, "How do we certify?"

If you present a cashier's check for payment of a financial obligation, you are, in effect, placing something of value with a third party for reference and safekeeping until such time as a request for payment is made by the party holding the original note. A cashier's check is an assurance to you both that funds are available for repayment.

A similar analogy may be made with a Certificate in Data Processing. The certificate, because of its intangible nature, only attests to the individual's attainment of minimum skills and tools of the trade. Certification as a professional data processor becomes a part, and *only* a part of a credentials package for that person. It should not be used as total identification of the individual's ability, but simply as a key to his potential. Relating to our cashier check example, attainment of the Certificate in Data Processing establishes the professional link or minimum assurance between employer and employee. Once that link has been made, it is obviously up to the individual himself to substantiate the assertions of the certification through direct performance on the job.

An article appearing in the November, 1973 edition of DATAMATION (p. 97) discussed and proposed an approach to establishing a certification program for data processing professionals. The article was authored jointly by Robert N. Reinstedt and Raymond M. Berger and was entitled, "Certification: A Suggested Approach to Acceptance." Prior to reading the article, I had formulated my own thoughts regarding certification and arrived at my own version of what I considered to be a "Certified Data Processor." As elementary and naive as these thoughts may have been, they have not been altered drastically as a result of the suggestions of Mr. Reinstedt and Mr. Berger. In fact, reading their article many times over has convinced me of what certification should *not* be!

The ideas imparted in their article leave one with an impression that to certify a dp professional, job standards must be designed and written which collect *all* programmers under one standard, *all* systems analysts under one standard, *all* systems software technicians under one standard, etc. The authors do not seem to take into account the individual

differences of the various data processing technologies. By this, I mean that the medical profession certainly would standardize itself differently with regards to data processing then, say, the airline industry or the banking profession.

As a practicing dp technician in the banking profession, I adhere to and produce programmed results based on standards specifically designed for the banking profession. If I changed occupations, say to wholesale food distribution, yet remained in data processing, I would expect a few basic standards to be the same as in the banking industry. The basic standards to which I refer are such things as "Code and debug program changes and corrections" or "Instruct operators and users in running a program." However, for the most part I would expect a new set of job standards by which to govern my performance.

I do not quarrel with the establishment of job standards for the dp industry as suggested by the authors. However, to suggest that all programming philosophies are so mundane that they may be collected under one standards umbrella borders on absurdity.

From the generalized job standard as proposed by Messrs. Reinstedt and Berger, a meaningful examination supposedly could be created which would be "valid for operational purposes." Impossible I say, based on their presentation. The resultant job standards such as they propose would become so general and meaningless that desired exam questions would be even less appropriate than some questions on the current CDP examination. Results of such an examination would do no more toward specifying what a certificate holder should do than having him spell the word "computer" and then certifying him to perform as a data processing professional.

(Continued on page 150)

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the forum

While having its drawbacks, the existing CDP examination is a much needed preliminary yardstick for our profession. Messrs. Reinstedt and Berger suggest that the present CDP examination may be doing more harm than good. I certainly take issue with that belief. After much thought, I have expanded my own ideas into what could be the genesis of a meaningful certification program.

The current CDP examination should serve only as a base upon which to build higher and more meaningful plateaus. In its current form, it is general in nature. However, any set of 300 questions over five subjects will necessarily be general by design. But consider, if you will, the Admission Test for Graduate Study in Business (ATGSB) and the Law School Admission Test (LSAT). Are these not also general in nature? Neither of these examinations guarantee success in a graduate environment of business or law. They only serve to indicate a potential or attest to the attainment of a minimum set of standards. And even though they are general in nature, they are widely accepted by our educational system as a preliminary screen for graduate school candidates.

I envision certification through the ICCP (Institute for Certification of Computer Professionals) as a multi-step exercise to be undertaken by an individual after carefully considering his or her own career development path. Questions which the professional should answer for himself would be:

1. Do I plan to enter the scientific or commercial data processing areas?
2. Do I plan to pursue a career of management or one of a technical orientation?

Basic certification of a data processing professional should ideally occur after the individual has a minimum of five years in the field.

The proposed basic certification examination would be similar to the one given now, in that it would be comprised of five sections. Each section would contain 75-100 questions, rather than 60, as the current exam contains.

Whereas the examination now is given only once a year, in February, I see it as being given five times a year: in February, April, June, September and November. A candidate for the CDP would be able to sit for any section of the exam at any offering, with the restriction that he may only sit for only one or two sections at one time.

Spreading the sections out over the year removes the burden of "crash studying" for an exam which tests so many complex subjects. Cramming for the existing CDP exam yields no better CDP holders, nor does it benefit the employer to any appreciable degree.

The same testing criteria would still apply in that the candidate must successfully complete all five sections of the exam in order to be granted the Basic Certificate in Data Processing.

Depending upon professional workload, the candidate could, for example, study and sit for two sections of the exam in February. His work schedule might prevent him from sitting for the April exercise, but allow him to sit for the June session and/or subsequent sessions. Under this proposal, the potential candidate would have 1½ years from his first sitting to at least attempt the five sections of the exam. Should he not attempt to complete the five sections in the prescribed 1½ year period, then he would be required to start over and would not receive any credit for any sections he had previously passed. Total time allowed to pass the entire Basic CDP would still be limited to three years. These restrictions would prevent unnecessarily dragging out the basic certification process.

Under the expanded testing schedule, the CDP candidate

would have more meaningful time to devote to each section of the exam than under the current configuration. Each section of the examination could be more thoroughly and validly tested. I feel the result would be a more realistic testing program and one which would potentially yield a better quality dp professional.

I foresee the Basic CDP, as outlined above, being the minimum requirement to perform in the data processing industry after the five-year apprenticeship. Attainment of a Basic CDP would serve the data processing industry much as the Bar Examination certifies members of the legal profession to practice law.

Should the new CDP holder choose to pursue a management career, then his concern with a technical certification or endorsements are not a critical factor to his success. Because of the relative infancy of dp management certification, I do not intend to address that subject in this article. However, if the new CDP holder should pursue a technical path such as applications or systems software programming, then he should prepare for additional endorsements to the Basic CDP. For example, if a systems software technician were to desire certification from the ICCP, he would prepare and sit for the Systems Software Certification Examination which, upon successful completion, would be an endorsement to the Basic CDP. Prerequisites for taking this or any other endorsement are that the prospective candidate possess the Basic CDP, in addition to functioning for a minimum period in his chosen technical or programming capacity.

Other endorsements which might be available are: Applications Programming with specialties in PL/1, ALC, COBOL, etc., IMS Systems Design, TSO and Data Communications, Operations Research, Operations Control, etc.

The additional endorsements which are an integral part of this suggested certification program need not be written examinations in all instances. Just as progress in an advanced degree program is evaluated with such techniques as oral exams, essays, dissertations and theses, so might the advanced certification of data processing professionals be patterned.

For one example, testing a person's ability to design compilers might best be accomplished by allowing him to write the compiler, and then putting it to the tried-and-true test of actually using it.

For another example, an Operations Research or Management Science Analyst might best demonstrate his systems design abilities by designing and implementing a simulation model which would allow him to measure actual against predicted results.

While these examples may prove difficult to implement, they are workable and are given here to illustrate that certification of data processing professionals need not be restricted to written examinations. Let's place our stock in certification where it really counts . . . in actual performance.

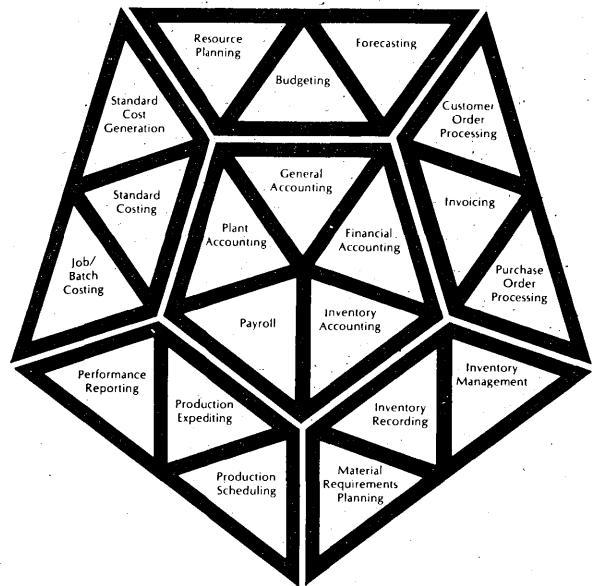
While the current certification program may be limited in scope, it is certainly not so bad that we should throw it out completely. I happen to think we've got a good thing going. I am also prepared to devote my time in behalf of its continued enhancements.

To the more than 14,000 CDP holders, I issue this challenge: you had enough pride in yourself once to take and pass the CDP; now get behind the ICCP with the same pride, for public support and recognition of the CDP.

—Martin A. Morris, Jr.

Mr. Morris is a senior programmer/analyst in the Information Management Services Div. of the First National Bank of Chicago, and a holder of the Certificate in Data Processing.

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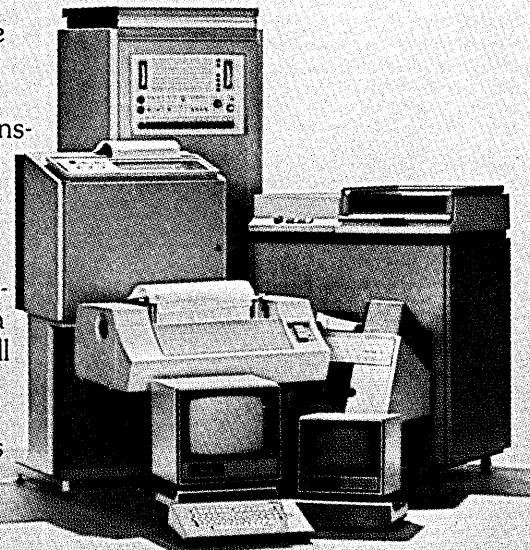
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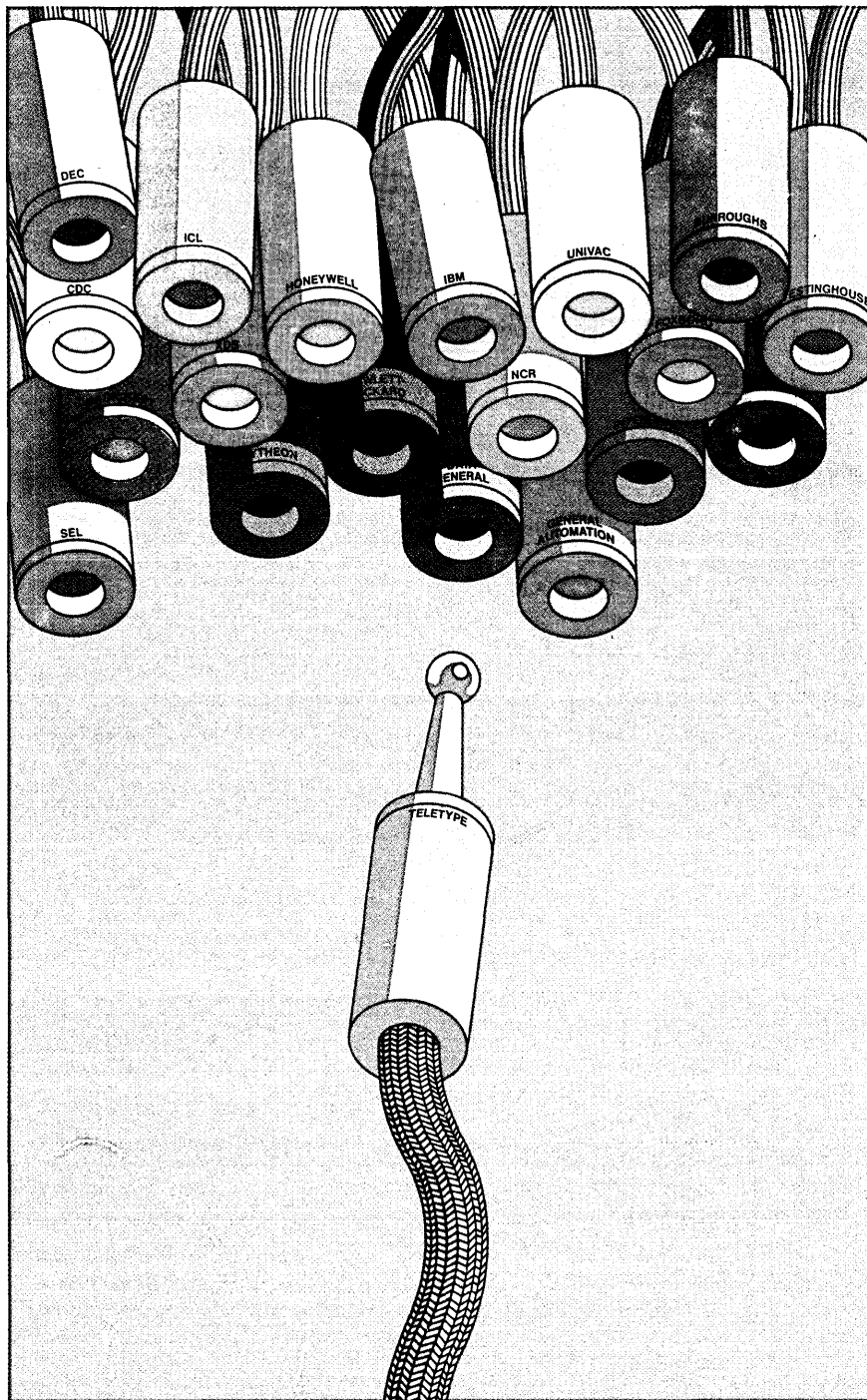


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